ARMOR

january-february 1970

UNITED STATES ARMY
THE CHIEF OF STAFF

TO THE MEMBERS OF ARMOR

On the occasion of the 193d anniversary of Armor, it is my pleasure to extend congratulations on behalf of the men and women of the Army.

The arm of mobility proudly carries the heroic traditions of the Cavalry, which reach back to the Revolution, and of Armor, with its spearheads of steel in more recent wars. Today, your record throughout the world is a notable addition to those traditions. In Vietnam, your accomplishments have culminated in the successful application of armor tactics and doctrine to the difficult terrain, again proving Armor's capability of adapting to the ever-changing conditions of modern warfare.

I have watched your progress with pride, and wish you every success as you continue your outstanding performance.

W. C. WESTMORELAND
General, United States Army
Chief of Staff

ARMOR

The Magazine of Mobile Warfare

Volume LXXIX | January-February 1970 | Number 1

ARTICLES

FEATURES

DEPARTMENTS

COVER

"ON THE ROAD TO TAY NINH" AN ORIGINAL PAINTING BY JOHN WHEAT, A VOLUNTEER CIVILIAN COMBAT ARTIST. A MEMBER OF THE O.S.S. DURING WORLD WAR II, MR. WHEAT HAS WON NUMEROUS MAJOR AWARDS AND HAS HAD HIS WORKS EXHIBITED IN THE LEADING GALLERIES OF THE UNITED STATES.

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LETTERS TO THE EDITOR

The Development of American Armor

Dear Sir:

The September-October issue is a fine one. As always, there is much interesting reading.

However, in the article "A Revised Mechanization Policy", there are two items requiring correction.

First — on page 48, reference is made to the 66th and 67th Infantry (Light Tanks). This is correct for the 66th Infantry. But, the 67th had been and was "(Medium Tanks)." It so remained until redesignated the 67th Armored Regiment (Medium Tank) on 15 July 1940 when that unit became part of the newly activated 2d Armored Division.

Second — the photograph caption at the top of page 47 refers to all three tanks as belonging to the 66th Infantry. In fact, only the M2A3 light tank belonged to the 66th. The other two were 67th Infantry tanks. The T4 was from Company F and the M2 from Company D. During the 1940 Louisiana maneuvers, Company D, 67th Infantry with 16 M2's was the only full medium tank company in the Army.

JAMES I. KING
BG, USA-Ret.

Killeen, Texas

The First Regiment of Dragoons

Dear Sir:

In the September-October "Tarpaulin" it was stated "2d Sqdn, 4th Cav, 4th Armd Div . . . was the first Army unit to complete the formal tank (sic) gunnery course for the M551 Sheridan. Setting a record for others to match, the squadron qualified 96.3 percent of its crews."

Not knowing the date of the firing, I must challenge the "first" claim. The 3d Squadron, 1st Cavalry, 1st Armored Division completed the M551/Shillelagh gunnery tables (as outlined in TC17-12, January 1969) and please, not *tank* gunnery, in April of this year.

Furthermore, the percentage of crew qualification for the 2/4 Cav reveals that one of their 27 crews was unqualified. All of the Blackhawk crews qualified and 26 of 27 were rated "expert." (This is in large measure the result of the low criteria of 78 percent to attain the highest crew rating. Ninety percent would be more realistic.)

Based on their performance, Blackhawk crews were selected to demonstrate their firing ability for the Chief of Staff, US Army on 20 June and for the Assistant Secretary of Defense on 24 June. One hundred percent hits were obtained, with both missiles and conventional ammunition, on very challenging targets.

The 3/1 Cav was rated #1 during the 1st Armored Division Army Training Tests and was a FY69 III Corps Superior Unit.

In any event, congratulations to the 2/4 Cav on their accomplishments. They may very well be the second best cavalry squadron in the Army.

THOMAS G. QUINN
LTC, Armor
Former Commander

3d Squadron, 1st Cavalry
1st Regiment of Dragoons
Fort Hood, Texas

Nor Lender Be

Dear Sir:

I am interested in obtaining some recent back issues of *ARMOR*. As usual, my losses were others' gains as copies loaned were ne'er returned.

I am looking forward to continued excellence in *ARMOR*.

ARMOR CAPTAIN

Pittsburgh, Pennsylvania

Continued excellence will be greatly facilitated, and your ARMOR *collection better preserved, if you will answer all requests for copy loans with an application blank (copies free on request-adv.).* THE EDITOR

Corrigendum

Dear Sir:

The September-October *ARMOR* was read with interest. However, on page 62, there is an unfortunate error. 1LT Paul C. Raver, not LTC William A. Adams as stated, was the commander of the 1st Battalion, 64th Armor who qualified 49 of 51 tanks. Lieutenant Raver assumed command upon the tragic death of LTC Donald C. Lundquist on 17 April 1969 and remained in command until I assumed command on 5 May.

ANDREW L. COOLEY, JR.
LTC, Armor
Commanding

1st Battalion, 64th Armor
3d Infantry Division
APO New York

Thank you for helping to set the record straight. LTC Adams was commander of the 2d Battalion, 64th Armor at the time. In his address to the 80th Annual Meeting of the Armor Association (Col 3, p 19, ARMOR *July-Aug 1969), General Polk paid deserved, although anonymous, tribute to Lieutenant Raver's outstanding performance.* THE EDITOR

Kudos

Dear Sir:

Your combat reports and articles on crew developments are highly interesting and make your exceptional magazine the best in the armor world.

E. WESTERHUIS
Platoon Sergeant
Royal Netherlands Army

41 Tank Battalion
Holine Camp, Germany

Such compliments from true professionals inspire the ARMOR *staff to do their best through thick and thin. That there be no misunderstanding, we staffers want to pass along a full share of credit to the* ARMOR *contributors who give of their knowledge and talent without any monetary reward.* THE EDITOR

Another Prodigal Son

Dear Sir:

I have always been in the enviable position of having *ARMOR* magazine available — either the unit fund copy or that of a friend. Now I'll have my own, thanks to your successful solicitation. Inclosed is my check for $12.00 for a two-year membership.

My best wishes for continued success of *ARMOR* magazine and the Association.

ARMOR CAPTAIN

Presidio of San Francisco

Your best wishes are surely welcome and needed. But, that $12.00 check impresses us as boding an even more solid future for your, we should say our, branch association and journal. THE EDITOR

Dear Sir:

I recall that in the article "Improved Organization and Equipment For Vietnam" by Major General A. L. West, Jr. and Col. D. A. Starry (*ARMOR*, May-June 1968) it was stated that the *M1* cupola mounted on our *M48* series tanks was found to be difficult to operate and that replacement with the *M19* type cupola was in order. While on six month's active at Fort Knox, (being trained as a turret mechanic) and later at my National Guard Armor Unit, I became thoroughly convinced of the immense difficulty of this *M1* mount.

While basically a sound idea, it seems that the design of the *M1* cupola defeats itself because of the inherent constricted space problem. The Browning *M2* cal. 50 never seems to have been designed to be mounted on its left side; ammo feed problems invariably result in frequent jamming. Space is at such a premium that only 50 rounds are available at one loading. The long receiver of the Cal. 50 *M2* projects back deep into the cupola, habitually in the way; the gun itself and the ejection chutes are extremely hard to mount in the cupola. In all, the headaches involved in properly readying this mount for operation seem to make it not worth the trouble.

The *M19* cupola found on the *M60* and *M60A1* series is a much better design. The *M85* cal. 50 allows easier mounting of components and in increased ready round capacity of 200 rounds. This is much more realistic. I always thought that the old *M1* mount suffered from a vision problem. The *M19* cupola corrects this with the addition of three more vision blocks (a total of eight) with the standard monocular, or as an alternate, a binocular periscope sight mounting with a nightscope for infrared operation. Ballistic protection of the *M19* is greater also.

The enclosed machinegun cupola has, since the *M48* tank series began, been the trend for US tanks. However, I believe that the tank commander's machinegun is not warranted. The TC has enough to do with observing, commanding, communicating, designating targets, and fighting his vehicle to be responsible for firing a machinegun. One of the best designed TC cupolas, I think, is found on the West German *Leopard* (a flat cupola with a ring of periscopes, and a pivoting, horizontally opening hatch). This cupola affords both excellent observation and great protection. I think US armor should go back to this type of cupola. If a larger machinegun such as a 50 caliber is desired, than let it be mounted co-axially with the main gun (even additionally to a 7.62) where it will be more effective.

As things are, I believe that, if practicable, the *M19* cupola should be mounted on the existing M48 series. This will be a substantial improvement. As an Armor buff and armored vehicle modeler, I am greatly interested in knowing whether this conversion has or will take place, and I would welcome hearing from anyone who has information on this or who has any views on this cupola subject.

WILLIAM J. TOTH
Private First Class N. J. ARNG

264 Easton Avenue
New Brunswick, N. J. 08901

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Page 1

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(Signature of editor, publisher, business manager or owner) L. A. Johnson
R.A. Johnson,2LT,Armor,Managing Editor

PS Form 3526 Aug 1967

OF HONEST MEN AND HONEST JOURNALS

These thoughts will be of no interest whatsoever to those seeking comfort in turbulent times, to those hoping for reinforcement of their foregone conclusions nor to those wanting precise answers to defined problems.

Recently we have been privileged to attend several gatherings of Army people at Fort Knox, West Point and here in Washington. The ages, ranks, backgrounds, career status, and even nationalities of those with whom we had thoughtful discussions were widely varied.

Two seemingly unrelated threads ran through the discourse. First, concern about the atypical behaviour of a few American men-at-arms who by their actions had brought a bit of tarnish to the shields of all. And second, how ARMOR "gets away with" its divergent views on, and open discussion of, professional matters. Statements and questions on the latter were frequently accompanied by comments or queries in quest of the "party line", "position" or "philosophy" of ARMOR.

First impulses being what they are, we were often tempted to answer that ARMOR is governed by no such dicta. But, after reflection, we cited the Constitution of our Armor Association which for 81-plus years has published a journal to disseminate knowledge, to promote professional improvement and to preserve and foster the traditions of the mounted arm.

Within the month, the Chief of Staff has addressed the officers of our Army pointing out that professional "competence and integrity are not separable." He stated that "In this uncertain world our best judgments may prove wrong. But there is only one sure path to honor -- unfaltering honesty and sincerity in word and deed."

A journal records deeds, and probably even more important, it puts forth words which are the communication symbols of mens' thoughts. In a truly professional journal, this is done not to propagandize nor to grind someone's (or some group's) axe but to stimulate honest and sincere thought leading to forthright discussion which will indeed result in professional improvement.

As one checks definitions of integrity in the leading dictionaries, one finds honesty used frequently. And definitions of both allude to freedom from deceit or fraud and, more positively, to candor, frankness and straightforwardness.

Come to think about it, it appears that we, as professional soldiers, and ARMOR, as a professional journal, have a common philosophy. This can probably be defined as integrity with decorum. Fundamental is agreement on shared basic principles. But equally essential is the right to disagree about how, or with what tools, these may best be achieved.

As always, the articles in this issue of ARMOR have been cleared in accordance with regulations. Additionally, some have been reviewed by other than author, clearing agency and editor. About many, there is already disagreement ranging from mild to heated. But no person or group has decreed that any article should not be printed. Thus, as we would ever have it, final judgments on all are left to you who support this professional endeavor.

As we enter a new year, and a new decade, armor, Armor and ARMOR face some even now very real, and many unknown, challenges. Hopefully these will be the more interesting and stimulating because we, as rational men of integrity, have in our professional journal a means to exchange our sincere views frankly and openly.

Properly used, and fully, ARMOR should help to build both the character and the competence of us all.

The Editor

The Royal Armoured Corps Tank Museum

by COLONEL P. H. HORDERN

Bovington Camp, site of the British armor museums, has been the home of the armored fighting vehicle in the United Kingdom since the establishment there in 1916 of the Headquarters, Heavy Section Machine Gun Corps. The Section became the Tank Corps in 1917, the Royal Tank Corps in 1923, and the Royal Tank Regiment in 1939. Here the original techniques of driving, maintenance, and tactical handling were translated into instruction, with gunnery six miles away near Lulworth Cove. Fifty-three years later, Bovington and Lulworth still serve the same purpose. Since 1939, they have served for all the regiments of the Royal Armoured Corps, formed in that year to include all the then mechanized units.

Shortly after the end of the Great War, large numbers of the 2600 operational, training and experimental British tanks built in that war accumulated on Bovington Heath. Most of them were gradually broken up and removed. But 26 selected machines were collected inside a wooden fence. Stimulated by the late Rudyard Kipling's remarks (during a visit he made to Bovington in 1923) on the lack of preservation for these historic machines, a handful of enthusiasts moved them to an open-sided shed in part of the Driving & Maintenance School. Thus began the Royal Tank Corps Museum, open for the education of the Corps and of selected service visitors.

The Museum gradually attracted the beginnings of a library, some show-case material, and such fresh AFVs as had served their experimental purpose. By 1939 there were about 40 major exhibits, with some engines and some examples of tank armament. The Royal Armoured Corps Museum originates from this date, with the Royal Tank Regiment Museum continuing to flourish in parallel with it.

Sad to relate, the scrap metal drive of 1940 led to the breaking up of many faithful friends, including the first of them all, "Mother." She was not then the *Male Mark I* prototype she had originally been, but a mere gutless hull on which trials of the Daimler petrol-electric drive had been done in 1918. With her went the last of the other Great War experimental machines, now recorded only on paper. Away too, went the *Mark VII*, the *Mediums B, C,* and *D;* and the *Martel* 1- and 2-man tanks. But not all of the exhibits were lost in this way. At least two were carefully and surreptitiously removed for hiding in

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nearby forestry land, from which they were retrieved later. Others rose to the demands of the very real danger of invasion of those days, and left for active service. One of the *Mark Vs*, the "Independent", a Vickers medium—still in service then—and some light tanks guarded the approaches to Bovington and the coast east of Lulworth Cove. Even "Little Willie" went to be a static machinegun post at a Glouchestershire airfield. The Museum was perforce suspended for the duration.

By 1947, it was once more established, and opened to the public for the first time. Today, 22 years later, its hangar is too small and the exhibits too close together. But we are extremely fortunate to have a building which houses 102 AFVs, even if the other 31 do have to stand outside. Our coverage of the years is reasonably comprehensive, but there are important gaps. Although we may envy the Queensland Museum in Australia for their possession of the only remaining German *A7V* in existence, it is encouraging to know how valued it is there. We shall never see again the unique machines broken up during World War II. We lack some of the early light tanks and tankettes of the 20s, and the experimental mediums of the 30s. Over the 24 years since 1945, the Museum can only show something over a quarter of the principal tracked and wheeled AFVs built by the tank-producing nations. It is fortunate for the student of armor that Aberdeen's exhibits are generally complementary to those at Bovington, the limited range of duplications being outweighed by some unique examples in each. So much for the background.

A great deal can be learned from a thoughtful tour

RAC

of the Museum. "Little Willie" and seven, shortly to be eight, marks of Great War tanks are there. One is astonished at the vast achievements of that period. For 1919, they planned a monthly production of 400 *Mark VIII*s, among others. Despite its 42 tons and advanced layout for those days, its thin skin in the face of the German antitank measures taken by the time of the Armistice had made it obsolete on the drawing board. Such success as might have attended it would have been mainly due to its presence in large numbers on the battlefield. We find this theme again, the relation of quantity to performance, 25 years later.

1919 to 1937 represents the 18 lost years, when the British forwent any safe basis for waging a future conflict of Great War magnitude. Entrenched hostility to mechanization and, based on the hope that the Great War really had been the War to end Wars, the "No war for ten years" policy made it easy for tank development funds to be withheld. The promise of the Vickers Medium and the "Independent" which stand in the hangar, together with the experimental *A6* and *A7* mediums of the 30s, of which none survived, was neglected.

The use of tanks and aircraft, pioneeringly proposed by a handful of serving Tank Corps officers including Fuller, Broad, Lindsay, and later, Hobart, ably supported by Liddell-Hart, could have been the credible deterrent of those days, to parallel the nuclear weapon of today. Instead, the years went by, with marginal funds stretched to the limit on tankettes and light tanks, not a few of which originated in private backyards. Quite a few of these are in the hangar, and they form an odd background to the theories of the time.

Practical trials to test organization and theory were in fact conducted intermittently from 1927 onward. But the equipment had to be what was available in service, and not the promising new types. The force was small, and clear-cut policy decisions were not taken afterwards. The British paid the long-term cost later, for the Germans watched our development and practical trials with more than mere interest. By 1937, they had decided on their own organization and AFV types, had done their user trials in the Spanish Civil War, and were in production on four machines which gave them Poland in 1939 and France in 1940. These machines can be compared in the Museum with the variety of types developed in the United Kingdom under pressure of war, when urgency for numbers prevailed at the expense of performance and reliability.

The policy of having light tanks for reconnaissance, lightly armored, gun-armed *Cruisers* for deep penetration, and slow, heavily armored Infantry—or *"I"* tanks for the deliberate assault, which was adopted in 1937, is now seen to have been wrong. But it was pursued until 1945, at least for *Cruisers* and *"I"* tanks. The result, in conditions of 1939, when sound basic designs were lacking, was merely to pile Pelion upon Ossa. In the Museum they can be seen, the *A9*, *A10*, *A13*, *Crusader*, *Cromwell* and *Comet*; *Matilda I*, *Matilda II*, *Valentine* and *Churchill*, together with their additional opponents of 1942 and later, *Tiger I*, *Panther*, *Tiger II*, *Jagd-Tiger* and *-Panther*, and the ubiquitous Sturmgeschutz machines.

It is in this area that the race between gun and armor can clearly be seen. With proved hulls to work on, the Germans never lost their early lead in armament. Paradoxically, they were helped by the appearance in 1942 of the USA's 75mm gun, for this weapon's excellent dual-purpose HE and anti-armor performance led to the British decision to concentrate on that type of armament to the neglect of the high velocity weapon. This changed later, but it delayed what chances we had of taking the lead. Neither the UK nor the USA ever matched the German 88mm *L71* gun of 1944, although the British 17-pr (76.2 mm) came nearest to it.

But whatever the US 75mm may have been responsible for in this direction, its presence in the *Grant* and *Sherman* tanks put the British level with the German *Mark IV*; and afforded us our first opportunity of successfully clearing a way with tank HE through the German ground-mounted antitank screens, something which the excellent solid shot of 2-pr (40mm) and 6-pr (57mm) had not. The Museum's desert-painted *Grant*, and *Sherman II* (*M4A1*) "Michael," the first ever of the many to land in the UK, record an outstanding event, the significance of which is now less apparent than it should be. For, apart from its opportune timing, the *Sherman's* availability in quantity and its reliability went a long way toward counterbalancing the German gun-armament advantage. It went on doing so even after lapse of time had begun increasingly to show up its shortcomings. Here, once more, was the relation of quantity to performance. The effect, in over-simplified terms, can be seen in the figures. Taking an estimate that only 45,000 of the 76,500 tanks built in the USA and Canada went to North Africa and Europe, and knowing that the British built 25,000 and the Russians 75,000, then Germany's war production of 24,500 tanks represents odds of roughly 6 to 1 against her.

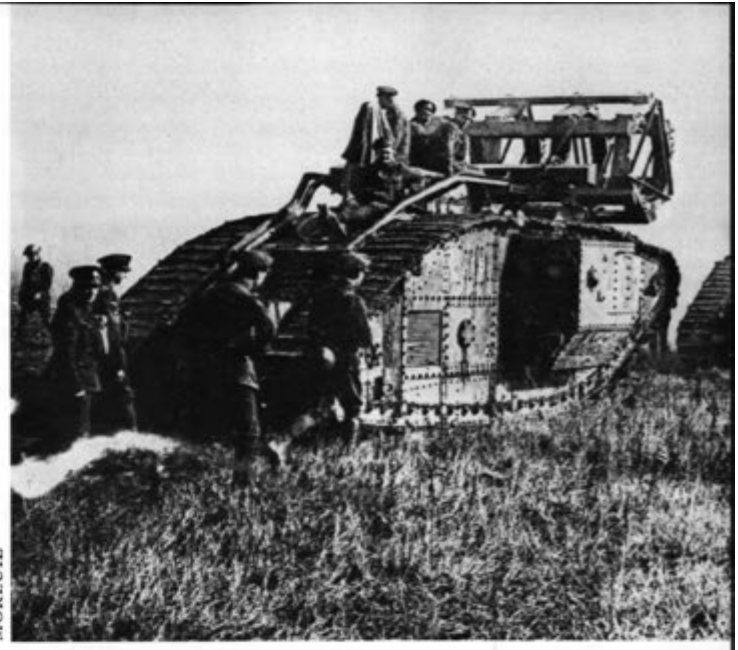
The fact that she was very nearly successful in Russia, and that she held off disaster until 1945 at least points partly to her AFVs' performance in the face of Allied quantity.

There is no space here to cover, as they deserve, the various specialized Allied "funnies" of World War II. But D-Day and later operations in the Low Countries would have been considerably greater struggles without them. The Museum possesses examples of bridgelayers, *CDL*, *DD*, flail and flamethrowers, of the many varieties then in service.

With the array of German AFVs in the hangar stand four French, two Italian, a Japanese, a Swedish, and four Russian machines. If there were more room in this article, they would receive more than just a mention. The same is true for the British *TOG II*, *Valiant*, and *A33*; the British-instigated American-developed *T14, Staghound* and *Boarhound*; and the international stable of 22 other armored cars from five countries. They recall Royal Tank Corps service in Russia, Ireland, Shanghai, the Indian Northwest Frontier, Iraq, Transjordan, Egypt, and Palestine. Later, in the hands of regiments of the Royal Armoured Corps, they saw service in North, East and West Africa, Persia, Syria, Burma, Malaya, Abyssinia, Greece, and most of Europe.

By 1945, the British *Comet* cruiser tank embodied all the principal characteristics of the Universal, or Main Battle, tank. Its successor, *Centurion I*, marked the final end of the 1937 policy. Initially it was armed with a 17-pr, the equivalent of the *Panther* of 2½ years earlier. But subsequently upgunned, first to 20-pr (83mm), then to 105mm, and also up-armored, *Centurion* went to 13 Marks before being superseded in 1967 by *Chieftain*—a prototype of which stands in the Museum opposite a 1918 *Mark V*. *Centurion's* 105mm may be familiar from its adoption for the *M60*, the Swedish *S-Tank*, the *Pz61* of Switzerland, the Vickers 37-tonner; and, perhaps an irony, the German *Leopard*.

The British *Conqueror*, with its USA-developed 120mm gun, is one example of the heavy tank 'back-up' policy followed by Russia and adopted by most other countries in the 50s and early 60s to provide longer range armament than could be installed in the MBT. But with the improvement in high velocity gun performance, that ace of tank characteristics, it became possible to mount a British 120mm in *Chieftain* at the same weight as *Centurion*. This is almost certainly the best tank armament now available anywhere.



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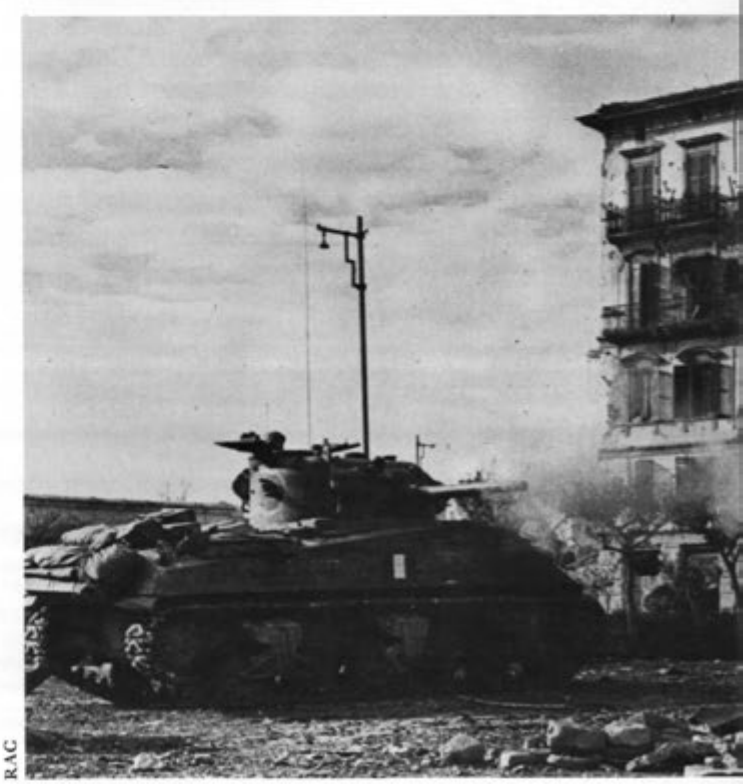

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EXHIBITS IN ACTION

Mark V's **(upper left) carrying crib fascines for trench crossing in France, August 1918.**

French ***Renault FT17 (Male)*** **(upper right) in reserve. Note French *poilus* and British sergeant.**

Vickers Medium Mark I **(center left) during 1924 maneuvers.**

Matilda I **(center right) advances with infantry on a March 1940 field exercise in Belgium.**

American-built *Sherman* (lower left) fighting through the streets of Ortana, Italy in World War II combat.

Chieftain Mark II **tanks (lower right) on recent training exercises in Germany.**

Number of Major Exhibits at the RAC Tank Museum

	U.K.		U.S.A.		Germany		France		Russia		Italy		South Africa		Japan		Sweden		Australia	
Wheeled or Tracked	W	T	W	T	W	T	W	T	W	T	W	T	W	T	W	T	W	T	W	T
Great War	2	9			1															
1919-1939	5	15				1		4				1								
WW II	12	22	3	15	2	15				4		1	2			1		1		1
Post–1945	2	10		2	2		2													
TOTALS	21	56	3	17	3	16	2	4		4		2	2			1		1		1
	77		20		19		6		4		2		2		1		1		1	

However well the lessons of the past have been learned, the theme of quantity in relation to performance remains, in Europe. This time in reverse. Perhaps there is also now less to choose between the performances of the opposing AFVs. But does NATO's technical tank excellence, with its rising complexity and cost, outweigh the numbers which might be brought against it? Perhaps so, if the very great flexibility conferred by combining with tanks the use of air vehicles, armored or not, can be developed. There will need to be a comparable command and control system. For us Europeans, these seem to be two areas where progress has not kept pace with the tank. In these circumstances, the Museum is glad to have on exhibition a *Skeeter* helicopter, the last machine that flew operationally of the first type of rotary wing aircraft introduced into service in the Royal Armoured Corps.

We could wish that more of those who are concerned with armored development had the time to come to the Museum. Technical refreshment on past ideas often confirms that there is not much new in engineering except the brains and the techniques; but the actual hardware does show what has been tried before. Some 280,000 visitors came to see the exhibits last year. They will have had a variety of reasons for doing so. Whatever they were, we hope they came because of the part which Twentieth Century armor has played in their heritage.

RAC

COLONEL PETER H. HORDERN, DSO, OBE, British Army-Retired, was commissioned in the Royal Tank Corps (now the Royal Tank Regiment) in 1936. Following distinguished service in World War II, he was a member of the British Joint Services Mission in Washington from 1949 to 1951. In 1961, he began nearly three years service as Regimental Colonel of the Royal Tank Regiment. Then followed further experience in the research and development field at the War Office in London. Colonel Hordern's extensive service with armored troops, and in the design field as well, fits him admirably for his second career as Director and Curator of the Royal Armored Corps Tank Museum.

CUT SOME MORE 50 CALIBERS!

In the early forties, during the Carolina Maneuvers, the Reds and the Blues had been having a nip and tuck battle for about three days. Umpires with white flags and white arm bands were running all over the place.

At dusk on the third day of this particular exercise, a long range Red mechanized cavalry patrol spotted a Blue unit headquarters going into bivouac for the night. A solo motorcycle messenger rushed the news back to the Red cavalry regimental command post. The commanding officer read the patrol leader's message and issued the following order:

"Cut some more fifty caliber machine guns (forked sticks) and label them. We're going down there after dark and surround them!—COLONEL GLEN E. FANT, AUS-RET.

LEOPARD
The German Battle Tank

by H. D. von Bermuth and J. H. Reuter

In 1956, when the Army of the Federal Republic of Germany was re-established, it received 1200 *M47* tanks from the US army. At that time, this fighting vehicle already had become obsolete since the US Army was introducing the *M48*. Therefore, in the same year, the Federal Procurement Office approached German industry concerning development of a medium battle tank intended to replace both the *M47* and the *M48* some time in the 1960s.

Thus, in 1957, German industry entered upon development of a battle tank designed to meet certain specified standards of firepower, mobility and protection. After the most severe tests of the prototypes developed by the Porsche, Jung, MaK and Luther, as well as the Wegmann and Rheinmetall companies, the Federal Procurement Office made its choice in 1961. In the following years, a total of 26 prototypes and 50 vehicles of the initial models were built, tested and put into the hands of the troops for trials.

Thereafter, in September 1965, Krauss-Maffei AG of Munich started production and supply of the *Leopard* battle tank to the Army of the Federal Republic of Germany. In the meantime, the governments of Belgium, the Netherlands and Norway placed orders for a total number of some 850 *Leopard* tanks. As a result, total orders for this vehicle now amount to nearly 2700.

FIREPOWER

In common with the US *M60* tank, the British *Centurion* and *Vickers* tanks, the Swiss model 61 and the Swedish *STRV 103* (the latter two in a modified version), the *Leopard* mounts the British high-performance 105mm *L7A1* gun. This modern tank

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J. H. Reuter, 28, served for four years with the Armored Corps of the German Bundeswehr. He is now associated with Krauss-Maffei.

cannon is able to fire the NATO APDS, HEAT and HESH rounds.

The *Leopard* main gun can be elevated from —9° to +20°. Ammunition stowage is 60 rounds. The *Leopard* is equipped with a machinegun mounted coaxially to the cannon and an antiaircraft machinegun which may be mounted either on the commander's hatch or on the loader's hatch as desired. Both machineguns are the *NATO* 7.62mm caliber. The ammunition stowage for these is 5500 rounds. The German model of these machineguns is a further development of the renowned *MG42*.

Because of a highly modern fire control system, the inherent efficiency of the main gun can be fully exploited. The commander operates a variable power panoramic telescope, with magnification from 6 to 20 power, which not only enables him to scan 360° but also to measure the range and open fire to engage a target by means of a control overriding that of the gunner. In addition, he has eight fixed periscopes for continuous all-around vision. For night fighting, the panoramic telescope may be exchanged for an infrared sighting device. The searchlight which may be switched from white to infrared light, has a range of 1500 meters with white light and 1000 with infrared light. The 16-power magnification binocular rangefinder is operated by the gunner and may be switched from stereoscopic to coincidence rangefinding. The gun elevation is coupled to the rangefinder by means of a mechanical linkage. The rangefinder also as the gunner's main telescope. The eyepiece of the gunner's main telescope follows the movements of the turret. This is especially advantageous when driving with a stabilized main gun.

All *Leopard* tanks are now being refitted with a weapon stabilization system. The installation of a fire control calculator, which will give the *Leopard* a fully integrated fire control system and which is designed to increase hit accuracy and reduce laying time even further is soon to follow.

MOBILITY

The Daimler-Benz multifuel engine has an output of 950 horsepower. It is a 10 cylinder V-type engine with two mechanically driven superchargers. The high horsepower gives the vehicle a power/weight ratio of 22 horsepower/ton and a speed of 45mph on the road as well as an accelerating power of 0 to 100 meters within 11.7 seconds. The *Leopard* has an electro-hydraulic, semi-automatic shifting and steering transmission which permits full-torque shifting without a clutch. Steering is by a regenerative steer-

ing mechanism. The *Leopard* is able to pivot about its vertical axis. This feature permits it to leave a railway flatcar without needing a ramp.

The tracks with individual torsion bar suspension and hydraulic shock absorbers enable the *Leopard* to take full advantage of its power/weight ratio even in the most difficult terrain without creating intolerable crew discomfort or injury. The road wheel travel of 11.2 inches is extremely high.

Taken together the power and suspension enable the *Leopard* to surmount obstacles up to a height of 45 inches and ditches up to a width of 9½ feet (3 meters).

The fuel tanks, with a capacity of about 256 gallons, make possible a cruising range of about 360 miles.

A submerge hydraulic system permits the *Leopard* to ford water-courses up to 7½ feet in depth after a preparation time of less than five minutes. After fording, the vehicle is made ready for combat with only a few manipulations during which the crew need not leave the vehicle. For deeper water fording (up to 14 feet 9 inches) a snorkel is mounted on the commander's hatch.

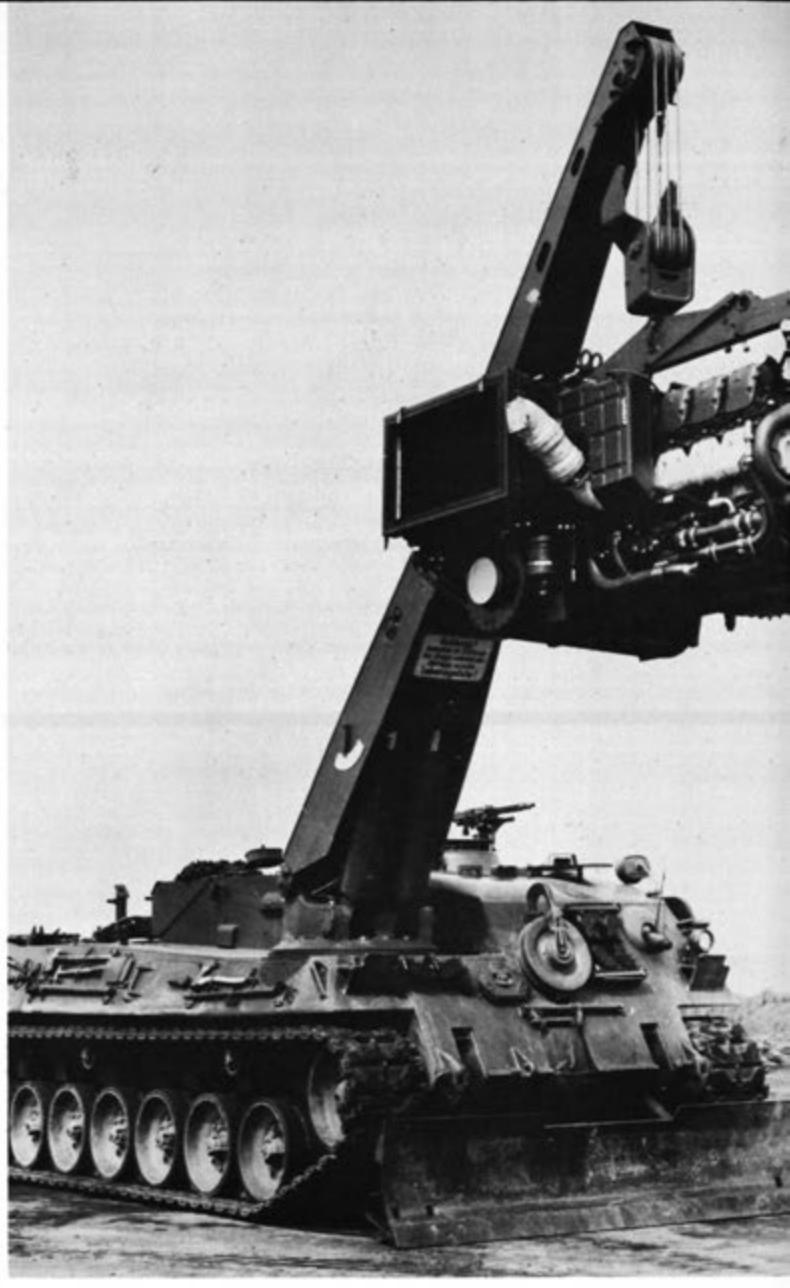
PROTECTION

In the opinion of German experts, the best protection factor of a tank following mobility is its silhouette. The *Leopard* has a comparatively low silhouette. In addition, when designing the *Leopard*, special stress was laid on a ballistic shape for the hull and turret. The armor plating meets modern tank requirements. Furthermore, the *Leopard* is equipped with a CBR protective system which permits it to operate in contaminated areas.

MAINTENANCE

According to the experience gained so far, a general overhauling of the *Leopard* need be undertaken only after approximately 6000 miles. This long interval was attained because during the development phase particular emphasis was placed on achieving low wear and tear, on minimum maintenance and on prolonged operation before overhaul. It is noteworthy that the complete power plant can be replaced under battlefield conditions within 20 minutes. With respect to spare parts cost, experience has shown that the cost of replacement parts needed over three years is less than 10 percent of the original cost of the tank.

In addition to the battle tank, several special applications using the *Leopard* chassis have been or are being developed.



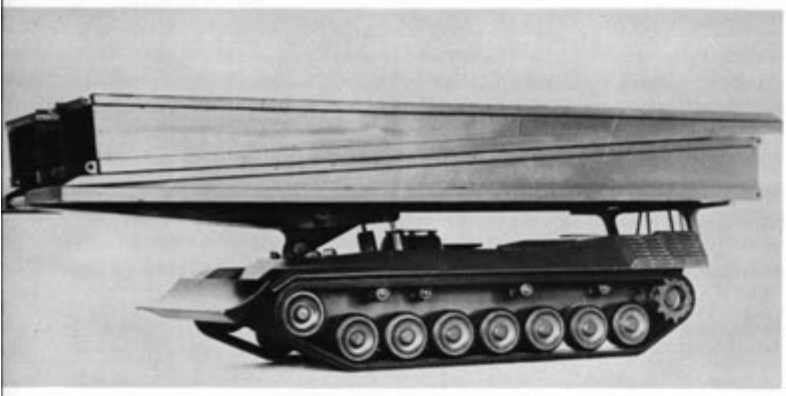
MAK

RECOVERY TANK VEHICLE

The *Standard* recovery vehicle is equipped with a 270° rotating crane having a lift capacity of up to 20 tons. This vehicle also is equipped with a cable winch and bracing device having a maximum pull of 35 tons. This may be increased to 70 tons by using a block to increase leverage. The dozer blade mounted on the front of the vehicle can be used for levelling, obstruction clearance and for digging emplacements. Normally, during operations the *Standard* carries a complete spare power plant for a battle tank.

ENGINEER TANK

This vehicle was developed from the recovery tank. The dozer blade has been reinforced. Furthermore, this special vehicle has been equipped with an earth auger and several supplementary units specially developed for combat engineer operations.



KRAUS MAFFEI AG

BRIDGE-LAYER TANK

A bridge-layer version of the *Leopard* is under development. In contrast to the American AVLB system this model does not work using a folding bridge but lays the bridge horizontally. This system has an advantage in that the vehicle does not disclose itself by elevating its silhouette. The maximum silhouette of the *Leopard* bridge-layer is 11½ feet compared to the approximately 36 feet high silhouette of scissors bridges being unfolded prior to emplacement.

RHEINMETTAL

ANTIAIRCRAFT TANK

Two antiaircraft tank systems on the *Leopard* chassis are being developed and tested. One has twin 30mm and the other twin 35mm guns. These will constitute extremely modern gun weapon systems having up-to-date electronics in the form of search radar, fire control radar and ballistic calculator.

The *Leopard* battle tanks and related auxiliary vehicles have attained technical maturity over a period of four years production and troop use. Refinements to, and expansion of, their many strong points continue. Acknowledgement of their many capabilities is shown by the acquisition of members of the *Leopard* family by the armies of the four NATO nations.

From The Armor Branch Chief...

MANAGEMENT OF ARMOR LIEUTENANTS

This note is directed specifically to Armor commanders at all levels. It concerns your responsibilities in the management of lieutenants assigned to your organization or unit.

Each lieutenant of Armor, Regular or Reserve, faces the strong prospect of serving in a short tour area during his commissioned service. Before he is eligible for a Vietnam assignment, he must, by Army Regulation, receive at least four months experience in a leadership position. Only Armor and Infantry lieutenants are in this category. The reason, simply, is to insure that the officer has an opportunity to learn his trade before he is called upon to lead troops in combat.

We are fully aware of the worldwide shortages of captains and majors that sometimes require lieutenants to be utilized in staff positions. However, you should make every effort to qualify each lieutenant with troop leading experience, i.e. COMMAND OF A PLATOON, before the end of his first year of service.

You, the commander, have a specific and definite responsibility to assign your Armor lieutenants properly when they first arrive. More significant, however, is insuring that when they leave your command en route to Korea or Vietnam, you can honestly say that you have done everything in your power to prepare them properly as combat leaders.

Operational Mobility–A Function Of Design

The Leopard As A Noteworthy Example

by Colonel Dr. F. M. von Senger und Etterlin

Mobility is a key element of a tank's battleworthiness.

The concept and meaning of *tactical* mobility is generally well understood. It comprises such important characteristics as:

- acceleration
- speed, forward and reverse
- hill climbing
- vertical obstacle clearance
- water capability (fording, deep water fording, swimming)
- maneuverability
- operating range

On the other hand, the factors which determine *operational* mobility are not so well known. According to German and Soviet military usage, the scope of "operations" lies between tactics and strategy. The brigade and division are tactical in nature, while the corps and army or army group are operational units.

Therefore, it follows that movements which the corps requires of a division are, as a rule, operational. Certainly, movements which effect concentration are operational in nature when they are made over long distances. By the same token, this category includes large shifts behind the front, indeed all marches over great distances which cross several division areas or which are undertaken from rear to forward areas or vice versa.

Clearly, such movements can be accomplished by rail, but this aspect of operational mobility shall not be treated here. What is pertinent here is that state of the art recent battle tanks have reached in order to cope with operational movements by road.

CRITERIA OF OPERATIONAL MOBILITY

Evaluation standards for operational mobility can be found by measuring certain technical capabilities. While the above mentioned elements of tactical mobility may also apply, they will be superseded in some cases by capabilities which have no direct import for tactical mobility. There are also tactically important capabilities which have only exceptional or incidental influence on operational mobility. For example, all of the characteristics affecting cross-country mobility are of secondary importance for operational mobility.

Hill and vertical obstacle climbing capabilities will have only small import for the march in central Europe under normal conditions. More important would be top speed and acceleration capabilities. Likewise, water capability would not normally apply, since one must assume that bridges would be available for operational moves. Only when destruction of the normal road net interferes can tactical mobility influence operational capabilities, and then admittedly in a decisive manner. Only the operating range is equally valuable for both types of mobility.

Which criteria can be added then to those of tactical mobility in order to evaluate operational mobility? Foremost would be:

- cruising speed, then
- durability, or the related maintenance requirement, and finally
- roadability

CRUISING SPEED

Cruising speed should be understood as the sum of those technical performance characteristics of a battle tank which allow it to cover the greatest possible distance with the highest possible average speed. Since a battle tank makes no operational moves alone, yet another element which favors travelling in a march

unit formation must be considered. Namely, one must be able to maintain the average speed as evenly as possible.

Expressed in terms of road marching: the driving speed of the individual vehicle must with all possible constancy equal the specified marching speed of the unit. A march unit or a whole convoy formation can attain a high cruising speed, that is, march over a long distance at high speed, only when the march column can maintain its integrity. But this is not the case when the notorious "accordion" (i.e. that phenomenon of rearward vehicles falling back and closing up) occurs. As is well known, this phenomenon occurs—regardless of the driver training level—because briefly necessary reductions in speed progressively snowball to the rear.

Integrity depends, therefore, upon how well all vehicles in the column are able to maintain the exact march speed. They can only do this when they have flexible high performance engines and transmissions which can immediately compensate for every single variation from the normal course. For tracked vehicles, it requires no power loss for steering and no speed loss on curves. The same is true for ascending grades.

The *Leopard* battle tank has two-radius superimposed steering. For large radii a continuous-steering slip clutch engages. The *Leopard*'s combined shifting and steering transmission, *ZF4HP250*, represents a modern combination of completely continuous steering, where efficiency remains less than 75 percent, and the simpler clutch and pure differential steering transmissions. The *Leopard* transmission has the added advantage that it precludes differential action when straight tracking and thereby holds a stable course, a significant improvement resulting in an uninterrupted and power-saving running mode.

The shifting transmission is a four-speed planet type with precedent torque converter. With the help of the converter and its variable torque multiplication, changing gradients can be negotiated with constant speed, practically without shifting. Because the power train is not interrupted during shifting, the spasmodic falling back and closing up does not occur at increased column speeds. The converter is locked-up during normal running to save fuel. For negotiating particularly difficult terrain, the tank's tractive power can be increased by unlocking the converter. The advantageous design of the transmission and the low fuel consumption of the engine allow operating ranges up to 580 kilometers (360 miles). This means, for example, that in the flat terrain of the North German Plain tanks can march all the way across the Federale Republic without refueling and still have enough fuel on arrival for one day of battle.

But back to the problem of sustained speed. As has been shown, the transmission and the flexible engine allow the *Leopard* to hold a constant speed, which is the most important provision for relatively high speed marching. The days are long past when the commander had to reckon with a speed of 15kph (10mph) for tank unit moves.

Speeds from 30 to 50kph (18 to 30mph) are first attained in third gear, where the tractive power is still more than 10 percent of maximum. A well trained *Leopard* battalion is quite able to move long distances at march speeds of 30kph (18mph), indeed 35kph (22mph), provided the necessary precautions for march security are taken. When necessary, *Leopard* companies can even be moved around at 40kph (25mph).

To elaborate on the example given above—suppose the unit moves at a march speed of 30kph (22mph); the driving time alone to cover 250km (155mis) would be about 8½ hours. Including the necessary maintenance halts of about ½ hour per 2 hours driving time (Total 2 hours), the march would take about 10 hours. Such a performance must certainly be expected of a tank unit. For example, the Russians moved a division more than 800km (500mis) on poor roads "in three nights" during their recent Dnieper maneuvers and committed it to battle immediately on arrival.

DURABILITY

Because of the way they are built and employed, tracked vehicles understandably wear out faster than wheeled vehicles. Durability is expressed in terms of the maintenance requirements which are necessary after certain usage. Most important here is the maintenance which must be performed after specified fuel consumption. Other maintenance falls due with the passing of specified time periods. It goes without saying that operational mobility is influenced by these maintenance requirements. The less there are, the greater the mobility. The more the commander is forced to reckon with tanks being out of operation for certain periods, the less freedom of decision he has for operational or tactical employment.

After consuming 1500 liters (400 US gallons) of fuel, the *Leopard* requires certain maintenance work which costs the crew, assisted by a six-man company team, about five hours. Beyond that, after 3000 liters (800 gallons) of fuel are consumed, second echelon

maintenance, requiring battalion teams for special tasks, is necessary. For example, the engine must be removed. This so-called 3000 liter inspection normally takes five men 20 hours. Maintenance after a specified number of kilometers driven includes, above all, tracks and drive wheels. The *Leopard*'s tracks are so designed that they require no maintenance for about 6000km (3750mis) on normal roads. After that it is necessary to change worn-out end connectors. The sprocket rings last about 4000km (2500 mis). With parts on hand, the crew can change them in about four hours. The track itself is good for about 10,000km (6200mis) net driving stress on roads. These attrition rates are significantly below those of other battle tanks. For tanks with steel skeleton tracks without rubber pads, which the Russians still use today, the number runs about 3000km (1850mis).

Operational moves by tank units necessarily lead to a certain amount of attrition. That vehicles will have to fall out for maintenance purposes must be taken into account. But if one relates these breakdowns to the possibilities which a fast operational move offers the commander, the actual failure rate of the *Leopard* must be seen as favorable. In other words, a *Leopard* battalion can march all the way across the North German Plain (about 250km or 150mis). After that it can be employed for yet another 250km, before the 1500 liter inspection is due. The 3000 liter mark is not reached for another 500 km (310mis).

ROADABILITY

To judge operational mobility, yet another factor must be considered. In spite of a favorable cruising speed and low attrition, a particular tank could be unable to make optimum use of a given primary and secondary road net. If, for example, the tank is so heavy that it can cross only certain high load class bridges, then how seriously the unit's freedom of movement is restricted depends on the number of bridges of the requisite class available or on extensive engineer preparations. The tank's battle weight is, therefore, of great significance to operational mobility. If in a given sector there are, for example, only 10 through roads, each with a Military Load Class 50 bridge, then the mobility of *MLC60* tanks is zero and that of *MLC40* tanks 100 percent.

Roadability is further influenced by the physical dimensions of the tank. If it is very wide, a similar calculation to that made for the bridges may be made for narrow village streets, close forest trails and similar constrictions. If the tank is very high, it will not pass through many underpasses. Finally, the tracks and suspension of a heavy tank can, for example, if the tracks are not padded, affect the roads so badly that they are impassable to following units.

The tracks of the *Leopard* are rubber padded and have rubber-bushed pins. They spare the roads as much as is possible anywhere at the present state of the art. In this connection, the *Leopard* battle tank exhibits above average characteristics in comparison to other current tanks. It can in a given area, for example in the State of Lower Saxony (Niedersachsen), cross around 20 percent more bridges than a *MLC50* tank. For operational moves, therefore, considerably more bridges are available than for heavier tanks.

The aforementioned tactical mobility of the tank must also be taken into consideration here. It can benefit operational mobility in situations ranging from through roads being interdicted to crossing rivers when bridges are destroyed. This mode of operation also is demonstrated frequently by the Russians when they, for example, have tank regiments move up long distances and deep-ford the Elbe at Magdeburg.

In summary, it can be established that units equipped with the *Leopard* have an operational mobility which lies far above the average. Next in line is the French *AMX30*, but it is being produced only in very limited quantities. It is this great operational mobility, above all, which makes the *Leopard* battle tank an outstanding weapon in the hands of a high command for whom it is essential to offset possible conventional superiority of the aggressor. Finally, under nuclear conditions, great operational mobility is the compensation for wide dispersion.

Colonel Doctor F. M. von Senger und Etterlin, German Army General Staff, served for four years in Russia during World War II as a platoon leader and company commander in the German 1st Cavalry and 24th Panzer Divisions. After being wounded eight times he was transferred in 1945 to the Armor Inspectorate of the German Army High Command. In 1949 he earned the Doctor of Law degree at Göttingen University. Following public service in the Ministries of Interior and of Defense, he reentered the German Army serving as G3 of an armored brigade and commander of Panzerbrigade 94. Recently G3 (Ops) of Northern Army Group in Europe, Colonel von Senger is now commanding a Panzergrenadier Brigade. A graduate of the German Staff Academy and the NATO Defense College, he is author of *The World's Armoured Fighting Vehicles* and a number of other works on armor matters.

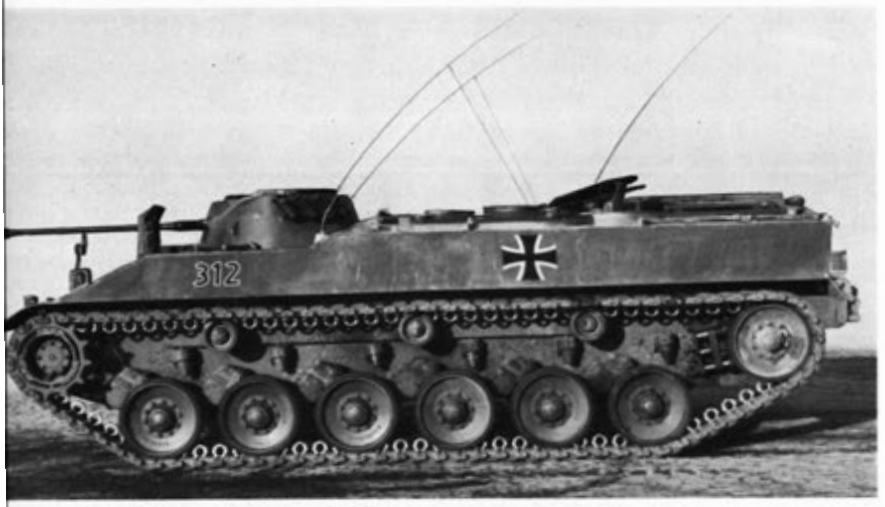
This article first appeared in German in *TRUPPENDIENST,* official professional journal of the Austrian Army. It appears here by kind permission of the editor and the author.

This translation is by **Major Charles E. Poole, Jr.,** GS (Armor), formerly Assistant Professor of German at West Point, who is now on duty with the Office of the Deputy Chief of Staff for Operations, Headquarters, Department of the Army.

▲ Prototype 2 Mowag 211

by Colonel Dr. F. M. von Senger und Etterlin

The New German Armored Carrier



▲ Prototype 3 RU 262 ▼ The adopted model

Translated with kind permission from SOLDAT UND TECHNIK © 1968
by Major Ronald M. Hofmann, Department of Foreign Languages, USMA

Shortly after the introduction of the *HS30* armored carrier, developmental work on a successor model began. The principal genesis of this new development was the desire to create a new light armored vehicle family, using the same basic components. It was thought that the various types would differ from each other chiefly through locating the engine in the front, in the center, or in the rear of the vehicle. Initially the following vehicle types were considered:

- Tank Destroyer, Cannon *(Jagdpanzer Kanone)*
- Tank Destroyer, Missile *(Jagdpanzer Rakete)*
- Armored Reconnaissance Vehicle with 90mm cannon *(Spähpanzer)*
- Armored Carrier, Squad, *(Schutzenpanzer (SPz) lang, Gruppe)*
- Armored Command Post & Communications Carrier *(SPz-Führung & Funk)*
- Armored Air Defense Carrier, Twin 30mm *(SPz-Flakzwilling 30mm)*
- Armored Self-Propelled 120mm Mortar *(SPz-Mörserträger 120mm)*
- Armored Self-Propelled Multiple Rocket Launcher, Light *(SPz-Raketenwerfer (mehrfach leicht))*
- Armored Ambulance Carrier *(SPz-Krankenkraftwagen)*
- Armored Cargo Carrier *(SPz-Transporter)*

In the course of development, it became clear that the armored reconnaissance vehicle would not be needed. The air defense system also proved to be technically infeasible on this chassis, and had to be developed instead on the *Leopard* tank chassis. Moreover, it was found to be more economical to mount the multiple rocket launcher on an existing reliable 7-ton truck which has excellent cross-country mobility and ease of maintenance.

The military requirements for the program were stated as: "The basic vehicle should be adaptable to many uses, to include the capability of mounting a variety of weapon systems. It should have excellent driving characteristics, with simple construction to reduce maintenance and logistical requirements. Since the same power plant and the same track and suspension system would be used for all types, it should be possible to mass-produce quickly. Such a program should also keep spare parts costs to a minimum." Specific technical requirements as outlined below, were listed for all vehicles of the new light armored vehicle family.

MOBILITY CHARACTERISTICS

The vehicle should attain, for track vehicles, a high speed: (up to 80kph (50mph) on roads). By using a hydrostatic steering drive, in conjunction with a torque converter, especially good driving characteristics should be achieved. These include:

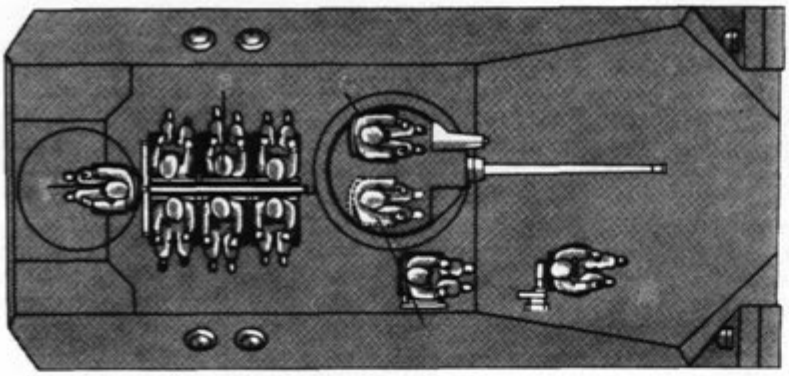
- greater driving safety at high speeds through using continuous steering as is done on wheel vehicles
- ease of handling and mobility during cross-country operations
- good general maneuverability and ease of steering

The necessary controls should be similar to those of a normal truck. That is, there should be a steering wheel with the gearshift control located on the steering column. In this way, driver training requirements and malfunctions should be reduced to a minimum.

SPECIAL TECHNICAL CHARACTERISTICS

In addition to the characteristics above, the mass-produced *SPz-Neu* should have certain maintenance and logistics advantages over currently existing vehicles. These include:

- a relatively maintenance-free track and suspension system
- economy of operation, increased cruising range, and reduced fire danger through the use of diesel fuel
- a multi-fuel capability
- quick and easy removal of the whole power unit affording good accessability for maintenance as well as the capability for inspection test runs outside the vehicle, in order to reduce to a minimum the time necessary for inspection and maintenance
- easy exchangeability of the principal parts.
- a hydrostatic cooling plant, controlled by a thermostat, which will insure constantly favorable cooling conditions in the engine and transmission thereby resulting in improved fuel economy at normal temperatures, guaranteed functioning in extreme temperatures ranging from —40° F. to +120° F. and improved operations in extreme cold through engine pre-warning



Crew positions in the *Marder* armored personel carrier. (A) Vehicle Commander in the turret or down with the squad. (B) Driver. (C) Gunner. (D) Riflemen. (E) Rear Gunner.

The vehicle should be able to ford, without any special treatment, depths of up to 5 feet (1.50m) and, with on-vehicle equipment, up to 6½ feet (2.00m). Underwater crossings, with a special kit, must be possible up to depths of 16¼ feet (5.00m). Underwater orientation would be assured through a special navigation instrument.

SPECIAL REQUIREMENTS FOR THE SQUAD ARMORED CARRIER

This vehicle should allow room for a 10-man squad, plus the driver. An organic weapon of at least 20mm caliber would be essential. The vehicle should allow the squad to fight mounted, as well as to allow it to dismount quickly. Initially, complete armor protection for fighting mounted was not considered, but good observation for the squad and the squad leader were demanded from the start.

DEVELOPMENT AND TESTING

In 1960 and 1961 four differing prototypes, Type 1, from different industrial groups were constructed. By 1963, seven prototypes, Type 2, had been built. And by 1967, 12 prototypes, Type 3, were available.

For financial, organizational, and production reasons, the Tank Destroyers, Cannon and Missile, were the first to be readied for production. Thus, in 1965, the model for the Tank Destroyer, Cannon, was standardized, and large scale production began immediately. The Tank Destroyer, Missile, followed in 1967. Sufficient prototypes of both these vehicles had been available for testing since 1960. As a result, success in fully developing satisfactory main components was attained.

In the Type 1 Squad Carrier prototypes, the goal was to obtain the lowest silhouette possible. To achieve this, it was necessary to place the engine in the left rear with the transmission located in the front. This novel arrangement permitted placing the turret pod low in the hull. However, this also resulted in a restricted passageway inside the vehicle which allowed only one man to mount or dismount at a time.

To correct this, a broader rear ramp was built in the follow-up prototypes *RU122* and *2M1*. In the *RU122,* the engine was relocated in the middle of the vehicle, to the right; and in the prototype *2M1* the engine was placed behind the turret to allow passage for the driver on the left, and for the vehicle commander on the right. The *RU122* solution was not satisfactory because the squad leader could not control his squad properly when engaging the enemy while mounted. Secondly, the squad members were too far separated from each other. Finally, the squad was too heavily concentrated on the left side of the vehicle.

With some Type 2 prototypes, another solution to the problem of space allocation was tried. The turret was set in the front center, with the driver and vehicle commander beside it. The engine, in the center of the vehicle, was flanked on each side by a rifleman. In the rear compartment, room for six riflemen sitting back to back was created. Characteristic of this solution is the prototype *211 (Pirat)*, developed by MOWAG, the Swiss firm.

Other solutions, developed by German companies, relocated the engine to the front, and created uniform crew spaces in the center and in the rear. This solution eventually gained preference and was accepted. Further development concerned itself primarily with details of armament, human engineering, and improvement of the armor protection.

ARMAMENT

About 1965, a requirement to mount the weapons outside the actual fighting compartment was laid down. Initially, in compliance with this requirement, a small cupola with a light machinegun was developed. This was to cover the dead space of the turret and to give the vehicle a better defense capability to the rear. Technical tests proved this solution so successful that the principle was also extended to the main weapon of the vehicle.

An additional important demand was now made: the vehicle commander should have the same degree

of observation as the main weapon gunner, as does a tank commander. Thus, in order to do this, he must have an override capability. This necessitated the development of a two-man turret. In less than a year, by the fall of 1966, a prototype was ready. With the help of school troops, several different approaches which allowed the squad to fight mounted were tested. By 1966, the following experimental models were available:

- Prototype *Ru 361:* 1-man turret, 2 large hatches
- Prototype *Ru 362:* 2-man turret, 4 small hatches, 6 periscopes extending from the crew department
- Prototype *Ru 363:* 1-man turret, 2 small hatches
- Prototype *M3:* 1-man turret, 2 medium hatches, 6 periscopes, 2 mounted *LMGs* facing to the left and right.

Some of these proved quite satisfactory. However, the troops demanded full armor protection for the weapons firers when fighting mounted. Better hatches to allow good observation, hearing, firing of individual weapons, and the use of grenades were needed.

The two-man turret, on the other hand, was a success from the first. The pod concept for such a turret for an armored carrier is not new. It has been used before, but never in the form of a two-man model with a cannon and coaxial machinegun. These weapons, equipped with sights that can be instantly switched, are suitable for both air and ground targets.

The silhouette of the carrier from the front remained low, since the slim weapons are hardly noticed. The turrets of further prototypes were only slightly improved before the final design was adopted. It should be noted that, in the future, the turret can be stabilized and the present weapons replaced by newer developments with little difficulty.

SPECIAL CHARACTERISTICS

The new armored carrier has a simple and clean configuration. The fighting compartment extends over the whole track and suspension system. The engine is located to the right front, the driver to the left front. One man is seated behind the driver. The traversing turret is in the approximate center, slightly to the right. Outside the turret, to the left, is a covered storage space for guided antitank missiles, which can be reached through a hatch.

The vehicle commander sits in the left seat of the flat turret, the gunner to his right. Six riflemen, each facing outwards, are seated on benches. Backrests make into bunks. In addition, hammocks can be installed. Another rifleman is seated in the light machinegun cupola, facing to the rear. Four small hatches in the roof of the fighting compartment can be opened for mounted combat, and for observation. Through engineering improvements, vibration, noise, heat and riding discomfort have been considerably reduced. This allows the squad to ride in the vehicle for considerably longer periods, even under difficult terrain or combat conditions.

The new German armored carrier is not amphibious. The price for including this advantage would have been a considerably less satisfactory vehicle configuration. However, with snorkel equipment, the vehicle can make underwater crossings.

The track and suspension system deliberately has been kept conventional and simple. The six roadwheels on each side are damped through torsion bars and overload springs. In spite of the great vertical movement of the roadwheels, there is little tension buildup in the torsion bars. A 592 hp (600PS) diesel engine is used, together with a hydromatic torque converter, and a superimposed continuous-power hydrostatic steering drive; these comprise an integral power-pack unit. Since the transmission can be shifted while under load, the engine can run steadily at high rpm. Power, while shifting, is not interrupted. This assures smooth driving, even when in formation. The power plant, as in the *Leopard* tank, can be swiftly removed or installed.

Two cooling blowers are located in the rear of the vehicle, on the left side and on the right side. By removing heat from the compartments these contribute to crew comfort. When making an underwater crossing, the cooling ducts are flooded. The outlet grates are in the rear wall of the vehicle. The brake system consists of ventilated dual disc brakes.

A STRONG TEAM

After a developmental program extending over eight years, the new German armored carrier has reached an engineering plateau which places it quite above any other APC in troop use worldwide. It has now been adopted as standard and given the designation *Marder* (marten).

Like the animal for which it is named, it is sleek, swift, agile, and a real fighter. It moves cross-country at the same fast pace as the *Leopard* and can accompany that tank anywhere. In common with the *Leopard,* tactical and operational mobility are of a high order. Together, the *Leopard* and the *Marder* comprise a fully compatible armored fighting vehicle team which, properly manned and employed, will be hard to stop.

LOOKING AT THE CHIEFTAIN

by STAFF SERGEANT EDMUND L. DEVEREAUX III

During a 10-day training period in West Germany as a guest of "A" Squadron, the British First Royal Tank Regiment, I had the opportunity to look closely at the latest British main battle tank, the *Chieftain,* together with its 120mm gun.

The basic premise underlying the *Chieftain* is that of quality — not quantity.

British Tankees have long said ironically that it is far easier to replace the crew than it is to replace the tank. In apparent response, the British have included many features in their latest main battle tank for the betterment of the crew. These are refinements which are not found on either the *Centurion* or on our *M60* series tanks.

With the key word quality in mind, the British now have a main engine which is multi-fuel. The power pack and transmission can be exchanged as rapidly as ours. To the Tankee who gained his experience on the *Centurion* series, this was really news. One of the major difficulties with the 13 types of *Centurion* tanks was maintenance. For example, it took a good crew from eight to 10 hours to pull and replace the main engine and transmission, and two hours to pull the transmission alone.

One of the often voiced complaints about our *M48A3* and *M60* series tanks is the lack of an auxiliary engine. The *Chieftain* has a quiet auxiliary engine. To the tanker who remembers the raucous sound of the "Little Joe" of yesteryear and who now must keep the noisemaking main engine running during searchlight operations or radio watch, a quiet auxiliary engine should sound like a good idea.

Unlike most other British tanks, the *Chieftain* has an automatic transmission. The transmission is shifted something like a motorcycle and has six forward gears and three reverse gears. In sixth gear, on good smooth ground, the tank has a speed of more than 25 miles per hour.

The *Chieftain* is steered by laterals. The laterals can be used by the driver both in the sitting position for normal operations, and reclining when buttoned up. This unusual driver position has helped give this tank a lower silhouette. And when stopped, the driver has a place to sleep.

Our $10,000.00 searchlight, which is so necessary, can be put out of action and into the maintenance shop by someone with a rifle and a few cents worth of ammunitioin. In marked contrast, the *Chieftain* searchlight is mounted on the side of the turret rather than over the main gun. It is enclosed in metal and thus protected. It has metal shutters in front, operated from inside the turret, to protect the lens and lamp. The shutters also allow no reflection from the lens during daytime operations. The searchlight has both infrared and white light capabilities, and it moves coaxially with the main gun.

The tank commander has nine periscopes for all-around vision. Each periscope has its own individual washer/wiper system. The gunner's and driver's periscopes have the same feature. The provision of washer/wipers seems to warrant further consideration by our designers. The British washer/wipers are allegedly soldier-proof; a real plus feature. On the negative side, the *Chieftain* driver has but one periscope. However, this is protected by armor on the sides and to the rear. Two complete spares plus a spare head are carried.

In one of the units which is completely equipped with the *Chieftain,* most crews have spent better than 30 hours buttoned up. The tank was designed so the crew can live closed down in the tank for up to 72 hours. This brings out some points that the British designers added to aid the crew.

When buttoned up for extended periods of time, how does a *Chieftain* crew know just where they are? No problem, since they have a map reading device, called a "Navaid," mounted in the turret. This tells one's location in six-digit coordinates. It is accurate to within 50 to 75 meters. And for non map readers, one does not have to be buttoned up to use it. On one occasion the device was tested in downtown London, and after a day's driving around, it was something like 10 meters off. Not even a map reading instructor could fail to be impressed by that. My guide pointed out that the Canadians also have something like this, only more sophisticated and secret.

Like most British tanks, the *Chieftain* employs the ranging gun technique. The Tankees swear that the use of a caliber .50 ranging gun in conjunction with the gyrostabilized main gun is the only way to engage a target rapidly. Since most main gun engagements are under 2000 meters, and time and accuracy are most important, they appear to have a valid argument.

Over the years, some have complained that optical range finders have a lot of faults. First it was the "flying geese" and now the coincidence range finder. Later on it will be the new laser. As R. M. Ogorkiewicz wrote in *ARMOR,* a ranging gun "takes into account such factors as cross wind and trunion cant, which the optical range finder does not. It is also easier to use when light is poor or when the target — such as bushes hiding an antitank weapon — does not have sharp contours." With a ranging gun, the gunner is actually firing burst on target before he fires his main gun.

In talking with tank professionals, the argument consistently came up that the .50 caliber was not as fast as someone who can range properly, and that its accuracy depends too much on the training of the gunner. This is partially true. It does depend on the gunner, but what tank crew does not depend on a well trained gunner?

A well trained British crew, while on the move, can identify, range, fire Sabot, and destroy a target in well under the 15 seconds we allow a crew on Table VIII. The British point out that firing on the move with their 120mm gun is not recommended except during an emergency. Among other things, Sabot still requires pinpoint accuracy. This notwithstanding, a crew from a tank squadron still equipped with the latest *Centurion* tanks, mounting a 105mm gun, did much the same thing. Only this time it was done with pop-up targets. A first round hit was obtained in seven seconds. That's impressive.

The ranging gun is mounted coaxially with the main gun, next to a 7.62mm coaxial machinegun, and is fired using a foot lever mounted under the gunner's feet. This leaves the gunner's hands free to manipulate his fire controls. The ranging machinegun is adjusted to fire in a three-round burst. No more four steps of putting the range finder into operation — just headspace and timing.

The designers added additional batteries mounted in the turret for emergency use. These are particularly useful for radio watches. The master switch can remain off while leaving the radios on. The additional batteries eliminate the need to crank the main engine at night to keep the tank main batteries charged. And if the regular power fails during active operations, this emergency power source will allow the crew up to 20 minutes of silent watch. This is usually enough to get out of a firefight.

Millions of words have been written on how to cook "C" rations, and millions more on the English and their tea. But a securely mounted water boiler in

the turret is a new twist. This is sealed so that it will not spill during cross-country operations. The boiler heats both the canned rations and the hot water for the tea. When first shown this, my immediate reaction was the memory of the Willie and Joe cartoon of World War Two: "Drop the cans in the coffee gently Joe, I've got a chicken stewing on the bottom."

When the tanker on our *M60* series wants to heat his "Cs" he has two options. He can start his tank heater, put a single can inside the driver's heater outlet, and close the cover. If he forgets to shake the can up while it's heating, he may find the pungent smell of beans and franks, burnt crisp, all over the driver's compartment. Or, the tanker's other option is to get out his little gas stove, sit on the back deck, swear and curse to get it started, only to have to move out suddenly. As a result he has a dirty stove to clean, and a cold "C" ration or no hot coffee.

Now when the *Chieftain* crew wants a mug of tea they draw hot water from their boiler. The British tankees normally put their canned food in the boiler before moving out. When they pull into an assembly area, their meal is hot.

Where we carry a five gallon water supply plus our canteens, the *Chieftain* crew carries a three-and-a-half gallon supply in the turret and in the driver's compartment. The water is carried inside the tank and is protected against the elements.

The turret has a filtered air blower system, which keeps the turret at slightly above atmospheric pressure. This is quite unlike our turret air filter, since it is not necessary to wear a protective mask when buttoned up. During wintertime the air is heated. The tank is sealed from rain, snow, sleet and most of all, nuclear fallout.

If the turret heater system does go out, and the gunner's hands get cold, he puts on a mitten for his trigger finger, turns on his muff warmer switch, and his fingers get warm. When first told this, I thought they were putting me on. But it is true.

Another point brought out in my visit with the British was their use of asbestos covers, called "thermo shields," to keep the gun tubes at a uniform temperature in order to eliminate droop. Many Americans, especially when they are on the range, complain that the sun, early in the morning will heat up one side of the gun tube causing rounds to drift, even ever so slightly. The same happens in the evening. To solve this problem for the *Chieftain,* covers are put over the tube so that it has equal heat 360 degrees around. The cover also serves another purpose; it breaks up the outline of the gun for better camouflage.

Mounted on the side of the British tanks are boxes for stowage of the crew's personnel gear. Any tanker who has tried to stow his gear in or on the *M60* series and keep it secure and dry, can see the benefit of inclosed outside storage. However in designing a tank, the designers should place these stowage boxes on the rear of the turret and then add the bustle racks. The stowage boxes on all of the British tanks, as convenient as they are, can be shot off fairly easily with main gun ammunition. And the turret is not as sleek as either the *M60* series or the new *MBT70* prototypes.

The *Chieftain* has a number of different features which certainly seem attractive and practical to a professional tanker. Some of these, like the washer/wiper for the *Sheridan* driver (but not for the other crew members), are beginning to appear on our fighting vehicles or are being planned for future models.

My experiences with the *Chieftain* convinced me first that those of us who work and live daily with what the designers come up with for us might well spend a bit more time and effort on making clearer to these designers our needs and wants.

Secondly, it seems to me that, if more of our tankers could have an opportunity to actually work with the equipment of our Allies, we would get a number of useful ideas about equipment and other military matters as well.

STAFF SERGEANT EDMUND L. DEVEREAUX, III, first entered the US Army in 1959. After a tour in Europe with the 3d Squadron, 2d Armored Cavalry Regiment, he left the service returning as a private in 1964. After a brief tour in CONUS with the 1st Battalion, 72d Armor, 2d Infantry Division, he was assigned to Company F, 40th Armor, Berlin Brigade. While in Berlin he trained with "A" Squadron, First Royal Tank Regiment (formerly the Berlin Independent Squadron). SSG Devereaux remembers the officers, NCOs and other ranks of that unit as "fine allies and, even more important, good friends." SSG Devereaux is presently an instructor with the Fourth Army Tank Commanders Course at Fort Hood, Texas. This is his first article for *ARMOR*.

Pile On

by Colonel George S. Patton

from sketchy intelligence to visual contacts, to engaging the enemy and simultaneous generation of friendly forces, followed by the violent destruction of the enemy unit, whatever its size . . .

From July 1968 through April 1969, the 11th Armored Cavalry Regiment continued operations throughout the III Corps Tactical Zone. The Blackhorse mounted a series of highly successful cordon and search and reconnaissance-in-force operations. At the same time it provided ground, rocket, and mortar security for the Saigon-Bien Hoa-Long Binh Complex, prevented enemy movement toward Saigon, contributed to II FFV/III CTZ operations interdicting VC/NVA attacks in Tay Ninh and Binh Long Provinces, and conducted continuous intensive pacification operations throughout the regimental area of operation (AO).

During my entire tour as commanding officer, the regimental headquarters and the preponderance of the regiment's elements served under the operational control of the Commanding General, 1st Infantry Division. No report of this sort could be written without paying tribute to that distinguished division and its commanders at the time, Major Generals Keith L. Ware and Orwin C. Talbott, who guided and led us over these critical months. General Ware was killed in action while leading the division near Loc Ninh on 13 September 1968.

It must be emphasized that, in each of the operations described here, divisional infantry, artillery, engineers and other supporting elements played a vital part. The Blackhorse Regiment was essentially the 4th Brigade of the "Big Red One" and our close affiliation with the entire Division was most rewarding to all concerned.

The principle factor which dictated my day-to-day operations was the flow of intelligence resulting from a very strenuous collection effort. It was, and continues to be, my judgment that the key to tactical success in Vietnam is the ability to identify good intelligence and to react to it rapidly with over-

ARVN CAPT Nguyen Thuong, COL Patton, CPT Hugh E. Hagen, Senior Advisor to Thuong's 51st Ranger Bn, and MAJ O'Meara discuss intelligence matters during an operation.

whelming combat power. The word *good* is emphasized since time is not available to develop the perfect intelligence fix. This precept is not new in warfare. Bonaparte told his marshals on many occasions, "Ask me for anything but time."

So too, the war in Vietnam is too fleeting, too unstable to allow the pursuit of perfect intelligence.

Our method of initiating combat focused on using every possible form of reconnaissance. Continual reconnaissance was bound to produce visual contacts with the enemy. These contacts were exploited at once. Immediate engagement was accompanied simultaneously by the rapid movement of forces to the area of contact and the generation of forces to encircle, compress and destroy the enemy.

Direction of the reconnaissance effort was based upon available intelligence. In a large area of operations, such as that of the Blackhorse, the reconnaissance effort must be programmed carefully, utilizing a priority system that focuses attention on the best available leads. The system has to be flexible enough to respond to any fresh intelligence input, and aggressive enough to facilitate immediate engagement of the fleeting foe. This build-up from sketchy intelligence, to visual contacts, to engaging the enemy and simultaneous generation of friendly forces, followed by the violent destruction of the enemy unit, whatever its size, was known as "Pile-On."

"Pile-On" commences with the rapid but careful analysis of fragments of information provided by the POWs, ralliers, captured documents and other intelligence sources. It progresses through a verification stage which is primarily a visual reconnaissance (VR). VRs were conducted, in the main, by the magnificent Aero Scout Platoon of the Air Cavalry Troop and by the equally effective but smaller air elements of the three squadrons. This effort was closely coordinated by the regimental S2. During most of my tour this position was held by Major Andrew P. O'Meara, who often conducted VRs personally. A measure of his personal involvement, as well as outstanding coordination, is that he was seriously wounded and evacuated on 13 February while on such a VR.

When a contact was made or a probable "hot spot" was located, the Aero Rifle Platoon (ARP), supported by Cobra gunships, Tac Air and artillery, moved in to conduct further reconnaissance and simultaneously to force a hostile reaction. Contact was joined and the situation developed. If the ARP encountered a numerically superior force, a ready reaction force of rifle, armored cavalry or tank elements "piled on." At this point it could be said that the enemy was truly located and the battle joined. Forces were then literally thrown together on a fragmentary basis in order to overpower, encircle and destroy the located enemy. Planning necessarily was minimized. Movement and operations against the enemy had to be paramount.

The first element to arrive behind the ARP in a reinforcing role was normally of platoon size. A company or troop commander, with his command and control element, moved in with one of his platoons. As soon as he was given the situation, the captain assumed operational control of all ground forces in contact. Essentially, this gave him a rifle company or armored cavalry troop minus one platoon, and supplied the basic command building block for the addition of forces if they were required.

At this point in the development of the fight, the newly-arrived captain remained under the overall operational control of the air cavalry troop commander. When and if the decision was made to insert additional combat elements, the battalion or squadron commander providing these, moved in with his third reinforcing "layer" to assume control of the entire battle. The decision on the timing of the changeover was normally made by the regimental commander and was of utmost importance to maintain the momentum of the action. When the battalion or squadron commander assumed control, the air cavalry troop commander reverted to a direct support (DS) role and the ARP was then extracted and returned to air cavalry troop control. Thereafter, the regiment added whatever units were considered necessary to complete the destruction of the enemy force.

Through violent execution of this concept, the 11th Cavalry was able to achieve noteworthy results, while conserving tactical strength. Thus, our motto, along with our doctrine, became—"Find the Bastards—Then Pile On." In execution of the "Pile-On" concept my policy was to consider any unit not in contact to be in reserve.

The descriptions of six separate, but typical Pile-On actions which follow shall serve to illustrate how an armored cavalry regiment uses the pile-on concept in a combat environment like that of Vietnam.

THE MULCAHEY RAVINE AFFAIR

This action was named in honor of CSM Daniel J. Mulcahey (then regimental sergeant major) who received the Silver Star for his gallantry during this fight. Later, on 20 December 1968, CSM Mulcahey was wounded and evacuated.

On 5 September 1968, ARVN Major Phuoc, District Chief of Chau Thanh District, Binh Duong Province, learned through his special channels that the executive officer of the enemy K4 Battalion, Dong Nai Regiment was ready to defect. With the assistance of elements of the 3d Squadron (LTC John W. McEnery) and the Air Cavalry Troop (MAJ Robert A. Wagg, Jr.) which were operating in the area, Major Phuoc was able to rendezvous with the would-be defector in the village of Chanh Luu, Binh Duong Province. The pick-up was completed and Major Phuoc and the defector were evacuated immediately to the province headquarters.

It should be noted that the actual planning for the pick-up and rendezvous was developed by Major Phuoc. The report of the preparation for, and execution of, the plan to bring the defector in safely reads like a James Bond novel. It is unfortunately beyond the scope of this article. The defecting VC, known as Ka, was questioned hurriedly in order to obtain highly perishable intelligence, such as the current locations of the K4 Battalion, which was believed to be dispersed in the general area. Ka was able to give approximate locations of elements of the K4 Battalion, which were then along the northern and western boundaries of the Blackhorse AO. The intelligence furnished by Ka was not studied or correlated, but accepted at face value and acted upon.

Within 30 minutes of Ka's pick-up, two squads of the ARP were inserted in the vicinity of the locations he had identified.

The selected landing zone (LZ) was less than 200 meters across an open field from the objective area. Gunships provided protective cover during the insertion. With the LZ secured, the ARP maneuvered toward a tree line, which had been identified by Ka as the most lucrative objective area.

Upon reaching the tree line, the ARP moved on line and immediately gained contact with and killed two Viet Cong. At a creek bed to their front, the riflemen then discovered a small cache containing 15 RPG rounds, cooking utensils, medical supplies, and other assorted equipment. The intelligence had checked out thus far. Sweeping further, they found a tunnel entrance in the creek bank. Fragmentation and concussion grenades were thrown into the tunnel, resulting in one additional wounded VC. Another VC leaving a second exit was captured by the flank security, and still more ran from a third exit.

The situation was developing rapidly. The platoon leader (1Lt Dennis J. Reardon) requested Major Wagg to give additional gunship support and to insert the remainder of the ARP. As gunships softened the area, Troop I, plus two platoons of Company D, 1st Battalion, 16th Infantry, joined the Pile-On and sealed off the area. The composite force was placed under the command of Captain John N. Jaeger of I Troop. When the gunships lifted their fire, the ARP again assaulted the tree line and came under heavy automatic weapons fire from the same tunnel complex. Fire superiority was achieved and the small force maneuvered toward the enemy position, smashing pockets of resistance. After regrouping, a sweep of the area netted six more dead and one prisoner.

During the period of the contact, CSM Mulcahey observed from the regimental command and control ship that a group of VC were attempting to leave the area. He directed the fire of the door gunners into the narrow ravine, which concealed the enemy soldiers. The pilot landed the ship next to the ravine, permitting CSM Mulcahey to dismount the door gunners of the aircraft and place covering fire on the ravine. The subsequent search of the ravine produced two dead VC and a wounded North Vietnamese soldier, who was newly arrived from North Vietnam.

The firefight portion of this small action could not have lasted over one hour. The intelligence had been fleeting and sketchy but surely worth a try. The reaction was immediate and ground reconnaissance revealed that Ka's information had been quite accurate. The ensuing Pile-On of airmobile infantry and armored cavalry resulted in effective destruction of the enemy, additional intelligence, and only one slightly wounded US soldier.

Had we waited long enough to plan carefully and execute a larger operation, success would have been doubtful. VC knowledge of Ka's defection would have insured that the target would have been long gone within just a few hours.

THE PRU INCIDENT

Pile-On reinforcement of a Provincial Reconnaissance Unit (PRU) ambush patrol on 17 October 1968 is a second and somewhat different example of Blackhorse operations. On this date, a PRU force of about 12 men was occupying concealed positions and attempting to gain hard intelligence on enemy activity along the northern portion of the AO. At about 1400, the PRU patrol observed an NVA company, well armed and equipped for extended operations, moving southeast of their observation position. The PRU reported the enemy force but elected to let it pass as the NVA heavily outnumbered them. However, about 15 minutes later, a second group of 14 NVA appeared. The PRUs popped the ambush and killed five of the 14 enemy, but lost their own leader who was killed during the exchange.

In the interim, elements of the 2d Battalion, 2d Infantry (M), 1st Division (LTC George D. Greer) and the Aero Rifle Platoon of the air cavalry troop were moving to reinforce the PRUs. After the ARP insertion at the ambush site, the PRUs were extracted by the same aircraft. The ARP moved along the trail following the path taken by the NVA company. Suddenly, Major John C. ("Doc") Bahnsen, commanding the Air Cavalry Troop, spotted an NVA soldier in a fighting position about 200 meters east of the ARP route of advance. This soldier was engaged and killed by Bahnsen's C & C ship. Bahnsen then landed to confer with the ARP commander. But, in so doing, he touched down precisely in the killing zone of the NVA force, which opened fire on his hovering aircraft and caused it to depart the area without Bahnsen. In order to avoid being struck by intense hostile fire, Bahnsen dove into the hole now occupied by the dead NVA soldier and radioed the ARP to attack and link up with him. As the ARP advanced, they gained immediate contact with an enemy squad slightly west of Bahnsen's position. An armored infantry platoon of the 2/2 Infantry which had been previously alerted, reinforced quickly. Bahnsen then consolidated these forces and led a hastily coordinated assault against the enemy force, capturing three NVA soldiers.

During the assault, Blackhorse gunships made accurate firing passes within 15 meters of the friendly forces. In this contact, the enemy left behind 10 killed and three POWs. There were no U.S. casualties. As mentioned earlier, the PRU patrol leader was killed. Once again, enemy prisoners had furnished the regiment with considerable good intelligence.

Major Bahnsen received the Silver Star for his part in this action.

THE DONG NAI HEADQUARTERS FIGHT

Our habitual employment of air cavalry assets included the use of the "pink team." This team consisted of one *AH1G Cobra* gunship at altitude and one *OH6A LOH Cayuse* reconnoitering at nearly treetop level. We found, through experience, that this was unquestionably the best method of employment.

On 1 December 1968, a pink team dispatched on a routine VR mission was diverted to assess the results of an immediate tactical air strike. A bit earlier, the alertness of a forward air controller (FAC) and prior reconnaissance of the area had resulted in the delivery of a strike on an active enemy base camp. After the air strike, the pink team began a routine bomb damage evaluation during which it observed two bodies in the bomb strike area. A continued search revealed that more enemy troops were present. The team notified the Air Cavalry Troop's tactical operations center (TOC), and the troop

commander immediately advised me of the situation. The ARP moved in, and the troop commander assumed control of the operations from his C & C ship.

Two ARP squads, under the command of 1Lt C. W. Doubleday, landed in a two-ship LZ 200 meters from the enemy position. After the insertion, the lift platoon stationed itself at a nearby fire base and prepared to air lift additional infantry elements into the contact. A second air strike and intense artillery fire raked the area, uncovering more enemy positions. Simultaneously, the ARP came in contact with and killed three more enemy. During their advance into the base camp area, it became evident that they were approaching a heavily fortified position occupied by a sizable enemy force. ARP initial reports indicated the position was a headquarters complex. This later proved to be correct.

The Pile-On continued as elements of Company B, 1st Battalion, 18th Infantry (CPT Richard E. Holden) moved into the area and linked up with the ARP, which then came under his operational control.

The lift ships returned to the forward LZ where they remained on standby for resupply and MEDEVAC missions. Throughout this period, the pink team, other gunships and the Air Force FAC provided continuous overhead cover for both the lift ships and ground elements. The tempo of the contact quickly increased. Holden reported 14 enemy KIA. However, well emplaced automatic weapons fire restricted the movement of his force to the extent that neither resupply nor evacuation was possible at the moment.

As darkness fell, the friendly elements withdrew 150 meters from the area of contact and established a hasty night defense position (NDP). The lift platoon returned for a resupply mission. As they approached the LZ, one *UH1D* was hit by hostile fire which caused engine failure. The pilot made a successful forced landing about 700 meters south of the ground elements, and two ARP squads moved to secure the downed helicopter.

Company B, 1/18 Infantry undertook surveillance of the enemy area and directed artillery fire to block possible counterattacks or enemy withdrawal. At 2230, the last requested resupply arrived with a fire team and an Air Force *Spooky (C-47),* which together made available cover and illumination. Two *UH1D* ships remained on standby for the rest of the night. Enemy contact ceased at 2300.

At dawn, TAC Air hit again. As *OH6A* scout ships and Air Force FACs directed the air strike and did a follow-up bomb damage assessment, the infantry moved out to sweep the area.

During this two-day engagement, the VC/NVA suffered 32 KIA, with an additional estimated loss of 20 dead. U.S. losses were one killed and three wounded. Noteworthy in this successful combat operation was the fact that the enemy unit had started the fighting. Documents taken from the enemy dead identified elements of the headquarters of the Dong Nai Regiment, the traditional enemy of the 11th Cavalry. Communications equipment was seized together with documents containing certain enemy operational plans for the next 30 days.

For reasons still unknown, the enemy chose to remain in his bunkers after his position was disclosed and to engage the U.S. units. He fought well and to the last man. For the enemy troops involved, it was their final mistake.

Captain Holden and Lieutenant Doubleday, as well as several enlisted men from both the 11th Cavalry and the 1st Infantry Division, received the Silver Star for their actions in this engagement.

THE K4 WOODS

The three foregoing tactical examples of Pile-On were developed by air-landed infantry reinforced by additional infantry as required. The greater part of this reinforcement came through combat air assault. The next example illustrates the employment of armor, air cavalry and air-landed infantry in a Pile-On. Where weather and terrain permit, this, in my opinion, is the way to go.

On 3 February 1969, two pink teams and several "slicks" with the ARP aboard, together with the air cavalry C & C ship, were ordered to conduct detailed reconnaissance of certain newly assigned target areas northeast of Lai Khe. Although the first insertion area was "cold" and showed no signs of recent activity, continuing aerial reconnaissance by pink teams detected fresh trail activity and bunker and trench networks in a jungle area slightly to the east of the first area. Lift ships immediately inserted the ARP 200 meters from the suspected enemy base camp.

On the ground, the ARP moved east toward the objective. The troop commander immediately deployed the aero-scouts to reconnoiter for possible enemy movement. As the ground elements continued to move forward toward the objective, they came under heavy fire from a numerically superior enemy force well concealed in carefully constructed defensive positions. The point man, SP4 Otis J. Darden, directed the small patrol to withdraw, while remaining behind himself to provide cover. He was fatally wounded during this courageous stand. SP4 Darden was awarded the Bronze Star posthumously for this action.

The ARP withdrew westward from the wooded area, returning to the LZ. While the target area was marked and *Cobra* gunships expended their ordnance, TAC Air gave air support to pin down, compress and hold the enemy in position until reinforc-

ing elements could arrive. Three separate air strikes were placed on this enemy position in less than 40 minutes.

During the softening-up phase, elements of the 2d Squadron (LTC Lee E. Duke) were concentrating and moving rapidly toward the contact. This force consisted of portions of Troop E (CPT Thomas W. Templer) and Company H (CPT Thomas M. Montgomery) reinforced by one platoon of Company B, 2d Battalion, 28th Infantry. As the air strikes terminated, the armor led by the Company H medium tanks moved through the jungle, overrunning and literally destroying the base camp. When an additional rifle company (A 1/18 Infantry), made available by General Talbott, reinforced on the ground to block escape routes, the ARP was extracted. After repeated sweeps through the area by tanks and APCs, enemy casualties reached 18 NVA KIA and seven captured. These enemy troops were newly arrived NVA enroute to join the Dong Nai Regiment.

The foregoing operations are historical examples of small unit Pile-On techniques as practiced by the Blackhorse Regiment and its OPCON infantry units, both US and Vietnamese. Incidents of this type occurred almost daily during the period under review in this article. They were, in my opinion, characteristic of the "continuous pressure" concept which were our orders at the time.

Part II of this article, to appear in a forthcoming issue of ARMOR, will discuss large unit "Pile-On" operations as well as pacification by a committed combat unit. A biography of the author will be included with that installment. THE EDITOR.

ARMOR NOMINATIONS

FOR COLONEL — AUS

Aarestad, James H	0233	Fisher, Robert W	0453	Noce, Robert W	0170
Anderson, James R	0771	Forbes, Dennis L	0744	Noll, John B	0626
Ballou, De Forrest	0525	Freedman, Edward P	0728	Norton, John M	0607
Battreall, Raymond R Jr	0483	Grasser, Peter G	0212	Palmer, Paul R	0252
Betts, Edward E	0444	Hammes, Norman W	0127	Patterson, Clyde H	0103
Birk, Elmer L	0725	Harmon, Benjamin F	0379	Phillips, Charles L	0101
Black, William C	0615	Hendry, John R	0612	Pickarts, John M	0270
Bolte, Phillip L	0558	Hilburn, Jack B	0139	#*Ponder, William R	0874
Bradley, Robert L	0179	Hoffmaster, George C Jr	0176	Quinn, Thomas G	0110
Brown, Lloyd J	0707	#Johnson, Lawrence H	0446	Renick, Roderick D	0214
Buchanan, William J	0268	Jones, Ogden S Jr	0503	#*Reuter, Robert M	0881
Bundy, Richard N	0491	Kemble, Charles R	0168	Rife, William T Jr	0815
Byers, John R	0235	Knapp, Theron W Jr	0171	Saalberg, John J	0730
#Cameron, Stephen F	0675	#Lehner, Charles R	1504	Sharp, Earl W	0295
Charney, Theodore J	0346	Levitt, Robert J	0638	Singletary, Albert W	0493
*Cochran, Arthur F	0887	Lind, Carl B	0355	Spettel, Charles L	0166
Conner, Judson J	0505	Martin, Louis B	0309	Stockton, Thomas W	0498
Corcoran, Edward F	0390	Mather, Linwood B	0156	Tague, Duane R	0347
Creuziger, Donald P	0215	Mayfield, Ross F Jr	0844	Turner, Frederick C	0518
*Crowe, J Godfrey	0890	Meyer, Keith	0726	Uttinger, Joe W	0654
Crowley, Ellsworth	0765	Milia, Carmelo P	0632	Walby, William G	0781
#Davis, Edward P	0698	Moreau, Donald W	0083	Wheeler, Neil W	0589
#*De Loach, William W	0872	Neal, William B	0785	*White, Kenneth H Jr	0882
Di Ciro, Charles M	0603	#*Nevins, Robert H Jr	0851	Wickers, Charles A	0040
Downey, Neil B	0616	Nielsen, Jack W	0519	Williamson, Dan H	0169
Dye, Clarence C	0526			Wright, Lawrence S	0763
Fairey, John M	0363			Yost, William L	0549

*Secondary Zone #Army Aviator

ARMOR BOX SCORE

OVERALL

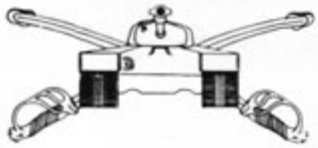
	CONSIDERED	SELECTED	%SELECTED	SECONDARY ZONE SELECTED
Armor	231	72	31	7
Army	3132	770	25	66

FIRST TIME CONSIDERED

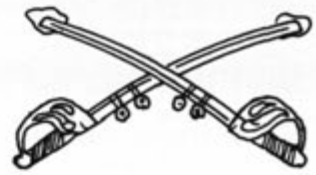
	TOTAL	SELECTED	%SELECTED
Armor	132	71	54
Army	1443	736	51

ARMY AVIATORS

	CONSIDERED	SELECTED	%SELECTED	SECONDARY ZONE SELECTED
Overall	5	4	80	4



OR?



There are indications that many Armor people prefer the crossed sabers, as formerly worn by the cavalry, to the present insignia on which an M26 tank is superimposed on the crossed sabers. Among these indications are verbal comments to Armor Association officers and Executive Council members, letters to the Editor of *ARMOR*, and the fact that many in air and ground cavalry units are wearing the traditional crossed sabers. Moreover, a few scholarly, or old soldier, types point out that the woefully inadequate M26 is hardly a fitting part of the symbology of a powerful, highly mobile combat arm.

Before championing the cause of the crossed sabers as the proper insignia for Armor, your Association very much needs a formal expression of your views on the matter. Please fill in the survey form below and return it by 1 February 1970.

TO: The Secretary, The United States Armor Association
Suite 418, 1145 19th Street NW, Washington, D. C. 20036

☐ I recommend that the Armor Branch insignia remain as it is.

☐ I recommend that the crossed sabers without other devices be readopted as the branch insignia.

☐ Neither of the above represents my views on a proper Armor branch insignia. A proposed design and/or description is attached.

NAME _____ RANK _____ BRANCH _____

ADDRESS _____

_____

_____

☐ Active Army ☐ ARNG ☐ USAR SSAN _____

☐ THIS IS MY NEW ADDRESS

☐ I am not currently a paid-up member of the Armor Association but my interest in branch affairs is high. My check for dues is attached ($6.50 one year; $12.00 two years; $18.00 three years).

COMPARATIV
Current Armored Fig

Main Battle Tanks	Combat Weight (tons)	Hull length	Hull width	Hull height	Ground clearance	Maximum speed (mph)	Vertical obstacle	Ditch crossing	Ha
M48A2	52.5	21′ 6″	11′11″	10′ 2″	1′ 3″	30	2′11″	8′ 9″	3′ 9″
M60	51.0	21′ 9″	11′11″	9′ 9″	1′ 6″	30	3′ 0″	8′ 9″	4′ 0″
T54	40.0	19′ 8″	10′ 9″	7′11″	1′ 5″	30	2′ 8″	8′10″	Unk
T62	40.8	22′ 9″	11′ 0″	8′ 6″	1′ 5″	30	2′ 8″	Unk	4′ 0″
Leopard	43.2	22′ 0″	10′ 8″	7′10″	1′ 6″	40	3′ 9″	9′ 6″	7′ 6″
Chieftain	56.6	25′ 1″	11′ 6″	9′ 3″	1′ 8″	25	2′11″	10′ 4″	3′ 6″
Vickers MBT	38.0	23′11″	10′ 5″	8′ 0″	1′ 4″	35	3′ 0″	8′ 0″	3′ 9″
AMX30	37.0	20′11″	10′ 2″	7′ 6″	1′ 6″	40	2′11″	9′ 7″	7′ 1″
STRV103 ("S")	41.0	22′ 8″	10′10″	6′ 3″	1′ 5″	30	Unk	Unk	Unk
Light Tanks									
Sheridan	16.8	20′ 8″	9′ 2″	7′ 7″	1′ 6″	43	2′ 8″	8′ 4″	5′ 2″
M41	25.4	18′ 4″	10′ 8″	9′ 4″	Unk	41	2′ 4″	6′ 0″	4′ 0″
PT 76	15.4	22′ 6″	10′ 5″	7′ 3″	Unk	30	Unk	Unk	Unk
Scorpion	8.7	14′ 5″	7′ 2″	6′11″	Unk	50	1′ 7″	6′ 9″	3′ 6″
AMX 13	14.6	16′ 0″	8′ 3″	7′ 2″	1′ 3″	37	2′ 2″	5′ 3″	2′ 0″
Armored Personnel Carriers									
M113	11.4	15′11″	8′10″	7′ 2″	1′ 4″	40	2′ 0″	5′ 6″	Unk
USSR M1967	13.2	22′ 6″	10′ 2″	6′ 6″	1′ 3″	36	3′ 7″	6′ 8″	Unk
Marder	29.0	21′11″	10′ 3″	6′ 1″	1′ 5″	45	2′ 6″	6′ 8″	Unk
FV. 432	16.1	16′ 9″	9′ 9″	6′ 2″	1′ 4″	33	2′ 0″	Unk	Unk
AMX-VTT	15.7	18′ 8″	8′10″	7′10″	1′ 7″	38	Unk	6′ 8″	Unk
Pbv. 302	13.3	17′10″	9′ 4″	8′ 3″	Unk	40	Unk	5′ 0″	Unk

*152mm gun/launcher; carries 20 rounds for gun and 10 for launcher.

E DATA
nting Vehicles

ry fording	Snorkel	Flotation	BHP at rpm	HP to tonnage	Operating range (mis)	Ground pressure (psi)	Main gun (mm)	Main gun ammo (rds)	Armament
	Yes	No	820/2400	15.7	160	11.5	90	64	1-Cal. 50, 1-7.62mm
	Yes	No	750/2400	14.7	335	11.3	105	57	1-Cal. 50, 1-7.62mm
	Yes	No	520/2000	13.0	250	11.8	100	35	1/2-7.62mm
	Yes	No	571/2000	14.0	220	Unk	115	45	1-7.62mm
	Yes	No	830/2200	19.2	361	12.2	105	60	2-7.62mm
	Unk	No	700/2400	12.4	250	14.0	120	53	1-Cal. 50, 2-7.62mm
	No	Yes	700/2670	18.4	420	12.8	105	44	1-Cal. 50, 1-7.62mm
	Yes	No	720/2600	19.4	300	11.0	105	56	1-20mm, 1-7.62mm
	Yes	Yes	490	11.9	105	12.8	105	50	3-7.62mm
	No	Yes	305	17.7	370	6.8	152*	30	1-Cal. 50, 1-7.62mm
	No	No	500	19.6	108	10.2	76	57	1-Cal. 50, 1-Cal. 30
	No	Yes	240	15.0	155	6.7	76	40	1-7.62mm
	No	Yes	195/5000	26.3	350	5.0	76	40	1-7.62mm
	Unk	No	270/3200	16.5	250	11.0	90	37	1-7.5mm
	No	Yes	200/3900	17.5	200	7.2			1-Cal. 50, 2-7.62mm
	No	Yes	236	18.0	310	Unk			Sagger AT Missile
	No	No	592/2200	22.4	375	10.9			1-20mm, 2-7.62mm
	No	Yes	240/3750	15.0	Unk	11.3			1-7.62mm
	No	No	246/3200	15.7	220	10.0			1-Cal. 50, 1-7.62mm
	No	Yes	270/2200	22.0	220	7.8			1-20mm

the APC *in* RVN

by LTC ROY F. SULLIVAN

How effective is the *M113* Armored Personnel Carrier (APC) in Vietnam? What features of the *M113* do returning Armor officers extoll or, conversely, want changed?

These and other answers were the goal of a recent survey conducted by the author among approximately 400 Armor and Infantry officers attending the 1968-69 regular course of the US Army Command and General Staff College, Fort Leavenworth, Kansas. Not only do survey results give an insight into the quality of the *M113*, our first fully tracked APC to see combat. But also they reflect those characteristics nominated by those with combat experience for a succeeding generation of APCs.

Included is a tabulation of answers by branch to the specific queries of the survey questionnaire. The percentages shown reflect only the answers given by Armor and Infantry officers who asknowledged having "first-hand combat experience with the *M113*" in Vietnam.

WHAT ARE THE *M113*'s STRONG POINTS

Ranked highest by Armor respondents was the design factor of dependability. Seventy-four percent described this factor as "excellent" while the remainder selected "satisfactory." Aggregating Armor responses to the design factors of silhouette, slope of armor, height, dependability and suitability results in the following:

- 36.4% of Armor respondents think overall design is excellent
- 48% think the *M113*'s design is satisfactory
- 15.6% judge the overall design as unsatisfactory

Also high in the opinion of most respondents were the *M113* capabilities of speed, cross-country mobility and ease of maintenance, which are cardinal assets for any tracked combat vehicle. The aggregate

SURVEY RESULTS

		% EXC	% SAT	% UNSAT
Silhouette	ARM	19	58	23
	INF	15	67	18
Slope	ARM	21	58	21
	INF	13	75	12
Height	ARM	16	55	29
	INF	10	60	30
Dependability	ARM	74	26	0
	INF	37	60	3
Average of above	ARM	36	48	16
	INF	20	67	13
Speed	ARM	65	35	0
	INF	70	30	0
Cross-country mobility	ARM	73	27	0
	INF	42	53	5
Cruising range	ARM	59	41	0
	INF	54	44	2
Amphibious capability	ARM	24	69	7
	INF	20	64	16
Air transportability	ARM	32	54	14
	INF	11	62	27
Carrying capacity	ARM	42	55	3
	INF	30	64	6
Ease of maintenance	ARM	58	40	2
	INF	10	86	4
Average of above	ARM	50	46	4
	INF	34	58	8

of responses to questions concerning the *M113*'s capabilities (cross-country mobility, cruising range, amphibious capability, air transportability, carrying capacity and ease of maintenance) indicates that:

- 50.4% think the capabilities are excellent
- 45.9% think them satisfactory
- 3.7% of Armor respondents judge them unsatisfactory

Not included in the questionnaire, but often commented upon by the officers surveyed, was the *M113*'s adaptability to operations in the environment of Southeast Asia. Such adaptability is well-illustrated in the following excerpt from *US Army Mechanized and Armor Combat Operations in Vietnam*, commonly known as the MACOV study, published by Headquarters US Army Vietnam:

> In addition to its traditional role as an Infantry carrier and its emerging use in a tank-like role, the *M113* is demonstrating further versatility in RVN. In those areas in which tanks are unable to operate because of soft terrain, the *M113* is used to make trails through light jungle and dense underbrush .This capacity of the *M113* to knock down undergrowth is also used to make landing zones for helicopters and fields of fire for defensive perimeters in wooded areas. During search and destroy operations [now termed strike operations] *M113's* are used to transport rice and other material uncovered in locations inaccessible to other vehicles. The *M113* continues to be used as a CP vehicle and as a communications platform for a wide variety of radio equipment.

WHAT WEAKNESSES HAVE BEEN REVEALED?

Despite the predominate praise accorded the *M113*, the respondents were candid about items needing improvement. Chief among these was the design of the *M113*, specifically the slope of the front, the silhouette and the height. Many comments were made about the "boxiness" of the *M113* and recommendations were made to lower the front slope of the *M113*, thus improving impenetrability. Comments were generally reflective of the design of the West German APCs, the *HS-30* and the newer *Schützenpanzer Gruppe*. Both of these have lower silhouettes and better armor sloping but no amphibious capability.

Although the *M113*'s cross-country mobility was generally lauded, several observations concerned the APC's mobility in swamps and heavy mud. According to these, the *M113* can be stalled by mud and debris jamming between the track, the hull and the rubber skirts. This is avoided by removing the skirts from the sides of the APC. However, such removal diminishes the speed developed by the *M113* in the water, which is only three to four miles per hour at best.

WHAT IMPROVEMENTS WOULD BENEFIT THE *M113*?

Seventy percent of the Armor respondents wanted more armament for the *M113*, which has only one caliber .50 machinegun. Of those selecting a specific weapon, most choices were for the 40mm grenade launcher which has been field tested in RVN. Runner-up was a 20 to 25mm automatic gun. These responses are also reminiscent of the two German APCs mentioned, both of which mount a 20mm gun.

Most Armor respondents favor an increase in the armor of the *M113* just as they want more armament. Strong support was given to the addition of three gun shields, one for the APC commander and two

MODIFICATIONS

	BR	% YES	% NO
Should carrying capacity be changed?	ARM	11	89
	INF	10	90
Should armament be added? If yes what type?	ARM	70	30
	INF	54	46
A 20-25mm auto gun?	ARM	44	
	INF	41	
An antitank missile?	ARM	0	
	INF	9	
An area anti-personnel weapon such as the 40mm grenade launcher or 60mm mortar?	ARM	56	
	INF	50	
Should more armor be added? If yes where?	ARM	70	30
	INF	66	34
To the front?	ARM	17	
	INF	21	
To the commander's cupola?	ARM	13	
	INF	24	
To the sides?	ARM	27	
	INF	31	
To the bottom?	ARM	43	
	INF	24	
Should the M113 have a "see and shoot" capability?	ARM	60	40
	INF	63	37
Should the M113 have a multifuel capability?	ARM	76	24
	INF	86	14

for machinegunners standing in the rear deck hatch. These shields are added in Vietnam where the modified *M113* is dubbed the Armored Cavalry Assault Vehicle or ACAV. The commander's cupola and caliber .50 machinegun are completely encircled by the larger of the three shields. Two smaller, partial shields protect the *M60* machinegunners firing from the rear deck.

The *M113* armor is often bolstered in Vietnam by the addition of titanium plates beneath the driver and squad compartments. Another way to gain protection against antitank mines is to line the floor of the driver and squad compartments with sand bags. Pierced steel planking (PSP) is also used for stand-off shields to protect the APC sides from shaped charge rounds, such as those fired from the *RPG2*.

As a solution to the cross-country mobility problem mentioned previously, some units add a capstan kit to the *M113*. The purpose of this kit is to assist the *M113* in pulling itself out of a morass. The kit consists of two capstans, which convert the front drive sprockets into winches, two lengths of heavy nylon rope which connect the capstans to anchors, and two anchors which are buried in solid ground and toward which the *M113* winches itself.

Sixty percent of the respondents supported the premise that the M113 needs a "see and shoot" capability. This term means that the squad inside the APC can see outside and can use individual weapons without exposing themselves. Tests conducted by the US Army Infantry Board, Fort Benning, Georgia, using *M113*s to which had been added four observation and firing ports on each side, should be reflected in the forthcoming Mechanized Infantry Combat Vehicle (MICV) being developed.

A large majority (76 percent) of the Armor respondents favored the *M113* having a multi-fuel capability. Several favorable comments were made about the *M113A1* which has a diesel engine. Those in favor of a multi-fuel version were skeptical that this feature could be added economically or without degrading the ease of maintenance of the present *M113*.

Although the percentages presented by this survey cannot be interpreted as being precise or even indicative of the opinion of all Armor officers, they do reflect the combat effectiveness of the *M113* in RVN. The survey also advances suggestions for improvement which should be considered as we develop future APCs, or MICVs, capable of rapid and effective employment anywhere in the world.

LIEUTENANT COLONEL ROY F. SULLIVAN, Adjutant General's Corps, was commissioned in the infantry in 1954 upon graduation from Texas A&M. After an initial assignment as an instructor at the Anti-aircraft Artillery and Guided Missiles School, Fort Bliss, he served for three years with the 2d Battalion, 48th Infantry, 3d Armored Division in Germany. Here he first became interested in the armored personnel carrier, the subject of this article. Subsequent assignments included being a tactical officer at the Infantry OCS and, after transfer to the AGC, Chief Personnel Services Division, Headquarters 1st Cavalry Division Section in Korea. LTC Sullivan is a graduate of the University of Arizona and of the Command and General Staff College. He is presently assigned to Headquarters, US Army Vietnam.

SCORPION RECONNAISSANCE TANK

by RICHARD M. OGORKIEWICZ

Tracked reconnaissance vehicles have been generally the least successful type of armored equipment. They have either been too much like battle tanks in size and weight without having anything like the battle tanks' combat capabilities. Or, when designed to be light and mobile, they have not been fitted with any armament worth speaking of.

Thus, armored reconnaissance units have been burdened with tanks weighing as much as 50,000 pounds but armed only with 76mm guns. At other times, including the present, they have been equipped with relatively light armored vehicles armed with nothing better than a caliber .50 machine gun. When it is recalled that more than 30 years ago light tanks of comparable weight were already widely armed with 37mm guns, the armament of some of today's tracked armored reconnaissance vehicles becomes little short of the ridiculous.

VEHICLES FOR RECONNAISSANCE

The reason for this unsatisfactory state of affairs lies in a widespread failure to recognize that armored reconnaissance units need something other than an inferior copy of the contemporary battle tanks or a miniature "battle taxi" (i.e., a scaled-down version of the first-generation armored personnel carriers). Obviously what they need, instead, is a vehicle designed to suit their specific needs—no more and no less.

This means, first of all, a vehicle which is significantly more mobile than a battle tank. If it can not be considerably more mobile it is not worth having, since battle tanks are bound to be superior in all other respects.

Secondly, it means a vehicle which is so armed that it can fight in its proper environment of reconnaissance and counter-reconnaissance operations and in the performance of the various security missions normally entrusted to armored reconnaissance units. To do this the reconnaissance vehicle need not have armament as powerful as that of battle tanks. It should not try to compete with them in this respect, as it can never have their combat capabilities. Nor should it aspire to the role of a light tank destroyer which calls for different characteristics. In other words, the reconnaissance vehicle should be able to

fight hostile reconnaissance vehicles, but it should not, and it can not, be expected to fight hostile battle tanks.

An attempt to develop such a reconnaissance vehicle in Britain has now resulted in the appearance of the *Scorpion* light tank or, to give it its official designation, *CVR(T)*—an abbreviation for Combat Vehicle, Reconnaissance, Tracked. Since it represents a fresh approach to the problem of the armored reconnaissance vehicle, the *Scorpion* deserves close attention. It is also noteworthy for a number of detail features.

OUTSTANDING MOBILITY

The most important characteristic of the *Scorpion* is its mobility, which is certainly greatly superior to that of any contemporary battle tank both in the strategic and the tactical sense. The basis of this mobility is the *Scorpion*'s light weight and small size. Its weight, combat loaded, is in fact only 17,500 pounds. Its overall dimensions are equally low, the length being 173 inches, the width 86 inches and the overall height, measured to the top of the gunner's periscope, only 82 inches.

The light weight and compact dimensions of the *Scorpion* make it possible to carry two of these in such standard military transport aircraft as the C130, which, incidentally, is used by the British Royal Air Force as well as the U.S. Air Force. The small size of the *Scorpion* also allows it to use even relatively narrow forest or mountain trails which larger vehicles can not negotiate.

What is even more important, the light weight of the *Scorpion* has made it possible to reduce its nominal track ground pressure to only 5psi, which is very much less than the ground pressure of most armored vehicles in use today. In consequence, it can move across soft terrain impassable to other armored vehicles and difficult even for men to cross on foot.

The light weight has also helped to make the *Scorpion* amphibious with the addition of a relatively small collapsible flotation screen. The screen is carried permanently on the vehicle and enables it to swim across inland water obstacles with a minimum of preparation. When in the water the *Scorpion* can propel itself at more than 4mph by means of its tracks.

On level road surfaces, the *Scorpion* has a maximum speed of 50mph which is higher than that of almost all other contemporary tracked armored vehicles. So is its power-to-weight ratio of 22bhp per

ton (26bhp per long ton) which results in rapid acceleration and high average cross-country speed.

EFFECTIVE ARMAMENT

In spite of its light weight and outstanding mobility, the *Scorpion* is well armed. Its main armament consists of a medium velocity 76mm gun which fires HEP or, to give them their British designation, HESH projectiles. The HESH, or High Explosive, Squash Head, projectiles are capable of defeating medium armor, which means that the *Scorpion* can effectively combat all hostile armored vehicles except for heavily armored battle tanks, and even then it might be able to knock them out from the side. The HESH rounds are also very effective against concrete weapon emplacements and against buildings. In addition to HESH, the 76mm gun can fire more conventional high explosive rounds as well as smoke and canister ammunition. The *Scorpion* can, therefore, act as a highly effective fire support vehicle for the infantry or for other light armored vehicles.

The main armament makes the *Scorpion* greatly superior to several contemporary tracked armored reconnaissance vehicles. And, if the latter compare unfavorably with light tanks of 30 years ago, the *Scorpion* certainly does not. To prove this, one need only recall that 30 years ago tanks with 75 or 76mm guns weighed at least twice as much as the *Scorpion* and were classed as medium tanks.

In addition to the 76mm, the *Scorpion* mounts a coaxial 7.62mm machine gun which, apart from its usual anti-personnel role, can also be used as a ranging machine gun for the 76mm gun. This results from developments in sighting equipment and increases the chances of a first round hit at longer ranges without introducing the complexity and vulnerability of a range finder.

THE CREW

The crew of the *Scorpion* consists of three men: the commander (who also acts as the loader of the 76mm gun) and the gunner, both of whom are located in the 360° traverse turret, and the driver. The turret is located toward the rear of the vehicle while the engine is at the front of the hull, alongside the driver's compartment.

The side-by-side location of the driver and engine at the front of the hull makes for a compact vehicle. It also makes the *Scorpion* readily adaptable to the construction, on its basis, of a whole family of light armored vehicles, including armored personnel carriers, command vehicles, missile launchers and so on. A family of such vehicles is, in fact, under development.

FIRST ALL-ALUMINUM TANK

The hull and the turret of the *Scorpion* are both welded from aluminum armor. Aluminum armor is not, of course, new, having been used for more than 10 years on the *M113* armored personnel carrier and in several more recently produced vehicles, such as the *M551 Sheridan* armored reconnaissance/airborne assault vehicle. But the use of aluminum armor in the Sheridan is confined to the hull. Its turret is still of steel armor whereas the *Scorpion*'s turret, as well as hull, is of aluminum. In consequence, the *Scorpion* represents a further significant step forward in the development of aluminum armored vehicles. It is, in fact, the first all-aluminum tank in the world.

In addition to the turret and hull, aluminum has also been used for many other components of the *Scorpion* in order to reduce its weight to a minimum. These components include the forged aluminum trailing arms on which the road wheels are mounted and the road wheels themselves. The cylinder block and head of the engine are also of aluminum.

JAGUAR ENGINE

The engine is a militarized version of the 6-cylinder, water-cooled Jaguar *XK* gasoline engine of racing car fame, derated from the 265bhp of the high-compression car model to 195bhp. It was chosen because its configuration and high power-to-weight ratio made it particularly suitable for the *Scorpion* and also because it was a well-proved unit in regular commercial production. Furthermore, this made it available at a more reasonable price than specially produced military engines. Cost has, in fact, been considered as important as weight not only in the choice of the engine but also in the design of the whole tank. This certainly represents a refreshing departure from prevailing practices in the development of military equipment.

However, to anticipate possible user preference for a compression ignition engine, the *Scorpion* has also been developed to take a General Motors *4-53T* two-stroke diesel as an alternative to the Jaguar gasoline engine. The GM *4-53T* is similar to the diesels used in vehicles of the *M113* family. Although it makes the *Scorpion* heavier, the diesel engine also increases its operating range which, on roads, is already in excess of 350 miles.

The drive from the engine is transmitted through a semi-automatic hot-shift epicyclic gearbox which povides seven speeds in each direction. The gearbox, specially developed for the *Scorpion*, is very similar to the gearbox of the British *Chieftain* battle tank, but very much smaller, of course. Like the latter, it incorporates a triple differential steering system and thus represents a significant advance on the far less sophisticated controlled differential or clutch-and-brake steering systems used hitherto in light armored vehicles.

Another interesting features of the *Scorpion* is a novel, mixed flow (part-axial, part-centrifugal) engine cooling fan which is significantly quieter than others and particularly suitable, therefore, for a reconnaissance vehicle. The importance attached to silent operation has also led to the adoption of polyurethane tires for carrying the track around the driving sprockets. This has reduced metal-to-metal contact in the running gear to that at the sprocket teeth. The cast steel track links are of an exceptionally light, skeleton design with rubber pads providing contact surfaces on both sides. In keeping with modern practice, the track pins are rubber bushed and the road wheels are rubber tired, of course.

EXTENSIVE DEVELOPMENT

Before they were incorporated in its design, the various features of the *Scorpion* were tried out in the course of an exceptionally extensive development program. Work which led to the *Scorpion* may, in fact, be traced as far back as 1962, when a vehicle called the *AVR* (Armored Vehicle, Reconnaissance) was being considered. This was followed, in 1964, by the construction of a test vehicle called the *TV-15,000* which foreshadowed the *Scorpion* and helped to finalize its specifications in 1965. The next major step came with the construction of a static rig which reproduced the essentials of the front end of the hull and in which the Jaguar and General Motors engine installations were thoroughly tested. This was followed by another noteworthy step, namely the construction of a mobile test rig which was, in effect, a pre-prototype of the *Scorpion*.

Among the features which were tried but which have not been adopted was a hydro-pneumatic suspension. This was considered to offer insufficient advantage at this stage of its development, particularly in view of the fact that it weighed and cost more than the conventional torsion bar suspension which has been adopted.

All the original design and development of the *Scorpion* was carried out by the Fighting Vehicles Research and Development Establishment of the British Ministry of Defense, which corresponds to the U.S. Army Tank Automotive Command. However, in 1967 the Alvis Company, already well known for its highly successful *Saladin* armored car, joined in the development of the *Scorpion*. It is now building a series of prototype vehicles.

A GOLDEN ANNIVERSARY

This article is the 50th that Richard M. Ogorkiewicz has contributed to *ARMOR*. Coincidentally, his first appeared in the first *ARMOR*, when the title was changed from the *Armored Cavalry Journal* in July-August 1950. Mr. Ogorkiewicz is now Senior Lecturer in Mechanical Engineering at the Imperial College of Science in London. His books *Armour* (1960) and *Design and Development of Fighting Vehicles* (1968) are widely recognized as unique authorities in their field. He is a most engaging and renowned lecturer whose address to the 1967 Armor Association Annual Meeting was a highlight. And much else could be written about his distinguished career.

But to *ARMOR*, Dick Ogorkiewicz is much more. He has been mentor, adviser, supporter and staunch friend of five editors and even more *ARMOR* staff members. He has unstintingly helped numerous authors and baffled Armor graduate students. And, above all, he has stimulated, and continues to stimulate, mobility thinkers with his authoritative and original views. We salute him as best we can while riding hard to keep up with him.

ALL PHOTOS BY SOLARTRON

BANG! BANG! YOU'RE DEAD

A NEW LOOK IN COMBAT SIMULATION

by

LIEUTENANT COLONEL J.O.G. PATON, BRITISH ARMY-RETIRED

There can be few Armor officers who have not had a blazing argument with the umpires in the middle of a tactical exercise. Umpires are, of course, all blind, deaf, stupid, and biased (except when you happen to be one yourself). Indeed, one of the SOPs for a successful exercise is to lose your umpire as early as possible. The sort of thing that can go on is illustrated as follows: A platoon of tanks is advancing through broken terrain supported by a platoon of infantry in APCs. As they approach a track, the leading tank "fires" at an enemy tank on the far side of the track, at about 500 yards range, by flashing his searchlight. The target tank has his gun traversed away from the attacker, and has apparently been caught unaware.

"At last," thinks the umpire accompanying the attacking tanks, "no argument about it this time." So he goes over to the target tank, and talks to the commander:

Umpire: "You are knocked out for two hours."

Commander: "What do you mean — knocked out?" (or words to that effect!)

Umpire: "You have been fired at at a range of 500 meters by that tank there. You're dead!"

LIEUTENANT COLONEL J.O.G. PATON, British Army-Retired, joined the British Army in 1947, and served with armored car regiments in Malaya, Germany and the U.K. In 1966, he commanded the team that won the NATO Tank Gunnery Competition, the Canada Cup, while he was commanding a squadron of Centurion Tanks in Germany. Later he was an instructor in military electronics at the Royal Military College of Science. In March 1969, following retirement from the service, he joined Solatron Electronic Group, Ltd.

Commander: "The hell I am. I shot him and the rest of his no good platoon as they came over that ridge back there. They crossed it like a herd of cattle in full view of me at a range of 1500 meters. Didn't you see me flashing my searchlight at them?"

Umpire: "No, I didn't. In any case we've got to get on with the exercise. So, move back about one mile. While you're doing so, I'll hold him still!"

Commander: "O.K. if you insist, but I am going to tell my company commander what has happened."

And so it goes on. The company commander complains to the chief umpire. Arguments go back and forth. Eventually after about 30 minutes (just what the company commander needed for his redeployment) the tank commander is given the order to move back, and the exercise can go forward again. This sort of messy and inconclusive action can happen four or five times a day to one platoon on a tactical exercise.

The problem boils down to a need to simulate realistically the effects of gunfire at operational ranges. If some such simulator had existed in the situation above, the target tank would have produced "casualties" among the attacking tanks and APCs as they crossed the ridge, (if he had seen them at all!), and the attackers would have had to deploy to undertake a set-piece attack on his position. The umpire's problem would have been solved, for the results of the engagement would have been clear for all to see. Furthermore, casualties would have been imposed which would require medical and repair support to come forward to evacuate and rectify. Everyone in the action would have known what was happening. In particular, the tank gunners would have had to use their skill, so expensively learned, in order to engage and "destroy" their targets.

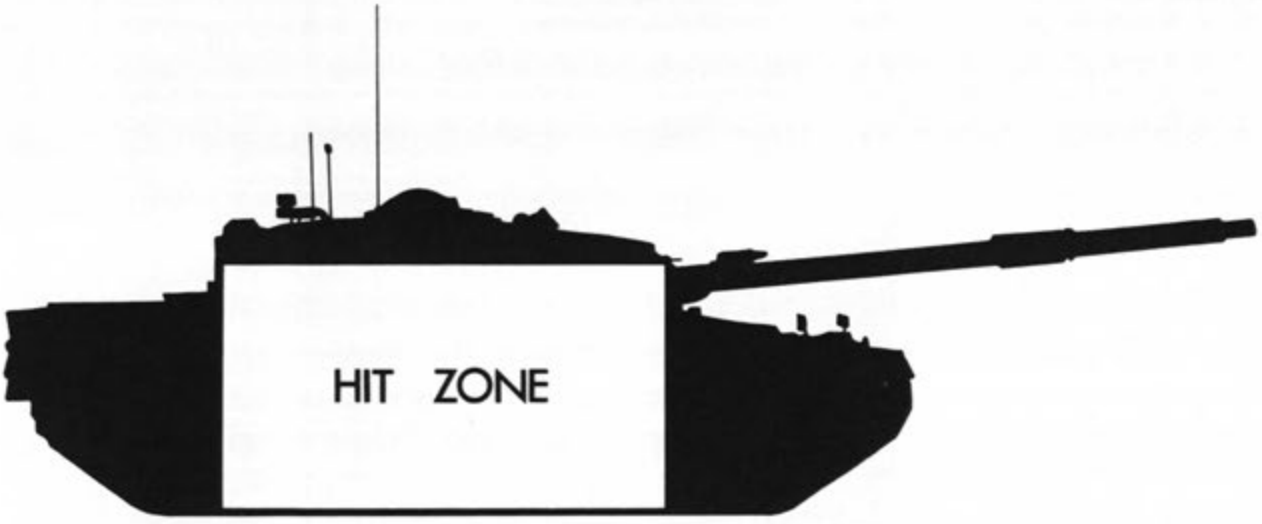
The British Army recognized the urgent need for some such tank training simulator for many years. In 1966, with the help of various firms in the United Kingdom, they formulated six objectives which they wanted a simulator to satisfy:

- The gunnery procedures used with the simulator must be identical to those used with live ammunition. No retraining to different procedures, specially for use with the simulator, was acceptable.
- The simulator must not only register when a hit is obtained on a target vehicle, but also must give indications of a near miss, so that the gunner can apply his standard corrections to bring him on target.
- "Kill" indications on the target vehicle must disable the vehicle, and be clearly visible to all concerned in the engagement.
- The chance of achieving a hit must be similar to that when using live ammunition. The tactical balance between attacker and target must be as close as possible to actual battle.
- There must be precautions against cheating by over-enthusiastic crews.
- The cost must be compensated by savings elsewhere in the training system.

The Solartron Company of Farnborough, Hampshire, England (a subsidiary of Schlumberger Limited, New York) initiated development of equipment to meet these challenging specifications. Fortunately at the time, gallium-arsenide laser technology was reaching the point, in various laboratories in the United States, where it was ready for commercial use. It was decided, therefore, to develop a simulator based on the GaAs laser, with the laser beam in effect simulating the flight of the projectile from the gun. One of the many points in favor of a GaAs laser solution is its inherent safety. There is no danger of eye damage from this laser, even if an observer is looking at the beam through binoculars or other optical instruments.

The operation of the equipment from the point of view of the tank crew is very simple. The commander sees a target, and gives his fire command in the usual way. The loader simulates the loading of a round; the gunner sets the range and lays his sight on the target. The commander orders "Fire!" The gunner presses the trigger. Three things then happen. First, a pulsed laser beam is emitted by the projector for a period of two seconds. Second, a flash cartridge is fired from the flash generator, giving off a puff of smoke and a flash of light to simulate the firing of the gun. From the target end, the signature of the gun "firing" is very realistic, and gives the target crew a chance to see the direction of the attack. Third, a light appears in the gunner's eyepiece attachment to indicate that the projector has fired. One and one half seconds later (to allow for the time of flight) the gunner and commander both receive indications in their eyepiece attachments of the strike of the round. Small red lights come on to indicate left, right, plus or minus fall of the shot. The gunner can then correct his aim accordingly.

If a hit is obtained, two lights appear in the eyepieces, at 12 o'clock and at 6 o'clock. The gunner also has the satisfaction of seeing a smoke flare go off on the target vehicle, causing a most impressive



Comparison of the size of the "hit zone" at 1500 meters, with a side-view silhouette of a Chieftain tank. The size of the hit zone remains constant even if only the top of the target is showing above ground cover.

pillar of smoke to indicate for all to see that he has had a successful shoot. Meanwhile, on the target vehicle, the crew receives an indication by a flashing light on the control unit when they come under attack. If they are alert, there may be time to take evasive action. This again is a realistic situation. However, if they are hit, they will know about it from the smoke flare. Although in no way toxic, this smoke is not pleasant and the crew will not enjoy being "knocked out." In addition to the flare, a relay opens to switch off the weapon projector and (if desired) the radio set, and a "killed" light goes on on the control unit. Additionally it can be arranged that the engine is cut out. However, the British Army rejected this option. What would happen they argued, if a tank was hit just as it was crossing a busy highway! It is probably enough to cut out the radio and the projector since without these the target vehicle would be of no further use in the action, even if able to travel.

There is a cover plate on the control unit which is locked by keys held only by the umpires, and the switch which releases the vehicle from the "killed" state is under this cover plate. It is therefore feasible to "knock out" a vehicle for several hours until it is released by the umpires. Also under the lockable cover plate are two counters to register the ammunition expenditure. The ammunition loading of the tanks before an exercise is decided by the commander, and set up on the counters. These are then locked up, and when the ammunition load is fully used, the weapon projector can no longer be fired. Resupply must then take place, under umpire supervision, before the tank can be operational again. This facility prevents indiscriminate and wasteful shooting, and forces the commander to think realistically, as he should, about his resupply problem.

The simulation is very realistic, and crews who

M60 tank control unit. The white panel can be covered with a locked plate.

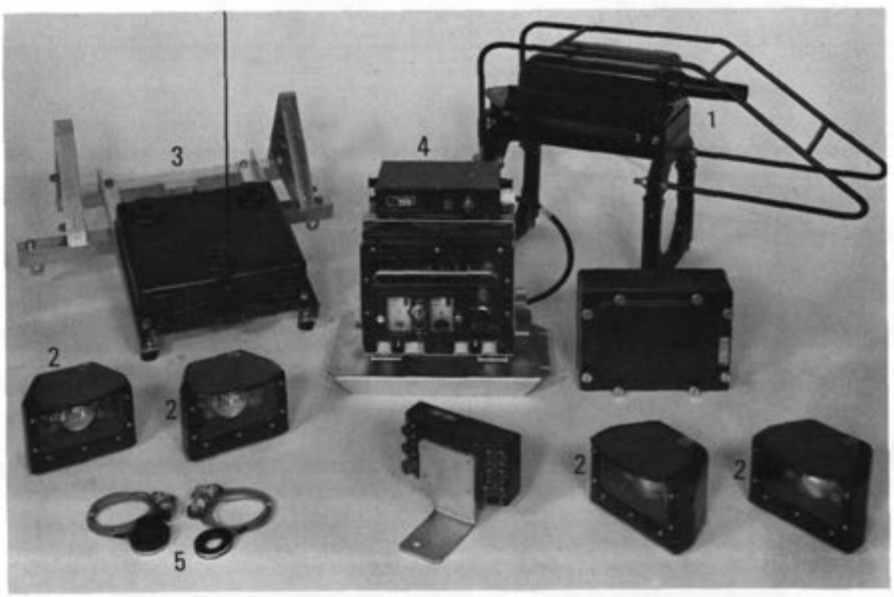
have used it in the U.S. at Fort Knox, in England at Bovington, in Germany and elsewhere, have been impressed by the speed with which they can become familiar with its operation. This is undoubtedly because there is so little change in the operating procedures from the standard procedures they have been taught to use when firing live ammunition.

This sort of detailed simulation did present three major problem areas in development. The first of these problems is concerned with the difficulty of simulating the curved trajectory of the shot by means of the straight-line path of the laser beam. The requirement clearly is to assure that the trajectory of the shot, and the straight-line path of the laser beam, coincide at the target. When firing live, the gun barrel has to be elevated above the line of sight by an amount known as the tangent elevation angle (super-

The external components of the Direct Fire Weapon Effects Simulator shown on a model of a Chieftain tank.

elevation) to allow for the trajectory of the shot. So as to maintain normal gunnery procedures, the same tangent elevation angle must be set on the gun when firing with the simulator as when firing live. This angle depends on the type of ammunition used and on the range to the target. So the simulator is designed to compute this angle, and then the laser beam is depressed by an amount equal and opposite to the tangent elevation angle. This ensures that the shot and beam would coincide at the target. The information on the type of ammunition is fed in by the loader pressing the appropriate button on the control unit. The range is fed in by using the projector during the first half-second of the operational cycle as a laser range-finder. This system has been accurate and reliable in practice, and did not present the anticipated difficulty in development.

The second problem area concerned the target size. Obviously, to meet the fourth of the requirements listed above (correct simulation of hit chance), the hit zone, covering the area in which indications of a hit are received in the eyepiece attachments, must coincide as nearly as possible with the apparent size of the target at the range of engagement. This proved a difficult problem, but has been solved as follows: The laser beam is made to trace a circular path in space by means of a rotating convex lens system placed in the path of the beam. This beam is slightly offset from the optical axis of the lens. The top and bottom positions of the beam overlap as it rotates. This overlap zone is the hit zone, and the area of scan outside the hit zone is the acquisition zone. The detectors on the target respond to the laser beam striking them. If there are two strikes on a detector



COMPONENTS

1 — Laser Projector
2 — Laser Beam Detectors
3 — Receiver/Transmitter, Target to Attacker
4 — Control Unit
5 — Commander's and Gunner's Eyepiece Hit Indicators

during the rotation of the beam it means the target is inside the hit zone and is killed. If there is only one strike then the target is in the acquisition zone and is missed. The acquisition zone is divided into quadrants to give the appropriate indication back to the attacking tank. The size of the hit zone is set up by careful adjustment of the projector, and represents the target size of a battle tank side-on at about 1500 meters. At longer ranges the hit zone is slightly larger than the apparent size of the same target. Closer in, the hit zone becomes slightly smaller than the target. In other words, the chance of scoring a hit at long range are slightly better than they are with live ammunition, while at short range they are slightly worse. This effect has not proved to be objectionable since it encourages those crews who keep alert and spot their targets at long ranges, while crews who wait till the enemy are upon them before they wake up are at a disadvantage.

The third problem area, and the one that proved more troublesome than all the others, is the old one of service reliability. Almost every piece of electronic equipment that is strapped on a tank initially proves to be unreliable. Any engineer who claims he has made a new piece of electronic wizardry that worked to specifications on tanks the first time it was switched on, is more likely to be a liar than a genius. Life is not like that, and this equipment proved to be no exception to this universal rule. It is hard to simulate the dirt, vibration, dampness, and rough treatment to which tank equipment is subjected; it is harder still to persuade engineers to design for these conditions. "Why *must* they stand on it" they say. "Do they *have* to use it as a step when climbing in and out!" They soon learn, and accept that they must change the design rather than change the age-old habits of soldiers the world over. After a great deal of time spent operating the equipment on tanks under all conditions and in all weather, and with the patient cooperation of the staff of the Royal Armoured Corps, Solartron has upgraded the equipment to the point where it will withstand all (or nearly all!) that the operating environment or a tank crew can do it.

Soldiers, being ingenious, try to find ways to cheat the equipment so as to make sure that they come through an exercise unscathed. Two ways that spring to mind are to disconnect the power lead to the equipment or to cover the detectors with camouflage nets, bedding or steel helmets. Rather than build in more and more complex and expensive safeguards against this sort of tampering with the kit, an external solution was devised. Each umpire is provided with a laser gun, the size and shape of a submachine gun with two triggers. If he points this at a vehicle equipped with the simulator kit, and presses the first trigger, he should get a response. If he does not, he knows the target is cheating, and can act accordingly. His second trigger, the "kill" trigger, allows him to knock out any vehicle going out of bounds, over a "minefield," or across a "blown" bridge, at a range of up to 2000 meters. At last the poor, frustrated umpires have a chance to get their own back when they see things getting out of hand.

This equipment then meets the first criteria listed at the start of this article. The remaining factor is cost. This will be the subject of a second article, which will include an assessment of the direct-fire weapons effect simulator as a gunnery training aid. It is on the basis of the cost effectiveness of the equipment in terms of the expense of training ammunition that a cost analysis of its worth can be made. The second article also will describe some of the other applications of this equipment which are currently in development for use with air-to-ground, ground-to-air, antitank and small arms weapons.

Meanwhile the British Army trials of an evaluation quantity of these kits are nearing completion at the Royal Armoured Corps Center at Bovington Camp, England. A quantity will be with the British Army in Germany this spring, and it is intended that this quantity will be increased rapidly over the next five years. Not only will they be used to equip tanks, armored cars and antitank guns, but a proportion will be supplied as target only kits, to equip armored personnel carriers, command vehicles, repair vehicles, self-propelled guns, supply vehicles and so on, to subject these equipments to the effects of direct fire attack. No one in the British Army doubts that the arrival of this equipment will have a profound effect on the conduct of tactical exercises and will force all participants on an exercise to act as realistically, as speedily, and as effectively as if they were under the threat of attack from live ammunition. Not least, their use will give commanders a most valuable tool for assessing the performance of the troops under their command, which will instill a competitive spirit based on a true evaluation of operational efficiency and crew skills, rather than on the subjective opinions of umpires. Some such assessment tool has long been required, and it should go a long way to improving the spirit of professional competition which is the basis of all good training.

TANKS FOR

by LTC T. S. Riggs, Jr.

It is strange that many, even in Armor, consider the tank to be really suited only to easy, rolling terrain—what they call "tank country." The tank was conceived as a means to restore mobility to one of the most difficult battlefields on which man has ever struggled. In 1916, with automotive engineering in its infancy, it was possible to build machines that moved through the morass of waterlogged, cratered mud that two years of intrenchment and shelling had made of the Western front.

Decades later, in the difficult terrain of Korea and Vietnam, American Armor had only equipment designed for "tank country." Despite this handicap to its mobility, notable successes were gained. But what might have been done with tanks designed for the job, and for the terrain, at hand? My objective here is to discuss what a tank optimized for difficult terrain should be.

THE NEED

Design of forces for timely and effective use must include development of equipment suitable for the situations and areas in which those forces are to be employed. What is the probability of our needing Armor forces designed for difficult terrain?

In his article, "Geographical Patterns of Conflict" (*Military Review*, February 1969), based on historical and geographical analysis covering more than a century of recent conflicts, Roger Beaumont found that almost 60 percent of over 240 wars studied were fought within 30 degrees of the Equator. The less numerous conflicts occurring more than 30 degrees from the Equator included the seven largest wars examined. These were fought in "major war areas" under rather specialized geographic conditions of "crowding, excellent communication and transportation, ethnic-religious tension and friction, rich agricultural and industrial nutrients, and open terrain." This is the kind of theater for which Armor has been, and is now, primarily organized, equipped, and trained.

Not only historical and geographic analysis, but also the nuclear deterrent to major conflict in developed areas and announced Soviet and Chinese doctrines concerning "wars of national liberation" point to so-called little wars in the underdeveloped areas near the Equator as the most probable environment for which we should prepare. It is time for us in Armor to give more thought to the tropical and subtropical areas with poor communication and transportation, underdeveloped agriculture and industry, and all varieties of close and difficult terrain. Current operations in Southeast Asia can tell us a great deal about what to expect.

AD HOC DESIGN OF FORCES

Beaumont observed that "designing military forces for commitment in trouble spots has often been *ad hoc*, too frequently after the event, and limited by the previous experience of policy makers." Certainly, any tanker who contended with Korean mountains and paddies in *M4*s and *M46*s, or with Vietnamese jungles, paddies, and mountains in *M48*s, knows the problems that arise from *ad hoc* design of armored forces. In the absence of anything better, the *ad hoc* solution was to use obsolescent tanks against the

NON-TANK COUNTRY

Korean, Chinese, and Vietnamese forces, which had little or no armor.

The firepower and survivability built into these old tanks for their original role were exploited successfully by Armor commanders, in spite of the mobility limitations imposed by difficult terrain on vehicles bigger and heavier than necessary for their actual role. It seems obvious that properly designed tanks, built for the job, could have made an even greater contribution.

DEFINITIONS

Definition of terms is a logical beginning for discussion of any subject. It is significant, perhaps, that the 1965 Army Dictionary (AR 320-5) does not define "tank" as a general term, but instead has different definitions for "tank, 76mm gun," "tank, combat, full-tracked, 90mm gun," "tank, full-tracked, 105mm gun," and "tank, main battle," as well as "armored reconnaissance airborne assault vehicle." Of these, the last two apply to those vehicles which will be the standard equipment of our Armor forces in the future. They are defined as—

"tank, main battle—A tracked vehicle providing heavy armor protection and serving as the principal assault weapon of armored and infantry troops. The new main battle tank will mount the *Shillelagh."*

"armored reconnaissance airborne assault vehicle—A lightly armored, mobile, full-tracked vehicle serving as the main reconnaissance vehicle in infantry and airborne operations and as the principal assault weapon of airborne troops." (This vehicle has now been standardized as the *Sheridan M551* and is also armed with *Shillelagh.*)

Neither of these definitions is related to a type of terrain or intensity of warfare. But the vehicles defined have, in fact, been designed to optimize their capabilities for operations against a well equipped enemy in terrain having generally good trafficability. If combat vehicles defined by the same words were designed to optimize their effectiveness against a nonmechanized enemy in difficult terrain, with poor natural trafficability and a limited road net, they might have much different characteristics. To facilitate further discussion, let us accept the definitions given above as being related to particular vehicles now under development or production, and not as general definitions.

The unsuitability of the predecessors of the heavy main battle tank in difficult terrain has already been pointed out. Even the *Sheridan* is designed for opertions against a mechanized enemy, as is indicated by its main armament being an anti-armor missile system. Its design is constrained by the anti-armor capability on one hand and by the light weight necessary for parachute delivery on the other. A use has been found for it in the "little war" in poor terrain, but, in spite of its mobility it is unsuitably armed and much too lightly protected (particularly against mines) for the principal assault weapon mission. Its usefulness for reconnaissance is also severely limited. Vehicular reconnaissance in difficult terrain generally requires an aerial vehicle. Here the function of the light tank in the conventional reconnaissance platoon necessarily is frequently assumed by that of the armed

Design of forces for timely and effective use must include development of equipment suitable for the situations and areas in which those forces are to be employed

helicopter gunship in the air cavalry unit, just as the scout vehicle and armored personnel carrier are sometimes replaced by the *LOH* and the "Slick."

What we are talking about, then, requires a name and definition of its own. Let us call it a *Difficult Terrain Tank* (*DTT*) and define it as "An armored ground vehicle serving as the principal assault weapon of troops engaged in warfare in difficult terrain." If it is to be a real improvement over present tanks, the *DTT* must have much better mobility, without unduly compromising its other significant characteristics of survivability and firepower.

MOBILITY

With the advent of the *C5A* aircraft, the constraint on strategic air movement of tanks will no longer be the maximum weight that can be lifted in one piece, but rather the best way to use the total available tonnage of airlift. Although light weight will always be an advantage for strategic movement, we no longer need to sacrifice other essential characteristics of a combat vehicle to meet a rigid weight limit dictated by aircraft capabilities.

In the largely roadless regions for which the *DTT* is to be designed, it would be highly desirable to make it adaptable to lift by assault aircraft or heavy lift helicopters. If other requirements raise the total weight above this limit we should consider the possibility of sectionalizing the tank for intratheater airlift. A similar approach has been applied successfully to engineer equipment for airmobile operations. But mobility on the ground is much more critical to the value of the *DTT* than is transportability. Even if it cannot be moved at 90 knots or more, what is important is the ability to go most places at several times the speed of a foot mobile enemy and to maneuver armor-protected firepower almost anywhere. These are the components of tactical mobility—responsiveness and battlefield maneuverability.

The tank mobility estimates of the MACOV study group (reported in *ARMOR*, March-April 1968) seem very optimistic to the author, based on his personal observation of operations in the III Corps tactical zone and command of operations in the II Corps area. The "GO, TK-APC" portions of the dry season map includes areas in the Central Highlands where vegetation and local obstacles (primarily stream lines) make *M48* tank movement possible only along carefully selected routes, with the assistance of Armored Vehicle Launched Bridges (AVLB), tankdozers or engineer bulldozers, and Tank Recovery Vehicles (VTR). Movement becomes even more restricted in the highland wet season, when muddy slopes and cultivation of rice along stream valleys limit rapid movement almost exclusively to roads and few of the flat topped ridge systems of the main plateau. As the slopes along stream lines are the main obstacle, rather than paddy fields, the *M113* is also limited in the Highlands.

In the coastal plains (at least in the Qui Nhon-Bong Son and Phan Thiet areas) streams and rivers limit movement even in the dry season and the MACOV estimate of a 10-12kpm movement rate should apply only to the dry paddies. Rapid response depends on finding routes on which frequent employment of mobility aids is not required. More often than not, 10-12 kilometers of movement off of roads represents the maximum capability of a tank unit working all day with all mobility aids organic to a battalion. And this under constant supervision of a hard-driving commander on the ground and another overhead in a helicopter selecting routes which look most feasible (and alternates to these when the tankers on the ground find obstacles not apparent from the air). In the wet season, tank movement off the road is so difficult in the coastal plain as to preclude rapid response. *M113*s do much better in the wet paddies but they also have trouble at stream lines.

The point is not that tanks cannot go where the maps indicate. With maximum effort on the part of all concerned tanks can eventually get there. But, the areas of Vietnam in which *M48* tanks can move quickly in response to tactical requirements and maneuver effectively during engagements are much more limited than the maps indicate. Tank mobility is a real problem in Vietnam and significant improvements are needed if Armor is to operate effectively there or in any tropical country.

RESPONSIVENESS = CROSS-COUNTRY MOBILITY

The tactical utility of combat vehicles is directly related to their responsiveness to changes in the tactical situation. How rapidly they can mass and strike when the enemy is found and fixed and how quickly they can react to an enemy raid or ambush are critical to their value in the area warfare likely to be characteristic of conflicts in the equatorial region.

What is important is the ability to go most places at several times the speed of a foot mobile enemy

High road speed, together with weight and dimensions compatible with local bridges, may be an important ingredient of responsiveness. As we have defined the environment, however, responsiveness will depend principally on cross-country movement, not only because of limitation of road nets but also because bridges and other defiles will be targets for interdiction and many stretches of roadbed will be subject to mining.

The cross-country capability of present day armored fighting vehicles depends on three factors: power, traction, and flotation. Both the *M48A3* and the *M113A1* personnel carrier have engine/transmission systems that deliver ample power to the tracks. When one of these vehicles is stopped, it is usually because it has lost traction or has been mired. But there are some situations where heavy vegetation is too much for the lighter, less powerful *M113A1*. Though the tank has more ability to push through jungle growth and plantation trees, continuous operation in heavy vegetation overheats and eventually damages the tank transmission. Even 50 tons of steel pushed by 750 diesel horsepower eventually meets its match in the closely spaced giant hardwoods of dense jungle and on very steep, rocky slopes, where power may give out before the track begins to slip.

Thus, there is a need to make some improvements in the amount of power available, particularly if we find ways to improve traction. For continuous operation in difficult terrain the weight to horsepower ratio should be higher than the approximately 15:1 of the *M48/M60* series. The transmission must be designed for long periods of operation at high load and low speed. In addition to these essentials, it would be desirable to provide for limited bursts of much higher power to break through obstacles, surmount steep slopes and banks, or extract a stuck tank.

Traction is the means of applying vehicular power to the ground. So far, the best means for providing traction to combat vehicles has been the caterpillar track. In its present form, refined but not essentially changed from what was used on the first tanks, the track compromises between traction in mud and efficiency on the road. In order to use what roads are available without undue damage to the surface or wear on the track we must continue to compromise. But for the *DTT* the characteristics should be weighted more toward cross-country effectiveness, like that of some of the Canadian muskeg vehicles, and less toward road efficiency than those of our present tank track.

We should also recognize that the track is not the only way to apply power to the ground. Some forms of wheel traction, particularly when combined with articulation of the vehicle, have a high degree of cross-country effectiveness. The Lockheed *Twister* is the latest vehicle to apply this approach. Considerations of vulnerability and difficulty in providing effective fields of vision and fire may prove to be disadvantages of such a solution to the mobility problem. However, both wheel traction and vehicle articulation should be considered in selection of a design for the *DTT*.

Another approach to improved traction is the provision of auxiliary means to assist the primary means in difficult situations. One means of improving the terrain and making it less difficult is a tank mounted

dozer blade. Current TOEs provide only one tank-dozer per company. The MACOV study group asked for four, which would be more realistic in the Vietnamese terrain. Even better would be designing the *DTT* so that a reasonably effective dozer blade would be part of the basic vehicle, instead of being an add-on modification which weighs down and unbalances the tank. A winch cable to apply positive pull, at least when extracting another tank and possibly in other situations, is another worthwhile auxiliary means which might be made an integral part of the *DTT* design. A device like the tank unditching beam provided for the World War I *Mark IV* and later tanks might be developed. This was a heavy beam that could be chained to the tracks and passed completely around the turretless vehicle as many times as necessary to get out of a hole. (See p. 51, *ARMOR*, May-June 1967.)

The mobility of a cross-country vehicle in mud is a function of its flotation as well as its traction. If the vehicle has a low ground pressure its hull and suspension system stay above the surface, rather than sinking in and impeding its progress. The *M113A1*, with a ground pressure of 7½ pounds of vehicle weight per square inch of track on the ground, can travel over many rice paddies so muddy they have water standing on the surface without sinking in enough for the hull to contact the mud. An *M48A3*, with a ground pressure half again as high at 11.5 pounds per inch, will sink into the same paddies until the hull is bogged and the tracks lose traction. Reduction of ground pressure to less than 7 pounds per square inch is essential for a tracked *DTT*. Provision of similar flotation characteristics would be a prerequisite to adoption of a wheeled traction system. The armor needed for the assault weapon mission may not permit the *DTT* to be a natural floating vehicle, like the *M113*, but it should not be difficult to provide auxiliary aids like those on the *Sheridan*, *Vickers Battle Tank*, and Swedish *S Tank*.

Even the Sheridan is designed for operations against a mechanized enemy, as is indicated by its main armament being an anti-armor missile system

BATTLEFIELD MANEUVERABILITY AND SURVIVABILITY

So far, mobility has been treated only in terms of the physical and mechanical characteristics of the vehicle, which is valid until the factor of the enemy is added. The ability to move on the battlefield results from a complex interaction among mechanical and physical characteristics, protection against enemy weapons, and ability to destroy or suppress the enemy. Although our Europe-oriented tanks are too heavy for tropical warfare, and this is due mainly to the weight of their armor, we must be careful not to sacrifice too much of our armor in the quest for lightness.

Immunity to small arms fire and to artillery and mortar fragmentation is relatively easy to provide without making a tank any heavier than it would need to be just to survive the wear and tear of moving in difficult terrain. But most of the hull and turret of a medium (or battle) tank is two or three inches thick and the front is usually much thicker. This distribution of armor is related to the weapons and tactics used in major war areas. An inch of armor is more than enough to stop anything up through .50 caliber machinegun fire. Two inches will stop 14.5 mm rounds at less than 200 meters range and 20mm rounds at longer ranges. The likelihood of encountering many such weapons in the hands of unmechanized enemy forces in tropical areas is small, so something between one and two inches of ballistic protection should be ample, if it will satisfy other requirements. Because of the tactical conditions in close country, whatever armor is used should be distributed evenly around the tank.

The principal antitank weapon in the hands of enemy troops is likely to be a rocket grenade like the *RPG2* (*B40*) or *RPG7*. Limited numbers of more sophisticated man-portable guided weapons may possibly be used. The type used will affect the enemy's probability of getting a hit at the longer ranges, but will not affect the near certainty that, given a hit, a man-portable shaped charge weapon will penetrate any thickness of armor that can be moved in difficult terrain. This would be a discouraging prospect but for three facts.

First, in at least two incidents in Vietnam, tanks hit by four *B40*s and penetrated continued to fight until contact was broken. In many other cases tanks fought on after one or more penetrations. Depending on the location, a crewman in the direct path of the penetration might be killed or seriously wounded. Other crewmen were painfully, but not seriously, wounded by a spray of molten metal and many were completely untouched when their vehicle's armor was penetrated. Second, anything that detonates the rocket before it strikes the armor, whether an oil can

Flexible, or cupola mounted, 7.62mm machineguns manned by other crewmen should be placed to fire to the sides and rear

or ration box on a fender or a sheet of airfield plank hung over the suspension (as tried by the 3d Squadron, 4th Cavalry), greatly reduces the probability of penetration. Finally, even at the point blank range of 50 meters or less, commonly used by *B40* gunners, many more rockets were fired than ever hit the fighting compartment.

In short, the *B40* or any similar rocket is a real hero's weapon because it is unlikely to do enough damage to prevent the tank from retaliating. This does not seem to be true of an aluminum vehicle which tends to give less protection. Here the blast of the warhead and fragmentation effects are not limited to a narrow cone as they are in the penetration of two or more inches of homogenous steel. For protection against shaped charge rockets, then, one or two inches of steel all around would seem to be worthwhile, particularly if the tank can be arranged to cause rockets to detonate some distance from the main armor.

MINE PROTECTION

In the experience of the 1st Battalion, 69th Armor, and most other Armor units in Vietnam, many more tanks were damaged by mines than by direct fire weapons. By mid-1968 in Binh Dinh Province, large numbers of 105mm projectiles and some larger artillery projectiles and aerial bombs were being used as anti-vehicular mines in roads, old tank tracks, stream crossings, defiles, and even random locations in paddy dikes. Against a tank, most of these mines caused damage which could be repaired within 24 hours if parts and a tank recovery vehicle were available. Even the 8-inch shells and 500 pound bombs which caused damage requiring depot maintenance usually did not cause serious personnel casualties. The smaller mines seldom caused any injuries to crewmen.

On the other hand, *M113*'s encountering 105mm or larger mines usually had to be evacuated and their aluminum hulls were often deformed to an extent that made it doubtful they could ever be rebuilt. Mines struck by personnel carriers usually caused several serious personnel casualties.

Since the enemy can stack explosives in a hole until he gets a bang big enough to stop any vehicle by blowing off parts of the suspension system, complete physical protection of a tank against mine action is unlikely to be possible. What can be done is to ensure that the hull is strong enough to protect the crew from injury and the non-suspension components from damage. The *M48* provides such strength, but the elliptical hull requires that the roadwheel arms be mounted on extensions which are vulnerable to damage and difficult to repair. Broken *M48* torsion bars are also difficult to get at and repair. A flat hull like the *M60*, or even a completely external suspension system like the *M4*, would make it less difficult to repair mine damage.

Increased cross-country mobility would do even more to counteract enemy mine warfare because it would be more difficult to pick likely spots for mines. Naturally, Armor commanders will have to insist that increased mobility be exploited. And, they will have to continue to place emphasis on the tried and true techniques like avoiding old tank tracks and stream crossings.

FIREPOWER

There is no point in moving ineffective weapons rapidly to, or on, the battlefield. What will make the

DTT successful as the principal assault weapon of a force is the capability to provide a heavy volume of controlled fire in spite of enemy return fire and to destroy targets against which other weapons of the force are ineffective.

The first of these capabilities is as much a function of armor as of armament. We have already discussed the protection necessary to keep tank weapons in action against the likely enemy threat. A heavy volume of fire implies automatic weapons and an ample supply of ammunition. The coaxial 7.62mm machinegun on current tanks makes possible this type of fire. But, in close country fighting we need a multidirectional capability, like that made possible by the side mounts on the *M113* modified as an Armored Cavalry Assault Vehicle (ACAV). The well-known limitations of the *M1* cupola with the caliber .50 machinegun suggest that this is not the way to provide multidirectional fire. Besides its mechanical and ammunition capacity limitations, this mount is operated by the wrong crewman. The tank commander should be free to direct the employment of all tank weapons, particularly the main armament in the principal direction of fire. Flexible, or cupola mounted, 7.62mm machineguns manned by other crewmen should be placed to fire to the sides and rear.

What about the old, familiar .50? It was long ago outmoded as an air defense weapon but still has substantial virtues for ground combat, if properly mounted and supplied with ammunition. It should be put where its range, accuracy, and penetration superiority over lighter machineguns can be exploited—as a coaxial gun. Many tankers in Vietnam jury-rigged their .50s in the telescope mount with good results. The 40mm grenade launcher is another valuable weapon, especially for putting CS into holes and for harassing fire around a night position. *M79*s in the turret as crewmen's individual weapons provide this capability cheaply and effectively. Another possibility would be to install automatic 40mm grenade launchers like those on helicopters.

This brings us to the second capability of the assault weapon, destruction of targets which other weapons in the force cannot handle. Other requirements have already made our vehicle big enough to obviate the advantages of a recoilless weapon, without eliminating its disadvantages of backblast and a slow rate of fire. A main armament flamethrower is also ruled out by its short range and the space required for fuel. A small flamethrower (on the order of the one which could be put in the sponson of the *M4* and fired through the bow machinegun mount) would be a fine special purpose weapon, however.

There seem to be four good alternatives for main armament: a high powered automatic weapon like the *Vulcan*, a howitzer, a conventional tank cannon, or the *Shillelagh*.

A concentrated burst of automatic cannon fire would destroy most targets any of the others could knock out. Its dispersion would make it less effective for close support of infantry from long range. Moreover, in spite of everything we do to improve mobility, we must still recognize the need to extend our support to locations we cannot reach immediately. Also, masonry buildings, caves, and heavily constructed fortifications require more penetration than is possible with an automatic cannon.

Employed in the direct fire role, the 105mm howitzer with appropriate ammunition has all of the capabilities of the other alternatives. It is lighter than the 90mm or 105mm tank guns and uses lighter, more compact ammunition. It does not have a canister round, but its *Beehive* fired with muzzle action is similar in effect. Because of its lower muzzle velocity and higher trajectory close support at long range would require precise range determination means, such as a rangefinder.

The 90mm tank gun has a highly developed ammunition system giving virtually every capability of the howitzer except illumination and high angle fire. The characteristics of the gun, ammunition, and standard fire control system make it very effective for long range close support of assaulting infantry. In addition, its variety of armor-defeating rounds can penetrate all but the heaviest enemy tanks at long ranges. The armor penetration of the 20mm is only a couple of inches; and the 105mm HEAT round is limited in performance both by its low velocity and by the effect of rotation on the HEAT penetration. Although we have postulated a non-mechanized enemy, he might have some obsolescent "big war" tanks, perhaps even the residue of a US aid program. The experience of our *M24*s against North Korean *T34*s shows what might happen to undergunned *DTT*s in a similar situation. The 105mm tank gun is a more effective anti-armor weapon than the 90, but its ammunition system is less complete and lacks some types which are of more importance in tropical warfare than antitank rounds. Both the gun and its ammunition are heavier and bulkier.

An ammunition system of limited versatility is also

We must be careful not to sacrifice too much of our armor in the quest for lightness

characteristic of *Shillelagh*. The low velocity of the conventional round makes it less suitable for long range support than other tank guns. Although the gun-launcher is smaller and lighter than a tank cannon, the conventional ammunition is bulky and requires special protection against moisture and flame. The missile and its fire control equipment are expensive and complex. Putting a missile capability on the *DTT* would cost more than the few opportunities to use it could justify. Without the missile capability we have a weapon with low velocity and a slow rate of fire since it was really designed to be a missile launcher.

The choice of main armament narrows down, then, to the 105mm howitzer or the 90mm gun. The choice between the lighter, more compact howitzer and the gun, with its greater direct fire accuracy and superior armor penetration, can only be made in the light of the other characteristics of a specific vehicle design.

Having outlined the requirements for armament, a word about fire control equipment for the *DTT*. The rangefinder, computer, and other sights on the *M48A3* have proved themselves highly effective in a variety of situations in Vietnam. At least equal capabilities should be given the *DTT*. The tank-mounted searchlight, including its infrared feature, contributes greatly to the effectiveness not only of the tank but also of the force it supports. In addition, each tank should have a large Starlight Scope, since this can be used without running the engine. It should be mounted for employment either as a surveillance and observation device or as a part of the fire control system.

SUMMING UP

Up to this point, we have demonstrated a need for a tank specially designed as the principal assault weapon of forces engaged in warfare in difficult terrain and have discussed its essential characteristics. A difficult terrain tank must have the proper balance among outstanding mobility, armor protection sufficient to ensure survival in its environment, and firepower capable of destroying targets against which other weapons are ineffective; and it must be capable of producing a heavy volume of fire in the face of enemy counterfire.

Part II of this article, to be published in a coming *ARMOR*, will discuss how these requirements might be met, using three different vehicle concepts.

LIEUTENANT COLONEL T. S. RIGGS, JR., was commissioned in Armor in 1951 from the Officer Candidate Course at the Ground General School and saw combat in Korea with E, H, and Tank Companies, 31st Infantry, 7th Infantry Division. Later Armor assignments included five and one-half years in non-divisional tank battalions, three years in the Weapons Department at the Armor School, and one year as executive officer of a divisional cavalry squadron. He is a graduate of the Armor Advanced Course and the Command and General Staff College. He spent seven and a half months as a combat developments liaison officer in Vietnam before commanding the 1st Battalion, 69th Armor, from March until September 1968. He is presently assigned to the Office of the Deputy Chief of Staff for Military Operations.

The President of the United States of America, authorized by Act of Congress, March 3, 1863, has awarded in the name of The Congress the Medal of Honor to

Captain James M. Sprayberry

for conspicuous gallantry and intrepidity in action at the risk of his life above and beyond the call of duty:

Captain (then First Lieutenant) James M. Sprayberry, Armor, United States Army, distinguished himself by exceptional bravery on 25 April 1968 in the Republic of Vietnam while serving as Executive Officer of Company D, 5th Battalion, 7th Cavalry, 1st Cavalry Division (Airmobile). On this date, his company commander and a great number of the men were wounded and separated from the main body of the company. A daylight attempt to rescue them was driven back by the well-entrenched enemy. Heavily fire, Captain Sprayberry then organized and led a volunteer night patrol to eliminate the intervening enemy bunkers and to relieve the surrounded element. The patrol soon began receiving enemy machinegun fire. Captain Sprayberry quickly moved the men to protective cover and without regard for his own safety, crawled within close range of the bunker from which the fire was coming. He silenced the mahinegun with a hand grenade. Identifying several one-man positions nearby, Captain Sprayberry immediately attacked them with the rest of his grenades. He crawled back for more grenades and when two grenades were thrown at his men from a position to the front, Captain Sprayberry, without hesitation, again exposed himself and charged the enemy-held bunker killing its occupants with a grenade. Placing two men to cover his advance, he crawled forward and neutralized three more bunkers with grenades. Immediately thereafter, Captain Sprayberry was surprised by an enemy soldier who charged from a concealed position. He killed the soldier with his pistol and with continuing disregard for the danger, neutralized another enemy emplacement. Captain Sprayberry then established radio contact with the isolated men, directing them toward his position. When the two elements made contact he organized his men into litter parties to evacuate the wounded. As the evacuation was nearing completion, he observed an enemy machinegun position which he silenced with a grenade. Captain Sprayberry returned to the rescue party, established security, and moved to friendly lines with the wounded. This rescue operation, which lasted approximately seven and one-half hours, saved the lives of many of his fellow soldiers. Captain Sprayberry personally killed twelve enemy soldiers, eliminated two machineguns, and destroyed numerous enemy bunkers. Captain Sprayberry's indomitable spirit and gallant action at great personal risk to his life are in keeping with the highest traditions of the military service and reflect great credit upon himself, his unit, and the United States Army.

Captain James M. Sprayberry was born at La Grange, Georgia on 24 April 1947. Following graduation from B.B. Comer High School, Sylacauga, Alabama in 1965 and attendance at Alexander City Junior College, Alexander City, Alabama in 1966, he entered the United States Army on 8 April 1966. After basic training at the US Army Training Center, Infantry, Fort Benning, Georgia, he attended the Armor Officer Candidate School at Fort Knox, Kentucky graduating in January 1967. He was next assigned to the 4th Battalion, 69th Armor at Fort Benning. During his one-year tour in Vietnam, Captain Sprayberry served with the 5th Battalion, 7th Cavalry, 1st Cavalry Division (Airmobile) and with the Headquarters of the 1st Cavalry Division. Upon his return to the United States he was assigned to Company D, 4th Battalion, 5th Advanced Individual Training Brigade, US Army Training Center, Infantry, Fort Polk, Louisiana where he is now serving.

Call Of Duty

The President of the United States of America, authorized by Act of Congress, March 3, 1863, has awarded in the name of The Congress the Medal of Honor to

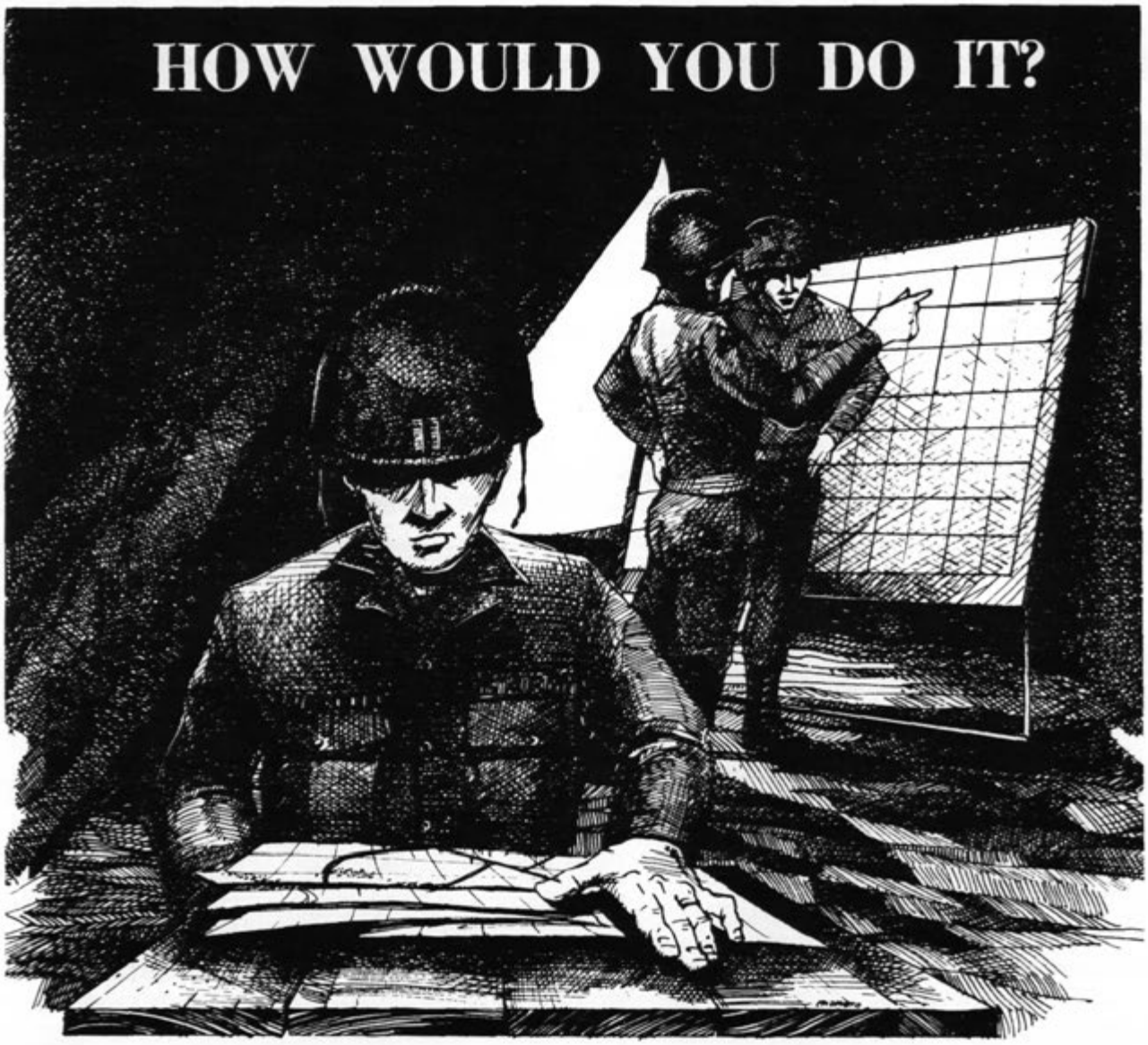
Sergeant Robert M. Patterson

for conspicuous gallantry and intrepidity in action at the risk of his life above and beyond the call of duty:

Sergeant Robert M. Patterson, (then Specialist Four), distinguished himself on 6 May 1968 while serving as a fire team leader of the 3d Platoon, B Troop, 2d Squadron, 17th Cavalry during an assault against a North Vietnamese Army Battalion which was entrenched in a heavily fortified position near La Chu, Republic of Vietnam. When the leading squad of the 3d Platoon was pinned down by heavy interlocking automatic weapon and rocket propelled grenade fire from two enemy bunkers, Sergeant Patterson and the two other members of his assault team moved forward under a hail of enemy fire to destroy the bunkers with grenade and machinegun fire. Observing that his comrades were being fired on from a third enemy bunker covered by enemy gunners in one-man spider holes, Sergeant Patterson, with complete disregard for his own safety and ignoring the warning of his comrades that he was moving into a bunker complex, assaulted and destroyed the position. Although exposed to intensive small arm and grenade fire from the bunkers and their mutually supporting emplacements, Sergeant Patterson continued his assault upon the bunkers which were impeding the advance of his unit. Sergeant Patterson singlehandedly destroyed by rifle and grenade fire five enemy bunkers, killed eight enemy soldiers and captured seven weapons. His dauntless courage and heroism inspired his platoon to resume the attack and to penetrate the enemy defensive position. Sergeant Patterson by his conspicuous gallantry and intrepidity in action at the risk of his own life has reflected great credit upon himself, his unit, and the United States Army.

Sergeant Robert Martin Patterson was born at Durham, North Carolina on 16 April 1948. After having attended Massey High School in Fayetteville, North Carolina, he entered the United States Army on 21 September 1966. Following basic training at the US Army Training Center, Fort Bragg, North Carolina, he attended Advanced Individual Training at the US Army Training Center at Fort Gordon, Georgia. After completing airborne training at Fort Benning, Georgia, he was assigned to Troop B, 2d Squadron, 17th Cavalry, 101st Airborne Division (Airmobile) with which unit he was deployed to Vietnam in December 1967. Upon returning to the United States in December 1968, he was assigned to Troop A, 1st Squadron, 17th Cavalry, 82d Airborne Division, Fort Bragg, North Carolina.

HOW WOULD YOU DO IT?



A PRESENTATION OF THE US ARMY ARMOR SCHOOL

SITUATION You are the S2, Task Force 2-10 Armor in a combat zone. For the past few days your unit has been in contact with a large enemy force. Numerous enemy weapons, documents, and other items of intelligence value have been pouring in for you to process. On top of this, your CP has been constantly visited by so called "VIP's" wanting to know what's going on.

PROBLEM As the S2, what means and devices are you going to use to keep those who have a need to know informed, as well as to properly record, evaluate, and interpret the documents, materiel, and equipment.

HOW WOULD YOU DO IT?

DISCUSSION *Problem One*: Processing of documents, materiel, and equipment.

a. *Documents.* In this fast moving situation, you first ensure the documents are properly tagged—reflecting:

1. Type documents
2. Date time group
3. Place of capture
4. Capturing unit
5. Circumstances of capture

Once this information is affixed to the documents, they are then evacuated by the fastest means available.

AUTHOR: MAJ RIPPETOE

ILLUSTRATOR: SP4 EDMUND ENOMOTO

b. *Materiel and Equipment.* The materiel and equipment is inventoried. Serial number's for those items having them, are recorded. The materiel and equipment are tagged to reflect the same information as that placed on a document tag. The items are then evacuated through S4 channels. Information on the tag, to include serial numbers of weapons, is forwarded as soon as possible to the brigade S2 in the form of a spot report.

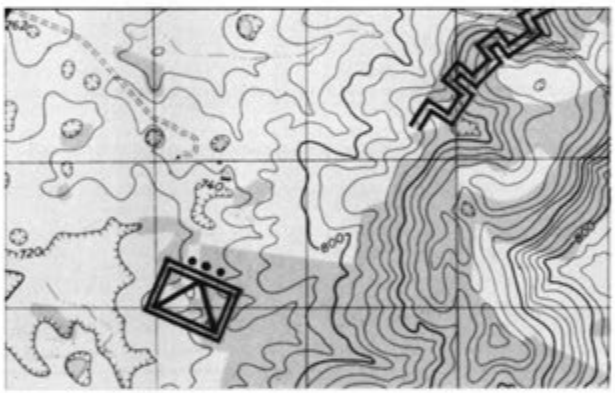
Problem Two. VIP handling.

a. The way in which you post your situation map will in many cases eliminate you, the S2 from having to stop what you are doing to bring VIP's up to date on the activity of your unit.

b. It is best for the S2 and S3 to work on separate maps which are placed side by side.

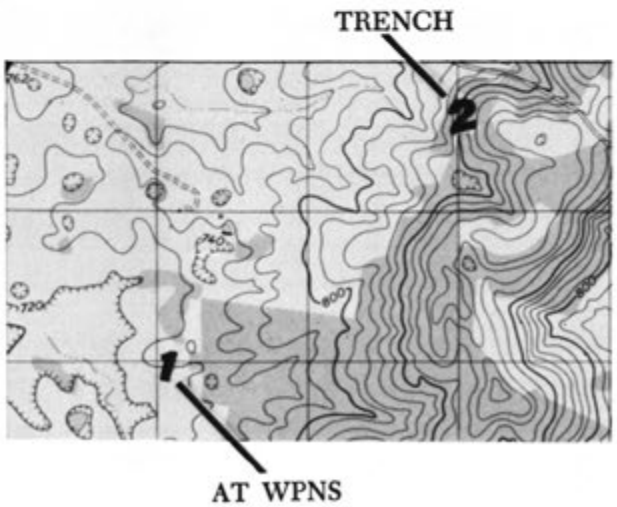
c. There are three common methods of depicting the enemy situation on the map.

1. Graphic portrayal. (POOR)



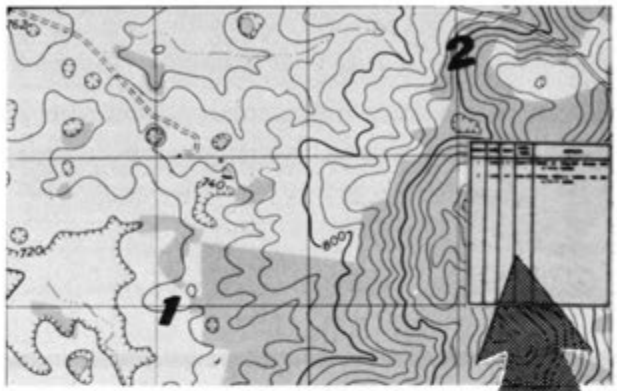
Viewers may confuse the meaning of symbols. Furthermore, the map becomes cluttered in a fast moving situation.

2. Line to margin. (GOOD)



This method is satisfactory. However, the map becomes obscured by the lines. In addition, it is difficult to erase the lines without disturbing other entries.

3. Marginal designators. (BEST)



ENTRY	TIME	UNIT	LOCATION	ACTIVITY
1	1630	A 2-10	NR6213	OBSR AT WPN-EST 85-MM NO ACTION TAKEN.
2	1635	OP	NR6129	FRESH TRENCH WORK, NO EN ACTIVITY OBSR.

The marginal designator method is by far the best method for depicting enemy activity. This technique allows viewers; to check for themselves the enemy activity in your area. If a briefing is required, it permits the S2, to step to the map and present a complete briefing of the activity reported. The marginal designator method makes it easy to use the posted material to prepare the intelligence summary (INTSUM) and other intelligence estimates or briefing that are needed.

ARMOR CENTER innovations

ARMOR MATERIAL AVAILABLE FOR ROTC UNITS

Armor School produced material to assist ROTC instructors is available on request from the Director, Instructional Services Department, US Army Armor School, Fort Knox, Kentucky 40121. This support includes:

- A packet containing 35mm colored slides to support Subject Schedule S-301, *The Armor Leader's Guide, The History and Role of Armor,* a map of Fort Knox, and *The Guide for Student Officers.* Multiple copies of much of this material are available for issue on request.
- A packet of pictures and posters promoting Armor.
- The Armor School Monthly List of Instructional Material, which is sent to each senior ROTC unit, lists new and revised Armor School publications as they become available for distribution.

In addition, the instructional Services Department will continue to fill requests from ROTC units for other specific Armor School Material. The 35mm colored slides which are included with the ROTC Packet, are in short supply and can be issued on a loan basis only. ROTC units are urged to use these slides fully but are asked to return them promptly so that other ROTC units can use them too.

ARMORED RECON SCOUT VEHICLE

Department of the Army has recently approved a revised Qualitative Materiel Requirement for an Armored Reconnaissance Scout Vehicle (ARSV). The *ARSV* envisioned is to replace the *M114A1* and *M114E1* Armored Reconnaissance Command and Control Vehicles. Proposed is a small, lightweight, lightly armored, highly mobile, agile, quiet vehicle with an inherent swimming capability and improved characteristics for entering and exiting inland waterways. The vehicle will mount, as primary armament, the Vehicle Rapid Fire Weapon System — Successor (VRFWS-S), commonly referred to as the Bushmaster.

To assist the scout with his primary function of observing and reporting information of the enemy and the area of operations, the proposed vehicle will incorporate day/night vision and sensor devices either as inherent components of the vehicle, or as kits for selected vehicles within the scout sections of armored cavalry and scout platoons.

The ARSV Project manager will shortly release the necessary documentation to industry for evaluation and subsequent submission of vehicle concepts based on the requirements set forth in the recently approved QMR for ARSV. It is presently anticipated that industry will propose both wheel and track vehicle concepts to be evaluated by military test agencies during the development cycle of the scout vehicle. Design concepts of examples of wheel and track concepts are depicted herewith. However, the final configuration of the vehicle will be determined after an extensive competitive evaluation.

APC STAKES

In the tradition of the Standard Stakes first run at the Cavalry School, Fort Riley, Kansas, the APC Driver's Proficiency Course is the culmination of the unique Armored Personnel Carrier Driver Training Program of the 3d Battalion, 1st Training Brigade, US Army Training Center Armor. The course allows the post-AIT student to demonstrate his competence in all phases of training taught in the comprehensive, three-week program. The APC driver is graded on a written examination and his performance at the 2.5 mile rolling terrain course. Competition is keen, for a score of at least 950 points of a possible 1000 is usually needed to win. The average score exceeds 870 points. The average time to complete the course is 50 minutes.

The course tests the driver's ability to negotiate obstacles, do proper before maintenance, read a map and use a compass, extract a mired APC using self-recovery techniques, use communication equipment properly, prepare a .50 caliber machinegun for operation, prepare the APC for swimming, and swim the vehicle.

For the 11B and 11D students assembled from training centers nation-wide, the APC Driver's Proficiency Course is a fitting climax to three days of tactical training in the final week before they leave for units in RVN, Germany, and Korea.

AIR CAVALRY WEAPONS INSTRUCTION

Students scheduled to attend the Armor Officers Advanced and Senior Officers Preventive Maintenance Courses can expect to graduate from the Armor School with a first hand knowledge of army aviation armament systems. An Air Cavalry Branch of the Weapons Department has been established to present aviation armament orientations that will give the non-rated officer a comprehensive knowledge of each subsystem's characteristics, capabilities, and limitations. Additional instruction has been proposed for Aeroscout Observer Courses, Officer/Warrant Officer Air Cavalry Qualification Courses and a Air Cavalry Command and Staff Officers Course. Working models of all Air Cavalry Weapon Systems are being assembled and will eventually be installed in salvage or mockup army aircraft for use as realistic training aids.

ORGANIZATIONAL MAINTENANCE

Recent efforts to provide suitable equipment will greatly enhance the capabilities of unit maintenance personnel to support properly all units equipped with light tactical tracked vehicles. The *XM806E1* is one such item. A 20,000-pound, single-line pull winch is mounted in the vehicle and a 3000 capacity hoist is mounted atop the vehicle. The hoist folds down when not in use. This new development makes available an adequate recovery capability and affords organizational repairmen a capability to replace on site larger components such as engines and transmissions.

Future improvements now stated as development objectives will provide a track-mounted shop set similar to the wheel-mounted contact maintenance sets. Responsive maintenance can be obtained only when organizational maintenance elements are afforded mobility equal to that of the unit being supported.

194th BRIGADE STARS

Filming of *"The Tank Platoon in the Night Attack and Night Defense,"* with a company of 96 from the 194th Armored Brigade, has now been completed by a crew from the Army Pictorial Center. The role of Lieutenant Floyd, the platoon leader, was played by an actual lieutenant, 1Lt William W. Gibbs. Tankers from the 6th Battalion, 32d Armor and infantrymen of the 4th Battalion, 54th Infantry completed the cast. Nearly 150 30-second to one minute scenes were needed to show proper platoon battle techniques. As much as two hours preparation was involved in each scene. Technical advisors were from the Company/Team Tactical Operations Division of the Armor School's Command and Staff Department. After editing, splicing, and reproduction, the 25-minute training film will be released Army-wide.

PREVENTIVE MAINTENANCE GUIDE FOR COMMANDERS BEING REVISED

The US Army Maintenance Board is revising Department of the Army Pamphlet 750-1. *Preventive Maintenance Guide for Commanders,* dated June 1964. The new guide will eliminate those items of equipment no longer in the Army inventory and will include representative equipment items that have entered the Army inventory since the 1964 publication. The established target date for completion of the revision is the 4th quarters, FY 70. This revised pamphlet should be available for issue to field units in the 1st quarter, FY 71. Armor Center team members are participating in this revision to insure full user usefulness.

NEWS NOTES

MG COATS COMMANDS HELL ON WHEELS

Major General Wendell J. Coats, recently Army Chief of Information, assumed command of the 2d Armored Division following Major General Leonard C. Shea's retirement on 31 October 1969.

General Coats was graduated from the US Military Academy in 1940. Following the Field Artillery Officers Basic Course, he joined the 39th Field Artillery Battalion, 9th Infantry Division where he served as a battery officer, battery commander, battalion staff officer and as battalion commander. During the World War II landings in South Africa he served on the division staff. He rejoined his battalion immediately after the invasion and remained with it, except for a two month tour as commander of the 9th Field Artillery Battalion, throughout operations in Sicily, the Anzio and Southern France landings and all the subsequent campaigns in Europe until September 1945 when he returned to the United States.

For six years thereafter General Coats served at the Artillery Center at Fort Sill, with 18 months away at the University of Wisconsin where he earned an MA in journalism. Then followed graduation from the Command and General Staff College, three years of higher staff duty in Europe and graduation from the Army War College in 1956. After service on the Army Staff, General Coats served in Korea with the 1st Cavalry Division. Returning to the United States he was appointed a Fellow of the Harvard University Center for International Affairs. Next he was assigned as Assistant Chief of Information, Department of the Army. In June 1963, he was awarded the Doctor of Philosophy in International Relations earned in off-duty study with Georgetown University. After an assignment in the office of the Secretary of Defense, General Coats was assigned to Headquarters, US European Command.

General Coats next was Deputy Commanding General of the US Army Training Center, Infantry at Fort Polk. In November 1967 he became Army Chief of Information.

BLACKHORSE CHESS MOVE

During an unusual operation, 24 ACAVs of Troop A, 11th Armored Cavalry Regiment were lifted through the air over 36 miles of difficult terrain laying between Loc Ninh and Bo Duc close to the Cambodian border. Air Force *C130s* flew 45 sorties to deliver the troop's equipment and supplies over a two day period. The unusual move, unexpected by the enemy, resulted in the sought after tactical surprise.

DSC FOR ARMOR SCHOOL STUDENT

Major Joseph H. Rozelle, a student in the Armor School's Armor Advanced Course Number 4-69, received the Distinguished Service Cross recently from Major General James W. Sutherland, Jr., Commandant of the Armor School.

Major Rozelle (then Captain) was commanding Troop B, 2d Squadron, 17th Cavalry, 101st Airborne Division (Airmobile) on 27 April 1968 when his unit came under fire from a concealed Viet Cong bunker system near Coa Bang, Republic of Vietnam. Despite heavy fire that wounded his machinegunner and radio-telephone operator, Major Rozelle continued to lead the drive into the enemy. After calling airstrikes to dislodge the enemy, he led the pursuit of the disorganized enemy remnants to either capture or destroy them all.

NIGHT HAWKS

The night perimeters of the 2d Brigade of the 1st Infantry Division are being protected by unlighted *UH-1D* helicopters of the 1st Aviation Battalion mounting starlight scopes, searchlights and two minigun systems that each fire 6000 rounds per minute.

Once the target is spotted in the crosshairs of the starlight scope, the tandem searchlight, its beam set to coincide with the area traversed by the scope, is then turned on. Simultaneously, the gunner triggers the electrically operated minigun and shoots down through the cone of light into the target area. Mechanical stops organic to the minigun housing prevent the six-rotating barrels from firing too high or too low thus insuring the safety of the crew and of the gunship.

The night defensive aircraft is unlighted. However, a chase ship above warns approaching aircraft of the night defensive aircraft's position. In addition to night perimeter defense, night patrol assistance is also provided by the curious multi-eyed gunship.

The basic idea was carried over from the *Night Hawk* flights of the 25th Infantry Division by SFC Robert M. Newman, who, together with chief armorer SP4 Henry L. Helton, fabricated the advance spotting and weapons systems used on the battalions' birds. Their progressive designs so impressed the inspectors of each division's prototype that United States Army, Vietnam, has ordered more gunships patterned after this modification.

VIET CONG LOSE MOBILE MINDEDNESS THEN LOSE LOST TANK

In Vietnam, the unlikely is just as likely to happen as the expected. Members of a Civilian Irregular Defense Group, assisted by 1st Infantry Division soldiers, found a carefully preserved US *M41* tank buried in a deserted enemy basecamp about 34 miles northwest of Saigon during a recent operation. It was well hidden and protected by mines and booby traps. Found with the near fully operational tank were 51 rounds of ammunition for the 76mm gun and 950 rounds of .30 and .50 caliber machinegun ammunition. Curiously, the machineguns were missing. *M41s* are no longer used by American Forces, but many have been distributed over the years under the Military Assistance Program.

IMPROVED HELICOPTER ROCKET

A fixed fin stabilizing system for the Lockheed 2.75 aircraft rocket increases performance 50 percent over the standard folding fin (FFAR) system. The new stabilizing system consists of a series of fins or flares located in the boattail section at the aft end of the rocket. A ring wing surrounding the fin structure of the new system promotes aerodynamic stability. The new fixed fin design uses the space formerly taken up by the folding fins for additional propellant thus greatly improving the performance of the rocket.

TANKER'S BOOTS

The Armor Association receives numerous inquiries about the availability of tanker's boots. One source is the Dehner Co., Inc., 2059 Farnam Street, Omaha, Nebraska 68102. A catalog will be sent on request.

▲ NEW LOH TO RVN AND ARMOR CENTER

The U.S. Army's newest light observation helicopter is being introduced to the troops. A 29-man Army New Equipment Training Team for the *OH58A Kiowa,* with five of the aircraft, will indoctrinate Vietnam based helicopter units in all aspect of the aircraft's operation and maintenance.

Concurrently eight of the *OH58As* will undergo confirmatory tests for 10 months at Godman Field at Fort Knox.

Throughout the Fort Knox test project, 26 pilots, and 16 mechanics and crew chiefs from the 8th Armored Squadron, 1st Air Cavalry will test the aircraft under simulated Vietnam combat situations.

Powering the *OH58A* at 120 knots per hour is a 317 hp turbine jet *Allison* engine. The new observation helicopter has the capability of prolonged flight for 2½ hours.

QUIET OBSERVATION PLANE

Lockheed Aircraft designers have modified the simple design of a sail plane and produced a new US Army reconnaissance aircraft. Details have recently been released on the *YO3A,* a silent observation aircraft adapted from the Schweizer *SGS 2-32* sail plane. Wings were strengthened to carry extra weight and the craft reconfigured from a high to a low-wing design. A conventional three-wheel landing gear was added to replace the Schweizer single wheel.

The unique Wankel rotary combustion engine powers the new aircraft. (See *ARMOR,* January-February 1968, *"Military Power Takes a New Shape.")* Flight test engineers report that the Wankel is quieter and has the potential to give more power from less weight than standard reciprocating engines.

Because the 30-foot long sail plane has an unusually wide wingspread of 57 feet, relatively little power is necessary to keep the *YO3A* on powered flights of long duration. Streamlined fiberglass fairings and cowlings have enabled engineers to keep an efficient aerodynamic shape and hold added weight to a minimum.

The Tarpaulin

Covers a bit of everything gleaned from the service press, information releases, etc. Contributions are earnestly sought.

TAKE COMMAND

BG Richard L. Irby, USA Training Center Infantry, Ft Polk . . . **COL John F. Forrest,** Support Command, 2d Armored Division . . . **COL Francis G. Gosling,** 2d Bde, USATCA . . . **COL Martin D. Howell,** 14th Armd Cav Regt . . . **COL Edward J. Mc Carren,** 1st Bde, 1st Armd Div . . . **COL Samuel R. Martin,** 1st Bde, 2d Armd Div . . . **COL Wilfred E. Irish, Jr.,** FA, DivArty, 4th Armd Div . . . **COL Donn A. Starry,** 11th Armd Cav Regt . . . **LTC Walter A. Ahrens,** 1st Bn, 81st Armor, 1st Armd Div . . . **LTC Jack M. Beringer,** 3d Sqdn, 3d Armd Cav Regt . . . **LTC Arthur D. Bills,** 3d Sqdn, 7th Cav, 3d Inf Div . . . **LTC Norman G. Blahuta,** 1st Sqdn, 3d Armd Cav Regt . . . **LTC Burton S. Boudinot,** 6th Sqdn, 2d Bde, USATCA . . . **LTC Sheldon J. Burnett,** 2d Sqdn, 6th Armd Cav Regt . . . **LTC Julian H. Carnes, Jr.,** CE, 24th Engr Bn, 4th Armd Div . . . **LTC Andrew L. Cooley, Jr.,** 1st Bn, 64th Armor, 3d Inf Div . . . **LTC Louis T. Dechert,** 15th Bn, 4th Bde, USATCA . . . **LTC Griffin Dodge,** FA, 2d Bn, 27th Arty, 3d Armd Div . . . **LTC Bart M. Filaseta,** 13th Bn, 4th Bde, USATCA . . . **LTC Richard W. Griffin,** FA, 1st Bn, 22d Arty, 4th Armd Div . . . **LTC Norman D. Harms,** 2d Sqdn, 14th Armd Cav . . . **LTC Ivan H. Howitz, Jr.,** 3d Sqdn, 14th Armd Cav Regt . . . **LTC George H. Isley, Jr.,** 1st Bn, 1st Bde, USATCA . . . **LTC Robert G. Mc Lennan,** CE, 16th Engr Bn, 1st Armd Div . . . **LTC William J. Moran,** 1st Sqdn, 10th Cav, 4th Inf Div . . . **LTC Robert B. Solomon,** 1st Bn, 35th Armor, 4th Armd Div . . . **LTC William E. Sweet,** FA, 2d Bn, 78th Arty, 4th Armd Div . . . **LTC Alfred L. Thieme,** Inf, 2d Bn, 50th Inf, 2d Armd Div . . . **LTC Richard G. Vander Meer,** 2d Sqdn, 3d Armd Cav Regt . . . **LTC Ralph C. Waara,** 4th Bn, 64th Armor, 3d Inf Div . . . **LTC Robert J. Washer,** 3d Bn, 77th Armor, 5th Inf Div . . . **LTC Richard L. Weaver,** 3d Bn, 64th Armor, 3d Inf Div . . . **LTC Kenneth R. Wilson,** MSC, 48th

Med Bn, 2d Armd Div . . . **MAJ George H. Watkins, Jr.,** 3d Bn, Sch Bde, USAARMS . . . **CSM Walter F. Corvin,** 12th Bn, 5th Bde, USATCA . . . **CSM Raymond R. Garofalo,** 1st Sqdn, 4th Cav, 1st Inf Div . . . **CSM Gale Johnson,** 7th Bn, 2d Bde, USATCA . . . **CSM Charles Ross,** 6th Sqdn, 2d Bde, USATCA . . . **SSM Russell E. Byrkett,** 4th Bn, 1st Bde, USATCA . . . **SSM Robert L. Frazier,** 1st Bde, USATCA . . . **SSM Clifford Rowland,** 3d Bn, 36th Inf, 3d Armd Div

ASSIGNED

LTG Alexander D. Surles, Jr., CofS, US European Command . . . **BG Wallace L. Clement,** Director of Training, J3, HQ MACV . . . **BG Samuel Mc C. Goodwin,** C of S, III Corps . . . **BG John G. Wheelock, III,** ADC, 4th Inf Div . . . **COL (BG Designee) Rolland V. Heiser,** ADC, 3d Armd Div . . . **COL (BG Designee) Lawrence M. Jones,** FA, ADC, 1st Armd Div . . . **COL (BG Designee) Charles J. Simmons,** ADC, 3d Inf Div . . . **COL (BG Designee) Wilbur H. Vinson,** FA, ADC, 2d Armd Div . . . **COL JAMES P. Cahill,** Director Automotive Dept, USAARMS . . . **COL Roy M. Jones,** Director Instructional Services Dept, USAARMS . . . **COL William D. Meara,** Dep Comdr, Aberdeen Proving Ground . . . **COL Alvin D. Ungerleider,** ADV Det, I Corps, Vietnam . . . **COL Ace L. Waters, Jr.,** Dep Comdr, USATCA . . . **COL George K. Webb,** CofS, USATCA . . . **LTC Robert H. Howe,** FA, G1, 4th Armd Div . . . **LTC Robert D. Ogg,** G3, USATCA . . . **LTC James R. Stuart, Jr.,** G1, USATCA

VICTORIOUS

SFC William R. Baum, Co E, 122d Maint Bn, 3d Armd Div was named Army Aviation Soldier of the Year for 1968-69 by the Army Aviation Association of America. Award was presented by **Hon. Stanley R. Resor,** Secretary of the Army at AAAA Annual Meeting in Washington . . . Distinguished Graduate of the Armor Officer Advanced Course was **CPT Lionel R. Ingram** . . . Distinguished Honor Graduates of the Armor Officer Basic Courses: 20-69 **2LT Douglas W. Knighton,** 1-70 **2LT Charles K. Wiggins,** 2-70 **2LT Gary A. Drescher,** 3-70 **2LT Louis F. Anderson** . . . Fort Knox won First Place 1969 Army Community Services Award for major CONUS installations.

APPLICATION FOR MEMBERSHIP OR SUBSCRIPTION

TO: THE UNITED STATES ARMOR ASSOCIATION
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Foreign subscriptions $22.50 three years, $15.00 two years; $8.00 one year.

FROM THE BOOKSHELF

AN INTRODUCTION TO TERRAIN-VEHICLE SYSTEMS **$27.50**

by M. G. Bekker. The University of Michigan Press. 846 pp 1969.

The author of this new book, Dr. Greg Bekker, is of course no stranger to readers of *Armor*. He has, for many years, been a leading proponent of the rational, systems approach to the problems of off-road automotive vehicle design. He has argued against the traditional empiricism centered around internal combustion engines, thermo-dynamic processes, materials improvements and quasi-scientific testing programs. This new work is oriented strongly on the application of modern systems analysis techniques, tempered by practical engineering considerations, to the design of off-road vehicles of all types, commercial as well as military. The framework of the various systems techniques — such as mission definition, mathematical modeling, design optimization, and decision analysis — is well illustrated with specific examples, flow charts and step-up procedures The examples are sufficiently detailed at least to illustrate the methodology and establish both the potential and the limitations of systems techniques in vehicle design work. The generalist need not fear the book because of the profusion of mathematical equations and symbology since most of the significant points are also portrayed in simpler graphic form.

The military officer, who finds himself these days increasingly likely to become involved in some aspect of vehicle or weapons system acquisition processes, should find this book extremely beneficial. Part I of the book addresses physico-geometric representation of soil and terrain properties. Part I links the new book with the author's previous books, *Theory of Land Locomotion* and *Off-the-Road Locomotion*. The university professor, student or practicing engineer should become very familiar with the previous works and Part I of the new. The military officer, the generalist, the user formulating materiel requirements, the Project Manager, the military technical policy-maker need not be familiar with the previous books nor be unduly concerned with the technical details of Part I of the new. From Part I alone if the reader grasps the concept that quantification of various definitive soil and terrain properties is essential in a rational vehicle design process, he may proceed to Part II and the chapters bearing more specifically on his interests. This does not imply that Part I is not significant in its contribution since it presents results of recent experiments and research work; but, its importance depends upon the background and specific interests of the various readers.

Part II concerns basic soil-vehicle relationships, vehicle mission and concept definition, modeling, and problem-method descriptions of the various steps in the analytical procedures. The military officer who might be faced with participation in a renewal or variation of the periodically recurring "track versus wheel" argument will find a comprehensive summary of this subject in Chapter VI of Part II. Other interesting topics covered in Part II include tabulations of standardized personnel, cargo, spatial and temporal specifications; the dynamics of rough ground ride comfort and cargo safety; agility, steerability and stability of various vehicle configurations; the dynamics of obstacle crossing; energy losses and efficiency of vehicle components such as tires, tracks, torque converters, and brakes; power, speed, fuel consumption and range of action; and composite indices of vehicle performance. The application of computer programs to the evaluation of terrain-vehicle systems is discussed, though — as the author points out — the work necessary to correlate laboratory and field results with computerized predictive programs will undoubtedly remain a basic activity in off-road locomotion research for years to come.

The forecasted variety of things to come in the off-road vehicle business during the next few years will result in a rapid proliferation of confusing choices available to the vehicle designer and decision maker. There will be improvements in vehicle economy, stability, comfort and safety. The possibilities of different heat engines or new power sources such as nuclear energy and fuel cells will be extolled. The often exulted potential of electric power trains, automatic controls, etc., will be heard continuously. No one will be able to build and try each prospective idea, particularly the military under the austere budgetary situations expected in the post-Vietnam era. And clouding the forecast of things to come is the author's underlying anxiety that despite the pro-

liferation of hardware choices there probably will be no quantum improvements in general off-road vehicle mobility. The limiting factors are ground pressure and motion resistance. Fifty years of vehicle industry design and development work made it apparent that there is small chance for a breakthrough in reduction of ground pressures. Possibilities for reduction of motion resistance are limited too unless present forms of ground contact areas are radically changed. The recent developments in vehicle articulation and low-pressure tires of large diameter are steps in the right direction, hopefully indicative of a lessening of general resistance to the radical changes which are required.

The solution to the problem of rational choice and morphological change lies in the application of systems analysis techniques to vehicle design and decisions, and this is precisely the theme of Dr. Bekker's monumental new book. No one other than Bekker himself, aided by his knowledge of several foreign languages, his vast personal library of reference material, and his acknowledged position of world eminence in the field of off-the-road and off-the-earth locomotion could have produced such a complete and all encompassing work as is represented in this new book. It is recommended as an indispensable reference volume for the libraries of those persons and agencies desiring to understand and apply the arts and sciences of the vehicle development process. LTC LAWRENCE S. LODEWICK.

The reviewer was assigned to the US Army Land Locomotion Laboratory from 1958-1961.

MARSHAL ZHUKOV'S GREATEST BATTLES

by Georgi K. Zhukov. Harper and Row. 1969. 304 pp. $6.95

Only for want of a more descriptive term do we label World War II a war. It was actually several wars, each having distinct military-political problems. Of them all, the greatest and most savage was the Russo-German War. As a matter of fact, no holocaust in history can match it in terms of numbers engaged, losses sustained, and the hugeness of the battleground. Greater numbers of Russians were killed than all the Americans who wore a uniform; more Germans perished in Russia than fought in France. While U. S. and British forces struggled from Normandy to the Elbe, over two-thirds of the Nazi might was tied down by Communist armies on the Eastern Front. All in all, it was clearly the largest single clash the world has seen.

And yet we know surprisingly little about it. At best we have a blurred, vague impression of what happened. At first blush our ignorance of so immense and important an event seems strange, but there are very good reasons. In the first place, the war was a private duel between two megalomaniac dictators, a no-holds-barred fight between opposing totalitarian systems to which witnesses were most unwelcome. Then, when Hitler and his Fascists fell, much of the German version disappeared with them. Finally, viewing history as a tool rather than a truth —something that indoctrinates rather than elucidates —the Russians have steadfastly refused to reveal the whole story. Only by driblets is the tale appearing.

Zhukov's book—an account of Red victories in the battles of Moscow, Stalingrad, Kursk, and Berlin —is one of those driblets. And that fact alone makes the work worthwhile.

Unfortunately, there is very little else to commend it. Zhukov, whose role in wartime Russia was something akin to those of George C. Marshall and Dwight D. Eisenhower combined, was in a position to know the inside story. He could have presented a balanced view, could have contributed a truly valuable book. But he did not. The Russian Marshal writes history just like he waged war: brutally and unimaginatively, and with cautious glances to sense the impact in the Kremlin. (He has, after all, been exiled by both Stalin and Khrushchev.) Moreover, he writes to enhance his own reputation and to put down competitors and detractors. In short, Zhukov was unable to evade the Russian penchant for propaganda and polemics.

Harrison E. Salisbury, a journalist with a perceptive knowledge of Russia and Russians, introduces the book and makes editorial comments throughout. His remarks on political and personality clashes add to the volume's value, but readers interested in military aspects of the battles will find his observations less than satisfactory.

Despite its obvious and serious shortcomings, *Marshal Zhukov's Greatest Battles* can be read with profit by students of military history as well as by those hoping to gain an insight into the inner workings of modern Russia. Although they are implicit, there are several significant themes in the book. Perhaps two of the most important are a sense of the very massiveness of the Russo-German War and a realization of Stalin's extraordinarily intimate involvement in all facets of the fighting. Zhukov has been called a "master of the art of mass warfare." That description seems apt. And, though the Mar-

shal's admiration is grudging, he makes it rather clear that Stalin was indeed the iron man who drove Russia on to ultimate victory.

A third thread worthy of note is Zhukov's disdain for the efforts of his allies. For example, American logistical aid, without which Russia might very well have been defeated, rated a single sentence: "The promised Lend-Lease aid from the United States was slow arriving." Although we might not like the slights, it is instructive to know how our contributions are remembered.

In sum, a disappointing book which is worthwhile only because it lacks competition. LTC DAVE R. PALMER

PUBLICATIONS NOTED

Military Affairs, the journal of the American Military Institute, is now being published by the Department of History, Kansas State University, Manhattan, Kansas 66502. Under the editorship of military historian Dr. Robin Higham, recent issues have been of increasing interest and have a welcome expanded coverage.

World War II Magazine has been introduced by the fledgling World War II Historical Association, 212 West Main Street, Bennington, Vermont 05201. The first two issues, while weak in format and poorly printed, have factual content which promises to be useful to those interested in World War II history.

Wargamer's Newsletter, 69 Hill Lane, Southampton, Hampshire, England is published monthly in a 6½ x 9½ booklet format. Copies reviewed indicate that it is wittily written and covers its field quite thoroughly.

Those responsible for armor displays and training aids, as well as collectors, will be interested in the free *ALNAVCO Armor Division 1969 Catalog,* Box 3, Westfield, New Jersey 07091.

Tankette, the bi-monthly 6½ x 8½ publication of the Miniature AFV Association, 15 Berwick Avenue, Heaton Mersey, Stockport, SK 4 3AA, Cheshire, England, has changed its format to include photographs. Issues have an average of five sets of scale plans for armored fighting vehicles. In addition there is historical commentary.

LATE NEWS FROM THE ARMOR BOOK DEPARTMENT

NEW BOOKS -- In WAR BETWEEN RUSSIA AND CHINA, Pulitzer prizewinning foreign correspondent Harrison E. Salisbury expresses his concern that the United States has much to gain by using its leverage to prevent such an Asian Armageddon. Based on a recent visit, the author's observations on the area of conflict are interesting ($4.95). . .DECISIVE WARFARE - A STUDY IN MILITARY THEORY by Reginald Bradnor ($7.95) reexamines the principles of war in the modern environment. Includes penetrating analysis of Napoleon, Liddell Hart, J. F. C. Fuller et al. . .TANK DATA 2 edited by E. J. Hoffschmidt and W. H. Tantum IV ($8.95) presents data on additional armored vehicles in the format of the ARMOR best seller TANK DATA ($8.50). A must for armored vehicle historians. . .JUST REPRINTED -- The classic THE FIGHTING TANKS by Jones, Rarey and Icks ($8.95) originally published in 1933. A well-illustrated, data-packed reference which has become a classic and was long out-of-print . . .SMALL ARMS OF THE WORLD by Smith and Smith ($17.95) has just appeared in the revised 9th Edition. The definitive work in its field. . .THE MIGHTY ENDEAVOR by Charles B. MacDonald ($12.50) is, we believe, the best one volume history of World War II American Army operations in Europe to date. Excellent history written in a lively style by one who commanded a rifle company during many of the events he describes.

CURRENT BEST SELLERS -- DESIGN AND DEVELOPMENT OF FIGHTING VEHICLES by R. M. Ogorkiewicz ($7.95) (reviewed in ARMOR Nov-Dec 68). . .ROMMEL AS A MILITARY COMMANDER by Ronald Lewin ($9.95). . .AMBUSH ($5.95) (ARMOR Sep-Oct 69) BIRD ($3.95) WEST TO CAMBODIA (ARMOR May-Jun 69) all by BG S. L. A. Marshall . . .GERMAN TANKS OF WORLD WAR II by COL Dr. F. M. von Senger ($11.95). . .MILITARY UNIFORMS OF THE WORLD by Preben Kannik ($4.95) (ARMOR Sep-Oct 68). . .ARMOR-CAVALRY LINEAGE by Stubbs and Connor ($6.75). . .WHAT EVERY ARMY WIFE SHOULD KNOW by Betty Kinzer and ARMOR author Marion Leach ($5.95). . . GUIDELINES FOR THE LEADER AND THE COMMANDER by General Bruce C. Clarke ($2.00) remains the best concise compendium of practical military advice available.

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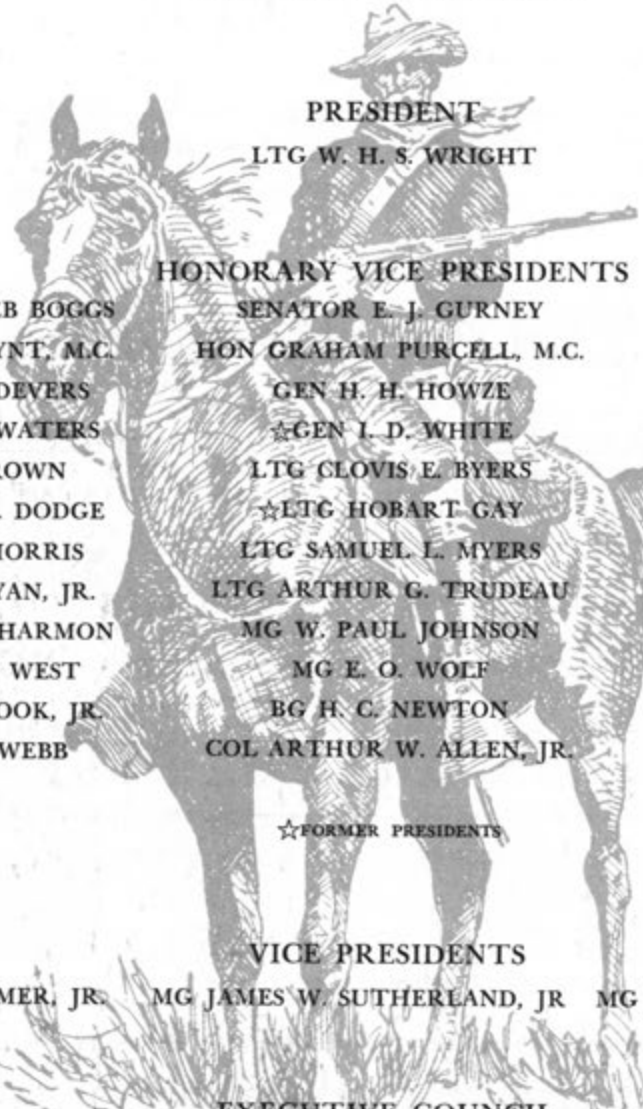

ARMOR

March—April 1970

United States Army
Distinguished Service School Award

The United States Army Armor School, Fort Knox, Kentucky, distinguished itself by outstanding achievement over a period of 82 years of faithful service to the United States Army and to the Nation.

The United States Army Armor School, as it is known today, was constituted on 22 January 1887 as the School for Cavalry and Light Artillery, and established at Fort Riley, Kansas on 18 November 1892. The school underwent the first of five redesignations on 30 April 1901 when it was renamed the School of Application for Cavalry and Field Artillery. The second change occurred on 13 September 1907 when it became the Mounted Service School. After World War I, on 30 October 1919, the school experienced its third change in name, becoming the Cavalry School.

The effectiveness of the Cavalry School in training pioneer armor leaders who were thoroughly imbued with the essence of its motto "We thrive by Mobility" caused the Secretary of War to authorize the establishment of an Armored Force School at Fort Knox, Kentucky on 1 October 1940. The fledgling school, under Lieutenant Colonel (later Major General) Stephen G. Henry received its first students on 4 November 1940. Within two years the student body had grown to a peak of more than 38,000. By 14 August 1945 (VJ Day), the school had trained 11,007 officers, 11,601 officer candidates, and 67,000 enlisted men, for a total of over 90,000 armor officers, gunners and mechanics for World War II.

During this period of the Armor School's history, it consisted of two schools, the Cavalry School at Fort Riley, Kansas and the Armored Force School at Fort Knox, Kentucky.

Following World War II, the Cavalry School at Fort Riley witnessed two further redesignations, first as the Ground General School on 1 November 1946 and then as the Army General School on 1 January 1950. On 1 May 1955, the latter was consolidated with the Armored Force School to become the present-day United States Army Armor School.

Through the next decade, the Armor School once again provided the needed leadership and training for the Army's armor and cavalry units which were to defend the Free World against the threat of communism. The Korean War was armor's third test against enemy aggression.

When the Vietnam conflict developed, the Armor School again responded to the demand for highly trained armor and armored cavalry leaders. In order to make available the trained officers and enlisted men needed for Vietnam, the school initiated two programs in addition to its normal activities. The first was an officer candidate course. This helped to provide the needed Armor officers, as had been done during World War II and Korea. From December 1965 to 23 February 1968, this course produced 4297 Armor officers. The second program was a non-commissioned officer candidate course designed to fill positions calling for sergeants and staff sergeants. Since its start in December 1967, this course has graduated over 2000 junior non-commissioned officers.

The Armor School not only gives instruction to those in the Regular Army, Army National Guard and US Army Reserve, but also to officers and enlisted men from 52 Free World countries. Three hundred and fifty allied students attend the school annually.

In the past 82 years the Armor School has grown from a small cavalry school on the plains of Kansas to the largest and most complex armor and armored cavalry training school in the world. Over 300,000 graduates have been infused with the spirit, and have learned the techniques, of cavalry and armor.

And today, the alumni of the Armor School continue to go forth to "Forge the Thunderbolt" throughout the United States Army and the entire Free World.

ARMOR

The Magazine of Mobile Warfare

Volume LXXIX **March-April 1970** **Number 2**

ARTICLES

FEATURES

DEPARTMENTS

COVER

AN ORIGINAL PAINTING BY *ARMOR* DESIGN EDITOR SP5 CHARLES R. ANDERSON PORTRAYS THE DYNAMIC LEADERSHIP ENVISIONED FOR ARMOR IN THE 1970's BY THE AUTHORS OF "THE REAL STRATEGIC DETERRENT."

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LETTERS TO THE EDITOR

More on Volunteer Army

Dear Sir:

I've just read General Clarke's fine article on an all-volunteer force in the November-December 1969 *ARMOR*! A great many Marines agree with his views. I would add only that motivation to volunteer for a life in service comes from having the law require all citizens of certain ages to be drafted into the service of their country. Without this kind of motivation, I believe very few will drop in at the recruiting stations and request hazardous infantry duties!

Hopefully the New Year will bring a better informed American public.

H. NICKERSON, JR.
Lieutenant General, USMC

III Marine Amphibious Force
FPO San Francisco 96002

Combat Armorman Badge (Cont'd)

Dear Sir:

I am sincerely disappointed in the apparent lack of interest in the creation of a Combat Armor Badge. In the November-December 1969 issue, LTC George R. Albert expressed many of my sentiments.

LTC Albert challenged the Armor Association to champion the cause for a Combat Armor Badge. The Editor answered that only two letters had been received concerning interest in the badge. I am in favor of the award.

Since tanks were employed in the Battle of the Somme in 1916, Armor has been used with increasing importance on the battlefield, whether it be the plains of Europe or the jungles of Vietnam.

It is widely recognized that Armor and Infantry are the primary frontline combat forces. Why then is there a Combat Infantryman's Badge and a blue cord given to the infantrymen and no such award for the tanker.

We tankers have the doctrine "mobility, firepower, and shock action." We also have our own branch association. I am certain that there is an esprit within the Armor Branch which will compel each one of you real tankers to at least have an opinion about the Combat Armorman Badge.

I challenge you readers of *ARMOR* to send in your opinions. Let's be for, or let's be against, but let's not be indifferent.

ARTHUR C. COOGLER, JR.
1LT, Armor

Fort Bragg, North Carolina

NCO Education

Dear Sir:

This letter is in response to the article "NCO Prepare Yourself," by Major David A. Neck. While I wholeheartedly agree that anyone who calls himself a professional is obliged to take advantage of the opportunities afforded him, I find it difficult to reconcile Major Neck's idealism with the facts of life.

Major Neck quotes the basic philosophy underlying the Army's general education program, as contained in AR 621-5, but unfortunately the philosophy generally has been carried out in practice only with regard to officers. The major's fine article is replete with examples of non-resident professional education opportunities. He poses the question, "Why haven't more of these been fully used?" the answer should be obvious to anyone who has ever gone down the nightschool, homestudy road, i.e. because it is the least efficient and the least desirable.

Guidance, inspiration, and reward are euphemisms that only cloud the issue. In the same issue (November-December 1969) General Clarke points up that pay (financial reward) alone is not the answer. I would add that neither is patronizing guidance of self-imagined charismatic inspiration. At the bottom of the November-December cover is the date 1885, and yet here we are in 1969, telling the NCOs that toward the end of hostilities in Vietnam the Army service schools are planning *possible* resident branch advanced NCO courses. After 85 years is that the best we can do for the backbone of the Army?

How would the shoe fit if the same admonition, under identical circumstances, was directed toward the commissioned officers? Pretty tight I would imagine. The day is long past when on-the-job training will produce adequate and timely numbers of NCOs competent to meet the challenges of the space age. Every career NCO, sergeant or above, deserves the same opportunities to attend full-time courses of instruction at service schools and civilian institutions as those afforded the commissioned officers. Armor has taken to the air but we force the NCO to stay earthbound on an educational pack mule.

It is respectfully suggested that since the Association has opened its membership to non-commissioned-officers, the Association has assumed not only a share of the responsibility for the discrimination, but an obligation to exert every possible effort to correct the situation in the shortest time possible. What is so sacrosanct about the basic branch course that would rule out an NCO? Certainly there must be a few slots that could be allocated for outstanding men upon whom we all place so much responsibility, trust and confidence.

IRVIN A. GRUBBS
MAJ, AUS, Retired

Hopkinton, New Hampshire

Looking Forward

Dear Sir:

I recently read Colonel Yale's interesting and enlightening article "Command and Control in the Grande Armee" published in *ARMOR*. I am presently a graduate student in management at the University of Alabama under the Army Advanced Schooling Program. At the moment, I am writing a paper entitled, "The Effects of a Computerized Information System on the Role of the Manuever Battalion Commander." This paper is concerned mainly with the decision making necessary in combat and the effect that ADSAF (Automated Data System within the Army in the Field) will have on the battalion commander's decision making.

In Colonel Yale's article I noticed the emphasis placed on accurate and timely information which enabled Napoleon to make effective decisions. I am interested in finding studies, articles, books, or whatever on this facet

of decision making to relate it to the computerized information systems that the Army is now field testing for issue in 1975.

I look forward to more articles by Colonel Yale in *ARMOR*. Frankly, I have become a bit bored by the "shoot-em-up" stories which seem to be so popular in *ARMOR*. (As an infantryman, I must add that *INFANTRY* Magazine is just as bad.) Many of my contemporaries have expressed the same opinion. We prefer articles on management, maintenance, administration, future trends in weapons systems and equipment, and the like. Sadly neglected have been such subjects as data processing and ADSAF which will be the commanders "bread and butter" in the not too distant future.

WILLIAM A. HENRY
CPT, Inf
Tuscaloosa, Alabama

While ARMOR *intends to continue to chronicle Armor's achievements in Vietnam and to derive lessons from that conflict, we believe expanded coverage of what is ahead to be most desirable. In particular,* ARMOR *needs more articles on how the computer and other electronic applications, can be expected to affect military decision making.* THE EDITOR.

Some Critical Notes

Imagine puttering around the old homestead with a 52-ton lawn mower. OK, so maybe it wouldn't fit your front lawn, but two of them fit quite nicely outside a division Fire Support Base.

The "lawn mowers" are actually two *M48A1* tanks tugging a 75-meter long, 3-ton Navy anchor chain. The tanks and chain belong to Charlie troop of the cavalry squadron and Bravo Company, of the engineer battalion, respectively. Both units are under operational control of the infantry battalion at the fire support base.

With the massive chain in tow, the two tanks bull their way through the dense jungle outside the fire support base. Their mission is to level the foilage — a ready-made hiding place for the Communists. Together the tanks clear about a 450-kilometer square each day — a giant-sized bite out of Charlie's territory.

Armored personnel carriers, small by comparison, move alongside the tanks providing flank and rear security. Another *M48*, acting as point, flushes out possible trouble to the front.

Because of its bulk the chain is dropped off outside the fire support base gate at night.

When asked whether there is any chance of the chain's being sabotaged, an NCO replied, "Nobody's walked off with it yet."

While not a true letter to the Editor, but a mimeographed press release sent to ARMOR *by a division information officer, the writings above seem germane to Colonel Bartley's article "Some Critical Notes"* (ARMOR, Nov-Dec 1969.) THE EDITOR.

Kudos

Dear Sir:

I wish to salute all of you responsible for the Armor leaders guide to professional reading/learning — *ARMOR* Magazine. Each of my platoon leaders, my first sergeant and each platoon sergeant are Armor Association members and *ARMOR* readers. Often we have a "bull-session" about the numerous topics contained in *ARMOR*.

D. B. Mc GARRY, SR.
CPT, Armor
Commanding

Co D, 1st Sqdn, 3d ACR
Fort Lewis, Washington

We try to keep the "bull" content pretty low in ARMOR. *But, seriously, we understand and those responsible return your salute with thanks for your thoughtful words and outstanding support.* THE EDITOR.

Dear Sir:

I didn't realize how much I missed your fine publication until I went without it in the past eight months. After 16 consecutive years as an Armor Association member, I guess I took *ARMOR* for granted. Inclosed is a check for two years dues and [some books.] Thank you.

RICHARD J. MAGUTH
PSG

HQ, 3d Sqdn, 17th Air CAv
APO SF 96289

Dear Sir:

I would like to take this opportunity to tell you all what an outstanding job the *ARMOR* staff are doing. This is even more impressive to me after I saw, and read about, some of the behind-the scenes activities you of *ARMOR* engage in to insure that good articles are published in every issue, while I was snowbirding at DLP of the Armor School last summer.

I can see that during my present assignment, civil schooling at USC, my issue of *ARMOR* will go a long way to keep me informed about current trends and where the "Armor types" are and what they are doing. Keep up the outstanding work.

ROBERT G. SINCLAIR
CPT, Armor
Los Angeles, California

Dear readers, please be assured [the foregoing exposé notwithstanding] that we of ARMOR *are in no way, wise sinister schemers but merely conventional soldiers trying to do our job. Come to think of it though, we do indeed sometimes do some unconventional things to get you the best possible reading. But — no trade secrets this time.* THE EDITOR.

On The Editor's Desk At Deadline Time

WHO'S ON FIRST?

Page 56 of the November-December issue of the usually authoritative (we hope) ARMOR reported Colonel Homer S. Long, Jr. to be the new Chief of Armor Branch. As 10,000 plus copies of that issue were literally just on their way to you, Colonel Long was tapped for an assignment in the Office of the Chief of Staff. So, having become a bit gun-shy, we determined to hold further announcements until a new incumbent actually sat down in the historic Chief's chair (See ARMOR, Jul-Aug 68.)

Now we are happy to share the news that Colonel James H. Leach is indeed the Chief of Armor Branch. "Jimmy" Leach went for a soldier when he enlisted in the Texas National Guard at the age of 16. Entering on active duty in 1941 as a staff sergeant in the 193d Tank Battalion, he was commissioned in 1942 and joined the 4th Armored Division. There, he rose from platoon leader to command Company B, 37th Tank Battalion in World War II combat during which he earned the DSC and numerous other decorations. (The history of that battalion and its parent division is required reading for any Armor professional.) Colonel Leach subsequently served in the 1st Armored Division at Fort Hood and in the 2d Armored Cavalry in Germany. Following a tour as a tactics instructor at the Armor School, he commanded the cavalry squadron of the 3d Armored Division in Germany and then became G3. Upon graduation from the Army War College in 1965 and earning a master's degree from George Washington University (earlier he had earned his bachelor's degree through off-duty study and Bootstrap), he served on the Army Staff. Next, he commanded the 2d Brigade, 1st Armored Division before going to Vietnam to become first Senior Advisor to the 5th ARVN Division and then Commanding Officer of the 11th Armored Cavalry Regiment, his last prior assignment.

A few years back, the Fort Knox school system lost a fine teacher and Armor gained a lovely wife when then Captain Leach took Marion to be his bride. Mrs. Leach is co-author of What Every Army Wife Should Know and has written several fine articles on service customs for ARMOR. We wish both Colonel and Mrs. Leach well in their new Washington assignment.

AND NOW A BOOK

The article "The Real Strategic Deterrent" by Generals White and von Manteuffel and Colonel Yale is based on a chapter from their forthcoming analytical book on the command methods of history's great captains. To be published by the Rutgers University Press, the work also presents some penetrating thoughts on how tomorrow's command and control systems might be made more effective.

ARMOR NEWS

The Executive Council has approved acquisition of new circulation equipment which will make possible better service and savings through elimination of waste -- and it will allow for 100% expansion of paid readership. Have you recently signed up another member or subscriber? Remember you, not we, are where the potentials are. ARMOR'S GROWTH AND VITALITY DEPEND ON WHAT YOU DO TO HELP!

The Editor

The Real Strategic Deterrent

General I. D. White, USA-Retired
General Hasso von Manteuffel, German Army-Retired
Colonel W. W. Yale, USA-Retired

"The Deterrent is everything. We cannot wait until the shooting starts to determine what we must do." *Former Secretary of State Dean Rusk, 27 July 1969.*

A national capability to wage immediate and highly mobile, or "lightning" warfare, is logically the most practical and effective deterrent to foreign aggression. Inherent in this capability is the basic ingredient of mobile warfare — a trained corps of tactical leaders at all levels all of whom are adept in the techniques of this type combat.

The foregoing premise implies redirecting the objectives of national military policy. Therefore, there are several factors which affect, and are affected by, this policy which warrant a brief analysis to establish the validity of the premise. These factors include:

- The suitability and feasibility of the nuclear deterrent
- The current public attitude of antimilitarism
- The difficulty of assuring public assessment of the gravity of the composite threat to national security
- Preoccupation with guerrilla warfare as the wave of the future
- The successful application of the principles of the premise by the Israelis

Since World War II, the so-called nuclear deterrent, dependent upon the United States will to invoke it, has suffered a dwindling credibility. Even when America enjoyed a complete nuclear monopoly, the concept of an implied massive threat was manifestly counter to the American character. Now that nuclear parity is tacitly accepted, many political figures have repudiated the concept. The credibility of the threat may now lie with the totalitarian powers, which perhaps explains why all-out warfare has not been resorted to in Southeast Asia.

In any event, there is an urgent need to develop an effective deterrent, compatible with the dignity and high purposes of the United States and its Allies, and once more acceptable to the general public.

In the present antimilitary mood prevalent in the Western world, it is questionable whether any announced military policy would find immediate favor, much less one pointing the central effort to the conduct of a blitzkrieg, with all its World War II connotations.

But what really is blitzkrieg? The dictionary defines it as "a conflict conducted with lightning speed and force. . . . a violent, surprise offensive by massed air and ground forces in close coordination, and designed to achieve victory in a minimum of time."

Although the word "offensive" is used, it does not necessarily follow that the action must be politically aggressive in character. In fact, the true meaning is summed up in President Kennedy's 1961 budget message to Congress wherein he said, "We shall never threaten, provoke or initiate aggres-

sion, but if aggression comes, our response will be swift and effective."

It is important to note, however, that blitzkrieg really relates to a battle at the level of a division or corps, or a series of connected battles with blitz characteristics that might add up to a "war". Advocacy of a lightning war capability of course does not mean that a more static type of combat might not be forced upon a government by a given set of circumstances; it implies that the capability will apply to all types of combat.

In reviewing public disaffection, which has followed many years of frustrating conflicts, it must be recalled that in the early stages of the Vietnam involvement polls showed adequate home support for its prosecution. It is therefore reasonable to assume that loss of support stems from exasperation with an indecisive, protracted and costly operation. It seems equally reasonable that national policies aimed at blitz objectives in the event of emergencies, promising rapid success at the outset, would overcome most if not all of the antimilitarism of thoughtful people. Provided grave interests were shown to be at stake, and provided that military action was retaliatory rather than provocative, such policies would seem to promise the public support so essential for field operations.

THE WAVE OF THE FUTURE?

The notion that guerrilla warfare is the wave of the future, following the tenets of Guevara and Mao, is another factor tending to inhibit the adoption of a lightning war policy through overemphasis on a special type of combat. But in this connection, it must again be stressed that blitz command and control methods apply to any type of action, including guerrilla.

Guerrilla concepts have gained adherents, even among military professionals. But this is the kind of war which the enemy imposes. Factually, guerrilla forces have been able to operate in favorable terrain, among generally friendly or cowed inhabitants, and against troops of inferior mobility, sometimes operating far from home bases. And, since 1945, the fact that American troops have had to fight within tight political constraints has given guerilla tactics a wholly unwarranted prestige.

The mere existence of guerrilla warfare constitutes tacit recognition that the anti-guerrilla forces are unable to strike in sufficient strength with mobile ground and tactical air power, backed by strategic air. For this reason guerrilla warfare is invariably indecisive — one side or the other fades away or gives up the struggle. The process may take years. And the longer it takes the more the guerrilla benefits.

Yet the 1st Cavalry Division (Airmobile) has had practically uniform success in spite of the operational restrictions imposed upon all troops in the Vietnam theater. Armor units, too, have scored increasingly impressive victories as techniques improve. All in all, results justify great pride in outstanding combat leadership. But it still spells indecisive results in the long run for lack of authority to apply the characteristics of the true blitz.

Though Vietnam has had tremendous significance world-wide, it is nevertheless an unlikely area of major confrontation where decisive results are vital.

The areas of real major confrontation with potential enemies lie in Europe, perhaps in the Middle East, and within continental America, for in a day of nuclear threat and of airborne armies the latter cannot be ruled out. There are other areas too. But these are the trouble spots which must engage the atention of our planners and which must be considered for the employment of massive force at the outset. If this is not practicable, it is sheer folly to resort to ground wars of attrition at the end of global supply lines and against unlimited manpower pools. Only blitz tactics provide the answer, assuming that the requisite leadership is available.

THE ISRAELI DETERRENT

Although a comparison between solving the problems of the small state of Israel and those relating to major Western powers is not completely valid, there are striking similarities. And the principles involved are the same. Israel's existence as a state has been continuously threatened for more than a generation by a seemingly overwhelming coalition of Arab nations. Yet Israel created a deterrent that, essentially, has kept the peace throughout that period, save for two episodes of about one week each. These episodes were lightning wars in the best and most decisive tradition.

Israel observed three principles. The first was the engendering of a national will for security based on a most obvious threat, coupled with fostering respect and support for the armed forces. The second was the procurement of a reasonable store of air and ground arms, most of which were World War II surplus. The third, and by far the most important, was the creation and the training of a corps of tactical commanders imbued with blitz principles and techniques.

The national aspirations of the Arab world have been widely publicized. It enjoys a heavy preponderance of manpower and it is supplied by an indulgent Soviet regime with more than adequate stocks of arms, fighting vehicles and aircraft, many of them of modern design. Therefore, Arab caution, if not fear, which makes real the deterrent must be based entirely upon the tough, skilled ranks of the Israeli air and ground command structure.

The lesson for the United States and its Allies is plain. The existence of a high-powered weapons system, important though it may be, is entirely secondary to the development of leadership infused with appropriate blitz doctrine. There is every reason to believe that such leadership and such doctrine would not only receive public acceptance but would effectively dampen the current wave of antimilitarism.

"There are many good generals, but only a few capable of conducting a pursuit . . ."

THE BLITZ AND ITS LEADERS

The extraordinary demands on tactical leadership imposed by mobile war, especially in a potentially nuclear environment, can be appreciated only by a thorough study of the history of blitzkrieg and of the methods of the great commanders who have made it famous through the ages, rare though the manifestations have been.

General Eisenhower, in a TV talk on the ABC *Issues and Answers* program (31 July 1967) pointed up the rarity when he said, in response to a question about General Patton, "There are many good generals, but only a few capable of conducting a pursuit." Since pursuit is one of the more striking aspects of mobile war, he thus highlighted the special requirements of lightning war command.

Few realize that blitzkrieg, even by definition, goes far back into history. It only came of age on the plains of Poland in 1939, when the new possibilities of combining fire and maneuver by means of tanks in mass, dive bombers, self-propelled artillery, motorized infantry and radio came into full power. Despite the new technology, the mechanics of command and control remained constant. For there is no real difference in coordinating the maneuver of tanks with artillery from coordinating the advance of centurions with bowmen.

Hannibal knew the formula at Cannae. Genghis Khan swept Asia and Europe with it. Napoleon was a true master of the blitz. His system was followed faithfully by Forrest, Rommel, Patton, Harmon and the other US World War II mobile commanders, and, finally, by Moshe Dayan and his brilliant stable of Israeli "war horses."

Research to bring out the story of their system of command is difficult. However, it makes fascinating reading. Unfortunately it is at least a book-length story. So, for the moment, it is necessary to be content with the statement that the study of blitz battles and the methods of the great commanders indicates that all fall into a common pattern. The battles feature mobility, integration of effort, close control by a single leader, surprise and audacity, among other attributes.

Commanders were uniformly colorful and dominated the action as a symphony conductor leads his musicians. They were forceful, yet compassionate because they knew the stresses facing their subordinates. They were audacious without being rash. Their sense of timing was acute, while they fought time continually as a major adversary. They directed their staffs, yet were receptive to advice, and they were tenacious in pursuit of victory.

If his methods can be epitomized in a few paragraphs, the ideal blitz commander —

- Bases his command attitude on courtesy and understanding, insisting on general emulation of these traits through all echelons of command.
- Recognizes that mobile warfare entails constant risk, especially in the areas of inadequate intelligence and logistical support. His attitude of calculated risk expresses his confidence that his control system will overcome the deficiencies by achieving surprise with massed effort. Thus he does not permit material deficiencies to prevent a decisive strike at the critical moment.
- Organizes his staff to insure maximum speed of information flow, especially decision-making information. The staff is charged with separating the routine from the critical. By issuing positive directives, he insures that operations planning reflects his own ideas; he is never a creature of his staff.
- Operates and personally observes critical stages of the action from advance positions, using the most suitable ground or air transport and is accompanied by a minimum staff group es-

sential for the type of operation. He secures his headquarters by having it located near that of the principal effort of the command.

- Employs his staff during actual operations as "eyes and ears", insuring that these efforts are tactfully carried out and are primarily aimed at providing additional resources where needed.
- Insures that all tactical movement in the presence of the enemy is covered in a timely manner by support fires from artillery, aircraft or other agencies, taking personal interest in nuclear or multi-battalion strikes.
- Shuns any attempt to take command prerogatives from a subordinate, but patiently advises inexperienced leaders, especially when necessary to coordinate elements of the command.
- Demands the highest standards of communications effectiveness, taking a close personal interest in the communications function and treating it on the general staff level. Where the system includes ADPS he insures that the system is adapted to command methods and not the reverse.
- Takes a personal interest in training, especially combat training for small task forces likely to be used on advance security missions, by employing battle drills aimed at rapid and violent commitment.

These precepts involve techniques, or actions required in the exercise of command rather than a knowledge of tactics. And it is in the area of techniques that command aptitudes must be sought. The question of where the necessary leaders are coming from and how they are to be developed in sufficient numbers is not an easy one to answer. There is a host of obstacles and inhibitions to bar any aspirant from reaching for the baton of a Rommel or a Napoleon.

LEADERSHIP TRAINING INHIBITIONS

In view of the superb school systems of the military services, the suggestion that leadership training badly needs emphasis may raise some eyebrows. Without doubt, the United States and its Allies possess many topflight field commanders. But the numbers do not run deep enough at tactical levels, and it is at these levels — the battalion, the brigade and the division — that blitz battles are won.

An examination of schools curricula will show the great stress laid on staff principles and methodology. This is good, of course. The present logistical and troop movement wizardry is entirely attributable to it. Where tactical leadership is concerned, however, very little in the way of practical instruction is possible. Accent is placed on the inspirational and administrative functions of command, which lend themselves to classroom work. The result is very much as though a budding Joe Namath were given a text on "How to Play Quarterback", urged to read it carefully, listen to a chalk-talk or two and then prepare to meet the Green Bay Packers on Sunday. The military quarterback not only lacks the opportunity to take part in "signals practice" but cannot even watch a combat "game" on television.

Things were better a generation or more ago in a small Army, when service in isolated stations and the great open spaces gave youngsters ample experience in leading platoons or companies, with sage advice being provided by sergeants of 25 or more years service. All that is gone. Departure of the top layer of command today exhausts the supply of those who benefitted from such a solid training foundation.

Unhappily, there are many other inhibitions to the production of mobile leaders. That there is a dearth of maneuver ground in both Europe and America today is obvious. There are maneuvers, true enough, but these are invariably exercises in logistics for major staffs from which the tactical levels get little or no profit. Otherwise, when some portion of favorable ground does become available for tactical training, there are so many restrictions on the use of tanks and live firing that not only is realism lost but bad habits are cultivated. As for actual battle experience, there have been few instances since 1945, except for airmobile actions, when a leader could exercise the options open to a blitz commander.

If the young officer could be given on-the-job training by an experienced field grade senior, some relief might be offered. But personnel rotation, a bugaboo even to Napoleon, precludes this. The senior is too often off to a new assignment before his advice can begin to bear fruit. The candidate, too must bow to the demands of career management. He must have a go at staff work, management science and a variety of non-combat specialties, each requiring a school and a diploma. The system appears to aim at taking a Joe Namath away from his job as a field general in order to give him a taste of what the linemen and the other backs have to put up with.

Added to these difficulties is that of finding a command with enough personnel stablity to provide

leadership experience. The first sergeant is sick, several squad leaders are away at schools, 10 men have been detailed to cut grass; two tanks and a personnel carrier are deadlined, perhaps because of a shortage of funds for POL. The picture is all too familiar; it is again the case of Joe Namath, this time compelled to operate on a tennis court, with two backs, a guard and both ends absent.

It might be argued that in combat many gaps will appear in any organization. But the novice leader must obviously become familiar with the whole machine before coping with malfunctioning parts.

The Washington Post said editorially (19 November 1968) "We suspect that it is not so much that an inexperienced man is likely to cause the death of his comrades * * but that it reduces overall effectiveness in the conduct of the war."

Young leaders, or even not-so-young leaders cannot be developed under such conditions. The situation must be faced squarely.

skills. For example, without the use of a model lunar module the success of Armstrong's assumption of manual control on the moon landing would have been highly problematical.

For the mobile field commander, decision making is a high frequency proposition. Yet decision making is both the cause and the result of the extraordinary personal mobility required of him. He must *do* things. He must be at the right point at the right time; he must manipulate his staff; he must be ready to change plans rapidly to suit an ever shifting situation. Book learning per se not only ill prepares him to face the hazards of combat, but often misleads him.

Dr. Baker has said that the simulation techniques which went into the Miniature Armor Battlefield (MAB) can be expanded through the use of command van mock ups, radio and computerized circuitry, display panels, movies and TV clips and all other accounterments of command, energized by

"We suspect that it is not so much that an inexperienced man is likely to cause the death of his comrades--but that it reduces the overall effectiveness in the conduct of the war."

A WAY OUT

Many are familiar with the training aids that have been developed by Dr. R. A. Baker and the HumRRO organization at Fort Knox. At least two articles in *ARMOR* have described the Miniature Armor Battlefield and the Armored Cavalry Trainer. Students manipulate tanks in miniature, under radio control, over a warehouse-sized terrain board where all the stresses of combat are simulated. Outstanding results have been achieved. Graduates of the system have shown superiority in the field, even over more experienced and higher ranking officers. But to date it has served only the lowest command echelons, even while providing a basis for higher tactical responsibilities.

Fine as this start is, it is only a start. Is it possible that with the great advances in technology that have been made in the production of simulation models by the Air Force and in the space program, similar strides cannot be made in duplicating in the laboratory the many combat imponderables that beset commanders at higher levels? The student airplane pilot studies text books but the skills which help him to avoid crashing an aircraft with mechanical or weather problems come from simulation models. He does not risk an expensive plane or space vehicle, and his own neck, until he has these instructors playing the part of senior and junior commanders and staff personnel. Exposed to a series of moving situations the student can gain more in hours that he might otherwise gain from weeks in the field, making mistakes at the expense of hundreds if not thousands of men. He must act as well as think.

It is true that attempts have been made to expand the MAB concept and that failure resulted. Consensus has it, however, that failure stemmed from trying to portray too much in a small area rather than presenting the student sequentially with situations more easily controlled by an instructor. Admittedly, it is not an easy problem, but neither was the design of the lunar module. Nor is it of lesser importance.

Manifestly, a simulation program must not be subjected to the very adverse factors which now inhibit leadership training. Direction of the program must represent the skills of recognized mobile generals; administration cannot be at the mercy of personnel rotation and cost effectiveness principles must be observed.

For example, MAB costs, exclusive of personnel, averaged about $25,000. However, were development turned over to a civilian research and development corporation, Parkinsonism might at once take

Whether airmen, tanker or infantrymen, few commanders among Western Armies have had to operate in an unfavorable air environment.

over unless highly qualified officers and scientists were able to exercise close supervision.

Yet, suppose that an effective device for training specially selected brigade commanders in a three-month course in leadership techniques, supplementing the Command and General Staff College course were developed, and costs ran $2-3 million for each installation. Is this too high a price to pay against the lives and materiel that an inept commander can lose in a single battle? Again, compare such costs with those of taking a brigade into the field one or more times a month so that a student commander can experiment with it!

THE CHALLENGE OF THE FUTURE

Leadership training in the laboratory takes on added meaning when the command-control challenge of potential nuclear war is considered. The problems are familiar to all — assemble rapidly from dispersed formations, strike and disperse again; conceal command posts, but displace them frequently; learn to handle a vast volume of information exchange by ADPS while separating the critical from the routine; make electronics serve the command system while avoiding the temptation to endeavor to inspire troops or to direct the action by viewing television sets within a buried concrete vault.

The techniques of airmobile command which exist today are forerunners of this challenge. In Vietnam, helicopter reconnaissance has time and again located isolated pockets of resistance and follow-up troops have dealt with them effectively in the best blitz tradition. Yet, in a major conflict, there would be grave risk that the "pocket" was in fact not a pocket but a strongly held defensive area. An attack on the basis of a pocket could well expose the entire attacking force to fire from unexpected directions. Without immediate control of fire and maneuver resources, disaster could result. Airmobile considerations of timing will inevitably compound the control problems formerly faced by the horseman or the tanker, to whom a minute was a long time.

Whether airman, tanker or infantryman, few commanders among Western armies have had to operate physically in an unfavorable air environment. What are the unpleasantries that active hostile air imposes? Certainly they complicate an already complex situation.

The future, then, presents command-control questions that textbooks and limited field experience are unlikely to answer by the time the future becomes the present. Only simulation training can close the lead-time gap, as well as fill the current general need.

If practical command-control problems can be solved by students in centers of instruction installed at the various service schools, supplementing the present curricula either as included or separate courses, the desired corps of mobile leaders would develop quickly.

Although the proposed instruction would finally focus attention on this long neglected form of military art, the chief value would be felt in several other directions. An air of self-confidence would be implanted in all ranks. That morale and responsiveness which are always generated in troops by leaders who are acknowledged to know their job would spread through all organizations and would help to overcome the handicaps of personnel rotation and terrain poverty that now beset combat troops in training.

But most of all, the products of the system would constitute a real deterrent to potential aggression — the end goal of every military activity. It would be an entirely credible deterrent. And, by its quiet "in being" it would avoid the saber-rattling that is inevitably associated with the nuclear threat. This factor, together with the announced aims of a program of leader development, with its cheap cost, would do much to curb unreasoned antimilitarism and dangerous disregard of growing threats to the national security.

To summarize, the nuclear deterrent, being a device incompatible with the American character, has become ineffective. During Vietnam full invocation of the nuclear threat, as President Eisenhower did during the Korean War, has been rejected as an unacceptable alternative. Similarly, the use of all-out conventional measures has been put aside.

The eventual outcome of the situation in Southeast Asia will leave the Free World still badly in need of a credible deterrent. While public opinion has emphatically repudiated wars of attrition, it is beginning to realize that limited war is the very

antithesis of the aims of blitzkrieg. The only logical alternative to nuclear weapons depends on the attainment of forces characterized by a quality of leadership attuned to the challenges of the future.

Achieving the required leadership philosophy and capability at all tactical levels, through simulation command-control training, will demand planning and coordination by military professionals thoroughly experienced in the techniques of successful command at the division and corps levels. In turn, they must be supported by scientists versed in the behavioral disciplines, by technicians adept in the development of new simulation devices and by cost analysts who will keep the dollar expenditure within reason.

What is needed will seem relatively inexpensive to some and very expensive to others. But not as expensive as losing a war.

GENERAL I. D. WHITE, USA-Retired was commissioned in the Cavalry in 1923 after graduation from Norwich University. He was an early member of the pioneer 7th Cavalry Brigade (Mechanized). In 1940, as a major, he became the first commander of the reconnaissance battalion of the newly formed 2d Armored Division. He remained with that division throughout World War II serving successively as commander of the 67th Armored Regiment, Combat Command B and the division. Following World War II, General White was Commandant of the Cavalry School, the Ground General School and The Armor School and Commanding General of the US Constabulary, X Corps during the Korean War, Fourth Army and Eighth Army. In 1961, he retired as Commander-in-Chief US Army, Pacific. Subsequently, he has participated in numerous studies of command and strategy in this country and abroad. Throughout his career, General White wrote for *ARMOR* and its predecessors as well as numerous other publications.

GENERAL HASSO ECCARD von MANTEUFFEL, German Army-Retired, was born into a distinguished German military family. He was commissioned from cadet school in 1916, served in World War I and in the Reichswehr and Wehrmacht. From 1939 to 1941, he was Commandant of the Armored School at Potsdam. He commanded the 7th Panzer Division in Russia. In 1944, he commanded the Fifth Panzer Army in the Battle of the Ardennes and later the Third Panzer Army on the eastern front. He was the 24th soldier to win the highest German award for heroism — the Knight's Cross of the Iron Cross with diamonds, swords and oak leaves. After World War II he became an industrialist and subsequently served as a representative in the Bundestag. Following retirement from politics in 1957, he has served as a consultant on military matters with emphasis on command and control.

COLONEL WESLEY W. YALE, USA-Retired, was commissioned in the Cavalry from West Point in 1922. During World War II, he commanded Combat Command B of the 11th Armored Division. Thereafter he served on the faculty of the Command and General Staff College and held several important planning and operations assignments, to include that of G3, Fifth Army. In 1954, he retired from the Army to become a Senior Analyst for the Stanford Research Institute, specializing in command and control matters. Recently, he has served as a consultant at Headquarters, US Army European Command and at the German Ministry of Defense. Colonel Yale is a former Editor of *The Armored Cavalry Journal*, the immediate predecessor of *ARMOR*.

CASE, CARRYING, CARD, M170 TO BE ISSUED?

According to an article by J. B. Weilepp in the division paper *Frontline*, a 3d Infantry Division NCO in Germany recently noticed that his wallet was a bit bulky. Said he, "I knew it wasn't from all the money I carried." Further investigation revealed 20 some cards present. Included were: an ID card, Social Security card, rations card, meal card, weapon card, SMLM (Soviet Military Liaison Mission) card, Geneva Convention card, Code of Conduct card, a GTA 21-2-6 card (containing a copy of the General Orders) and a NBC (Nuclear-Biological-Chemical) card.

Immediate possession of all these is prescribed for all.

The sergeant also noted other cards which were optional or required only under certain circumstances. Among these were: a military driver's license, civilian driver's license, States of Forces card, club card, security clearance card, ammo pass, projector operators permit, hunting license and so on.

The item concluded, "So the next time you're thumbing through your billfold, why not check yourself out? If you find that you have two copies of the same card, why not trade it with your buddy. At last report a GTA 21-1-3 card (care and maintenance of the M-16A1 rifle) was worth two GTA 21-45 cards (artificial respiration).

But never, no never, be without current AUSA and Armor Association membership cards.

THE FOX

A NEW ADVANCED ARMORED CAR

by Richard M. Ogorkiewicz

No armored vehicle can boast of a background more distinguished than that of the *Fox* armored car produced recently in prototype form by the Daimler Company of Coventry, England. In fact, its ancestry stretches to the very beginning of combat vehicles since the Daimler Company supplied the engine for the world's first armored car in 1902. Thirteen years later it also supplied engines for the very first tanks. More immediately the *Fox* is descended from the Daimler scout and armored cars of World War II and their current successors, the *Ferret* scout cars which were described by the author in the May-June 1969 issue of *ARMOR*.

However, interesting as it is, the historical background to the development of the *Fox* is not its most significant characteristic. In fact, there are at least three other and far more important reasons for taking note of it: it is interesting technically; it represents an important advance in the development of light combat vehicles; and, it is a noteworthy example of continued military interest in wheeled armored vehicles.

ALUMINUM COMPONENTS

The *Fox* is interesting technically because its turret and hull are both welded aluminum armor. This makes it the world's first all-aluminum armored car. Thus, it represents another major step forward in the development of aluminum-armored combat vehicles and demonstrates further their advantages. In particular, at 12,500 pounds combat weight, it weighs little more than the closely comparable, steel-armored *Ferret Mark 4* scout car despite mounting much more powerful armament and carrying a larger crew. At the same time, protection is not sacrificed.

In addition to being used for the armor of the turret and hull, aluminum also is used extensively for chassis and other components. For instance, the suspension arms are aluminum forgings which weigh considerably less than their steel counterparts. The cylinder head and block of the engine are also of aluminum. The engine is a militarized version of the *Jaguar XK* car model. This is the same power plant that is mounted in the recently released Alvis *Scorpion* aluminum armored light tank. This engine develops 195 bhp.

LOGICAL DEVELOPMENT

In other respects the automotive design of the *Fox* represents a further, logical development of the Daimler *Ferret* scout cars. These scout cars have been used very extensively by the British Army since they began to be produced in 1951 and they have been exported from England to more than 20 other countries. In fact, today *Ferrets* are among the world's most widely used armored vehicles.

The automotive design of the *Fox* is particularly closely related to that of the *Ferrets Mark 4 and 5*, the latest models of the series which have been fitted with larger tires and a wider tracked, strengthened suspension to compensate for the progressive increases in weight over the original *Ferret Mark 1*. Thus, the *Fox* has basically the same type of independent suspension with double transverse radius arms and coil springs and 11.00x20 tires. The suspension allows great 11-inch vertical wheel movement which makes the *Fox* better able to travel at speed over broken ground. Since its weight is only slightly higher than that of the *Ferret Mark 4* and its engine is considerably more powerful, the performance of the *Fox* should be even better than its predecessor.

Another development wisely carried over from the *Ferret Mark 4* is the permanent installation on

Fox armored car successfully climbing a steep sandy slope.

the *Fox* of a collapsible flotation screen which can be erected by the crew in just over one minute. To reduce the size of the screen to a minimum, additional buoyancy has been provided by watertight reinforced plastic stowage boxes mounted between the wheels on each side of the hull. When afloat the *Fox* can propel itself at up to 3½ mph by means of its wheels. The amphibious capability increases markedly the overall mobility of the *Fox*. This is particularly important with respect to its intended role which is defined by its nomenclature as Combat Vehicle, Reconnaissance, Wheeled.

30MM GUN ARMAMENT

From the military viewpoint, the most important single feature of the *Fox* is its *Rarden 30* gun. This is a high-velocity 30mm gun developed specially for installation in light armored vehicles by the Royal Armament Research and Development Establishment of Fort Halstead, and the Royal Small Arms Factory, Enfield, England, from whose combined initials its name is derived. Its caliber is larger than that of automatic cannon used so far in light armored vehicles. Thus, this development represents a major step forward in the armament of light combat vehicles.

Guns of 30mm caliber have been used extensively in recent years on fighter aircraft but the adoption of this caliber for the *Rarden 30* is more closely related to the development, in Switzerland, by the Hispano-Suiza Company, of the high-velocity 30mm *HS831L* antiaircraft gun. Interestingly, the *Rarden 30* has been designed to fire the same ammunition

Prototype of the Fox moving at high speed along a dirt track.

as the Hispano-Suiza gun. But, in addition, an APDS round has been developed for it in England. This round is similar in principle to the highly successful APDS developed for battle tank guns and has a muzzle velocity of more than 4000 ft/sec, which makes the *Rarden 30* capable of defeating the armor of all vehicles, except the frontal armor of battle tanks. In particular, it can defeat the armor of all light armored vehicles at ranges of 1000 meters, or more. This includes the ever-growing number of armored personnel carriers and armored reconnaissance vehicles and makes the *Fox* a most effective counter-reconnaissance, as well as reconnaissance, vehicle. At the same time, the *Rarden 30's* ability to fire light but effective high explosive shells, coupled with the capabilities of the coaxial 7.62mm machinegun, makes the *Fox* eminently suitable for a wide variety of security roles.

An unusual and very useful feature of the *Rarden 30* mounting in the *Fox* is that it can be elevated to as much as 40 degrees, which makes it usable against attacking helicopters or low-flying aircraft. Another noteworthy feature of the *Rarden 30* is that it is loaded with clips of three rounds and designed principally for single shot fire even though two clips can be loaded at one time and bursts of up to six rounds are possible. This may seem surprising at first when it is realized that other automatic cannon have been designed with cyclic rates of fire of 600 to 1000 rounds per minute. However, these high rates of fire are of little or no value in light armored vehicles because of the very limited number of rounds which they can carry. On the other hand, the design of the *Rarden 30* as a short burst gun, made it possible to keep it relatively simple, more accurate, compact and light. Its 9-inch inboard length and weight of only 200 pounds make it comparable with guns of much smaller caliber. One other feature of the *Rarden 30* worth noting is that empty shell cases are automatically ejected out of the turret, eliminating the usual clutter of the crew compartment and the emission into it of noxious powder fumes.

CREW EFFICIENCY

Apart from its aluminum armor and effective armament, the most important design difference between the *Fox* and it predecessors is that it has a much larger turret with an internal diameter of 50 inches, which can accomodate two men. Thus the *Fox* has a crew of three rather than the *Ferret's* two. These are a commander/loader, gunner and driver. The turret can still be operated by one man in an emergency but the larger crew and especially the separation of the duties of the commander and the gunner makes for greater effectiveness of the *Fox*.

To enable him to observe effectively from within the vehicle, the commander has a ring of seven zero magnification (unity) periscopes around his hatch and a periscopic binocular surveillance instrument, with a magnification of ten or unity, in a rotating mounting. The gunner has two additional periscopes as well as a periscopic binocular sight linked to the armament. The driver has a novel, wide-angle periscope. There is also provision for infra-red and passive night sights.

COMING CLOSER TO THE REQUIREMENT

All this makes the *Fox* an effective combat vehicle and one which comes close to the requirements put forward by this writer in an article on armored cars in the March-April 1951 issue of *ARMOR*:

". . . The aim should be not to produce a vehicle to compete with tanks but a type of armored car which would be a really useful auxiliary to them and which could be used in all the different roles where it is uneconomical to employ tracked vehicles."

The same article concluded that:

"There appears to be a definite place for a really fast, reliable and inconspicuous auxiliary . . . a well designed wheeled armored vehicle should successfully fill this . . ."

This is a view to which I have adhered and have upheld ever since, in articles in *ARMOR* and elsewhere. The *Fox* goes a long way toward fulfilling it.

Operations Analysis for ARMOR

by Arthur R. Woods and Colonel Donn A. Starry

It was the scientist Archimedes who, at the request of the King of Syracuse, set to work finding a way to raise the Roman naval blockade of that city over two thousand years ago. Since that time, as no doubt before, the scientific hand has, more than once, been lent to the art of war. In more recent times, as early as Frederick the Great, war games playing out on a map the course of battles and wars received considerable attention. Later some bright American military minds of the nineteenth century brought the science to this country. The Englishman, F. W. Lanchester, in 1914-1915, described mathematically relationships between attrition, firepower superiority, and victory in air war, resulting in the now familiar Lanchester equations. American Thomas Edison, of electric light fame, working for the Navy in World War I, made analytical studies of more effective ways for ship convoys to evade submarine attack. Not until the Second World War and after, however, was there widespread application of the scientific method to military problems. Blackett's Circus, a mixed bag of scientists and military persons trying to improve United Kingdom air defenses in Hitler's War, really gave birth to modern military operations analysis, or operations research. And the Atlantic War against the German submarine fleet saw the scientific method applied in operations of the U.S. Navy's Tenth Fleet.

From these beginnings has grown today's profusion of agencies and groups dedicated to scientific evaluation of military problems. Business and industry have applied operations analysis to many activities—transportation, inventory control, merchandizing, and servicing; and to the curricula of colleges, universities and business and military schools. The recent past has seen the introduction of courses to train enough people in a wide variety of disciplines to meet the increasing demand for analytical talent in government and industry.

With respect to solving military problems, it is often said that new analytical methods of the scientific approach outdate more traditional systems of military decision making. There is extensive commentary about: the incompatibility of military thinking and the scientific method; the alleged military preoccupation with subjective and solution oriented thinking; and, the scientist's all too leisurely collecting, sifting, and sorting facts into shaky and inconclusive hypotheses.

The soldier (says the scientist) blunders with precipitate haste into premature decisions with inadequate data, blindly resisting change, even after better alternatives become apparent. The scientist (says the soldier) dawdles and ignores or obscures the commonsense obvious, delaying decision and avoiding responsibility for choice until decision's time is long past.

The military record of operatons analysis is spotty, even though the black art had its modern genesis in solving military problems. Too often, descriptions of operations analysis methods are in terms of rolls of the dice, turns of the playing cards, or revolutions of the roulette wheel; real, practical military application being much harder to define and describe. So while there is a profusion of literature describing tools and techniques in fundamental terms, or at best related to business applications where profit or loss statements suffice as measures of effectiveness, there is but limited writing about operations analysis couched in useful military contexts.

Making decisions about military operations is a military business. Of necessity, it seeks problem solution, not so much out of intellectual bankruptcy as from the ever present demand to get the

job done—and on time. Military decision making is the unique task of the military man. It combines experience, judgment, and technical competence, acquired through years of schooling, service assignments, and combat duty. Since 1945, an exponential growth of science has made available new and more powerful methods of analysis. These analytical methods are the unique field of the scientist. They combine education, experience, and technical competence in a field of expertness into a set of skills that have been, and can be increasingly, useful to the soldier.

Each year the Army gets more technical, and the soldier becomes more reliant on the civilian scientist to help decide what is needed for military tasks, to help design, test and produce weapons and equipment, and to help find better ways to use military equipment. It is nearly impossible, if not undesirable, to try to train the military man to stand in for the scientist. It is far more practical to educate the soldier into the scientist's ways just enough to combine scientific method and soldierly judgement in more precise statements of requirements, in conducting realistic research, development, testing, and engineering, in analysis of operational methods, and in the inevitable dialogue with the scientist.

This is the story of an association between scientists and soldiers lasting almost two years. It is a good demonstration of the potential of scientific skills applied to operational methods. It will not be necessary to identify units and persons except to say that the authors were parties to the dialogue—one a scientist, the other a soldier; that the setting is a Seventh Army tank battalion; the locale the historic German invasion routes in the Hessian Corridor; the time 1962-64. The scientists were a varied group of mathematicians, physicists, ballistics experts, electronic wizards, and psychologists, sometimes in platoon strength, who off and on during the period invaded the domain of the soldiers. The soldiers were the standard issue variety who have come to be furnished by the government for an increasing variety of purposes over the years.

Some of the data are hypothetical, but representative—for obvious reasons. Some experiments were not completed, and are so reported. Some ideas presented are embryonic and should be further investigated. All are related along with completed work to show the potential as well as the accomplishment. The story is told from the two viewpoints by a soldier and a scientist, and their dialogue is sent in differing type styles to ease identification.

SOLDIER: It was a meeting engagement at point blank range. Blessed by the division commander, whose wisdom (as usual) became more apparent as time wore on, they came with charts, big words, a scientific air, and a proposal to experiment with our operations. There were to be cameras, simulators, recording devices, and much analysis of small unit tank operations. There was at least a platoon of them.

SCIENTIST: We went to Europe that spring to collect, for the first time, good tank duel hit-kill data to use in a computer run war game analyzing small armor unit combat actions. We had an idea that with movie cameras strapped to tank gun tubes we could record gun lay, acquisition, identification, and fire times, gun trunnion cant, and accuracy of lay at time of firing. Thus we could better identify component elements of tank duels, and by further analysis get more accurate performance data for the war game. We briefed the soldiers on our problem.

SOLDIER: We huddled for a quick estimate. It was a big project, and would eat up training time. But we were scheduled for platoon and company exercises, and some of us felt that we could use their gadgets as gunnery training devices at a time when limited range availability had made us apprehensive about maintaining gunnery proficiency. So we set to work.

SCIENTIST: After some preliminary work with movie cameras we finally settled on 35mm data recording cameras capable of several thousand frames a minute. The camera attached to the tank searchlight mount was activated partly by an assistant instructor (civilian analyst) riding the tank, and by tank commander-gunner firing controls. It took individual pictures of targets at acquisition, during ranging and gun lay, and at the time of firing. At the bottom of each picture was a data panel (Fig. 1) on which twelve event marker lights indicated, when illuminated, a specific operation and time of performance. Seven events were marked manually by the assistant instructor, others automatically by commander-gunner controls. Range data was fed direct from the computer.

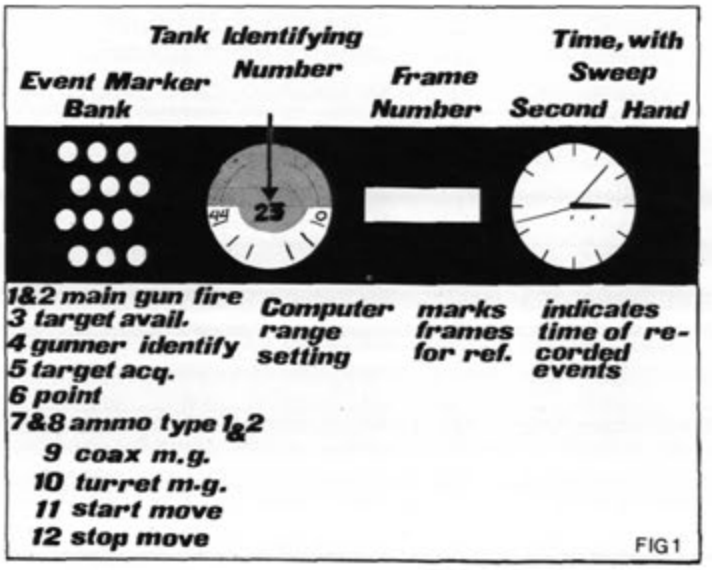

FIG 1

SOLDIER: The almost perpetual haze that shrouds the Hessian landscape, a year with a dark wet spring, and the inevitable graininess of 35mm negatives blown up to 8×10 for evaluation, combined to make it hard, often impossible, to spot a target in a picture, even though the crew had acquired, identified, and fired on the target. We used up our training stock of TNT for smoke and flash. And, since blank tank gun ammunition was not available, we turned to the scientific platoon for help.

SCIENTIST: Using some 3-inch diameter blank steel stock in 8-inch lengths, we drilled for half the length a half-inch diameter hole, and mounted the gadget on a large plank. These we fastened to the glacis plate of the tank, and into the tubes we stuffed some standard flash-bang simulators with detonators hooked to the tank firing circuit. The simulator generated enough flash and smoke to make target identification positive on film, and incidently we were told, made crew training more realistic.

SOLDIER: Although good searchlights were among our assets, we wanted a way to use the cameras at night, and we needed to know more about night firing without illumination. The problem we put to the scientists was simply to give us a night capability equal to the camera potential in daylight, and we could give them their data.

SCIENTIST: This was more difficult. We wanted night firing data, and this was a good idea. After some false starts we hit on the idea of ultra-violet target illumination which would not be visible to the human eye, and yet would burn through searchlight illumination to record on film. Ultra-violet light tubes were arranged on targets in "V" or "L" shaped patterns. Gun lay was scored by indexing with reference to the light pattern on the resulting picture. We tested it and it worked.

SOLDIER: By this time several months had passed, and we were ready to try our fledging training device in field exercises. We convinced the scientific platoon that they needed this kind of data too, and we finally agreed on a series of tests.

► Individual tank in quasi-combat course similar to gunnery table VIII day and night.

► Tank platoons in a quasi-combat platoon course day and night.

► Tank platoon quasi-combat courses with free maneuver against random targets.

► An exercise to develop data about battlefield agility. We had observed that for some reason our gunners' lead applications on moving targets varied a great deal, and that our lead doctrine, or possibly our training, needed examination.

We also felt that if we could not improve film processing times to make reasonably prompt debriefing possible, much of the training value of the camera system would be lost. We were not insisting on the immediate debriefing which was our custom on table VIII, but some reasonable approximation had to be achieved. The scientific platoon had been developing film, printing a set of 8×10s, and scoring each frame with a scoring grid. We suggested that if they could get a quick processing device we could settle for projecting the negatives on a screen in the debriefing shack, scoring as we went along. And they could get their needed data quicker. With several projectors we could display a whole platoon situation at one time by projecting identically timed frames from all platoon cameras. In this way we could score platoon coverage of the target area, see how the platoon leader distributed his fires, and at the same time score each individual tank for gun lay and fire time.

SCIENTIST: Hundreds of firing sequences from the first three tests outlined above produced a mass of data which reduced to these statistics:

POSTURE	TOTAL FIRE TIME (SECONDS)
Offensive	12
Defensive	8
Overall Average	10

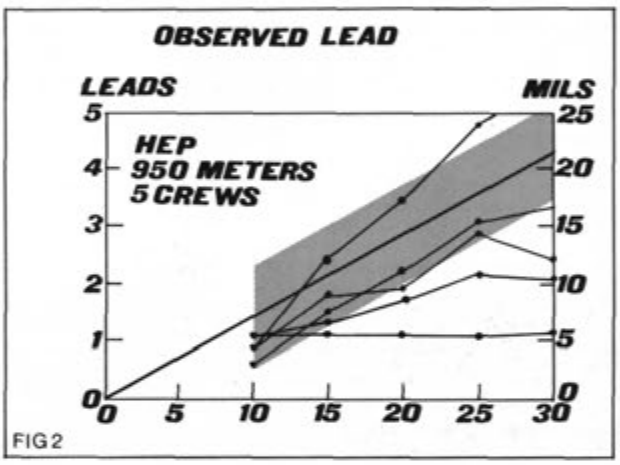

FIG 2

Gun lay data indicated a high probability of first round hit which, coupled with laboratory lethality data, worked out to a 70 percent probability of hit-kill on the first round.

There seemed to be wide variance in results depending on who fired the first round in a tank duel. It appeared from camera data that the tank firing the first round enjoyed about an 80 percent better chance of a kill than its adversary.

Graphical representation of parts of the agility experiment are shown in Figure 2. This portrays data concerning a platoon firing at a moving target. The shaded area represents acceptable lead variances for a lethal hit. Lines on the chart represent actual lead setting applied by gunners as target speed varied.

In night firing tests targets were flash-bangs to the front of the firing tanks, offset enough to require acquisition and gun lay. A lethality grid keyed to target range and type was used for scoring effects of the standard night firing sequences prescribed by gunnery doctrine.

The film processing problem we recognized ourselves from the beginning. Finally we found a suitcase size commercial film processor to develop film at a rate of six feet a minute. No darkroom was required, and battery power made this an ideal field kit. With standard issue 35mm slide projectors rigged for film strips we could begin debriefing within ten minutes of an individual tank run, and within twenty minutes of a platoon run.

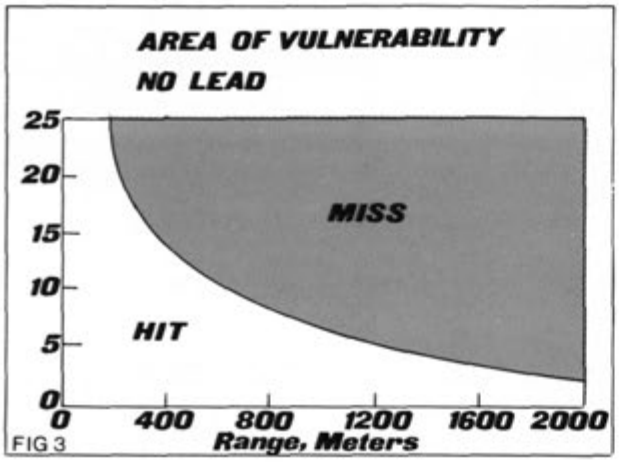

FIG 3

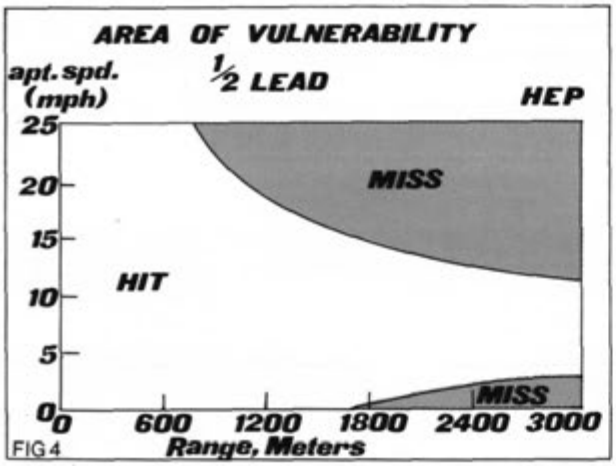

FIG 4

SOLDIER: At the same time the camera tests were in progress, part of the battalion was firing gunnery qualification tables. To verify data from the camera tests we made a complete record of live fire to match the nonlive data. Fire times for initial rounds were slower by more than a second than in camera recorded sequences, averaging about 11.5 seconds. This is probably accounted for by crew reaction to live fire. Using a lethal target area grid on live fire targets, and the laboratory lethality data, we were able to verify the 70 percent first round hit-kill probabilities suggested by the camera tests. It was of course not practical to verify that the tank firing the first round in a duel enjoyed an 80 percent better chance of kill, although by this time some were willing to suggest that a crew of scientists should oppose a crew of tankers for a live test.

Results of the agility experiment caused detailed analysis and revision of our lead doctrine. We noted that at no reasonable range was it possible to track fast moving targets accurately. This suggested that in the tank duel, if one is caught exposed, it may be the best tactic to simply turn flank to the enemy and run at top speed for a covered position from which to attack him. For at apparent speeds over 20 miles per hour, it appeared that there is no gunsight system in the world that could track accurately enough to consistently bring fire into the lethal band. We constructed a series of charts (Figs. 3 and 4) to analyze our problem and work out solutions.

The camera pictures also showed clearly a problem we had only suspected before—that of trunnion cant. The guns always seemed canted a little, but how much, and with what effect? We suggested an experiment first to find out what average cant is under field conditions, and a live fire test to determine the precise effects of cant on trajectory.

Scoring thousands of firing sequence pictures with the scientists showed us a wide variety of range and intervisibility factors. We knew now how much better it was to fire first, and were understandably anxious to reduce first round fire times. We also knew that tank commander ranging was the most time consuming element in the acquire to fire sequence. These factors combined to cause reevaluation of our battlesight doctrine. Battlesight is a way of reducing initial round fire time, but the other factors made us wonder if we had the best SOP battlesight. Which setting was better, and how to find it? The problem is shown graphically in Figure 5.

SCIENTISTS: To find average trunnion cant we bought several dozen builder's spirit levels, fastened them to commander's cupolas, attached a small acetate covered board and a grease pencil to each. The commander recorded his tilt at each firing position before moving off. Over several weeks of maneuvering and firing, average cant rounded out at about five degrees. Continued tests showed this figure varied with terrain as one would expect, but that the relationship between average slope and average cant was not linear. In other words, regardless of the terrain, tank commanders habitually sought

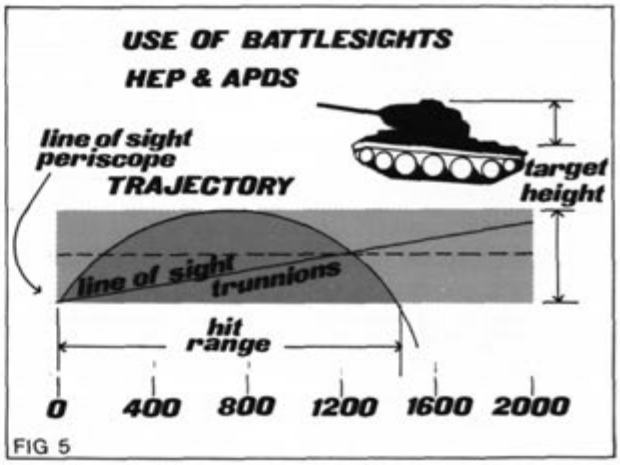

FIG 5

fairly level firing positions. With live fire we measured the effects of trunnion cant from two to 20 degrees in either direction. Right cant throws the round up and to the right, left cant down and to the left. Rounds with lower muzzle velocities are of course more affected than high velocity rounds.

The battlesight problem was more difficult. By this time the soldiers had sufficient insight into the way we worked to really hold our feet to the fire. The question they posed in this problem is illustrative: "Give us the range finder setting at which we get grazing fire for the greatest possible distance, with the round rising no more than five feet off the ground, which is generally the hull down elevation of an enemy tank." We set up a linear program to analyze thousands of ordinates along trajectories at hundreds of ranges for several rounds. But we had to get a computer to work it out. We instructed the computer to optimize range against a primary constraint of an ordinate no greater than five feet.

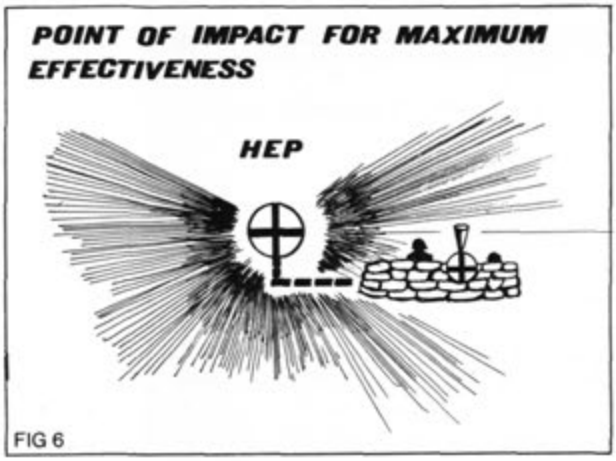

FIG 6

SOLDIER: Since they varied so widely from doctrine, we tested the computer results with live fire against a spaced array of targets from 100 to 2500 meters, with better results than the computer had predicted. Aiming at the bottom of mass, at a range finder setting of 1700 for example, the computer figured the round to fly no higher than five feet from 150 to 1700 meters. We found by test a much better performance, with the round flying no higher than five feet out to about 2000 meters. HEP, with a slower muzzle velocity, on the other hand, was not susceptible to battlesight, and required ranging for each round because of its high looping trajectory. We revised our gunnery doctrine generally as follows:

In the chamber: APDS
Range finder indexed: 1700 meters APDS
Initial fire command:

COMMANDER	GUNNER	LOADER
"Gunner"		
"Tank"		
	"Identified"	*"Up"*
"Fire"	*"On the way"*	

Average fire time:
First round—5 seconds
Second round—11 seconds (total)

Cutting fire times in half had licked the better part of the problem of how to get off the first round, and thereby increased effectiveness by a factor estimated to be about 60 percent. Should the initial target require ammunition other than APDS, we decided to fire the round to get the advantage of firing first, and change ammunition and index, or range for the second round.

Our evaluation of trunnion cant effects showed that for faster rounds they were generally within expected dispersion patterns for normal ranges so we decided to ignore them. With slower ammunition the problem was complicated by the unique bursting characteristics of the HEP round. A base detonating fuze on the round we were using caused much of the lethal spray of the round to go to the rear and sides of the point of impact. Before adjusting for average cant we wanted to have an integrated picture of the total effect of cant and burst characteristics, especially on horizontal targets. So we asked the scientific platoon to instrument a test firing to give us the data.

SCIENTIST: To instrument the test of ammunition burst characteristics we fabricated targets shaped like personnel in dug-in antitank positions. Target cloth envelopes were sewed up in appropriate form and by insertion and inflation of a large balloon we created a target with area, volume, and resistance to fragmentation approximating those characteristics in the human body. Body count we got by counting deflated balloons —those which fragments had penetrated sufficiently to rupture the target cloth envelope and the balloon skin.

SOLDIER: Recognizing only the bursting characteristics, maximum effectiveness could be gained by air off as indicated in Figure 6.

The cant problem was analyzed by studying a series of charts like Figure 7. We were working on a reticle calibrated in oranges—apples—lemons, or similar geometric figures, and fixed to indicate where to aim for average cant condition when the project had to be shelved. More work needs to be done on this problem.

About this time the helicopter was being widely recognized as a machine of great potential—especially in Vietnam. Having no experience or data to evaluate, we asked if cameras could be used in helicopters and on tanks to record the events of tank versus helicopter duels. By this means we hoped to get a preliminary view of what problems we might encounter fighting an enemy equipped with aerial platforms of the helicopter variety. So we put this problem to the scientists.

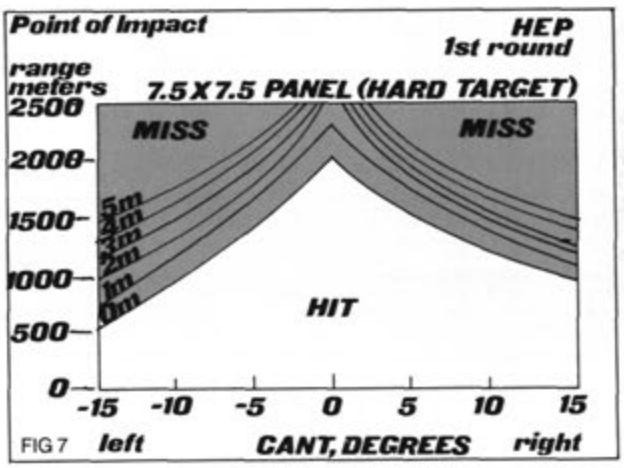

FIG 7

SCIENTIST: We were fascinated by this idea. No research had been done, and little if any real data was available. We resurrected the movie cameras with which we had begun our tank duel experiment, mounting one on the barrel of the tank's cupola machinegun, and another in a helicopter weapon system mount. With a hundred or so runs of helicopters against tanks in a variety of tactical situations we began to develop fairly consistent statistics and hit-kill probabilities. More analytical work needs to be done on this subject. Since we were near the end of the time available for field experiment, we were unable to explore this any further.

SOLDIER: Helicopters got some good shots at tanks, and tanks were quite effective against helicopters. This experiment convinced us that we had better potential against aerial platforms than we had been led to believe, and that it was probably better to fire than to hold fire against helicopter-like platforms. It certainly showed us the dangers of not looking up as well as all around, and it demonstrated the vulnerability of some of our formations to attack by aerial weapons platforms while

moving, and from the rear 120 degree sector. We acknowledged these facts in revisions to the training program, and by adjusting our battle drill combat formations.

SCIENTIST: Our time was up—in fact we were overtime. We had stayed on to investigate the new avenues that seemed to open up all the time. We had stimulated more ideas than we could handle, more knotty little problems that needed investigating, and were more than ever convinced that good scientific analysis is fundamentally the product of good real world performance data. But our data bank was full, thanks to an imaginative bunch of soldiers who were willing to try anything, and who many times showed opportunities for investigation that our more stereotyped vision just overlooked.

SOLDIER: Detaching the scientific platoon was a reluctant process. We had come to appreciate their tremendous capability to analyze our problems. Suming up, we were convinced that the camera system had potential as a training device. It permitted precise measurement of performance without firing a shot, and within reasonable tolerances of actual performance, at a time when training resources—area, time, and ammunition were all in critical supply.

At the same time we were equally convinced the 35mm data recording cameras were much too sophisticated. They were not the kind of equipment we could be expected to care for properly without additional skills, equipment, and personnel. They had capabilities far exceeding what we needed for training. In fact the old reliable movie cameras, with a little improvement, could serve our purposes very well. We had also investigated miniaturized television cameras, available commercially, for use as data recorders, and for instantaneous assessment of performance, but this had to be set aside for the moment.

The scenarios of all tactical tests designed to gather data had to be drawn very carefully, and with precision, to include measuring ranges, siting targets, positioning equipment, and rehearsing enemy scenarios beforehand. While initially we saw this as burdensome, it came through clearly before long that, the more meticulously training is planned, the better is the training. It should not be necessary to relearn this lesson, for it is much taught, but the idea of precision in planning, precision in measuring performance, and precision in analyzing effectiveness stuck with us. It permeated everything we did tactically from that day on, forming the basis for platoon and company test exercises, for equipment evaluation, and even for an analysis of performance of crew and small unit commanders. It caused us to reevaluate at one time or another almost everything we did. Better load distribution of our bulk fuel and ammunition loads was the product of a linear program set up for us by the scientific platoon, but which we were able to operate ourselves once they were gone. The prescribed load list of spare parts was the subject of a thorough analysis though this project had to be set aside in the face of insurmountable administrative barriers impeding implementation of what we had found necessary to improve. A scheme to navigate cross-country at night using a radio station grid system was put aside, but promised great potential. The battalion training program underwent a thorough analysis in which we found such a lack of available human performance data that we had to collect data to provide the basis for analysis and design of a new program.

In short the scientific platoon had been quite an asset. They taught us to apply the scientific method to military problems, and to temper it with a little military common sense—an invaluable combination. We learned we could make many analyses ourselves by just collecting good hard facts, and with them making some cupola estimates. The lesson was clear. We had a good synthesis. The scientists provided the technical knowledge and understanding of how to collect, relate, and interpret data. The soldiers contributed the sense of urgency, of purpose, of insistence on clear goals, the knowledge of how human beings and machines behave in battle, and a certain hopefully useful cynicism about the relationship between theory and practice in everything to do with war. We learned to tolerate one another's idiosyncrasies in the search for well reasoned, properly documented, soundly analyzed, and thoroughly practical results, results to improve our combat effectiveness.

COLONEL DONN A. STARRY, Armor, is a graduate of West Point, has graduated from the Armed Forces Staff College, the Army War College, and holds a Master of Arts in International Affairs from the George Washington University. He served with the 63d Tank Battalion, 1st Infantry Division in Europe, and as Armor instructor at the US Army Intelligence School, Fort Holabird. Five years of duty with the 3d Armored Division included an early tour as an aide de camp when the division was at Fort Knox, a later tour as S3, Combat Command C, and assignments as executive officer and battalion commander of the 1st Battalion, 32d Armor in Europe. While serving with the G3 Section, US Army Vietnam he joined the MACOV study group for its operations in Vietnam. He was next assigned to weapons systems analysis duties in the Office of the Assistant Vice Chief of Staff, US Army and then became assistant to the Assistant Secretary of Defense for Administration. Returning to Vietnam in 1969, he served in J3, MACV before assuming command of the 11th Armored Cavalry Regiment.

ARTHUR R. WOODS has been in the military operations research field for nearly ten years, joining the staff of the Operations Research Office (now the Research Analysis Corporation) after teaching two years in the Washington area. He was graduated from the University of Maryland and is currently doing graduate work at the George Washington University. His work in military operations research has ranged from logistics to field experimentation. During a two-year assignment with the RAC Field Office, G3 Section, Headquarters Seventh Army he was involved in air defense studies and evaluation of side-looking airborne radar operations. He spent several months in Vietnam evaluating the reliability of the tank and armored personnel carrier fleet just prior to joining the staff of the Directorate of Weapon Systems Analysis in the Office of the Assistant Vice Chief of Staff of the Army.

SERGEANT

by Master Sergeant Albert C. Charles

Ordinarily, when they hear "Sergeant" most people do not think immediately of a police sergeant or a sergeant-at-arms in a courtroom or in the legislative chambers. The picture that immediately flashes to mind when the word "Sergeant" is spoken is army — the professional soldier.

In our Army the term means dependability, ability, versatility. And a whole array of serious, or heart-warming, or even humorous pictures, be they of the 35-year sergeant major or the brand new buck sergeant, come in view. With respect to those scenes where the sergeant's personal ability, or his integrity, come into question, or in which some other shortcomings are evident, the overwhelming prestige of the non-commissioned officer corps arises to prevail over unpleasant memories. Above all, those qualities that have consistently marked the fraternity of sergeants over the years continue to be foremost in our minds.

Let us examine the source of this military professional. Where does he come from? What is it that makes the senior sergeant begin to consider that a recruit, or a specialist or a corporal should be recommended for the elite fraternity? What makes our commanders concur in these recommendations? And why, in the end, do we elevate some fledgling into the ranks of the true professional?

Over the years, bull sessions with the old sergeants indicate that at one time it was quite something to be promoted to sergeant, or in their own words, "get a sergeant's rating". Those same reflections indicate that in some cases, if one was capable of physically overpowering the average man in the unit, one was destined to become a sergeant. And maintaining that status depended upon how well one maintained his ability to overpower subordinates. It also depended on how authoritative your leadership was. Those who could demand and enforce discipline were the sergeants, and education, and the ability to comprehend, indeed were not prerequisites.

The close of World War II and rapid decrease in strength during the period following is commonly accepted as the end of that particular era (if, in fact, it ever existed). Post-Korean War managerial concepts, both technical and tactical, became part and parcel of the thinking of what we have today as the hard core of sergeants. The "old sergeant" found that he had to lean more on those subordinates who had the ability to understand and interpret these changes as well as to explain to others the most intricate details of new ideas and concepts. He had to do this with great skill, because he still had his prestige and personal pride to maintain. And he still had the image of the sergeant to keep up and protect.

Fortunately, our fraternity experienced a smooth and commendable transition. In the ranks you could sense the change. How very admirable were those old sergeants who never let you forget that first and foremost was duty — above all duty.

And there was the challenge of preparing this new breed of sergeants by slowly cultivating and harvesting them with pride. One could not help but feel a deep respect for the old sergeant. When duty dictated that he listen to a subordinate who had perhaps better knack for learning and a better grasp of the subject at hand, he listened with dignity and in full control of the situation. Maybe he was a slow learner, but he learned painstakingly and learned well — and in so doing he taught so much. His observations of his modern subordinates were keen, and the recommendations he made to his commanders, in most cases were very discriminating. Those who had the talent to adapt to the necessary changes represented the norm, not the exception.

Thus, the nucleus of today's corps of American sergeants was formed. This is a corps steeped in traditions of the past, with the same devotion to duty as its predecessors. The present sergeant has the same qualities that made a good one in 1776 or 1876. This is the same sergeant, who in eras past, recommended his subordinates who fit the bill to be promoted to carry out the sergeant's work. Thus today, the tradition that has been passed down through numerous campaigns is still alive. It is a tradition that carries the true sergeant's hallmark, *trust me.*

And, now again, the sergeant is experiencing a transition. Most of the old sergeants have retired. We find that it is slowly but surely becoming the task of those of us trained under the old "Old Sarge" to effect change without dropping the ball.

Indeed, we too are somewhat surprised with this man known as a recruit. We have to admit, as our predecessors did with us, that he is quite different. In fact, he's quite a guy. He's even more intelligent! He is better informed about what is going on in the world. We can see a reflection of ourselves in that he too, is calling a spade a spade, but he is saying it with better words. This comes as a big surprise. We thought these kids were soft — too much money, too much fun "never make in the Army" types.

But we realized that this is not the case at all. In fact, the new soldier is just the opposite. He is proving every day in Vietnam, and elsewhere, that he is not what we thought he would be. We are finding that he is easy to motivate, that he is easy to train, and that he can be trusted. It does not seem possible that he could be a screaming protester, the ugly product of a too affluent society. We see in him the qualities that our Army needs. And we take great pride in the fact that we are able to impart some of our personal qualities to him. We are finding that it is not hard to recommend him for the fraternity of sergeants.

We see that indomitable American spirit; we see all those other qualities that are essential to success in combat which we learned from our old sergeants and soldiered in our own experience. We see these young soldiers as future professionals and we take pride in the fact that we showed them the way. It pleases us that they imitate us in attitude as well as in those other soldierly attributes in which we take so much pride. We see that commendable determination to place duty above self, prejudices, personal opinions, political considerations and even family. These are the things we had hoped the young soldiers had observed in us as earlier we had seen the same attributes in our old sergeants.

But now let us add a little dull color to the bright

painting. How often have we fallen short of our ideals? How many of us have the tendency to forget them for a spell — to have longer than usual lax periods? How often do we let our privileges get the better of us — to forget that the title *sergeant* is a badge of responsibility as well as one of privilege? How frequently do we get entangled in breaches of our great trust and forget the words duty, devotion and leadership through example? Can we say honestly that we are indeed living up to the great tradition and projecting, to all with whom we come into contact, the true image of the American Sergeant.

We know that there are a lot of things that we should be doing right now to improve that image and to improve our army, our subordinates and ourselves. How many times do we put off until tomorrow what we should do today?

Work that correspondence course, take that new manual from the shelf or do that one more thing which we should have done before we called it a day. How many times have we failed to correct, on the spot, that young soldier we passed with his hands in his pockets. How often have we failed to give the commander a completely true picture? Have we rationalized those less than sharp fatigues which should have been thrown away years ago? All these things characterize each of us from time to time. Recognizing and correcting them before harm is done will make sure that the stripes fit; that they belong; and that it's one fine fraternity.

When that "recruit lieutenant" calls on you, he assumes that you fit the bill, and you take pride in that fact. You remember also that different and wonderful feeling which comes when the general addresses you as "Sergeant". We all have experienced that sense of pride when a civilian calls us "Sergeant". We are good, we sergeants — new breed and old. But think of how much better we can become — and how much we can add to this word "Sergeant". Dwell on how much we can add to the quality of our Army and finally how much more we can add to the strength of our Nation as a result. Let us set the example, let us be proud to call ourselves "Sergeant", and let us be fully worthy of the name at all times and in all places.

MASTER SERGEANT ALBERT C. CHARLES entered the Army in 1953. He then served in Korea with the 24th Division. Later, while a member of the 894th Tank Battalion at Fort Knox, he completed the advanced NCO course at the Armor School. He then served with the 69th Armor, 4th Armored Division in Germany. During two tours at USATCA, MSG Charles has been a drill instructor, platoon sergeant and first sergeant. While on a second tour to Korea, he served as a platoon sergeant in the 2d Battalion, 15th Armor in the DMZ. Now Senior Enlisted Instructor of the ROTC Instructor Group at Duquesne University, MSG Charles' last subsequent assignments were in Vietnam as an advisor and in Troop B of the 11th Armored Cavalry.

CAVALRY FLIES?

My World War II outfit, the 15th Cavalry Regiment, (Mechanized), (later the 15th Cavalry Group) was in the Great American Desert for desert training in 1943. It was 120 degrees in the August shade and flies were about to take over the camp.

The Regimental Commander put out an order to the effect that all latrines would be dug to a depth of 18 feet, that latrine orderlies would wear white coats and helmet liners and that all officers would carry fly swatters!

Some time after we had all become expert in the manual of the swatter, sanitary inspectors from Corps Headquarters were inspecting an Antiaircraft unit in an adjacent area. When they completed their inspection the team chief asked the Commanding Officer of the AAA outfit why there were so many flies in his area. The infuriated CO snapped, "That accursed 15th Cavalry Regiment across the road ran all of *their* damn flies over into our area!"

COL GLENN E. FANT, AUS-RETIRED

"Here's Hough"

by Colonel John Hughes Stodter

This American Army toast comes straight from our military history. Soldiers generally agree in ascribing its origin to the American Indian.

When he wanted to make peace with the "bluecoat soldiers," the Red Man of the western frontier often held up an empty hand, palm outward, and said "How" or "Hough"—as it used to be written.

Living sons of veterans of our last Indian Wars may have heard their fathers describe such a scene and western artists, including Frederic Remington, have pictured it. But few American Army men today realize that the Indian's "How" or "Hough" became our toast during the Second Seminole War. The first had been a brief war (1817-18) won by "Andy" Jackson. But the Second Seminole War, though little noted in our histories, dragged on for ten years (1832-1842) and was the longest most fiercely fought and costliest in lives and money of all our Indian Wars.

The Seminoles, renegades mostly from the Creek nation, plus outcasts from other tribes and a few runaway Negro slaves, having refused to be moved west to the Indian Territory, took refuge among the swamps of central and southern Florida. Here in the steaming lowlands and the Everglades, a grim but dreary war of bogtrotting and bushwhacking dragged on through swamps infested with alligators, snakes and mosquitoes. The American soldiers of today, fighting an elusive enemy through the swamps and jungles of Vietnam, can probably well appreciate the miseries of their predecessors in Florida over a hundred and thirty years ago.

While the 8th Infantry, plus artillery and engineer detachments served gallantly through the long conflict, much of the swamp fighting was done by the 2d Regiment of Dragoons which had been raised especially for service in the Seminole War. Much of the time, the Dragoons had to leave their horses behind and operate dismounted, or from boats and canoes. For mounted troops, especially it must have been a most distasteful war in which the only bright spots were those periods of truce when the troopers could get back to their horses, dry land and civilization.

Military men have long held that the best pacifists are the warriors who have seen enough of war to know that peace is worth fighting for.

Certainly our troops in the Seminole War valued peace enough to drink to it when they had a chance.

The accompanying verses of "Hough" were published in 1871 in a booklet entitled *Army Ballads and Other Poems*. The author, Second Lieutenant Arthur Tracy Lee, was born in Massachusetts, graduated from the United States Military Academy in 1867 and commissioned in the 5th Artillery. He then served at Fort Jefferson, Florida; New Orleans and Fort Jesup, Louisiana. From 1868 until his death in February 1870 at the age of 25, he was stationed at Camp Williams, Virginia and Washington, D. C.

While the labored sentimentality of these verses seems overblown to us, it was probably in tune with its time and the poem does proclaim "Hough" as an army toast. It is, however, Lieutenant Lee's footnote which establishes an historical basis and a credible explanation of the origin and adoption of so unique a toast:

COLONEL JOHN HUGHES STODTER, U.S. Army-Retired, was commissioned in the cavalry on graduation from the United States Military Academy in 1922. During World War II he served as a senior advisor to the Chinese Army and subsequently in 1951-52 was Chief of Staff, MAAG Republic of China. Following his retirement from the Army in 1954 he earned a Master of Arts from the University of Cincinnati. Since then he has been associated with research organizations in Washington, D.C. The son of a cavalry officer, Colonel Stodter has a lively interest in military history and has written a number of articles in the field.

An army sentiment, well understood in the Florida war,—but although uttered as a toast, generally, throughout the army at the present time, there are but few who know its origin. Coacooche, or Wildcat, the distinguished Seminole chief, at the time of his surrender at Camp Cummins, Florida, observing that the officers used certain expressions, such as "here's luck" " the old grudge!" etc., before drinking, asked Gofer John, a negro interpreter, what they said. John was puzzled; but finally explained by saying, "It means how d'ye do!" whereupon the chief, with great dignity, lifted his cup, and elevating it above his head, exclaimed in a deep guttural, and triumphant voice, "Hough!"

The word was at once adopted by the officers of the 8th Infantry and 2d Dragoons, and as a sentiment spread rapidly throughout the whole Army.

As to how "Hough" got to the western Indians: They could well have picked it up in western powwows with the Army, as did the Seminole chief in the east. Also, it is of record, that a detachment of mounted Seminole scouts served in the west against Comanches and other hostile tribes, after the Civil War. In any case, it is worthy of note that "Here's How!" had a legitimate origin in our military history, and that the toast of our Army has always been a toast to peace.

"HOUGH!"

Lonely by the campfire dreaming,
Whilst the stars are o'er me beaming,
Memory and thought come streaming,
  Rainbow-like across my brow.
Scenes that fate cannot deny me,
Float upon the night-winds by me,
Whilst dark cares forgotten fly me;
  And in dreams, I drink to "hough!"
"Hough!" boys, "hough!"—"hough!" boys, "hough!"
Drink beneath the tall palmetto,
  "Hough!"

  Pressing here my mossy pillow,
Forms that moulder 'neath the willow,—
Forms that sleep beneath the billow,
  Flit and frolic 'round me now,
Banishing all thought of mourning;
All my dreams with joy adorning;
May they tarry till the morning,
  Ere they breathe their parting "hough!"
"Hough!" boys, "hough!"—"hough!" boys, "hough!"
Let the soldier's toast be, ever, "hough!"

Soldier boys should never borrow
Idle troubles for the morrow;
Time enough, when comes the sorrow,
  'Neath its heavy weight to bow.
Then, whilst stars are shining o'er us,
Let not darker skies before us
In our dreams wake bitter chorus,
  Banishing the toast of "hough!"
"Hough!" boys, "hough!"—"hough!" boys, "hough!"
Underneath the green palmetto, "hough!"

Pile On

by Colonel George S. Patton

In Part I, published in the January-February 1970 ARMOR, *Colonel Patton described the development of his "Pile-On" concept of operations and gave illustrations of its use by the 11th Armored Cavalry Regiment in small unit actions in Vietnam. In this article, he discusses the concept as applied by larger units, and points up the importance of pacification efforts.* THE EDITOR.

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ATLAS WEDGE

The most successful large unit Pile-On conducted during my command was Operation *Atlas Wedge* which took place in the Michelin Plantation during the period 17-24 March 1969. II Field Force, Vietnam intelligence had indicated that the 7th NVA Division was again infiltrating southward from the Loc Ninh Area through the Michelin Rubber Plantation toward Saigon. This enemy division consisted of three regiments, the 141st, the 165th, and the 320th, each having an estimated strength of 1200. Total 7th NVA Division strength was held to be at 5000. It was believed that at least one regiment was located in the rubber, while the other regiments were staging to the north of this infamous area. There was little intelligence available on specific order of battle within the Michelin at the time.

The 11th Cavalry was alerted for participation in *Atlas Wedge* on 15 March 1969. Because our troops had never operated in the tactical area and were unfamiliar with it, permission was requested, and granted, to conduct initial reconnaissance operations. Accordingly, on 17 March (D-1) elements of the aero-scout platoon and certain key commanders proceeded to reconnoiter the new regimental AO.

By about 0900 on the 17th it became evident that the area was occupied by a major enemy force. Large groups of NVA troops were seen within the rubber plantation area. Clearance to fire was requested. While waiting for clearance, all aircraft to include the FAC's continued to sight larger bodies of enemy troops who made little or no attempt to conceal themselves. After a 90-minute delay, which I remember as the longest one and a half hours of my life, the regiment was finally given clearance to fire. Throughout the balance of the day nine TAC air strikes were directed against the enemy. Two 11th Cavalry *Cobras,* later reinforced by 1st Division gunships, remained permanently on station and made repeated strikes on enemy locations. During the course of the day, the combined Air Cavalry Troop and TAC Air actions caused a verified 34 killed. In addition, there were many "possibles" which could not be confirmed since authority to land had been denied. It is of interest to note that two *OH6A* scout ships logged a total of 20 hours of flying time on this day.

During the night of 17-18 March, elements of the 1st and 3d Squadrons displaced to the west from their regularly assigned AOs west of the Dong Nai River. Then, on the afternoon of 18 March, they moved into the eastern portion of the Michelin Plantation. Significant contact began when elements of the 1st Squadron (LTC M. W. Ireland), which at that time comprised Troops B and C, Company D and one company of the 2d Battalion, 28th Infantry, contacted and killed 23 NVA. Within the same hour, elements of the 3d Squadron (LTC John W. McEnery) which then included Troop L, Companies H and M and Company A, 1st Battalion, 5th Cavalry, 1st Cavalry Division, killed an additional 35 NVA and captured five prisoners.

Heavy contacts continued off and on throughout the balance of 18 March, resulting in a total of 123 NVA KIA and five prisoners with an additional possible 29 NVA KIA. This score was attained at a friendly cost of 17 wounded and several vehicles destroyed. On 19 March both squadrons, reinforced with infantry, continued to push northwest through the rubber plantation. The 19 March actions accounted for 51 more NVA KIA and three prisoners.

During the evening of 19 March and the early morning of 20 March, three *B52* strikes requested by the 11th Cavalry were placed on the jungle area slightly northeast of the rubber plantation. At first light, two pink teams and the ARP started a routine bomb damage assessment of the strike area. Several large base camps were discovered and the ARP was soon in heavy contact. Troop L, Company A, 1/5 Cavalry (OPCON from the 1st Cavalry Division), and part of Company M moved to reinforce the ARP in the area of contact. The engagement continued until dark when the ARP troopers were extracted and the ground elements took up night defensive positions in the battle area. This day-long contact accounted for 75 of the 89 enemy killed that day. Three medium tanks of M Company and one L Troop APC were destroyed. U.S. losses were three killed and 17 wounded including LTC McEnery who was evacuated. McEnery, now a Colonel, received the DSC for this action.

At first light on 22 March 1969, aero-scouts were dispatched northeast of the rubber plantation to develop additional *B52* strike areas. One aircraft spotted what appeared to be a group of NVA wounded being evacuated by litter to the north. Troop C (CPT Lemos L. Fulmer, Jr.), not then in contact, was diverted and moved to the area. Heavy contact ensued. The aero-scouts gave MEDEVAC support to the ground elements and screened the flanks to prevent enemy exfiltration from the area. The day's action resulted in 34 NVA killed and three prisoners. Two American soldiers were killed and several were wounded and evacuated.

Operation *Atlas Wedge* was remarkable for its immediate reaction to, and exploitation of, intelligence, and for the high number of enemy casualties at minimum cost. Moreover, it was an outstanding example of the successful combined use of TAC Air, Army aviation, armor and infantry. The coordination of armor and infantry units operating under the command of both the 1st and 3d squadron commanders was superb. Their employment of armor against the very heavily entrenched and well disciplined NVA 7th Division troops was well-timed and brilliantly executed.

Infantry elements from both the 2/28 Infantry and the 1/5 Cavalry proved indispensable in this operation as they followed the tanks closely and cleared all bunkers with grenades, LAWs and shaped charges immediately after the armor had overrun and crushed the positions. The LAWs were found to be a fine addition to our arsenal in this engagement.

A valuable lesson was re-learned during this fast moving operation. For almost one year, the 11th Cavalry and its assigned units had been operating in a fixed area of operations from generally permanent fire-support bases and a stabilized line of communications. However, *Atlas Wedge* found the regiment engaged not only in a war of movement over unfamiliar terrain, but in almost continuous contact with the enemy.

During this period, the requirements for maximum mobility and flexibility of both mind and task organization were extremely heavy, and logistical requirements were particularly demanding. This was caused in no small degree by the heavy demands for Class V (152mm) created by the new *Sheridans* assigned to the 1st Squadron.

Initially then, because of a felicitous change in tactics, which approached the proper employment of our type organization, we were forced to re-orient ourselves both mentally and physically in order to give close and continuous logistical support to the combat elements. Although this was done effectively, our operation would have been even more productive had we realized, at the outset, what the change to regimental scale mobile operations really meant, especially in the field of logistics.

The thought struck me at the time that despite my military schooling and a fairly large amount of field service, my own anticipatory planning had been somewhat wanting. One can never cease to learn war.

TREASURE ISLE

The last type of operation to be discussed may be termed the deliberate Pile-On. Operation *Treasure Isle* was quite a successful soft cordon (i.e. prolonged seal) and search of the village of Tan Binh located slightly east of Lai Khe in Binh Duong Province. It demonstrated the effectiveness of careful planning prior to a deliberate cordon and search.

The purpose of *Treasure Isle* was to destroy or neutralize the well entrenched VC political infrastructure which had grown up among the inhabitants of Tan Binh. Several previous efforts to apprehend those comprising the VC infrastructure (VCI) in Tan Binh had been made by both 11th Cavalry and 1st Division units with disappointing results. Available intelligence continued to confirm a well-organized VCI within the village.

Therefore, I decided to conduct a soft cordon and search of the area and thus to initiate a genuine endurance contest with these elusive characters in order to literally starve them out. I gave the mission to the 2d Squadron commanded by LTC Lee Duke. Forces available consisted of Troops E (CPT Templer) and F (CPT Thomas A. McAdams, later killed in action) and Company H (CPT Montgomery). The squadron was reinforced with rifle elements of the 1/26 Infantry and 1/28 Infantry of the 1st Division. These U.S. company-size elements comprised the seal force. The search force consisted of the 3d Battalion, 8th Regiment, 5th ARVN Division.

As the U.S. elements moved into position during darkness and started sealing off the village, support-

ing artillery fired preparations some four kilometers to the north as cover and deception measures. Artillery, mortar, and tank searchlight illumination assisted the positioning of the cordon. The seal was completed at 2300, 11 January.

At dawn on the 12th, a loudspeaker equipped helicopter announced the formation of the seal. The people were informed that Tan Binh was surrounded by Free World Forces, that no one would be permitted to leave the village, and that villagers must not wander from the immediate vicinity of their homes between 1800 and 0600 hours daily. Intensive combined U.S. and GVN S5 operations, consisting of leaflet drops, PSYOPS movies, MEDCAPs, DENTCAPs and armed propaganda teams (APTs) informed and educated the population throughout the seal period.

Interrogation teams screened ralliers, prisoners and detainees at a central collection point. From prior research and this preliminary screening, intelligence teams under the control of Major O'Meara, the regimental S2, developed a chart to depict the VC political and military structure which probably existed in the village. The chart predicted the existence of four basic committees: the People's Revolutionary Party Executive Committee, the Village National Liberation Front Committee, the Village Liberation Committee (a Communist village council), and the Village Military Affairs Committee. The interrogation teams used this chart as a "straw man" to assist in the segregation and identification of VCI members.

During the operation, individuals were collected and interrogated concerning their committee or section affiliation, as well as about the positions of other VC in the village. As names found their places on the chart, cross-interrogation confirmed the existence of committees and sections and served to identify additional local VC leaders. Interrogators then used the chart to determine relevant questions to ask those newly apprehended. During the eight-day operation, which had been planned to last as long as three weeks if necessary, the 11th Cavalry processed 70 ralliers and detained an additional 32 personnel. Of these 102 detainees/ralliers, 22 were actual guerrillas, 46 were VCI members and the remaining 34 were classified as draft dodgers, deserters, or civil defendants. As a result of *Treasure Isle,* an estimated 65 percent of the VCI and 90 percent of the local guerrilla force were captured and imprisoned and "blacklist" work in this area was considered complete. During the entire operation not a single shot was fired by either side.

Two factors, planning and time, were decisive. The intelligence collection and exploitation plan was executed unhurriedly over an extended period and permitted complete neutralization of local insurgent forces.

The lessons of this operation are two-fold: first, the Pile-On, viewed as a rapid reaction with minimum force based on good intelligence, is not appropriate for all missions. There are certain operations which, because of the nature of both the threat and the assigned mission, require a more comprehensive and complete intelligence collection effort concurrent with very thorough staff preparation at all levels. Secondly, and of real significance, is the fact that an operation such as the cordon and search described above nearly always becomes the source of a vast wealth of intelligence which will serve as a "camel's hump" for weeks and even months to come.

PACIFICATION

The pacification of certain borderline villages in the regimental AO was a continuing requirement, conducted in conjunction with all other operations. In my view, it is the key to our eventual success in Vietnam and its importance cannot be overstated. Pacification takes tremendous self-control and patience by all concerned, as well as thorough planning and enthusiastic execution. It must be conducted by highly disciplined troops who fully understand their role in this war.

One such operation worthy of discussion was the pacification of Binh My and Binh Co villages in Binh Duong Province. Both villages were VC contested.

In October 1968 Captain Fulmer, then Regimental S5, entered Binh Co to begin an intensified pacification program. He was assisted by Lieutenant Pavlina, a PSYOPS advisor, and a seven-man armed propaganda team (APT) composed of former VC who had rallied and had volunteered to enter the contested village to bring the government message to the people. During the initial phase, the pacification team emphasized fact-to-face communication. This direct communication set the stage for identification of key informers and leaders within the hamlet. Nightly use of the *MSQ85* mobile audio-visual van to show movies created a marked psychological impact on the villagers, exposing fallacies in VC propaganda and demonstrating the true nature and extent of their terrorist tactics.

The team scheduled conferences, called Friend-

ship Council Meetings, to discuss the institution of a hamlet government and community development. During the initial meeting the villagers elected, by secret ballot, the hamlet's first chief in four years. They discussed construction of a children's school and other worthy civic projects. The APT spread the word of the Chieu Hoi/Open Arms Program and provided after-dark security for movies and meetings. The council meetings were also a place to file claims and arrange solatium payments for villagers who had suffered losses from U.S. operations in the area.

By the end of the October, success could be measured by the work begun on the school, the rallying of the Binh Co NLF Committee leader, and the completion of two new homes to replace those destroyed in an earlier ground action. With the assistance of our surgeons, we instituted a program of weekly MEDCAPs and daily sick call. These activities in Binh Co attempted to demonstrate the tangible benefits which could accrue to a rallier.

By mid-November, the school had been completed and supplied with textbooks and school supplies. A flagpole stood in front of the school, and the colors of the Republic of Vietnam flew over the hamlet of Binh Co for the first time in seven years. They remain there today.

Although the pacification of Binh Co was still in its early stages, a solid foundation of trust and cooperation had been created. The experience and knowledge which we had gained in Binh Co was utilized as our efforts shifted north to Binh My, a two hamlet "metropolis." Each of these hamlets was much larger than Binh Co. Thus Binh My posed a major challenge.

The S5, the PSYOPS Advisor and the APT set out immediately to meet the people and to open communication channels. Within a week, the village elders had agreed to conduct a Friendship Council Meeting. We then discussed the importance of the Chieu Hoi program and asked the elders to spread the word to their children, some of whom were known to be active Viet Cong.

The Friendship Council meetings continued with discussions of community development and hamlet needs. By late November 1968, work on a small grade school was underway. With the assistance and support of the attached 919th Engineer Company (CPT Bernard J. Reilly) and certain key 1st Division elements, the people of Binh My were able to do the majority of the work. Concurrently, loudspeaker broadcasts and movies took place daily, and the squadron surgeon held daily sick call and weekly MEDCAPs. By 1 December, the school was completed and books and school supplies present. Benches and desks were built by the villagers using empty ammunition boxes. The result of the combined Vietnamese civilian and local U.S. military effort not only gave Binh My a school, but also improved the relationship between the Vietnamese and Allied military forces.

As a sidelight, during the first several days of the Binh Co civic action project, a group of engineers from the 919th were laying the foundation for the school and playground. As is the custom in Vietnam, a large group of small children were playing nearby. An engineer carrier approached bringing water and food to the soldiers at work in the hot sun. As it moved to the work area, it struck a mine wounding two soldiers and heavily damaging the vehicle. The casualties were evacuated, the track was pulled to the side of the road and stripped of retrievable supplies. The children continued their play and within 30 minutes those indomitable engineers were back on the job. Following that incident, mine locations began to be reported to us with increasing frequency — by the children of course.

At this time, the Squadron S5s stepped in and took over the pacification effort from the regimental headquarters. Shortly thereafter the people of Binh Co constructed, with some advice and assistance, a berm and three 50-foot towers to aid the hamlet in self-defense. By Christmas all projects were completed, to include playground areas which were equipped with swings, see-saws, monkey bars and volleyball courts.

By the end of the holidays, 28 VC had rallied. Information obtained from them led to the capture of a large number of other VC and capture of numerous weapon caches. The intelligence provided by the rallying of one VC is a prized acquisition; the rallying of 28 VC is like striking gold. Concentrated pacification was paying off.

In early January, the 919th Engineers terraced 38 acres of previously unused land in Binh Co and set up a water pump and 100 feet of plastic tubing for irrigation purposes. AID rice and assorted other vegetable seeds were obtained. Province officials at Binh Duong innoculated all domestic animals against disease, and plans began for building a market area for the hamlet.

The day before Tet 1969, over 2000 sets of clothing were distributed for the children. The next day, gifts were given to the hamlet chiefs while a "Self-

Defense" band provided entertainment. On the third day, the 1st Infantry Division Band presented a concert and the troops served refreshments at the Binh My school.

The results of the program were both immediate and long range. The aggressive Civic Action/ PSYOPS program produced immediate effects. The people of Binh My and Binh Co were freed from VC terrorism. Intelligence from ralliers increased materially. Adults, as well as children, repeatedly pointed out mines in the nearby roads and led Allied forces to ammunition and weapons caches.

A secondary result, applicable to our ultimate goals in Vietnam, is the emergence of a people who appear to have accepted an active role in their own government and who are actively seeking to resolve local problems within an established framework of self-government. Now, these villagers are people on whom the Free World forces can rely if they in turn receive some real security on a continuing basis.

It must be pointed out, however, that as the pacification effort strengthens and gains momentum along Highway 16 between Tan Uyen and Phuoc Hoa, the requirements for security will nevertheless continue. The area is still shaky but a significant start has been made. As the Vietnamese armed forces continue to grow in strength and ability, it will fall to these important allies to take up the burden in Binh Co and Binh My, as well as in the other contested populated areas throughout Vietnam. Hopefully, we will successfully "work ourselves out of a job." In turn, our Vietnamese Allies must, and will, I am confident, be able to go it alone.

POSTSCRIPT

No article such as this could begin to do credit to the gallant and remarkable 11th Cavalry under me or any other commander. Whether that privileged officer was Cobb, Farley, MacFarlane, Holder, Gorder, Patton or Leach, the record of Blackhorse achievement has stood in the forefront of all USARV units since the regiment's arrival at Vung Tau in early September of 1966.

During my tour I was particularly blessed with some of the finest and most dedicated officers, noncommissioned officers and soldiers I have served with in the Army. In this connection, such magnificent commanders as John McEnery, Lee Duke, Merritte Ireland, Jack Nielsen, John Prillaman, and Doc Bahnsen are worthy of special mention. On the staff side, particular credit must be given to Lieutenant Colonel Jim Tuberty (XO), Majors Dozier (S3), O'Meara (S2), and Finkbiner (S4) and to CPT Fulmer (S5). I must also recognize those true professionals such as Command Sergeants Major Mulcahey and Squires, First Sergeants Spivey, Transue, Ellsworth, Curtis and Mathis and Platoon Sergeants Kisner, Kelly and Biggin. Nothing could stop them. Nothing did. I was honored to associate my name with theirs and with those of all the thousands of other Blackhorse troopers and 1st Division soldiers, Rangers and 5th ARVN Division people I came to know and to respect so highly.

I salute them and wish them well in all their endeavors. In each case, their country can be justly proud of what they have done, are doing, and will continue to do to support our national goals in Southeast Asia.

COLONEL GEORGE S. PATTON was commissioned from the US Military Academy in 1946. Following the officers basic course and airborne training, he served in Germany successively as a platoon leader in the 5th Constabulary Regiment, company commander at the Vilseck Tank Training Center and Commanding Officer of Company C, 63d Tank Battalion, 1st Infantry Division. Following graduation from the Armor Officers Advanced Course in 1952, he was an instructor of tactics at the Armor School. In 1953, he assumed command of Company A, 140th Tank Battalion, X Corps then in combat in Korea. He next served as a tactical officer at both the US Military and Naval Academies. Following graduation from the Command and General Staff College in 1958, he served as aide to the Commander-in-Chief, US Army, Europe and as executive officer of the 1st Squadron, 11th Armored Cavalry Regiment. After completing the Armed Forces Staff College course in 1962 he served in J3, MACV. He next commanded the 2d Battalion, 81st Armor, 1st Armored Division at Fort Hood. Upon graduation from the Army War College in 1965, he was assigned to the Army Staff. In 1967, he returned to Vietnam to serve in G3, USARV until he was appointed to command the 11th Armored Cavalry Regiment in July 1968. After returning to the United States, he completed rotary wing aviator training in January 1970. Colonel Patton, who has been selected for promotion to brigadier general, is now Assistant Division Commander, 4th Armored Division.

The Medal of Honor was presented posthumously to Corporal Jerry W. Wickam, United States Army, by Vice President Spiro T. Agnew, in the name of Congress, in ceremonies at the White House.

Corporal Jerry W. Wickam, United States Army, distinguished himself by conspicuous gallantry and intrepidity on 6 January 1968, while serving with Troop F, 2d Squadron, 11th Armored Cavalry Regiment in the Republic of Vietnam. On this date, Troop F was conducting a reconnaissance in force mission southwest of Loc Ninh when the lead element of the friendly force was subjected to a heavy barrage of rocket, automatic weapons, and small arms fire from a well concealed enemy bunker complex. Disregarding the intense fire, Corporal Wickam leaped from his armored vehicle and assaulted one of the enemy bunkers and threw a grenade into it, killing two enemy soldiers. He moved into the bunker, and with the aid of another soldier, began to remove the body of one Viet Cong when he detected the sound of an enemy grenade being charged. Corporal Wickam warned his comrade and physically pushed him away from the grenade thus protecting him from the force of the blast. When a second Viet Cong bunker was discovered, he ran through a hail of enemy fire to deliver deadly fire into the bunker, killing one enemy soldier. He also captured one Viet Cong who later provided valuable information on enemy activity in the Loc Ninh area. After the patrol withdrew and an airstrike was conducted, Corporal Wickam led his men back to evaluate the success of the strike. They were immediately attacked again by enemy fire. Without hesitation, he charged the bunker from which the fire was being directed, enabling the remainder of his men to seek cover. He threw a grenade inside of the enemy's position killing two Viet Cong and destroying the bunker. Moments later he was mortally wounded by enemy fire. Corporal Wickam's conspicuous gallantry, extraordinary heroism and intrepidity at the cost of his own life were in keeping with the highest traditions of the military service and reflect great credit upon himself and the United States Army.

The late Corporal Jerry Wayne Wickam was born at Rockford, Illinois on 19 January 1942. After graduating from Leaf River High School (Illinois) Corporal Wickam entered the United States Army on 12 September 1966. Following basic training and advanced individual training at the US Army Training Center, Armor at Fort Knox, Corporal Wickam was assigned to Headquarters and Headquarters Company, 1st Battalion, 68th Armor in Germany. In June 1967, Corporal Wickam joined Troop F, 11th Armored Cavalry Regiment in the Republic of Vietnam. On 6 January 1968 Corporal Wickam was killed in action while performing the brave acts for which he was awarded the Medal of Honor.

TANKS FOR NON-TANK COUNTRY

by Lieutenant Colonel T. S. Riggs Jr.

Part II — Meeting the Requirement

Historical analysis, the "nuclear stalemate" between major powers, and Communist doctrines concerning "wars of national liberation" point to warfare in the underdeveloped areas near the Equator as the environment for which we should be preparing forces. In the past we have lacked a tank designed for such tropical and subtropical areas which are characterized by poor communications and transportation, underdeveloped agriculture and industry, and all varieties of close and difficult terrain. Consequently, we have had to use tanks designed for mechanized war in "tank country." Armor commanders have made the best of their mobility limitations and have capitalized on their firepower and survivability to produce good results, but much more could have been done with tanks designed for difficult terrain.

Part I of this article stated the need for a difficult terrain tank (DTT) defined as, "An armored ground vehicle serving as the principal assault weapon of troops engaged in warfare in difficult terrain." The essential mobility, survivability, and firepower requirements were discussed in detail, and are summarized below:

► *Mobility* Without imposing a rigid weight limit, design should facilitate strategic air movement and intratheater movement by assault airlift or heavy lift helicopters. Tactical responsiveness should be made possible by a high degree of cross-country capability. Power should be greater than 15 horsepower per ton, ground pressure less than 7 pounds per square inch, and traction greater than current tanks. Additional mobility aids, such as a winch and dozer blade, are also necessary. Battlefield mobility should be enhanced by the provision of improved physical and mechanical characteristics of the vehicle combined with suitable protection and firepower.

► *Survivability* Armor protection against ballistic penetration by light automatic weapons and small arms at close range is required in all directions. That protection against shaped charge weapons afforded by ballistic armor should be enhanced by the vehicle design making detonation likely at an ineffective distance from the main armor. Survival of the crew and essential vehicle components must be provided for, even when antivehicular mines with power equivalent to artillery projectiles are encountered. The suspension should be designed to minimize mine damage and to facilitate rapid recovery and repair.

► *Firepower* The tank must be capable of delivering a heavy volume of controlled fire in any direction, regardless of enemy return fire. This includes a need for at least a machinegun firing in other than the principal direction of fire. The DTT must also be capable of destroying targets which other weapons in the force cannot eliminate, particularly fortifications, and of giving close support to infantry from long ranges.

This is the need. How can it be satisfied?

M-48A2, DTT-I, DTT-II and DTT-III

CONCEPT

Of the many concepts possible, three have been selected for further discussion. Concept I (*DTT-I*) is an improved conventional tank, intended to use as much as possible of the know-how built up over the years of production and employment of the *M46-47-48-60* family. Concept II (*DTT-II*) is based on the Swedish *S tank* configuration with fixed main armament, but in this concept it has more turret mounted secondary armament. Concept III (*DTT-III*) is more radical — an articulated, wheeled vehicle based on the Lockheed *Twister*. A tracked, articulated variation of this concept, somewhat like the winner of the *ARMOR* tank design contest a few years ago, is also discussed.

CONCEPT I

Over the years since the *M26* tank was introduced at the end of World War II, the US Army has successively introduced new models of improved 50-ton, 90mm gun tanks. Power trains have been improved greatly by the introduction of the cross-drive automatic transmission and the *V12* air cooled engine. The *AVDS 1790* diesel version of the latter is an extremely good combat vehicle power plant. The 90mm gun and ammunition have also been refined and turret power systems, and fire control instruments, developed to gain the maximum effectiveness of this weapon. *DTT-I* is intended to be an application of these highly developed components to a conventional tank configuration optimized for the DTT role.

The most apparent differences between the Concept I vehicle and the *M48* are in the hull and turret shapes. Instead of the heavy elliptical hull of the *M48, DTT-I* has a rectangular hull with sponsons overhanging the tracks, looking very much like the former *M10* and *M36* tank destroyers. Like the tank destroyers, the main armor is much thinner than on a tank, about an inch thick, and there is no concentration of armor on the front. Additional protection is afforded by the sponsons, which are made of light steel armor to protect their contents against small arms fire and the effects of "jungle busting." They provide stand-off distance of 18 to 24 inches for protection against antitank rockets. Stand-off protection in the front is provided by a bulldozer blade and bar armor.

The turret appears large and box-shaped. The main armor, again about an inch thick, forms a triangular inner turret with the main armament at the apex in front and two machinegun cupolas at the base. Outside the main armor is another envelope of thinner steel. This includes a large stowage box at the rear, but the front portion is left empty because of its irregular shape and to help balance the turret.

The main armament is a 90mm gun. The advantages of this weapon are its versatility with the available ammunition family, long range accuracy, and armor defeating capability. It was chosen over the 105mm howitzer for this concept in spite of its greater weight and bulk because these are not major considerations in this design. Coaxially mounted on the right and left of the cannon are caliber .50 and 7.62mm machineguns. The principal fire control in-

strument is a coincidence rangefinder operated by the gunner, who is on the right of the gun. Both he and the tank commander, to the left of the gun, have periscope sights as secondary direct fire sights in daylight and as primary infrared sights at night.

The commander is positioned where he has a field of view of about 200 degrees to the front and both flanks of the turret. With turret traverse he can observe in any direction. He does not have a cupola machinegun, being properly concerned with employment of the tank and all its weapons. He is positioned to concentrate on the main armament when an engagement involves firing in more than one direction.

Two small cupolas with 270 degree traverse mount one 7.62mm machinegun each. Their fields of fire overlap to the front and rear and their gunners can provide all around observation and protective fire. Depending on the tactical situation, one of the cupola gunners may be used to load the 90mm. That is, the left manchinegunner would load when aboard the right tank of a section and the right machinegunner when aboard the left tank. In other situations requiring the manning of both cupolas, the gunner or commander could load while the other fired.

Using essentially the same track and power train as the *M48A3/M60,* any mobility advantage of the *DTT-I* would be derived from decreased weight and added mobility aids. Comparison of the *Vickers Main Battle Tank* (*ARMOR,* Jan.-Feb. 68) with the more heavily armored *Chieftain* on which it was based indicates that there should be substantial weight savings. The *Vickers MBT* weighs 38 tons, compared to 57 for *Chieftain.* A weight of 35 to 40 tons for *DTT-I,* as compared to 51 for the 105mm gun *M60A1,* seems reasonable. At that weight, with the same engine and track, we would get a ground pressure of 8 to 9 pounds per square inch and a power ratio of 18 to 21 horsepower per ton.

A dozer blade and a winch on the front of each tank would greatly enhance mobility of armor units in difficult terrain. The blade could be used for improving stream crossings, clearing landing zones and fields of fire, constructing tank positions and other emplacements, and to prevent slipping when using the winch. It would also decrease wear and tear on other components in trail breaking operations through heavy vegetation, as well as making a better trail. The winch is much more effective for recovery than standard tow cables. In most cases, a small tank unit should be able to do its own recovery quickly, without having to wait for the arrival of a VTR.

Concept I. M48A3 components are used wherever possible.

Additional cross-country mobility, properly exploited, should decrease the vulnerability of the DTT to mine warfare by making it harder for the enemy to emplace a relatively small number of mines effectively. The *DTT-I* configuration eliminates the vulnerable road wheel arm extensions of the *M48* suspension. This would make it easier to repair mine damage. The flat-sided hull also makes possible "short tracking" for recovery of mined vehicles.

Concept I would be a worthwhile improvement over present-day equipment for tank operations in difficult terrain. It would afford the necessary protection, improved firepower, and better responsiveness to requirements for cross-country movement. Although significantly lighter than the *M48,* it would not be adaptable to movement by helicopter or assault aircraft. Its improved ground pressure would give it better flotation in soft ground, but, in this respect, it would still not meet the goal of performance comparable to that of the *M113.* The great advantage of this approach is the feasibility of producing improved tanks for tropical warfare quickly, using thoroughly proven major components.

CONCEPT II

Sweden's *STRV 103 S tank* (*ARMOR,* Mar.-Apr. 68) is the basis for the second concept. An adjustable hydro-pneumatic suspension makes it possible to lay the main gun in direction and elevation, although the cannon is fixed in the hull. The *S tank* was designed for the main battle tank role in European terrain. It is heavily armored and equipped with a 105mm gun. In spite of this, its weight is only 41 tons, 20 percent lighter than equiv-

Concept II. Bulldozer depth of cut regulated by suspension controls.

alently armed and armored tanks of conventional design.

In the Concept II configuration, the *S tank* layout is modified to provide for more all around firepower, in keeping with the tactical conditions of warfare in close terrain. A small rotating turret in the left rear of the hull carries a combination gun mount with one three-barrel 20mm *Vulcan* gun and one 7.62mm machinegun. The three-barrel *Vulcan* is lighter than the six-barrel version and its 3000 round per minute rate of fire is plenty for the ground role (*ORDNANCE,* Jan.-Feb. 66, "The Roarin' Twenties"). The greater firepower of the 20mm, as compared to the caliber .50, seems appropriate in view of the slow traverse of the hull-mounted cannon. The combination mount is slightly to the left of the turret center line and the gunner is in the left rear of the turret.

The tank commander, in the right front of the turret, has a maximum vision cupola which gives him a 270-degree field of view to the front and flanks of the turret. He can also fire the turret armament. A small cupola to the rear of the commander mounts a 7.62mm machinegun with a 270-degree field of fire which is operated by a third crewman. The design of the turret allows a heavy volume of destructive fire in any direction and adequate security in other directions at the same time. Its compact layout permits this to be done with a five foot turret ring diameter.

The small diameter of the turret leaves room in the right of the hull for a fixed 90mm cannon. An automatic loader and 48-round magazine is in the extreme right rear of the hull, with the breech and recoil mechanism above the fuel tank and the tube extending over the engine compartment out the front of the hull. The gun is layed by the driver/gunner, using a periscopic sight, by turning the vehicle and adjusting the suspension with an integrated control until the gun is on target. Range is determined by a laser mounted in the hull. The commander can direct the driver/gunner to a target by an indicator showing him turret direction. With the turret locked forward the commander's sight can be synchronized with the main gun. The commander can lay the cannon with an auxiliary control, mounted in the hull but accessible from his station when the turret is forward.

The 90mm gun was selected for this application over the 105mm howitzer for two principal reasons. The fixed 90mm ammunition is more adaptable to automatic loading than the semi-fixed 105mm rounds. With its higher velocity and resulting flat trajectory, the 90mm is better suited to the limited elevation imposed by suspension adjustment, particularly for delivering long range fire. The fixed cannon can destroy hard targets other weapons in the force cannot deal with and makes available a superior long range support weapon. Combined with the volume fire capability of the turret armament, it affords the firepower necessary for the assault weapon mission.

As with Concept I, main armor is about an inch of steel. The sponsons, of lighter armor, give stand-off protection to the main armor on each side. The rear half of each sponson is an infrared suppressing exhaust tunnel for the power plant, similar to that provided by the back deck of the later *M48s.* Stowage boxes are located in the forward sponsons. Additional stowage spaces giving stand-off protection are located in the rear of the hull, around the turret, and in the hull nose on either side of the winch. The lower front of the hull is protected by the dozer blade, winch, and stowage space. Bar armor provides stand-off for upper portions of the front slope.

The combination of lighter armor and reduced overall size should make the *DTT-II* much lighter than the *M48* or *M60.* Savings in power plant weight are also feasible (see below). A weight of 30 tons seems reasonably attainable; and, it might be possible to reduce this to 25 tons without unduly compromising other characteristics. With track length and width about the same as the *M48,* a 7 pound per square inch ground pressure could be attained, giving flotation equal to the *M113.* An overall power ratio of 15 horsepower per ton, as in the *M48,* would require 450 horsepower. For a ratio similar to

Concept I about 600 horsepower would be needed. The *S tank* combines a 240 horsepower diesel with a 330 horsepower gas turbine for a total of 570 horsepower (to be raised to 730 with a bigger turbine). This makes possible the economy of a diesel in standby and road operation, while the additional power for heavy going is almost instantaneously available by starting a light gas turbine.

The DTT requirement for high power is likely to be more frequent. It would be advantageous to have a higher proportion of diesel power for better fuel economy and operating range. For *DTT-II* the main power plant would be a diesel engine of about 350 horsepower, having about half of the weight of the *AVDS 1790,* located in the right front of the hull under the gun tube. This would give about 12 horsepower per ton for road and moderate cross-country operation. A 330 horsepower gas turbine in front of the driver/gunner would bring the overall ratio to over 20 horsepower per ton when needed for very heavy going.

Additional aids to mobility would be a winch and a dozer blade, as on the *DTT-I.* The blade would need only to be moved to a down position and locked for use because the adjustable suspension would afford inherent control of the depth of cut. A flotation screen like that on the Swedish *STRV 103* and US *Sheridan* would enable *DTT-II* to cross inland waterways by itself.

A possible disadvantage of this concept for the DTT is the suspension control mechanism, which might be vulnerable to mine damage and difficult to repair. Particular attention to this would be required in design. If possible, components for all road wheels should be interchangeable and emergency replacement by a spare assembly should be possible for a trained tank crew.

Concept II seems to meet all of the requirements for a difficult terrain tank except transportability by helicopter or assault aircraft. Its mobility on the ground would be definitely superior to present tanks and to Concept I. Its firepower would meet all essentials for an assault weapon. Though the fixed cannon is not quite as flexible as a turret weapon, it should be adequate for the tasks which cannot be accomplished by its other weapons — long range support and destruction of hard point targets.

CONCEPT III

An articulated wheeled vehicle would be a radically different approach to the DTT requirement. Concept III is based on the eight-wheeled *Twister.*

Concept III. Wheeled version based on "Twister" concept.

(*ARMOR,* Nov.-Dec. 69.) An alternate development of this concept on a tracked articulated chassis is also outlined briefly below.

The articulated chassis consists of two bodies, each with four wheels, joined by a pivot. Each body is separately powered. The front body of *DTT-III* contains a diesel engine, transmission, winch, and bulldozer blade. All wheels are independently suspended and the front wheels have power steering. For road operation this would be a four-wheel-drive prime mover and the rear body would act as a semi-trailer. To provide a balance of weight on all wheels for flotation and traction, a portion of the weight of the rear body is carried by the front body through the yoke connecting the two.

All crewmen and armament are carried in the rear body. Suspension of the wheels is by a pivoted "walking beam" on each side. In an attempt to equalize the weights of the two bodies for assault air movement, the rear body has a light power train consisting of a gas turbine engine, central differential, and shafts to the wheels. This would be used for cross-country movement in heavy going.

Main armament is a 105mm howitzer centrally mounted in the rear body. It is layed in deflection by steering the vehicle. A very limited traverse for fine laying is provided by the gun mount. Elevation, including high angle fire capability, is provided by the mount. The 105 was chosen for this application because of lighter gun and ammunition weight compared to the 90. The howitzer is layed and fired by the driver/gunner, located in the left front of the rear body. It is loaded by a crewman in the right rear of the body.

Secondary armament is mounted in remotely controlled turrets on the right front and left rear of the body. Each turret contains a 20mm automatic can-

non (*M39* or *HS 802*) and a 7.62mm machinegun. The gunner for each turret is in the body next to his guns. This arrangement was chosen partly in order to move the guns out on the fenders for greater fields of fire. The gunners also require less of the limited space in the body because they do not rotate with their guns. This setup is a bit "gimmicky" for a tankers taste, but similar mounts are used effectively on helicopters. In any event, this completely different armament arrangement should provoke discussion, the real purpose of all these vehicle concepts.

The fifth crewman is the tank commander, located in the left of the body between the driver and rear turret gunner. His cupola provides good visibility in all directions. As in the Concept II design, turret mounted armament affords all-around protection and flexible, high volume firepower. The hull mounted howitzer can deal with point targets beyond the capability of automatic weapons and give long range fire support.

Provision of adequate armor protection to an assault weapon with this configuration is more complicated than for a more compact tracked vehicle. One-inch armor can probably be put around the fighting compartment in the rear body without excessive weight. The wheels and fenders would give stand-off protection to the sides as would a stowage box to the rear. The front body and the yoke connecting the two bodies would take most rockets fired from the front. Protection of the front body would be concentrated on the bottom and sides against mines. The dozer blade in front and the wheels on the sides would lend a degree of stand-off protection.

The crew and armament can thus be given good protection without too much difficulty. A major question, however, is the vulnerability of the wheels and suspension to mines and fire. It is possible that mine damage would tend to be limited to a single wheel and its suspension, in the absence of a track tying it to other wheels. The vehicle can probably be designed for emergency movement without one wheel, but repair of steering components would seem to be a minimum prerequisite for self movement. Resistance to damage by fire would have to be a feature of the tires used because it does not seem feasible to give them effective armor protection.

The weight of the rear body with the degree of protection, armament, and limited power train discussed above, should be less than the *Sheridan,* despite steel rather than aluminum construction. Estimating the rear body at 12 to 15 tons and the front body with the main power plant, most of the fuel, and the mobility aids, at 8 to 10 tons, we would have a total vehicle weight of 20 to 25 tons. Each body seperately would be moveable in assault aircraft, including parachute delivery. A 250 horsepower diesel engine, with automatic transmission, in the front would provide 10 to 12 horsepower per ton for roads and easy terrain in the semi-trailer mode of operation. A small gas turbine (200 to 250 horsepower) in the front yoke of the rear body would bring overall power to 20 horsepower per ton or more, when operating in the eight-wheel-drive mode for more difficult cross-country stretches.

Flotation and traction are difficult to compare directly between wheeled and tracked vehicle concepts. Judging from the performance of some earthmoving machinery, a large articulated wheeled vehicle could have excellent mobility in mud. Performance in very heavy vegetation is somewhat more questionable. The same basic vehicle configuration could be used with tracks, as in the *XM571* Utility Carrier.

The tracked alternative to Concept III would probably be a little heavier, more expensive, and have greater fuel consumption. Each body should still be lighter than a *Sheridan* and the overall weight about 25 tons. Substituting tracks for large, independently suspended wheels and the clearance required for steering would provide room for a larger diesel engine of about 350 horsepower in the front body. This would overcome the greater rolling resistance of tracks on roads and easy going. The gas turbine could then be smaller, about 150 horsepower, to give an overall ratio of 20 horsepower per ton for more difficult terrain, thus decreasing the power train weight in the rear body to compensate for the increased suspension weight.

Either version of Concept III would have an advantage over our present battle tanks or the other DTT concepts in being suitable for assault airlift. The wheeled version would have superior speed and economy on the road and easy terrain. The tracked version would probably be the better cross-country mover. Armor protection for the crew and armament would be sufficient for the mission, but the tires and suspension of the wheeled version would be more vulnerable. Even the tracked version would be less well protected overall than the other concepts, in order to keep weight down for air movement. The armament of Concept III includes a heavy volume of firepower from automatic weapons,

in all directions. For destruction of fortifications and long range support the 105mm howitzer would do an adequate job, although it would be less effective in this respect than a 90mm gun and it has little antiarmor capability.

CHOOSING A DESIGN

Three design concepts for a difficult terrain tank have been presented. Which should be chosen for this job?

One way to decide is by means of a table weighing the various characteristics of the vehicle concepts against one another. In the table shown, mobility and firepower are each given a total weight of 40 percent and protection is given 20 percent, with individual characteristics weighted as indicated. Adjectival ratings for each characteristic are assigned subjectively to each vehicle and are converted to a numerical measure according to the scale in the legend. The product of the numerical measure and the weight for that characteristic gives the value entered in the body of the table. At least one vehicle is given the maximum weight for each of the characteristics and the others are assigned values in relationship to this.

On the basis of the table alone, Concept II is the best choice, with the tracked version of Concept III and Concept I very close. Resolution of doubts as to cross-country mobility and resistance of the suspension to combat damage might give the wheeled Concept III a score in the same range. Greater weight given to transportability in assault aircraft would improve the relative scores of both Concept III vehicles. Because of the assumptions inherent in the weighting factors, this table, or any similar table cannot be used alone to select a concept. However, it is useful for displaying their characteristics in summary form.

A completely new and unconventional concept offers the greatest promise of markedly improved mobility, including intratheater air mobility. An articulated combat vehicle has been suggested before (as in the *ARMOR* tank design contest), but no actual hardware has been produced. Wheeled combat vehicles have been used in large numbers, but none have been adopted as the principal assault weapon of a force. A development program including construction and extensive testing of full-scale prototypes would be required as the basis for choosing such a design with any confidence. This would be particularly important in deciding between wheels and tracks for an articulated vehicle and in configuring armor and armament for maximum effectiveness with minimum weight.

A possible way of gaining experience with wheeled articulated combat vehicles in limited production of a specialized vehicle for protecting lines of communication. Because of the cross-country limitations of our present equipment and because of the importance of this mission in counterinsurgency,

SELECTION TABLE

CHARACTERISTICS	WEIGHT	VEHICLE TYPES				
		M48	DTT-I	DTT-II	DTT-III Wheeled	DTT-III Tracked
MOBILITY						
Assault airlift capability	5	NO	NO	NO	E 5	E 4
Roads, easy terrain	5	G 3	G 3	E 4	E 5	E 4
Muddy terrain	15	P 5	G 9	E13	? 11	E15
Heavy vegetation, slopes	15	G 9	E13	E15	? 9	E13
FIREPOWER						
All round volume fire	20	G14	E20	E20	E20	E20
Hard target destruction	10	E10	E10	E 9	E 8	E 8
Long range support	10	E10	E10	E 9	G 6	G 6
SURVIVABILITY						
Protection against fire	10	E 8	E 9	E10	E 8	E 8
Protection against mines	10	E 8	E10	E 8	E 6	E 8
TOTALS	100	67	84	88	78	86

LEGEND: Excellent 1.0-0.8; G = Good 0.7-0.6; P = Poor 0.5-0.1; N= None 0.0
? = Questionable 1.0-0.0

tanks and other armored vehicles are frequently used to protect lines of communication. A wheeled vehicle with good road speed and economy of operation, the ability to maneuver effectively off the road, plentiful firepower, and adequate armor protection would be more cost-effective for this job than our present tanks. The *Commando* armored car is now being introduced for this job but needs greater firepower and cross-country mobility before it replaces other armored vehicles. Combat vehicles smaller than Concept III, based on the *Twister* or the *M561* 1¼-ton Truck, with 20mm automatic cannon, machineguns, and 40mm grenade launchers, might be excellent complements to the DTT as part of a counterinsurgency force even if they never proved to be the basis for adopting a wheeled principal assault weapon.

Although it does not offer as much mobility improvement as the other concepts, the conventional Concept I vehicle offers the best firepower and survivability. *DTT-I* is particularly attractive if an immediate replacement for obsolescent battle tanks is sought, because it makes maximum use of components which are thoroughly developed and familiar to US tank designers and producers. It might even be possible to use many components, like guns, rangefinders, engines, transmissions, track, and suspension parts, salvaged from the tanks being replaced.

The Concept II vehicle appears to offer the best probability of an immediate, significant improvement in cross-country mobility, which is the basic reason for needing a DTT design. The technology involved has been thoroughly developed by Bofors in Sweden. The *STRV 103* uses a Boeing gas turbine and US tanks have previously used various multi-engine power plants. The controllable suspension would be the main new component, but some work along this line has already been done in the *MBT70* program. Even if it were preferable for political reasons to develop such a vehicle from scratch in the US, rather than attempting to get Swedish know-how under license, it would require no technological breakthroughs. Prototypes for testing should be available rather quickly if appropriate priority is given the program.

One consideration not discussed before is the utility of a DTT in other types of conflict. Just as we have used vehicles designed for mechanized combat over favorable terrain whenever we have fought other kinds of battle in non-tank country, we would probably need to find a use for the DTT in tank country. The Concept III vehicle, particularly the wheeled version, would be a good high speed reconnaissance vehicle, but its lack of effective antitank armament would be a great handicap in this role. Concept I or II vehicles could be assigned to infantry or mechanized infantry units as assault weapons. Their added mobility in rough country would make them valuable in exploiting or defending avenues of approach not available to conventional vehicles. Their antiarmor capability would not be as great as the main battle tanks but they could deal effectively with many enemy tanks by proper exploitation of their mobility to gain favorable positions. They would be definitely superior to enemy armored personnel carriers. The design of Concept II would make it easy to add an applique plate of armor to the front slope, increasing its survivability in mechanized war. Concept I has a much higher silhouette and it would be more difficult to protect it effectively.

CONCLUSIONS

Armor must have a definite program to meet the requirement for a principal assault weapon in those likely areas of conflict consisting mainly of difficult terrain.

The first step needed is recognition of the requirement and of the infeasibility of meeting it with a vehicle designed primarily for mechanized warfare in Europe. An outline of the requirement was given in Part I of this article. Combat developers should make detailed studies of terrain conditions to be met and tactical requirements to be satisfied, as the basis for a formal statement of a definitive requirement.

While the requirement is developed in greater detail, an advanced development program should be conducted to produce prototypes of vehicles based on widely differing concepts. As a minimum, an improved conventional vehicle, a fixed cannon vehicle, and an articulated vehicle should be tested. For comparison, *Sheridan* and current and obsolescent main battle tanks should be tested in competition with the prototypes against the difficult terrain tank requirement written by the combat developers.

Based on the author's experience and thought on the problem, it appears that a Concept II type vehicle would probably be the best candidate for the first generation DTT. Later development may produce a successor DTT similar to Concept III, either wheeled or tracked.

What Armor must do now is to recognize the problem and start a high priority program to get a true difficult terrain tank — a tank for non-tank country.

UPDATING THE AIR CAVALRY SQUADRON

by Captain Phillip V. Branstuder

Anywhere in the Republic of Vietnam where US or ARVN forces are in contact with the enemy there is a good chance that an air cavalry squadron will be in the thick of the fight. Why? Because the ground combat commanders have whole-heartedly endorsed this scrappy, flexible, highly mobile unit — that's why!!

Speaking of a typical engagement, Lieutenant General John J. Tolson, who commanded the first air cavalry division during the relief of the Khe Sanh combat base in 1968, said, "D-Day was set for 1 April. On D minus six, our air cavalry squadron, the division's scouting force, started reconnaissance operations. The air cavalry squadron gradually extended its reconnaissance in increasing concentric circles up to Khe Sanh, working at all times with Air Cap from the 7th Air Force or First Marine Air Wing, and with ample support from SAC *B52* strikes. Thus, the reconnaissance established enemy locations, antiaircraft positions, and strong points that we would try to avoid in our initial assaults and, obviously, in the selection of our landing zones.

The work of this pre-D-Day reconnaissance force was so effective that in the subsequent assaults of three brigades of the 1st Cavalry Division and the ARVN Task Force, not a single chopper was hit by ground fire — a real achievement!"

Originally deployed to Vietnam as a single squadron in the 1st Air Cavalry Division in 1965, air cavalry today has grown to a total of five squadrons in Vietnam with at least one squadron in each corps area.

The success of the air cavalry squadron organization thus far has been due to the imaginative leadership of the commanders and the aggressive, relentless pursuit of the enemy by all the air cavalry squadrons in Vietnam.

Even though the air cavalry squadron does work in its present configuration, I believe the following proposal would allow the squadron commander more freedom of action on the battlefield and thus has considerable merit.

First, I would not change the headquarters and headquarters troop or the ground cavalry troop (D troop), except to give the cavalry troop a much-needed airmobile, high speed, track laying vehicle to add to its off-road mobility.

What I believe should be done is to change the organization of the air cavalry squadron from its present configuration to that shown.

AIR CAVALRY TROOP WEAPONS PLATOON

The only change in the three air cavalry troops would be in the aircraft assigned to the weapons platoon. Instead of ten *AH1G (Hueycobra)*, attack helicopters, the weapons platoon would be equipped with eight *UH1M* helicopters. (This is a *UH1C* helicopter with a *T53-L13* turbine engine.)

UH1M vs AH1G (HUEYCOBRA)

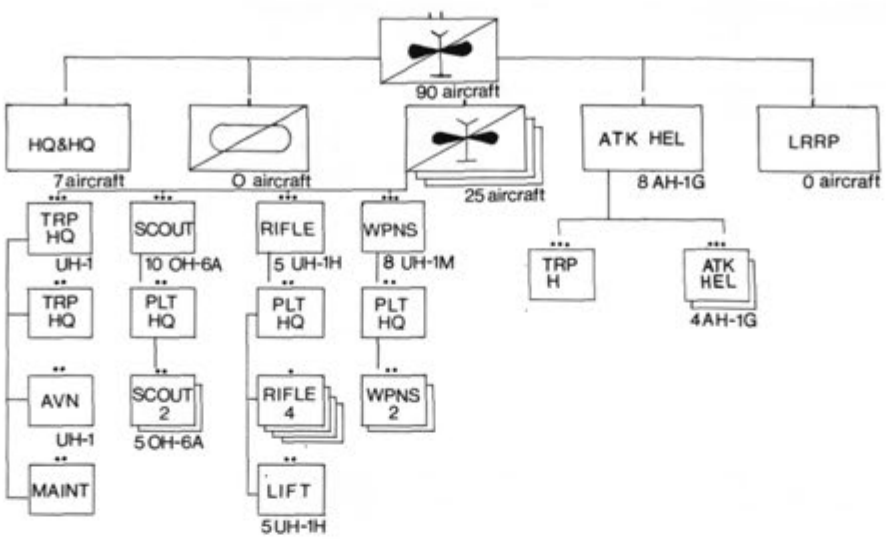
The *AH1G (Hueycobra)* has proved to be a wonderful aircraft in the fire support role. However, it is not a fully effective scout aircraft.

I believe the weapons platoon of the air cavalry troop must be able to conduct scouting missions, when required. This allows the air cavalry troop commander to conduct reconnaissance over a much larger area than is possible by using just the scout platoon.

Why isn't the *AH1G* an effective scout aircraft? Basically because it is not suited for low level reconnaissance. There are three reasons why it isn't suited for this type mission.

Lack of defensive fire capability. The turret weapons system *(XM28)* of the *AH1G* traverses only 115° left and right of center, leaving a 130° arc of dead space towards the rear of the aircraft. The

PROPOSED ORGANIZATION OF AIR CAVALRY SQUADRON



enemy often waits until an aircraft passes his position prior to opening fire. If the *AH1G* is the trail ship in a fire team, it is virtually defenseless unless the pilot turns toward the source of fire. This would not be a problem in the *UH1M*. The door gunner and crew chief in the *UH1B* and *UH1C* helicopters covered this area quite effectively with their hand-held *M60* machine guns. If the enemy exposed his position by firing at the aircraft, the result was immediate, and often deadly, suppressive fire delivered on his position.

Detection of hostile gun fire. The second problem area is the lack of an ability to detect hostile gunfire. Due to the canopy design of the *AH1G*, the aircraft is so well sealed that it is virtually impossible to hear hostile gunfire until rounds strike the aircraft.

The *UH1M* would present no problem in detecting hostile gunfire. This aircraft, like its predecessors the *UH1B* and *UH1C*, could be flown with the windows and cargo doors open. If a round passed near the aircraft, a well trained crew would usually detect it.

Observation capability. The final problem area is the crew size. Two men just cannot see as much as as four men. This is especially true when the two men are partially distracted by duties required in flying the aircraft.

In the *UH1B* and *UH1C* model helicopters, the crew chief and gunner have no such distraction. Their primary duty, until a fight started, was to act as observers.

It was my experience as an air cavalry troop weapons platoon leader, and the experience of almost every weapons pilot that I have talked to, that the crew chief and gunner were responsible for over 50 percent of the hostile KIA's and significant sightings.

POWER, FUEL AND ORDNANCE

The main limiting factor in the *UH1B* and *C* model helicopters, was the available power and consequently the less than ideal fuel and ordnance capacity. I believe this problem would be solved with the adoption of the *UH1M*. With this model, the air cavalry troop weapons platoon would have an aircraft suitable for use on scouting missions.

No tremendous expense, such as buying new aircraft, is involved in this proposal. The *AH1Gs* presently in the air cavalry troop weapons platoon could be used by the armed platoons in the non-divisional assault helicopter companies. The *UH1C* models used by the non-divisional assault helicopter companies could be modified as *UH1M's* for the air cavalry troops by installing *T53-L13* engines. The airframe and engine are both in the inventory, so the actual expense involved would be in transferring the aircraft and accomplishing the *UH1M* modification. This expense would be offset by the delayed obsolescence of the *UH1C* airframes.

ATTACK HELICOPTER TROOP

I do not believe that we should completely remove the *AH1G (Hueycobra)* from the air cavalry squadron. Just cut down the number and relocate it. I have already stated that this aircraft is a wonderful piece of equipment in the fire support role. When the *XM35* 20mm cannon and improved anti-

tank missiles are included in the inventory, this aircraft will have even greater capabilities.

While serving in the 1/9 Cav, frequently I called on our Aerial Rocket Artillery Battalion (ARA) for fire support. They were very responsive and did a fine job for us.

But what about the air cavalry squadron that does not belong to an airmobile division? There are times when the air cavalry troop operates beyond tube artillery range and something else is needed until TAC Air can get on station. An attack helicopter troop of eight *AH1G* helicopters will fill this void and give the squadron commander a combination of weapon systems that can better influence the action on the battlefield.

This organization could be used very much like the tank troop of an armored cavalry squadron within the armored cavalry regiment. The squadron commander could commit the attack helicopter troop as a reserve or reinforce other troops as needed. This unit would be extremely valuable against heavy caliber antiaircraft weapons or a tank threat.

By reducing the number of aircraft in the weapons platoon of the air cavalry troops to eight, this unit could be formed by adding two aircraft to the squadron total. I believe this proposal is workable if an aircraft maintenance (KD) team is authorized for each of the air cavalry troops and the attack helicopter troop.

LONG RANGE RECONNAISSANCE PATROL TROOP

The final change would be to add a long range reconnaissance patrol (LRRP) troop to the squadron.

The air cavalry squadron and the LRRP company (division or corps) are two great producers of combat intelligence information. Why not marry up the two so they can more effectively support each other? For quite a time in the 1st Cavalry Division, the lift battalions inserted and extracted the LRRPs of Company E, 52d Infantry. The air cavalry squadron reacted to their sightings and often extracted patrols when the enemy had discovered their location. This was not a very efficient system and the result was that the lift battalion flew a lot of extra missions, the LRRP's had to depend on a lot of coordination for extraction, and the cavalry squadron had to depend on someone else for information about the location of, and enemy sightings by, LRRPs.

The LRRP company was finally attached to, and located with, the air cavalry squadron. The result of this was a greatly improved operation.

The squadron was readily responsive to LRRP sightings and performed all insertions and extractions. Information gathered by the two units was better coordinated, and I believe the division benefited from the combination of the two units.

A plus factor in this arrangement is the fact that air cavalry troops are always snooping around at treetop level and often hovering. It follows then, that the air cavalry troop is better suited to conduct a clandestine insertion of a LRRP, especially if the more powerful *UH1M* gunship is used. The normal reaction of the enemy is to hide when a scout aircraft is searching for his location. If, however, a slick aircraft enters the area at low level, he becomes curious, and if the aircraft lands and takes off again, you can bet he will search the area immediately.

That is why LRRPs were discovered so often. A *UH1M* gunship with a light load of fuel and ordnance would have a better chance of inserting the patrol secretly than would a slick.

The air cavalry squadron has performed exceptionally well with its present organization. I believe the basic appearance should remain the same, but like the Volkswagen, we could and should redesign the interior.

CAPTAIN PHILLIP V. BRANSTUDER, Armor, enlisted in the Army in 1953. He completed OCS at Fort Benning in 1963 and was commissioned in Armor. He then completed the Armor Officer Basic Course and the Officer Rotary Wing Aviator Course. During 1965-66, he served as a fire team leader in the armed helicopter platoon of the 114th Aviation Company in Vietnam. Next he was an instructor pilot at the Primary Helicopter School, Fort Wolters. Captain Branstuder was the first AH1G (Hueycobra) qualified aviator assigned to the 1st Cavalry Division. During his second tour in Vietnam he served as the weapons platoon leader of Troop A, 1st Squadron, 9th Cavalry, 1st Cavalry Division. He then attended the Armor Officer Advanced Course and is now assigned to the Army Aviation School Element at Hunter Army Airfield, Georgia.

BANG! BANG! YOU'RE DEAD

A NEW LOOK IN COMBAT SIMULATION
PART II

by
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BRITISH ARMY-RETIRED

Any tank gunnery simulation system, if it is to provide realistic peacetime training for armored vehicle crews, must have two purposes:

- To represent the casualty producing effects of gunfire in tactical exercises.
- To cut gunnery training costs by reducing requirements for live ammunition in training.

The first installment of this article "Bang! Bang! You're Dead" (*ARMOR*, Jan.-Feb. 69) discussed the need for, and the means of, achieving realism in tactical exercises. This part will show how simulation techniques can be employed in gunnery training. Additionally, other aspects of the simulation of fire for training purposes will be considered.

In most armies, tank gunnery training is divided into three phases: familiarization, subcaliber shooting, and live firing. Techniques vary, but the principles are universal.

Familiarization • The early part of the training course is spent familiarizing the crewman with equipment, gunnery procedures, safety rules and range drills. Most work is in classrooms, using instructional diagrams, models, and sectionalized equipment.

Subcaliber Shooting • (Range Tables I to III in the US Army) For the subcaliber shooting phase, the British Army uses a .22 caliber rifle mounted on a bracket on the turret roof of the tank. Targets are rubber-composition models placed on a flat sandy range about 30 yards long. The US Army is introducing a laser device fitted into the coaxial machinegun mounting to fire at a fixed metallic target in an indoor range of 20-30 yards. The intention in both systems is to train crews in procedures, fire orders, and handling.

Live Firing • Live firing on an open range is the culmination of the training course. It usually progresses from static shooting on a concrete platform against fixed targets (Table IV), through static shooting at moving targets (Table V), to shooting at targets while moving in a semi-tactical way (Tables VII and VIII). The targets are normally of paper or canvas; the range is usually on open or rolling terrain; and most stringent safety rules are invariably applied.

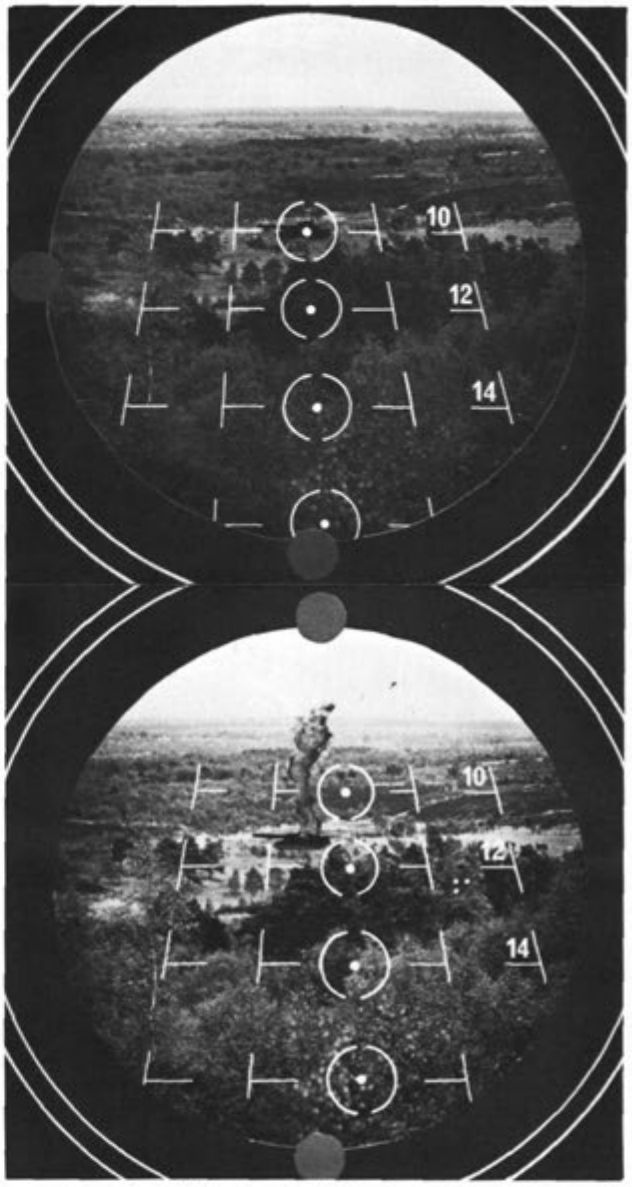
There is a fourth stage — combat experience — which is, of course, the finest training of all. But unless the first three stages bring the crew up to a really high standard of gunnery and, equally important, keep them at this standard up to the time they fire their first shot in anger, they are unlikely to survive this fourth stage.

This is the test. How do our present procedures meet it? There are two obvious shortcomings in the present training program. First, subcaliber shooting is an unrealistic representation of live firing. No practice can be given in range estimation, varying weather conditions, or in detection, recognition and acquisition of targets in a field environment. In short, although subcaliber shooting is an essential feature of the training cycle, the transition from this to live shooting on the range is too great. In consequence, much costly live ammunition has to be expended during range firing on the dull, procedural shoots, static tank at static target, before the crew goes on to more worthwhile realistic shoots.

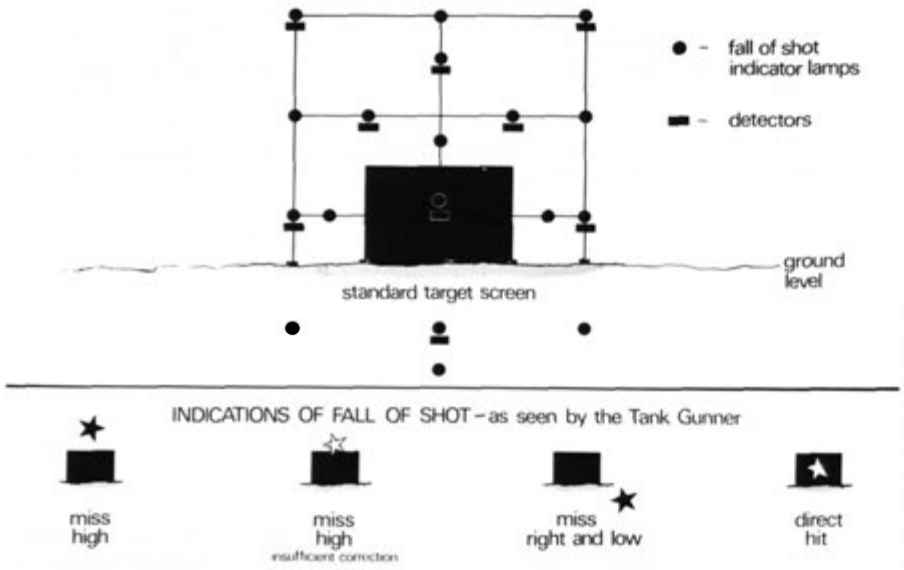
The second shortcoming is in the transition from live firing on the range to combat conditions. All of us are only too familiar with the normal situation on a live firing range, and we know how far this is from any combat situation. The range is unnaturally open, targets are unnaturally exposed, firing positions are unnaturally flat and firm. Crew actions must be closely supervised. By plan, hurry and tension are absent; everything happens in orderly and deliberate fashion. Firing stops for heavy rain, poor light, range fires, mist, damage to targets, and intrusions on the range. Perhaps most important of all, nobody is firing back! The transition from this artificially contrived shoot to combat conditions is at least as great as that from subcaliber shooting to live. No satisfactory method has existed to date to close these two vital gaps in the training sequence.

No substitute exists of course for live firing during the training of a tank crew. Simulators never can replace this experience. What a simulator system can do is rehearse routine drills and procedures until they become second nature, at no cost in range time or ammunition. This permits the limited amount of ammunition allotted to training to be spent on more interesting and realistic practices. The *Simfire* system, which was described in the January-February *ARMOR*, is an example of such a simulator. Because it was designed from the ground up as a gunnery training aid, as well as a tactical simulator, it enhances the logical and progressive route of a crew through the various stages of training.

A range target screen has been devised to bridge the gap between subcaliber shooting and live firing on the range. The operation of the equipment is self-explanatory. All normal gunnery procedures can be represented and rehearsed. The crew can operate from their own tank, using their own sights, in their own camp area. Live ammunition is not employed, so instructors are not tied up, and the equipment can be used by a crew any time of the day or night to check out their tank and its gun equipment. The equipment can be adapted to any size or shape to meet particular requirements. It can be fitted to a truck or any other vehicle, to provide moving target practice. The spotlamps can be specified to cover a particular length of firing-point base-line, so that many "firing" tanks can be lined up alongside each other. Then, since everyone can see and pass judg-



Two views through the gunner's sight of a British Chieftain tank when using the Simfire equipment. In the top view the gun is laid on a target at 1000 meters range. The gunner fires, and obtains indications that his shot missed left and low. In the lower view, the gun lay has been corrected to 1150 meters, aiming right of target. This time the gunner obtains a hit (spots of light at 12 o'clock and 6 o'clock), and the smoke pyrotechnic indicated that he has "killed" the target.



One typical arrangement for the range target screen associated with the Simfire equipment. The screen is equipped with detectors which react to the pulsed laser beam emitted by the projector mounted on the gun barrel of the firing tank. Indications of fall of "shot" are given by spotlamps. The design can be adapted to fit on a truck for moving targets, or it can be fitted to the side of a building, on trees or on the side of a steep hill.

ment on the performance of any crew selected to "fire," there would be a strong incentive to do well. It is easy to devise competitions based on this equipment. Perhaps the most important aspect of the equipment is that a crew using it can retain their skill between live firing practices. Frequent rehearsals of gunnery procedures would be easy to arrange and monitor. So it has a role, not only in the training cycle of recruits, but also in continuation training for the trained crew.

However, it is likely that a proficient crew would soon "grow out" of the relatively simple gunnery practice on the range screen. They would soon need something more difficult, more challenging, and more realistic, especially after they have satisfactorily completed their crew proficiency exercise (Table VIII). It is here, in bridging the second gap in the training sequence, between live firing and combat, that the standard tactics version of *Simfire* comes into its own. It allows a crew to practice their gunnery against realistic targets, moving in a realistic tactical fashion over operational terrain, in all types of weather conditions. Knowing that their opponents can "fire" back, they would be subject to some of the excitement and stress associated with combat. Under exercise conditions they would undoubtedly be tired and dirty, probably hungry and wet as well. The tank could be tilted over at an angle, the line of sight could be obstructed by trees and hedgerows, the light conditions might be poor, and it would almost certainly be cold, wet, windy, or all three. If a crew can still perform well without supervision under these conditions, if they can "kill" without being "killed," then they have achieved a higher state of gunnery training than if they had fired hundreds of live rounds on an open range. Furthermore, incorporating this sort of realistic gunnery training into every tactical exercise will help preserve precious annual training ammunition allotments and will free firing range time.

The control box associated with the range target screen is plugged into the laser projector on the firing tank and is controlled by the tank commander or instructor. By its use the apparent range to the target can be altered between 600 and 1800 meters, so that engagement at all normal operational ranges can be rehearsed. The lower switch enables the gunner to practice aim off procedure for wind or target speed.

A further aspect of this business of gunnery training is the night shoot. Night shooting with live ammunition can be a waste of the taxpayer's money and chaotically dangerous as well. Safety precautions are more restrictive than in daylight, control has to be far tighter, supervision much more rigorour. If hard targets are not available, the crew cannot see the fall of shot. They have no idea where shots are going, how many hits are obtained or even if the right target is engaged. The unfortunate firing point officers have very little idea of crew performance and can do but little to identify and coach the weaker ones. All but the most conscientious crews tend to blaze away into the darkness to get the agony over quickly! It can be fun, and is certainly spectacular, but even with the use of infrared searchlights and sights, night shooting is frequently a waste of time and ammunition.

A simulation system like *Simfire* improves this by providing realistic firing practice in conjunction with infrared searchlights and sights using any available area of training ground, before the crews go on to fire live at night. Targets can be actual vehicles, moving tactically, with indications of a hit given by a flashing light in place of smoke, and with mass indications being seen by the gunner and commander of the firing tank. In this case the necessity for safety restrictions on firing vanish, and it is not hard to visualize most realistic and exciting exercises where opposing sides battle it out in pitch darkness, and only the occasional flashing light reveals someone who has "caught an incoming." Improved crew confidence in night operations alone justifies the expense of tank gunnery simulation equipment.

Just what is this expense? In one typical case each *Simfire* tank equipment costs approximately $7500. Range target screen costs are difficult to assess, since these devices can vary enormously in size and complexity according to the specification. An average figure is around $8000. The British Army anticipates that initially it would be sufficient to buy one tank equipment per three tanks, since they are readily transferable from one tank to another. In this case the amortized cost of equipment for each tank is $2500. Over the expected life of the equipment it should be possible to pay for the equipment by a saving of two to three ammunition training rounds per tank per year. If missiles, such as *Shillelagh,* are considered, the cost effectiveness becomes even more favorable to *Simfire*. Whether this is a cost-effective solution to tank crew training must depend on the individual case. Suffice it to say that there are now six armies in the world who are convinced.

The simulation of battlefield conditions in training does not, of course, end with tank-versus-tank battle. Many other situations need to be simulated. One is the problem of training a helicopter pilot to evade ground fire. A simulation device, based on technology employed in *Simfire,* has been developed and a number have been ordered by the British Army Air Corps. A further development to simulate the effects of small-arms fire on human targets is in progress. This is primarily a means of training the "target" to keep his head down and use cover correctly. Development is progressing with a method of injecting the laser signal into the field simulators already used with all antitank guided weapons (ATGW). This will be applicable to both ground based and helicopter-borne ATGW. With this type of simulator, the controller can simulate the destruction of his target out to the maximum range of the missile. A direct field comparison between tank guns and ATGW would then be possible. Finally, an adapted version of *Simfire* can be used to simulate the effect of anti aircraft fire against aircraft and helicopters. It is the intention of the Solartron company to develop a range of simulators which will be matched to the characteristics of all the normal direct-fire weapons in use on or above the battlefield.

Increasingly, simulators are finding a place in the peacetime training of armies, as they have for over 20 years in the training of navies and air forces. Their use is certain to increase as the cost of training ammunition rises, and restrictions on the use of training areas grow. Not everyone will welcome this. "There is no substitute for the real thing." is a cry that rose from the lips of many salt-caked naval warriors 20 years ago as they looked with horror at electronics boxes that were said to "represent" their ships. Now they know that, unlikely though it seemed at the time, those boxes can better simulate the horrible realities of modern war than any fleet exercise, however elaborate and expensive. So it will be in the Army.

The process is only beginning, but already, as this article has shown, a simulator can provide more realism in training than can a live firing exercise. When, in a few years time, army simulators are fully developed and in service for a variety of weapon systems, we may look back and wonder how we ever managed to train realistically without them.

ARMOR THROUGH 1975

81st Annual Meeting THE U.S. ARMOR ASSOCIATION

Fort Knox 14–16 May 1970

THURSDAY, 14 May 1970

1830 Reception — Buffet

FRIDAY, 15 May 1970

0800 Honors Ceremony
0830 Keynote Address
Presentation and Discussion
"Armor through 1975"
1100 Business Meeting
1230 Luncheon
1330 Armor Equipment and Techniques
— in the Field
1845 Banquet

SATURDAY, 16 May 1970

0830 Executive Council Meeting

REGISTRATION AND PROXY FORMS WILL BE MAILED TO ALL ASSOCIATION MEMBERS BY 15 MARCH 1970

DRIVE ON LIEUTENANT!

by Major Ronald A. Duchin

Chariots have been replaced by tanks and armored personnel carriers, catapults have been replaced by mortars and howitzers, and swords have been replaced by automatic rifles. They all need maintenance.

"Firepower, Mobility and Shock Effect." These words have echoed throughout the Combat Arm of Decision since before our conversion from Cavalry to Armor. How many of you newly commissioned platoon leaders understand their meaning and effect? How many of you enthusiastic young lieutenants can assess your own role in implementing their meaning and effect? What is firepower without mobility in a tank or reconnaissance unit? You simply cannot attain superior firepower without having mobility in this age of highly sophisticated weapons systems. Generally, no tank commander can take another tank under fire unless he himself has the ability to shoot and to move.

What is shock effect? It is nothing more than the enemy's reaction to the combination of fire power and mobility. Needless to say, an armor or mechanized unit must maintain its mobility in order to accomplish its mission on any battlefield.

The maintenance of mobility can not be relegated to the maintenance sergeant, the mechanics and the vehicle drivers alone. It is something that must be eagerly and enthusiastically supervised by you, the platoon leader, because without mobility your platoon cannot DRIVE ON.

The reader may question why the Army service schools cannot devote the hours of instruction and practical exercises needed to familiarize the lieutenant completely with the techniques of effective maintenance management that he must use as a platoon leader. The inventory of equipment is vast and our tank, recon and mechanized infantry platoons are no longer standardized Army-wide. In addition, the programs of instruction in our basic branch orientation courses are limited by time and are already bulging with other mandatory subjects.

Therefore, as a newly commissioned lieutenant, you must have additional instruction, guidance and worthwhile practical experience after joining a tactical unit. Upon arriving at a unit, particularly overseas, you will learn quickly that your crew members are not as well trained and highly motivated as the service school instruction might have led you to believe. You will soon learn that tactical units have alert exercises and contingency plans that require the frequent participation of your platoon and its vehicles. Lastly, and sometimes painfully, you learn that although the members of your platoon may not be well trained or highly motivated they do know more about the maintenance system and the equipment than you do. Because of this lack of technical proficiency your leadership potential is in jeopardy!

What courses of action are available to you the platoon leader to remedy this situation and thus to improve the readiness capability of your platoon? First of all, you must realize the importance of being able to perform your assigned mission. No unit can successfully accomplish its mission when vital equipment is deadlined or non-available. You must understand that maintenance has to be stressed continuously and that supervision by both yourself and your platoon sergeant is absolutely essential. Your platoon must not be abandoned by its leaders during scheduled maintenance periods, or upon the return to garrison from field exercises. Many experienced Armor commanders have been known to say

MAJOR RONALD A. DUCHIN, ARMOR, was commissioned in June 1959 from Pennsylvania Military College. After attending the Armor Officer Basic Course he was assigned to the 3d Battalion, 69th Armor, 25th Infantry Division in Hawaii. Here he served as platoon leader, S2 and company commander. In 1962 he was assigned to MAAG Vietnam where he advised the ARVN 5th Mechanized Rifle Troop, 2d Armored Cavalry Squadron. In 1964, he was graduated from the Armor Officers Career Course and joined the faculty of the Armor School. In 1966, he was assigned to USARSO where he served as Post Commander, Fort Sherman, Canal Zone; S3 USA Atlantic Area Installation Command and as Executive Officer, 4th Battalion (Mech), 20th Infantry. In June 1969 he returned to Vietnam to command the 13th Military History Detachment, First Field Force Vietnam.

"The platoon leader's place is in the motor pool"! This is very true.

Secondly, as a newly assigned platoon leader you must develop the technical proficiency that you severely lack. Certainly self-education and home study are necessary. In addition, attendance at available unit level maintenance classes is also imperative. Some battalions and squadrons conduct schools for prospective wheel and track vehicle drivers. Newly assigned lieutenants should be required to attend these schools upon assignment to the unit and then detailed to act as instructors for future classes. Usually, the classes in driver training schools also include instruction on:

- ► Traffic safety and local traffic laws.
- ► Maintenance of communication and fire control equipment.
- ► Equipment Serviceability Criteria (ESC) evaluations.
- ► Vehicle recovery.
- ► Inspection techniques.
- ► Maintenance administration.
- ► Maintenance publications.
- ► Tools and OEM.

Now, when you have completed a maintenance school, what comes next? Are you completely proficient? Usually not! Although it can be assumed that you will be as proficient in maintenance as your company or troop commander forces you to be. The author has learned from experience that platoon leaders directed to supervise maintenance must be supervised themselves. A good maintenance program is usually established within each battalion size unit, and normally conforms to the principles of maintenance that the Army outlines in AR 750-1. You should be aware of the provisions of AR 750-1 that specifically pertain to you.

Maintenance time normally appears on the weekly training schedule. These periods are usually supervised by the company/troop commander with every member of the chain of command present. Naturally if your boss is present you will also be in the motor pool, supervising your platoon. Although many Armor types object to the term "Motor Stables" there are many advantages to organized maintenance and the procedure can be modified to suit the needs of your platoon. Basically, the maintenance period should be organized to allow each driver or crew ample time to accomplish the simple housekeeping chores that the vehicle needs. And, in addition to this, a time must be established to double-check the normal before operation services, to check and maintain selected items that have been causing maintenance problems and to make periodic checks into significant items of interest found in *PS Magazine*. Each area identified here must be supervised by the platoon leader.

In order to assure yourself that you are abreast of your platoon's maintenance status you should be able to answer at any time the following questions concerning the maintenance and readiness posture of your platoon:

- ► How many of your vehicles can move out now and perform their TOE mission?
- ► What is the fuel consumption rate of your platoon?
- ► Which vehicle in your platoon had the lowest ESC rating last quarter and what caused it to be low?
- ► What items are entered on the Uncorrected Fault Record (DA Form 2408-14) for any given vehicle?

Remembering the old adage "an ounce of prevention is worth a pound of cure," the Armor platoon leader must bear in mind that his ounce of prevention is preventive maintenance. Even though the equipment of war has become more complex through the ages the requirement for efficient maintenance has been with us since the age of the chariot. DRIVE ON LIEUTENANT. YOU HAVE A JOB TO DO.

PRINCIPLES OF MAINTENANCE FOR THE PLATOON LEADER

I. Each Commander is responsible for the maintenance of equipment issued to his unit.
II. Maintenance will be done at the lowest authorized level.
III. Repairs will be made in place whenever possible.
IV. Use the maintenance allocation charts.
V. Operator/crew maintenance will be finished at platoon level before the equipment is evacuated to higher levels.
VI. The IROAN principle will be adhered to. Inspect and repair only as necessary.

ARMOR SCHOOLING SELECTIONS

ARMY WAR COLLEGE

LTC Corcoran, Edward F
COL Gay, Joseph M Jr
LTC Lawrence, Richard D
LTC Luck, Robert H
LTC McGowan, Robert S
LTC Milia, Carmelo P
LTC Miller, Richard A
LTC Patterson, Clyde H
LTC Prillaman, John P
LTC Reuter, Robert M
LTC Rouse, William C
LTC Smith, Raymond C
LTC Walby, William G
LTC Wright, Lawrence S

NATIONAL WAR COLLEGE

LTC Aarestad, James H
LTC Booth, James W
LTC Connor, Judson J
LTC Stockton, Thomas W

BRITISH IMPERIAL DEFENSE COLLEGE

COL Ireland, Merritte W

INDUSTRIAL COLLEGE OF THE ARMED FORCES

COL Hayes, John G
LTC Norton, John M

NAVAL WAR COLLEGE

LTC Fairky, John M

AIR WAR COLLEGE

LTC Crowe, J Godfrey

NAVAL COMMAND AND STAFF COLLEGE

MAJ Hutton, Cuthbert P
MAJ Mead, Dana G

(Continued on next page)

ARMED FORCES STAFF COLLEGE

LTC Casey, Leonard R
LTC Day, E H Jr
MAJ Dembinski, Mark L
MAJ Friend, William N
MAJ Gumpf, John A
MAJ Inglett, Robert A
MAJ Lehman, Robert L Jr
LTC Maddox, Bobby J
MAJ Streeter, William F

CLASS 49 FEB 71-JUNE 71
ARMED FORCES STAFF COLLEGE

MAJ Andres, Dudley M
MAJ Gilbreath, John C
MAJ Greene, Fred W III
MAJ Lanzotti, Robert E
MAJ Maddox, David M
MAJ Nehammer, Karl F
MAJ Russell, Richard R
MAJ Simmerly, Julian C

USA COMMAND AND GENERAL STAFF COLLEGE

MAJ Allison, William C
MAJ Benson, Richard D
MAJ Bisping, Jack F
MAJ Bloedorn, Gary W
LTC Bourque, Archille O
MAJ Bradin, James W IV
LTC Brown, Edward M
MAJ Clark, Claude L
MAJ Coley, William Jr
MAJ Conrad, Hawkins M
MAJ Cooper, Jack B
MAJ Cortez, James J
MAJ Curtin, Thomas R
MAJ Cuttel, Dee Ernest
MAJ Dierickx, James E
MAJ Duchin, Ronald A
MAJ Dunegan, Walter L
MAJ Eady, Connie D
MAJ Edwards, Richard C
LTC Erkelens, Henri F
MAJ Filbert, Frederic J
LTC Floyd, John D
MAJ George, Ellsworth P
MAJ Good, William K
MAJ Greenwalt, Randall A
MAJ Griffiths, William R
MAJ Halbert, Edward
MAJ Halstead, Wayne P
MAJ Hamby, Jerrell E
MAJ Harris, James A
MAJ Harvey, Thomas H Jr
MAJ Haupt, Jerome L
MAJ Heldstab, John C
MAJ Hiller, Donald R
MAJ Hillier, Pringle P
MAJ Ivey, Charles E
MAJ Jackson, Gordon R
MAJ Johnson, Edward H Jr
MAJ Johnson, Harry T
MAJ Jolley, Charles A
MAJ Kaiser, James B
MAJ Lair, William R
MAJ Lane, Ralph B
MAJ Ledbetter, H M
MAJ Leland, Edwins S
MAJ Lozano, William
MAJ MacDonald, Alexander R
MAJ MacLean, Bruce D
MAJ Madole, James E
MAJ Mallory, Philip H
MAJ Massey, Lee T
MAJ McFadden, Phillip L
MAJ McGaw, Charles D
MAJ McVey, Peter M
MAJ McWain, James T
MAJ Meadows, James S Jr
LTC Medley, George W
MAJ Miller, Leonard L
MAJ Mitchell, Corless W
MAJ Moore, David G
LTC Murchison, John T Jr
MAJ Myers, James A
MAJ Norris, Jimmie R
MAJ Nowak, Leonard G
MAJ Oldinsky, Frederick E
MAJ Oualline, Charles E
MAJ Owens, William B
MAJ Pace, Donald L
LTC Pratt, Willis G
MAJ Pursel, Terry C
MAJ Reidl, William H
MAJ Robbins, Chandler P III
MAJ Rogers, Gordon B Jr
MAJ Rollins, George N
MAJ Schloesser, Kenneth J
MAJ Sedgwick, Clyde N
MAJ Sheaffer, Phillip G
MAJ Short, Albert V
MAJ Short, William L
MAJ Shrader, Cecil L
MAJ Smith, Harold L
MAJ Smith, Wade C
MAJ Snow, Don F
MAJ Sones, Richard A
MAJ Storms, Robert N Jr
MAJ Swindells, John E
MAJ Tamminen, David L
MAJ Terry, Thomas J
MAJ Thompson, Chadwick C
MAJ Turner, Harvey E
MAJ Vamvakias, Nicholas P
MAJ Vockery, William L
MAJ Wagner, William J
MAJ Walker, Jack E
MAJ Wallace, Bobby S
MAJ Weaver, Carl A
MAJ Weers, Jimmy D
MAJ Wilhite, James A
MAJ Wolfe, Ralph R
MAJ Zierdt, William H III

AIR COMMAND AND STAFF COLLEGE

MAJ Wollerton, Charles V

MARINE COMMAND AND STAFF COLLEGE

MAJ Betters, Richard B

HOW WOULD YOU DO IT?

US ARMY ARMOR SCHOOL PRESENTATION

SITUATION

You are the platoon leader of the 3d Platoon, Co C, 1st Bn, 4th Armor. It is during the monsoon season and the weather is extremely bad. It has rained every day for the last week. While conducting an area sweep in RVN with your platoon, you have just completed a communication report to the Company CP. The company has informed you of a suspected enemy concentration in your immediate area. You switch back to your platoon frequency to alert your platoon but find you are unable to raise them; visual inspection shows your radio seems to be operating normally.

AUTHOR: SSG HERBERT M. ANDERSON

ILLUSTRATOR: SP4 EDMUND M. ENOMOTO

PROBLEM

Your platoon must be alerted to the suspected enemy concentration. Everything seems to point to antenna trouble. You immediately check for a broken cable or loose connection. Finding neither of these troubles, you seem to have exhausted all the field expedients for immediate repair. However, you do notice that the antenna matching unit of your radio is rotating continuously.

What can you do to re-establish this communication? HOW WOULD YOU DO IT?

SOLUTION

The vehicular mounted AN/VRC-12 series radio set has the matching unit MX6707/VRC, and in many instances, due to high humidity and moisture conditions prevailing, there is an accumulation of water due to condensation in the matching unit which shorts out the electrical contacts. By removing the Phillips head screw (see figure 1) which fits flush with the face of the matching unit, it will allow the accumulated water to drain out. This screw may be removed to prevent the recurrence of the same problem during the remainder of the mission, but it is a field expedient and at the first opportunity, the radio mechanic must be notified so that the matching unit can be checked for corrosion and the electrical contacts thoroughly cleaned.

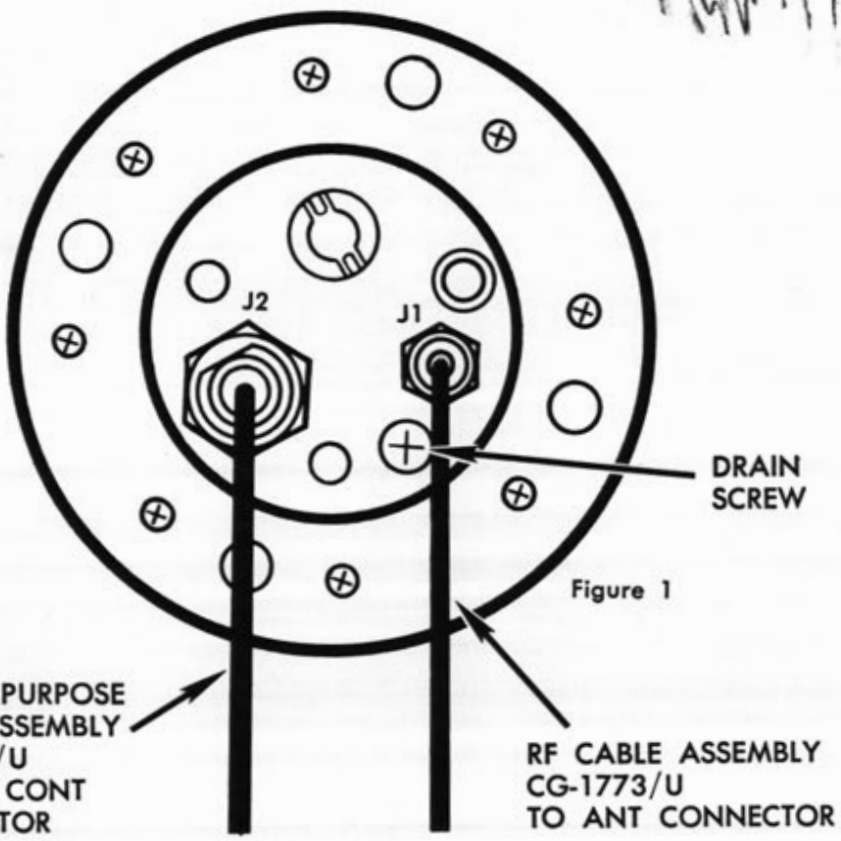


Figure 1

ARMOR INNOVATIONS CENTER

BETTER TRAINING, BETTER SHOOTING

Commanders in the field can now expect to have assigned better trained tank turret repairmen by virtue of a revised program of resident instruction at USAARMS. Formerly the would-be MOS 45G turret artillery repairman received conventional organizational maintenance training on the *M139* 20mm gun, tank mounted machineguns, fire controls and cupola systems of the *M60/M60A1, M48A3* and *M48A2C* tanks, the *M728* combat engineer vehicle, *M114A1E1* command and reconnaissance vehicle, *M109/110* self propelled artillery as well as *Shillelagh* system turret training applicable to the *M551 Sheridan*. Students successfully completing this course of instruction were awarded the 45G20T MOS and were assigned to tank, armored cavalry or artillery units.

The duties of the tank turret repairman have now been separated from those of the artillery mechanic thus creating two new MOS designations; 45K identifying the tank turret mechanic and 45L the artillery repairman, responsibility for the training having been given to the Field Artillery School.

The revised programs of instruction for tank turret repairman is now divided into distinct phases; conventional turret maintenance as described above less the artillery weapons. This comprises a course for six weeks duration. Graduates receive MOS 45K20 and are earmarked for assignment to tank units. A second phase for that 25 percent of the Phase I graduates showing aptitude is a 4-week add-on devoted to *Shillelagh* system training. Graduates of Phase II are awarded an M-9 suffix to their previously earned MOS and are marked for assignment to *Sheridan* equipped units.

A MUST

The Senior and Junior Officers' Preventive Maintenance Courses have been conducted by the Army Maintenance Management Department, of the Armor School, since March 1958. Over 14,325 officers, including more than 262 generals, have completed the 41-hour course.

The course is divided into maintenance management operations and preventive maintenance indicators. Maintenance management subjects are taught in the classrooms and include instruction on the Army Maintenance System (TAMMS), The Army Equipment Record System (TAERS), Inspections, Standards, Evaluation of Maintenance, Maintenance Accounting, Materiel Readiness, Equipment Serviceability Criteria, and Command and Staff Management of Preventive Maintenance. The emphasis in these classes is on the commanders' responsibilities and what assistance is available to him to do his maintenance management job. Included is a searching probe into the job of each officer on the commander's staff and his role in the maintenance program.

The use of preventive maintenance indicators is taught in the well-equipped shops of the Army Maintenance Management Department. Here students can examine equipment representing high density items found in the US Army divisions and separate units. Emphasis is given in the course of instruction to "indicators" that the commander can use to give himself a firsthand estimate of how efficient his people are in performing preventive maintenance operations and how well maintenance training is progressing.

This valuable course can be yours. Ask your training officer to refer to the Army School Catalogue for complete details on eligibility and class quotas. You will find it a management tool that will be useful the rest of your career.

DIAGNOSTIC EQUIPMENT EVALUATIONS

Today, few commanders are fully aware of the complications resulting from difficulties in properly diagnosing the cause of electrical failures in electronic and fire control equipment.

Developers' efforts to improve reliability have introduced redundant circuits, integrated circuitry, throwaway modules, and so on. As a result, reliability has been greatly enhanced. However, troubleshooting procedures, have become a nightmare. Redundant circuits must be checked to insure that the backup circuits are operable although no malfunc-

tion is indicated in the end item. Integrated circuits sometimes reveal phantom failures which are caused by a minor deviation in input/output tolerances of another component. Throwaway modules are too expensive to throw away and replacement modules are not always available. Also, modules are sometimes replaced while actually serviceable and tests may establish the module to be serviceable.

Recent test items submitted to the US Army Armor and Engineer Board reveal that developers are properly assuming the responsibility to help reduce the delays in diagnosing problems by military repairmen. The laser rangefinder mounted on the *M60A1E2* tank is one such item. The equipment is designed to provide range in increments of 5 meters. Any number in the unit's readout position other than 0 or 5 will be accompanied by an indication on the malfunction lamp. The actual number will identify the faulty module, thus saving the repairman's time and reducing overall downtime.

Another such item is the *M16* computer test set recently tested by the US Army Armor and Engineer Board. This set not only diagnoses problems in the modules of the *M16* computer but also provides the acceptable tolerances to the repairman at a glance, thus saving the time previously expended in consulting tolerance tables and/or calculating the acceptable tolerance.

Every effort must be made by all parties concerned to halt the trend previously experienced in which diagnostic time far exceeded the actual repair time required.

CEV/AVLB TRAINING UNIT

USATCA recently activated the first full-time Combat Engineer Vehicle/Armored Vehicle Launched Bridge training unit in the US Army. Company E, 4th Battalion, 1st Brigade will conduct an add-on, 8-week special skill course for graduates of the pioneer combat engineer advanced individual training program at Fort Leonard Wood. Successful completion of the new USATCA course will see the award of a new MOS — 12F, Combat Engineer Tracked Vehicle Crewman.

MAINTENANCE TOOLS AND TOOL SETS

The US Army Materiel Command is conducting an extensive study of tools, tool sets and test equipment for units. The objectives of the study are twofold. First, to update and consolidate tools and test equipment authorization documents to allow units easy access to authorization information. Second, to improve the availability of tools and test equipment in the supply system to make it easier for units to get the tools and test equipment which they are authorized. The US Army Maintenance Board is the focal AMC agency for the tool and test equipment study. The Armor Center is assisting in the study.

PS Magazine will soon have an article on procedures to obtain and to manage tools at user level.

A USATCA 2d Brigade (AIT) *M114E1* reconnaissance vehicle shows clearly the new *M139* 20mm gun and the M27 power cupola. Replacing the M2 cal .50 machinegun, the 20mm has a muzzle velocity of 3608 feet per second and a maximum rate of fire of 1050 rounds per minute. It has the capability of defeating lightly armored vehicles at ranges up to 1000 meters and soft targets or personnel at ranges up to 1800 meters.

ARMOR'S 'ORACLE'

In the days of the Delphic oracle personages of import would travel miles to consult about the future. Today, the Army Combat Developments Command's Armor Agency at Fort Knox is consulted frequently by Department of the Army about the future of Armor and related developments. Instead of an oracle or a crystal ball, the Armor Agency, in the last several years, has begun using advanced battlefield computer simulations which depict battalion-sized battles to include supporting ground and air weapons. Such simulations serve as a base to assist military analysts in solving many of the organization, doctrine, and equipment problems posed by Department of the Army. Use of these modern techniques is now becoming common prac-

tice within the Armor Agency's newly-formed Studies Division, which is now responsible for the conduct of all Armor concept and special studies.

Until the summer of 1966, studies were conducted by the Doctrine and Materiel Divisions of the Agency. But in the summer of 1966, Headquarters, USACDC, directed the Agency to conduct a major study named the Tank, Antitank and Assault Weapons Requirements Study, Phase II (TATAWS II). This study was an outgrowth of earlier limited efforts called Antimech and TATAWS I which had attempted to determine what tanks and antitank weapons the US Army should adopt, and in what quantity. TATAWS II was to be conducted in two parts. Part 1 was to be a limited study using existing computer models of tank battles to obtain quick answers. Part 2, a more detailed examination, included the development of more realistic computer simulations to provide more refined efforts. To accomplish these tasks, the Commanding Officer of the Armor Agency established a TATAWS Study Group directly under his supervision.

The Study Group completed TATAWS Phase II, Part 1 early in 1967. But by that time the scope of the Part 2 effort had been expanded so much that the decision was made to scrap Part 2 and do an entirely new study to be called TATAWS Phase III or TATAWS III. This new study was finally completed 22 months later at a cost of over 2.7 million dollars and was credited with major breakthroughs in study techniques and methodology.

With the successful completion of the TATAWS III Study in March of this year, the TATAWS Study Group was redesignated the Studies Division and assigned those study requirements previously conducted by the other divisions of the Agency. Some study efforts are treated by subjective analysis only, but older more laborious methods are often being replaced these days by modern operational research techniques which includes the employment of advanced computer simulations of tank battles. An example of such simulations is the "Individual Unit Action" (IUA) model developed by Lockheed Missiles and Space Company. This IUA model was developed largely on guidance furnished by the Agency.

This IUA simulation is a battalion-sized battlefield that allows a selected force to move or deploy over different designated terrain tactically and engage an enemy force. The tank and other weapon systems are played with their known or designed characteristics and capabilities as part of a force in a fully integrated battle. Variables, as well as firm data, are considered throughout the process.

Currently the Studies Division is engaged in research touching on all aspects of Armor operations and materiel. These include such subjects as the best secondary armament configuration for the *MBT70*; the doctrine and organizational impact of the *MBT70*; an evaluation of suggested antitank weapon mixes for European-oriented mechanized infantry battalions; Armor's aviation requirements for the future; and Armor's role in the US Army in 1985. In addition, the division has already completed supplementary TATAWS efforts such as an evaluation of the "K" Tank (an advanced concept proposed by a developer) and a review of likely Armor systems projected beyond 1975.

Not limited to assigned study tasks, the division is constantly on the alert for material and doctrinal improvements for Armor. Recently, members of the division have proposed changes in techniques of employment of main gun ammunition for the *M60A1* tank which may permit enhanced effectiveness against hard targets. This was initiated after detailed examination of hit and kill probability tables computed for the *M60A1*.

Today, Armor's future is being forecast by the use of the most advanced analytical techniques and computer simulations. Nonetheless, the raw results of such efforts are not accepted until after a thorough military audit has been accomplished by officers of the Agency and further review conducted by other members of the Armor Center Team. In this manner, validity of conclusions and consistency with the real world is insured. Thus, the military judgment of Armor officers, supported by years of field experience in troop units, still remains the final and most important element in the development of tomorrow's Armor.



NEWS NOTES

MG DESOBRY COMMANDS OLD IRONSIDES

Major General William R. Desobry recently assumed command of the 1st Armored Division at Fort Hood. General Desobry was a 1941 ROTC Armor Graduate of Georgetown University. During World War II, he served successively as a company commander, battalion S3 and battalion commander of the 20th and 54th Armored Infantry Battalions of the 10th Armored Division. He commanded a task force at Bastogne. Subsequently, he was wounded and captured by the Germans. Returning to the United States he served on the Army Staff until he went back to Europe to serve in Headquarters, Third Army and Headquarters, US Forces in Austria. In 1951, he was graduated from the Command and General Staff College where he remained to serve on the faculty for four years. Again in Germany he commanded Combat Command C, 2d Armored Division and then became division Chief of Staff. After an assignment as G3, V Corps he returned to the United States to attend the National War College from which he was graduated in 1959. He then served for three years on the Army Staff and for three years as an instructor at the Army War College. In 1965, he became Deputy Senior Advisor to the ARVN IV Corps in the Delta Region of Vietnam and then Senior Advisor. His last assignment prior to joining the 1st Armored Division was on the Army Staff in the Pentagon.

1/18 CAV HONORED

On 12 December 1969 the 1st Squadron, 18th Cavalry completed 18 months of active duty with the 3d Armored Cavalry Regiment at Fort Lewis. Mobilized from the California Army National Guard in May 1968, under the command of Lieutenant Colonel Robert F. Brainard, the squadron was soon filled with men and equipment. An intensive training program quickly brought men and units to full readiness. Colonel Brainard and all but 60 of the 1100 men mobilized served in other units in Vietnam while the squadron remained at Fort Lewis. Lieutenant Colonel Dunbar S. Norton commanded the squadron during the latter part of its Federal service. At a review to bid farewell to the Golden Bear unit, Brave Rifles Commander Colonel Sidney Hack presented the 3d Armored Cavalry Certificate of Merit and other awards to the squadron. Now again a California Army National Guard unit, the 1st of the 18th, commanded by Lieutenant Colonel Stanley R. Geach, is headquartered in Ontario.

XM 191 FLAME LAUNCHER

A new light-weight, shoulder launched rocket with an incendiary warhead, developed by the Army's Weapons Development and Engineering Laboratories, Edgewood Arsenal, Md., is currently undergoing operational evaluation in Vietnam by the US Army and Marine Corps.

Capable of firing four rockets within four seconds, the new *XM191* multishot launcher and rocket delivers and disseminates flame agents on targets at far greater ranges, and is more economical and lighter in weight than standard portable and mechanized flame throwers.

Shoulder fired from standing, kneeling, sitting or prone positions, the *XM191* is designed to neutralize hard, soft or jungle targets. It is extremely accurate at ranges up to 200 meters.

The launcher consists of four fiber-glass launching tubes assembled in a rectangular arrangement. It is 27 inches long, extends to 34.75 inches with the clip inserted and weighs only 26.6 pounds complete with clip of four rounds.

After the first four rounds are expended the empty clip can be removed from the launcher and

a new clip inserted. Each clip contains four, three-pound 66 millimeter rockets that are 21 inches long. They are factory-loaded with 1.35 pounds of poly-isobutylene-thickened triethylaluminum (TEA).

Engineers at Edgewood Arsenal said that the use of launching tubes, the rocket motor, fuse assembly, igniter and aluminum clip tubes from existing production lots of the *M72 LAW* considerably reduced developmental costs and lead time in the development of the new multishot portable flame weapons.

The *XM191's* sight is the same *M30* optical sight used on the 3.5" Bazooka. This was chosen due to its familiarity and accuracy.

The entire multishot flame weapon system requires no maintenance. Adjustments can be accomplished with a standard screwdriver.

In combat the launcher operator carries the weapon loaded with one rocket clip. Extra clips are carried by other members of the squad.

XM15 COLLECTIVE PROTECTOR

The *XM15* collective protection equipment (CPE) designed to give chemical and biological warfare agent protection for men and equipment within *M577* and *M577A1* command post carriers is currently undergoing qualification testing under an Army-sponsored research and development contract. With the *XM115,* individual or collective masks and protective clothing need not be worn inside the vehicle.

The *XM15* CPE operates off of the vehicle engine generator and consists of three major components: a gas particulate filter unit, a pressure-sensing control network, and a protective entrance (air lock). Various equipment operating modes initiate automatically; manual overriding is possible. Airflow valves allow sufficent airflow through the crew compartment and protective entrance to maintain pressure levels and meet ventilation requirements.

The *XM15* CPE gas-particulate filter unit consists of six major subassemblies: a housing, a precleaner, gas and particulate filters, a control panel, and a fan assembly. Air entering the vehicle first passes through a mechanical precleaner, mounted under a ballistic shield on the vehicle roof, which removes most of the particulate matter entrained in the airstream. The partially cleaned air then passes through the particulate filter, which removes essentially all particulate matter, and then through the activated charcoal gas filter, where gaseous agents are removed.

Airflow (up to 250 cfm) is provided by a vane-axial fan which discharges the now purified air into the crew compartment and protective entrance. Both visual displays and audible alarms automatically register unit status and warn if unsafe conditions exist.

The pressure-sensing control network monitors pressures in the crew compartment, engine compartment, filter units, and protective entrance, and, through its logic system, regulates pressure and airflow by opening and/or closing associated airflow valves.

The protective entrance allows contamination-free entrance and exit. It is collapsible, and is stowed when the vehicle is manuevering or when the CPE is not in operation.

BLACKHORSE ASSOCIATION

On 4 November 1969, former members of the 11th Armored Cavalry Regiment met at Fort Knox to form the Blackhorse Association. The response was heartening and the Association embarked on a spirited program reflecting the Regimental Motto "Allons" (Let's Go!). Major William W. Poynter had worked for six months to bring about the initial meeting and had provided a draft constitution. This was unanimously accepted. A slate of officers was unanimously selected to serve, *pro tem*, until the first full meeting can be conducted in conjunction with the Armor Association meeting scheduled for 14-16 May at Fort Knox. These are: COL C. R. Gorder, President; CSM Paul W. Squires, ISG Edward W. Ellsworth and SFC James J. Brady, Vice Presidents; CPT Duane E. Harman, Secretary; and CPT Joseph A. Fuks, Custodian of the Spurs.

The Blackhorse Association seeks to foster and strengthen regimental traditions and comradeship and to assist the survivors of regimental members. The members assembled at the initial meeting voted unanimously to establish a fund to provide educational assistance for selected children of those who gave their lives while serving in the regiment.

Annual dues are $1.00. Life memberships are $10.00. Sustaining Life Members include all who contribute more than $10.00. Correspondence should be addressed to: COL C. R. Gorder, 1st Bde, USATCA, Fort Knox, Kentucky 40121

ARMOR AND CAVALRY MUSIC

An Army band officer is presently developing an article for *ARMOR* on the history of armor and cavalry music, to include regimental marches and songs, as well as the division marches of more recent times. Anyone with information, lyrics and the tune to which they were sung, suggestions on sources, or remembrances concerning the history of armor and cavalry music is invited to send his comments to the Editor, *ARMOR*, who will refer the information to the researcher. Of particular interest would be information concerning songs and marches which have come into common use in regiments and divisions during the 20th century.

LAND NAVIGATION DEVICE TEST

The Magnetic Automatic Navigation System (MAN) and the Gyro Automatic Navigation System (GAN) (See *ARMOR* Newsnotes, May-June 69 for details) will undergo extensive testing at Fort Carson this year. Test units include: the 4th Squadron, 12th Cavalry; the 3d Battalion, 77th Armor; the 1st Battalion, 29th Artillery; and the 3d Battalion 61st Infantry. The 240-man test directorate is headed by Major General Bernard W. Rogers, 5th Division commander. The new equipment will be compared with traditional navigational methods. In addition to operability, maintainability and reliability, type unit requirements for the devices will be determined.

ACT

Automotive Industries Magazine reports that a British manufacturer has shown a 30-foot long air cushion trailer capable of transporting a seven-ton load over soft terrain. Lift is given by two 95 hp engine driven centrifugal fans.

SOLDIERS ALL

Recent tank-infantry training exercises held at Wildflecken, Germany by the 1st Battalion, 64th Armor with Company B, 1st Battalion, 30th Infantry attached were distinguished by the participation of soldiers from four nations. The 3d Infantry Division troops were joined by three Bundeswehr soldiers, two of whom were not German. In addition to Gefreiter Karl Waldmann of Germany, the group included Gefreiters Patauasak Kranlert of Thailand and Heung Hwan Park of Korea. The latter two are members of a Federal Republic of Germany officer training program whereby, having been selected by their own countries' military academies, they will spend three years training with the German Army. When they successfully complete the prescribed course, they will then be commissioned in the armies of their respective homelands.

Gefreiter Patauasak Kranlert, Gefreiter Heung Hwan Park, Sergeant Orman Osborn and Gefreiter Karl Waldmann atop a 1st Bn, 30th Inf, 3d Infantry Division APC at Wildflecken, Germany.

MICROFILM AVAILABLE

The 45,058 pages of *The Cavalry Journal* (1888-1946), *Armored Cavalry Journal* (1946-1950) and *ARMOR* (1950-1966) have now all been put on microfilm. The complete set of 12 reels is about $300.00. However, individual reels including from three to 11 volumes are available separately. The 1967 volume in microfilm is $4.00. Details on these microfilm editions and other reproductions can be had from University Microfilm, Ann Arbor, Michigan 48106.

BACK ISSUES NEEDED

The Armor School Library and the Patton Museum are seeking to increase their reference collections of *The Cavalry Journal, The Armored Cavalry Journal* and *ARMOR.* Those having needed issues, as shown below, who are willing to donate these to either repository are urged to write the Director of Administration, US Army Armor School, Fort Knox, Kentucky 40121

	USSARMS LIBRARY	PATTON MUSEUM
1881-1921	X	X
1922-1923		X
1924	X	X
1925-1928		X
1931-1935	X	X
1936		X
1937-1938	X	X
1939	X	
1941-1944		X
1946-1950		X
1951		X

HOPE SPRINGS ETERNAL

Does your map turn to mush in a monsoon? Did your buddy spill a canteen cup of hot cocoa on the only map left in the company?

Well, cheer up; US Army Combat Developments Command (CDC), at Ft. Belvoir has undertaken some speedy action to provide covers for tactical maps in the field.

The CDC proposal requires a cover that will protect the map and at the same time provide a convenient surface upon which to draw overlays or other vital information. The map cover will be designed in two sizes, a 1-map and a 4-map configuration, and it must be highly flexible, transparent and colorless. CDC states that the new map cover will be sufficiently durable to last six months under constant field use. In addition, to foldability equal to that of high wet-strength paper, the device must be relatively non-reflective. The requirement for the new waterproof map cover was the result of comments solicited from Vietnam returnees who recommended development of the device.

The Tarpaulin

Covers a bit of everything gleaned from the service press, information releases, etc. Contributions are earnestly sought.

TAKE COMMAND

BG William A. Burke, 1st Bde, 5th Inf Div, Vietnam . . . **COL Paul F. Pearson,** DivArty, 2d Armd Div . . . **COL Earl W. Sharp,** Spt Comd, 1st Armd Div . . . **LTC Robert A. Arnet,** 3d Sqdn, 17th Cav, 12th Avn Gp . . . **LTC John C. Bahnsen,** 1st Bn, 32d Armor, 3d Armd Div . . . **LTC Charles M. Belt,** 4th Sqdn, 7th Cav, 2d Inf Div . . . **LTC LaVere W. Bindrup,** 2d Sqdn, 17th Cav, 101st Abn Div . . . **LTC Paul H. Blackwell, Jr.,** 3d Sqdn, 8th Cav, 8th Inf Div . . . **LTC Grail L. Brookshire,** 2d Sqdn, 11th Armd Cav Regt . . . **LTC J. Byron Colson,** 1st Bn, 72d Armor, 2d Inf Div . . . **LTC Richard G. Graves,** 1st Sqdn, Ist Cav, Americal Div . . . **LTC William Greenberg,** 2d Bn, 34th Armor . . . **LTC William T. Hoar,** 2d Sqdn, 10th Cav, 7th Inf Div . . . **LTC George C. Hoffmaster,** 3d Sqdn, 11th Armd Cav Regt . . . **LTC Joseph A. Langer, Jr.,** 2d Bn, 81st Armor, 1st Armd Div . . . **LTC James L. Marini,** 1st Bn, 69th Armor . . . **LTC David C. Martin,** 1st Bn, 16th Inf, 1st Inf Div . . . **LTC Walter L. McMahon,** 1st Bn, 23d Inf, 2d Inf Div . . . **LTC Corwin A. Mitchell,** 3d Sqdn, 4th Cav, 25th Inf Div . . . **LTC Clyde L. Morrison,** FA, 2d Bn, 16th Arty, 4th Armd Div . . . **LTC George S. Murry,** 7th Sqdn, 17th Cav, 17th Avn Gp . . . **LTC Carthel L. Sands,** 1st Bn, 73d Armor, 7th Inf Div . . . **LTC John W. Shannon,** Inf, 7th Bn, 2d Bde, USATCA . . . **LTC James P. Van Sickle,** INF, 2d Bn, 52d Inf, 1st Armd Div . . . **LTC Douglas S. Smith,** 1st Sqdn, 17th Cav, 82d Abn Div . . . **LTC G. E. Taylor,** 3d Bn, 33d Armor, 3d Armd Div . . . **LTC Ronald T. Walker,** 7th Sqdn, 1st Cav, 164th Avn Gp . . . **LTC Richard R. White,** 19th Bn, 5th Bde, USATCA . . . **LTC Robert T. Zargan,** 2d Bn, 72d Armor, 2d Inf Div . . . **MAJ Charles M. Hood, Jr.,** FA, Sp Trps, USATCA . . . **CSM Shelby W. Belding,** 1st Bn, 32d Inf, 7th Inf Div . . . **CSM Walter F. Corvin,** 12th Bn, 5th Bde, USATCA . . . **CSM Raymond H. Cottrell,** 4th Bn, Sch Bde, USA Armor School . . . **CSM Robert W. Hunt,** 2d Bn, 72d Armor . . . **CSM Horace L. Jones,** 4th Sqdn, 7th Cav, 2d Inf Div . . . **CSM Raymond T. Kelley,** 1st Bn, 72d Armor, 2d Inf Div . . . **CSM Jerome E. Kraus,** 1st Bn, 13th Armor, 1st Armd Div . . . **CSM Hershel Mullins,** 18th Bn, 5th Bde, USATCA . . . **CSM William Norwood,** 1st Bn, 13th Armor, 1st Armd Div . . . **CSM Donald L. Tefft,** 1st Bde, USATCA . . . **CSM Richard E. Warnick,** 2d Sqdn, 9th Cav, 24th Inf Div.

ASSIGNED

MG John K. Boles, Jr., CofS, ALFSEE, Izmir, Turkey . . . **BG Carleton Preer, Jr.,** Fort Gordon, Ga. . . . **BG Lawrence V. Greene,** J1, MACV . . . **BG Michael J. L. Greene,** ADC, 25th Inf Div . . . **BG Adrian St. John II,** ADC, 4th Armd Div . . . **COL James T. Brewer,** Ch,

Facilities Br (Army), Mil Dept Calif . . . **COL Owsley C. Costlow,** CofS, 100th Division (Training), USAR, Louisville . . . **COL Robert S. Ford,** IG, Hq Calif ARNG . . . **COL (BG Desig) James A. Grimsley, Jr.,** INF, ADC, 2d Armd Div . . . **COL George E. Kimball,** Dir C&S Dept, USA Armor Sch . . . **COL Charles T. Krampitz,** IG, USA Armor Cen . . . **COL (BG Desig) George S. Patton,** ADC, 4th Armd Div.

VICTORIOUS

4th Armd Div won first place 1969 Army Safety Award for divisions in non-combat areas . . . **Tank B 11, 14th Armd Cav Regt (SSG John Metcalf, SP5 Jose Salazar, SP5 Clyde Webb** and **SP4 Tom Denton)** scored 2210 out of 2400 possible to sweep 1969 regimental tank gunnery competition. Troop CO **CPT Robert W. Hess,** and the crew received hearty congratulations from **COL Martin D. Howell,** regimental commander who was himself once commander of Troop B . . . **3d Sqdn, 1st Cav** and **1st Bn, 81st Armor** of **1st Armd Div** joined **4th Bn, 3d Arty; 4th Bn, 46th Inf;** and **501st S&T Bn** in receiving 1969 III Corps Superior Unit Award. **1st Armd Div** also took high honors in Fort Hood marksmanship competition . . . **3d Bn, 35th Armor (LTC Jimmy L. Pigg, CSM Oscar R. Payne)** received **4th Armd Div** 1969 Tank Gunnery Trophy from **Secretary of the Army Stanley R. Resor** and division commander **MG Stephen W. Downey** as it has done in five of the six past years . . . **1st Bn, 54th Inf, (LTC Williams L. Harrison)** won **4th Armd Div** Major General John S. Wood Combat Readiness Award for 1969. The "Mailed Footmen" also won the award in 1966. Other winners in the Trophy's five year history have been the 4th Bn, 35th Armor in 1965 and 1968 and the 2d Sqdn, 4th Cav in 1967 . . . **3d Sqdn, 12th Cav (LTC Lloyd J. Brown)** received 2d Panzerdivision commendation for outstanding performance under operational control of that division during German Army excercise Rosselsprung, largest for the Bundeswehr since World War II.

AND SO FORTH

Troop F, 15th Cav was activated with 4th Bde, 5th Inf Div (M) at Fort Carson to replace **Troop E, 114th Cav,** 69th Inf Bde which has returned to the Kansas Army National Guard . . . **CPT Dean R. Dort, Jr.,** JAGC, has joined 4th Armd Div SJA Section where his father now a colonel at Fort Huachuca, served as division SJA 10 years ago . . . Distinguished Honor, Graduates of the Armor Officer Basic Courses: **4-70 2LT Thomas H. Ryder,** III, USMC, 5-70 **2LT Robert M. Engeset,** 6-70 **2LT Randolph L. Jones, Jr.,** MI, 7-70 **2LT John F. Stone.**

FROM THE BOOKSHELF

VIET NAM: THE ORIGINS OF REVOLUTION

by John T. McAlister, Jr. Alfred A. Knopf. 1969. 377 pp. $7.95.

Journalists and theorists, as well as soldiers, are fascinated by the challenge of limited war. Chameleonlike, it persists in defying description. *Viet Nam: The Origins of Revolution* is the most recent and scholarly of the continuing flood of interpretations. Unhappily, it is not the most valuable.

The author combines an impressive blend of experience with erudition. He served in the U. S. Navy, and spent two years in the Mekong Delta as an advisor to the Vietnamese River Force. He also studied at the Princeton University Center of International Research. McAlister has an indispensable talent for exploring Vietnamese problems: namely fluency in the language. He has judiciously tapped the best available Vietnamese and French sources documenting the history of the country and its colonial experience.

McAlister takes aim at a western attitude in vogue not long ago—that Vietnam is another Korea in a Communist chain of conquest. His book expertly dispels the remnants of this myth, picturing the disunity of Vietnam as the principal cause of conflict and Communism as helpmate. He writes of the country's migratory beginnings, of its geographic dispersion, of reaction to Chinese rule and susceptibility to Chinese culture, and of clandestine resistance to the colonial overlay of French domination. In less than 40 pages McAlister describes the traditional Vietnamese bases of power: the mandarin system and hereditary rule. This solid historical foundation helps explain the changes in Vietnamese society caused by French and Japanese occupation, and sets off the critical period in Vietnam's history of fragmentation, the 1930s and 1940s.

The author focuses on these pivotal years. He traces in detail the rise of nationalism and Communism in Vietnam. Keeping these two threads plainly in view, he devotes the bulk of his work to an analysis of the complex interaction between Communists, nationalists, French, and Japanese. The triumph of the Viet Minh is explained as a masterpiece of understanding by its leaders in applying Marxist-Leninist theory to the unique wartime environment of Vietnam.

A thought-provoking chapter on the dilemma of the French governor general during the Japanese occupation is followed by the interesting hypothesis, that eviction of the French from Vietnam by Japan in 1945 liberated latent revolutionary instincts. McAlister then compares, with authority, the difference between the Communist bid for power in northern Vietnam with that in the south.

At this point in the narrative, the author seems to fall into a familiar trap for Vietnamese scholars, to turn from objective appraisal of Vietnamese history to passionate indictment of western policies. The effect is to diminish the force of his main argument, that conflict in Vietnam grew out of and continues to be fed by revolution. The author also fails to resist the temptation to interject theoretical models of political systems, thus confusing with jargon an issue crying for simplification. Clausewitz' theory of war, Professor Karl Deutsch's definition of nationalism, and Professor R. R. Palmer's concept of revolution appear at disturbing intervals. Far more useful to the practitioner who will have to deal with revolutions would be McAlister's views on revolution. They are there, but the reader will not find all of them without painstaking study and reflection.

MAJ ALBERT S. BRITT, USMA

THE MIGHTY ENDEAVOR

by Charles B. MacDonald. Oxford University Press. 564 pp. 1969. $12.50.

The cover is significant — olive drab and army blue; the title is engaging — words expressed by FDR on D-Day; the author is well known — the soldier who lived and then wrote *Company Commander,* the combat classic of World War II. Yet, it takes more than a striking cover, title, and name to make an exceptional one-volume history of either of the two great wars. To know what can be left out, to present succinctly and understandably the many aspects of a world war that cry to heaven for inclusion, and, in the process of writing briefly about much, to produce a work that is readable — these are some of the difficult standards that the one-volume author should meet. On all these counts, and on others, Charles MacDonald stands out as the author of *The Mighty Endeavor,* a history of American experiences in the European Theater during World War II.

Since the publication of *Company Commander,* Charles MacDonald has worked in the Office of the Chief of Military History (OCMH), contributing to the writing of World War II history. Presently, he is the Deputy Chief Historian, and in this capacity he was able to draw extensively from the excellent research that underlies the OCMH "green" series, *U. S. Army in World War II.* Do not infer, though,

that *The Mighty Endeavor* is "official" history, with the limitations that this word connotes. Instead, it is MacDonald's book. Writing it, during his off-duty time to use his words, he has done his own interpreting, criticizing, and lauding. He takes a stand on the critical issues and controversies of the war — and does so without hyperbole.

In addition to his unemotional assessments, there are other things that are particularly likable about the author and his book.

For instance, he excels in explaining the strategies of the war and the policies on which the strategies were based. In fewer words than many a World War II scholar would think possible, he makes it easy for the reader to grasp the pre-war U.S. plans and the evolution of the Germany-first strategy, the decision to invade North Africa and the continuation of the Mediterranean strategy, the controversies over *OVERLORD* (the cross-channel invasion), and the differences between Eisenhower's "broad-front" and Montgomery's "single-thrust" concepts.

For those who prefer tactics to strategy, *The Mighty Endeavor* also provides. Somehow, using straight narrative, without Catton-like anecdotes and quotations, the author creates the illusive "feel" for the battlefield that makes military history readable. MacDonald's success in this respect probably derives from his own experience. He has seen war and knows what to express. And as a military historian of long standing, he knows how to express it. As a result, the reader will enjoy, if not sweat through, Kasserine Pass, Anzio, Omaha Beach, and other World War II battles.

The author also is adept in presenting the personalities behind the tactics and strategies. He introduces them with perceptive vignettes and builds upon these initial portrayals as the book progresses. He expresses his own opinions — of Eisenhower, Bradley, Patton and others — in balanced, measured terms.

Another strength of *The Mighty Endeavor* is the coverage of World War II technology. The author uses his knowledge of weaponry in explaining all aspects of World War II, including the air and sea war. The "Strategic Bomber Offensive" and the "Battle of the Atlantic" are particularly well presented.

But *The Mighty Endeavor* is not faultless. In making his book readable, the author has succumbed to the insatiable urge, which swells up in all of us, to use the overly expressive adjective or adverb as well as the metaphor. Unfortunately, metaphors are either perfect or poor, poignant or prosaic. In this regard, Charles MacDonald's book suffers a little. Very little.

Therefore, do not scratch *The Mighty Endeavor* from your buy list because of some nit-picking reviewers. It deserves a space on every soldier's book shelf and a reading by soldiers and civilians alike.

LTC JAMES F. RANSOME, JR., USMA

SOMETHING ABOUT BOOKS

"Reading and discourse are requisite to make a Souldier perfect in the Art Military, how great soever his practical knowledge may be." -Duke of Albemarle, 1671

NEW BOOKS -- THE MIGHTY ENDEAVOR by Charles B. MacDonald ($12.50) - World War II by one who commanded a company therein and who then became an authoritative but witty and humane historian. . .WHEN THE THIRD CRACKED EUROPE by General Paul D. Harkins ($5.95) - The WWII Deputy Chief of Staff of Third Army reviews the legendary organization's campaigns from the beaches to Czechoslovakia in well-chosen words and photographs . . .AIR ASSAULT by Lieutenant Colonel John R. Galvin ($8.95) - traces the development of the third dimension of ground warfare from WWII through Vietnam. Includes some fine material for professional discussion if not heated argument. . . SMALL ARMS OF THE WORLD by Smith and Smith ($17.95) - This 9th Edition gets right down to the how-to of each weapon. . . WAR BETWEEN RUSSIA AND CHINA by Harrison E. Salisbury ($4.95) - The thinking professional soldier should give this subject careful study. This volume is a good start or a good summing up depending on how far one has gotten.

EQUIPMENT -- Among the many books on WWII armored fighting vehicles, two recently published works stand out. Both deserve a place in the library of every professional soldier, military historian and armor buff. GERMAN TANKS OF WWII by F. M. von Senger und Etterlin ($11.95) with over 300 illustrations and superb charts is a fact packed text that has been an authority in German. It now will be so in English. BRITISH AND AMERICAN TANKS OF WWII by Peter Chamberlain and Chris Ellis ($9.95) with over 500 illustrations and a well-written, authentic text is a fitting companion piece.

CURRENT BEST SELLERS

DESIGN AND DEVELOPMENT OF FIGHTING VEHICLES - Ogorkiewicz	$ 7.95
ROMMEL AS A MILITARY COMMANDER - Lewin	$ 9.95
MILITARY UNIFORMS OF THE WORLD - Kannik	$ 4.95
ARMOR-CAVALRY LINEAGE - Stubbs and Connor	$ 6.75
GUIDELINES FOR THE LEADER AND THE COMMANDER - Clarke	$ 2.00
PANZER BATTLES - von Mellenthin	$ 7.50
HELICOPTERS SINCE 1907 - Munson	$ 2.95
THE TANKS OF TAMMUZ - Teveth	$ 6.95
TANK DATA - Aberdeen Proving Ground Series	$ 8.50
TANK DATA 2 - edited by Hoffschmidt and Tantum	$ 8.95

PRICE CHANGES

Due to increased costs to us, the price of ARMOR binders has had to be increased to $3.75 (2 for $7.00), and ARVN Armor badges to $4.50.

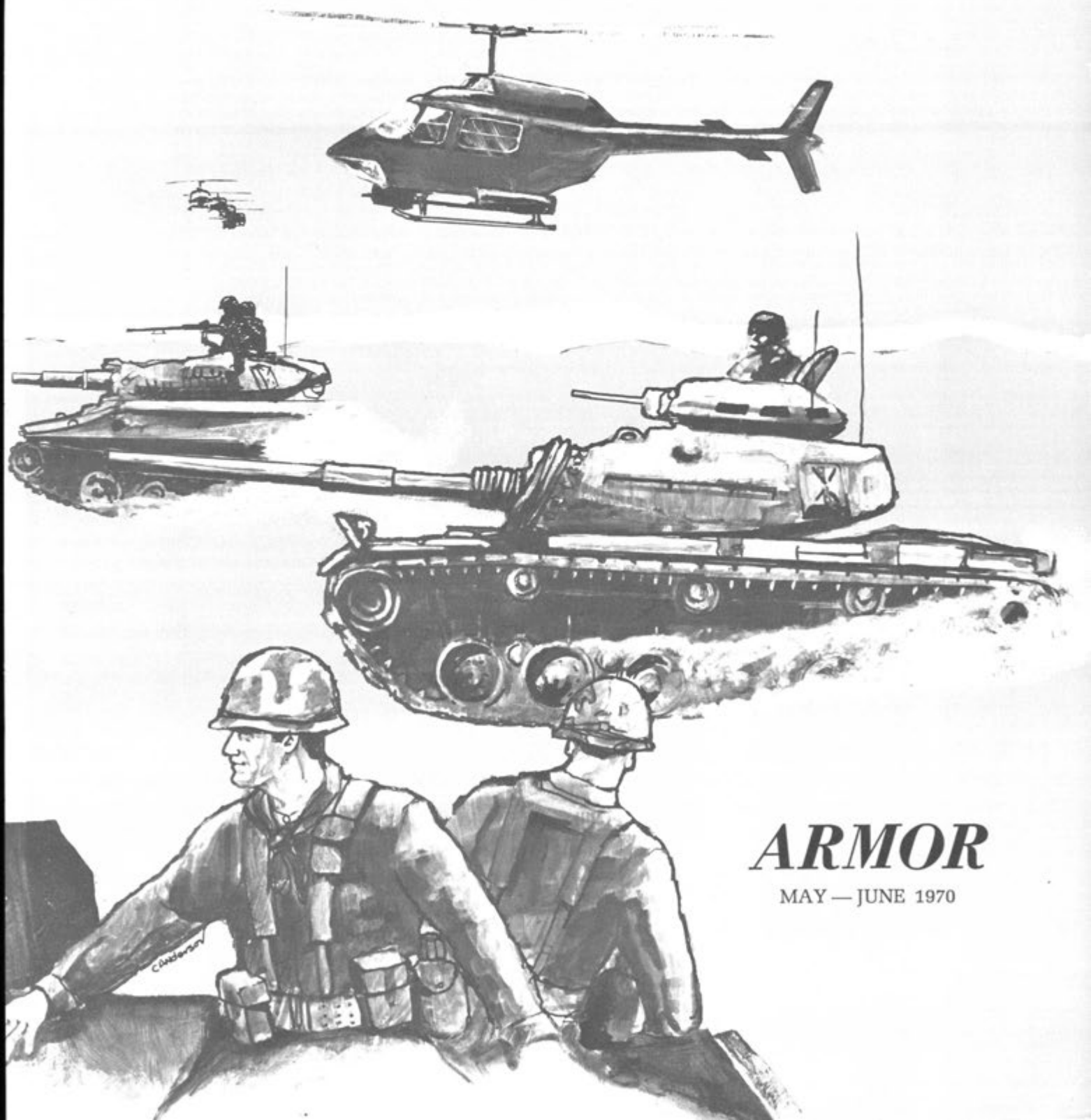
THE UNITED STATES ARMOR ASSOCIATION

Established 1885 as The United States Cavalry Association

"To disseminate knowledge of the military arts and sciences, with special attention to mobility in ground warfare; to promote the professional improvement of its members; and to preserve and foster the spirit, the traditions and the solidarity of Armor in the Army of the United States"—Constitution.

"The Armor shall be a continuation of the Cavalry..."

— ARMY ORGANIZATION ACT OF 1950



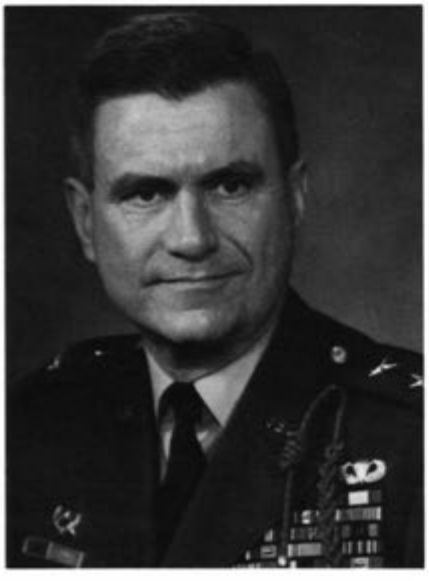
ARMOR

MAY — JUNE 1970

LTG MICHAEL S. DAVISON COMMANDS II FFV

A prudent ARMOR Editor would always keep a space in mind for announcing another leading assignment for LTG Davison. A 1939 Cavalry Graduate of West Point, he first served in the 12th Cavalry. During World War II combat he served as division G2 and CO, 1st Bn, 179th Infantry, 45th Inf Div and later successively as G2 and G3 VI Corps. Then followed assignments on the Army Ground Forces and Army Staffs, as CO, 18th Cav Sqdn, as a regimental commander and Commandant at West Point and as CO, CCA, 3d Armd Div. Himself a graduate of Leavenworth and the National War College, General Davison was Commandant of the CGSC from 1966 to 1968 at which time he became Deputy Commander of USARPAC. Just prior to assuming command of II Field Force, Vietnam this Spring he was Chief of Staff, Pacific Command.

MG KNOWLTON 49th USMA SUPERINTENDENT



In late March MG Knowlton was appointed Superintendent of the United States Military Academy from which he graduated in January 1943. General Knowlton stood seventh in his class and thus had his pick of branches. He chose Cavalry (Armored Force.) During World War II combat he was an assault gun platoon leader and troop commander in the 87th Cav Recon Sqdn, 7th Armd Div. Following battalion command and staff duty in the Army of Occupation he returned to the US to become Assistant Secretary to the Army General Staff. Then followed command of the 1st Sqdn, 3d Armd Cav Regt and the 1st Bde, USATCA together with key staff assignments at SHAPE, on the Army Staff, in the Office of the Secretary of Defense and at USMACV as well as teaching posts at the Armor and Field Artillery Schools and an associate Professorship at West Point. In 1968, General Knowlton served as Assistant Division Commander, 9th Inf Div in Vietnam. His last previous assignment was as Secretary of the General Staff, US Army.

General Knowlton is the first Armor officer, and the fifth Armor or Cavalry officer to serve as Superintendent of the Military Academy. Brigadier General Wesley Merritt who served as 21st Superintendent from 1882 to 1887, and was the first Cavalryman appointed to that important position, subsequently served as second President of the newly founded US Cavalry Association until 1908. Perhaps history will again in part repeat itself.

General Knowlton's son and namesake is a member of the USMA Class of 1970 and has chosen Armor.

ARMOR

The Magazine of Mobile Warfare

Volume LXXIX **May-June 1970** **Number 3**

ARTICLES

FEATURES

DEPARTMENTS

COVER

THE 28TH OF JUNE 1970 MARKS THE 20TH ANNIVERSARY OF THE NAME ARMOR FOR A BRANCH OF THE ARMY. IN SO ENACTING, THE CONGRESS PROVIDED THAT ARMOR WOULD CONTINUE, AND ADD TO, THE ROLE AND TRADITIONS OF THE CAVALRY. *ARMOR* DESIGN EDITOR SP5 CHARLES R. ANDERSON HAS ATTEMPTED TO CAPTURE THE LOOK AND SPIRIT OF ARMOR TODAY AS IT FULFILLS THE LAW OF THE LAND.

ARMOR Magazine is published bimonthly by the United States Armor Association, Suite 418, 1145 19th Street, N.W., Washington, D. C. 20036, to stimulate interest in, provoke thought on, and provide an open forum for decorous discussion of professional matters. Articles appearing herein represent the personal views of the contributors. Unless otherwise stated, they are neither expressions of official policy nor do they represent the position of the publisher. Unless credited, photographs are official Department of Defense releases.

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LETTERS TO THE EDITOR

"Pile On"

Dear Sir:

Colonel George S. Patton modestly left out two significant details in his superb article "Pile On" as regards the Mulcahey Ravine Affair. It was Colonel Patton who directed that his C&C helicopter be set down in the open between the VC and the I Troop ACAVs that were containing the VC in the ravine. Despite the fact that the C&C ship was hit by enemy fire, Colonel Patton, armed with only his revolver, personally led a small group of troopers from his ship down a narrow fissure in the earth caused by water erosion to meet the VC head on. Colonel Patton earned the DSC for his action.

On the more humorous side, acting on the same intelligence Colonel Patton had, I helped the 5th ARVN Division mount a battalion-size airmobile operation into the area. As I arrived over the area ahead of the lift ships with the intention of immediately firing an artillery preparation, I found that we had been preempted by Colonel Patton who had moved out considerably faster. It wasn't until after dark and with the command assistance of the late Major General Keith R. Ware that I was able to get Colonel Patton to extricate himself from the Mulcahey Ravine.

JOHN W. McENERY
COL, Armor
Fort Monroe, Virginia

Kudos From Experts

Dear Sir:

Congratulations for your outstanding January/February issue which contained some of the best articles we have read in quite some time. Our Ordnance Division design engineers have been reading and re-reading the articles which present armored vehicles from the soldiers point of view. And they do this in a manner which provides valuable information for design engineers.

J. J. MacROSTIE
Manager
New Product Engineering
FMC Corporation
San Jose, California

Vietnam and Armor

Dear Sir:

Recently, I returned from a year as an advisor in Vietnam. I was amazed at the interest in *ARMOR* shown by Vietnamese cavalrymen. The tactics described in the articles are not always agreed with by the ARVN troopers but the articles are read. And they keep abreast of the new equipment shown.

Since most of the issues devote many pages to Vietnam, the ARVN Cavalrymen claim it is an ideal professional magazine. Keep up the good Vietnamization of your magazine.

PAUL FOURNIA
Major, Armor
Fort Knox, Kentucky

With respect to the Vietnam coverage, we feel three important responsibilities. The first is to keep Armor people up-to-date on lessons learned from combat. The second is to help those going to Vietnam for service in US units or as advisors. And the third is to recognize, and to record for history, the achievements of our Armor people and units and those of our Allies. To acquit these, we depend on good articles from those who have served in Vietnam. Happily some fine ones are on hand for future issues. But more will be needed. THE EDITOR

Journals For Cadets

Dear Sir:

I believe many ROTC instructors are passing up a terrific chance to help cadets by not bringing professional journals to their attention.

Several of our cadets, primarily those interested in Armor or Infantry branch assignments have joined the Armor Association and/or subscribed to *INFANTRY*. When asked for advice, I encourage both. To do otherwise seems to me somehow to lack the spirit of the combined arms concept. Thus far, the cadets are very receptive. I cannot help but feel that these informative professional publications are giving future officers a depth and professionalism that will pay dividends in the years to come regardless of their final branch assignment.

JOHN E. GRABOWSKI
CPT, Armor
Assistant PMS
University of Pittsburgh

One hundred percent agreement here. But we would add that all ROTC cadets will also benefit greatly from joining AUSA and reading ARMY. THE EDITOR.

True Mobility

Dear Sir:

Your November-December issue is an outstanding piece of work. As a subscriber to the *Cavalry Journal,* the *Armored Cavalry Journal* and now *ARMOR,* I believe I have the breadth of experience to make this observation.

ARMOR has reason to be proud of the fact that its members elected to continue to support their arm-oriented publication years ago.

Combat lessons and "How Would You Do It?" are available only in the pages of *ARMOR* or at the Armor School. To young officers, entering the service, the Basic Officer's course is a blur, half remembered. It takes a year or more of line duty for these officers to begin to put the pieces together. The articles in *ARMOR* help smooth the way.

Having been a participant in the transition from horse to helicopter (via the Marmon-Herrington combat car — Harley-Davidson route) I feel qualified to suggest to junior leaders (and some not so junior) that the duty of all of us is to maintain mental mobility. With the spirit and traditions of the mobile arm backing us, and an open-minded, flexible approach to problems, all that is needed is to remember "mobility is a state of mind."

COLONEL PRESTON BRAND

ARMOR *believes that its pages reflect the mobile minds of the members of the mobile branch whose mobile pens produce stimulating thoughts for other mobile minds and so on full circle. This dynamic cycle is what* ARMOR *is all about. Its driving force is* you *who give of your selves and substance to support it.* THE EDITOR

From The Newest

Dear Sir:

Thank you for your welcome to the *Women's Army Corps Journal.* Although many problems beset us, we have published. I hope that some day

we will be able to match your magazine in excellent copy and layout.

We will be very happy to place you on our exchange list. Times are lean, but we think we can manage.

The youngest professional journal accepts with pleasure the good wishes of the oldest.

ANN J. PREVITO
LTC, WAC
Managing Editor
Fort McClellan, Alabama

A Dragoon Battle

Dear Sir:

Thank you for your recent letter with an enclosed copy of *ARMOR* Magazine, which was prompted by George Bradford's comment in *AFV News.* You may rest assured that this was a very sincere, well-deserved compliment.

ARMOR is well known to me since it is a familiar sight in the Officer's Mess of most Royal Canadian Armoured Corps units. It appears regularly in most of our military libraries, as you must be well aware, including the Canadian Land Forces Command and Staff College. The magazine is held in very high regard; in fact, in our Mess there is literally a battle to be among the first to read each edition.

G. D. SMITH
Major, The Royal Canadian Dragoons
CFB Gagetown

Should the casualty rate become unacceptable or the standards of decorum in the mess be lowered to intolerable depths, we would happily accept additional subscriptions. In any event, our thanks for this further evidence of the warm relationship between Canadian Armour and US Armor. THE EDITOR

Sensing?

Dear Sir:

Upon my return from Vietnam, I was assigned to the 3d Battalion, 3d Artillery, 194th Armored Brigade. I was fortunate enough to command Battery B for nearly a year and then moved to the headquarters, where I served as the Battalion S3.

Shortly after arriving in the Brigade I decided that *ARMOR* would be a wise investment, as it would keep me well-informed about the arm with which I was in daily contact. I assumed that I would be a moderately short-term scholar of the Armor methodology, and then would revert to my Artillery-oriented studies.

Not so! Although I am — and most certainly will remain — a proud Redleg, I am presently attending the Armor Officer Advanced Course at Fort Knox. Three theories have arisen concerning my attendance at the Armor School: (1) you really are desperate for memberships and just couldn't let a "live one" go; or (2) Artillery OPO discovered my subscription to *ARMOR* and expelled me from the chosen flock; or (3) my next assignment will be Fort Sill, where the Field Artillery School will conduct a thorough and extended anthropological debriefing following my isolated tour with the "yellow scarves."

No matter the rationale; I have found your magazine to be extremely interesting and informative, and welcome the opportunity to study Armor tactics in the Armor School — of which you are justly proud. I am forwarding my check for another year's membership in the Armor Association and another six issues of *ARMOR* magazine. Keep up the excellent work; I may yet become a permanent Armor, or *ARMOR,* scholar.

RICHARD W. FOX
CPT, FA
Fort Knox Kentucky

We too have three theories: (1) this is an example of Sun Tzu's injunction to "Know Thy Enemy" in action; or (2) we have been had for only a $6.50 outlay; or (3) here is real direct support reminiscent of the line from "The Caisson Song" which goes "Boot to boot with the Cavalry . . ." In view of the number of good Field Artillery supporters we have, including three former Armor Association presidents, it must be that (3) is the correct choice. THE EDITOR

1970 annual association meetings

1st Armored Division: August, Miami
John W. McNutt, 12 Greymore, Chesterfield, Mo 63017

2d Armored Division: 13-16 August, Long Beach
Colonel R. F. Perry, Box 8116, Wainwright Sta., San Antonio Tex 68208

3d Armored Division:
Paul W. Corrigan, 38 Exchange, Lynn, Mass 01901

5th Armored Division: 6-8 August, Boston
Mrs. Claire Watrous, 8549 Lowell, St. Louis, Mo 63147

6th Armored Division: 22-25 July, Charlotte, NC
Edward F. Reed, Box 492, Louisville, Ky 40121

7th Armored Division: 13-16 August, Albany
Irving Osias, 147-28 72d Road, Flushing, NY 11367

10th Armored Division: 4-7 September, Augusta
E. L. Loiacono, Box 1025, Langley Park, Md 20787

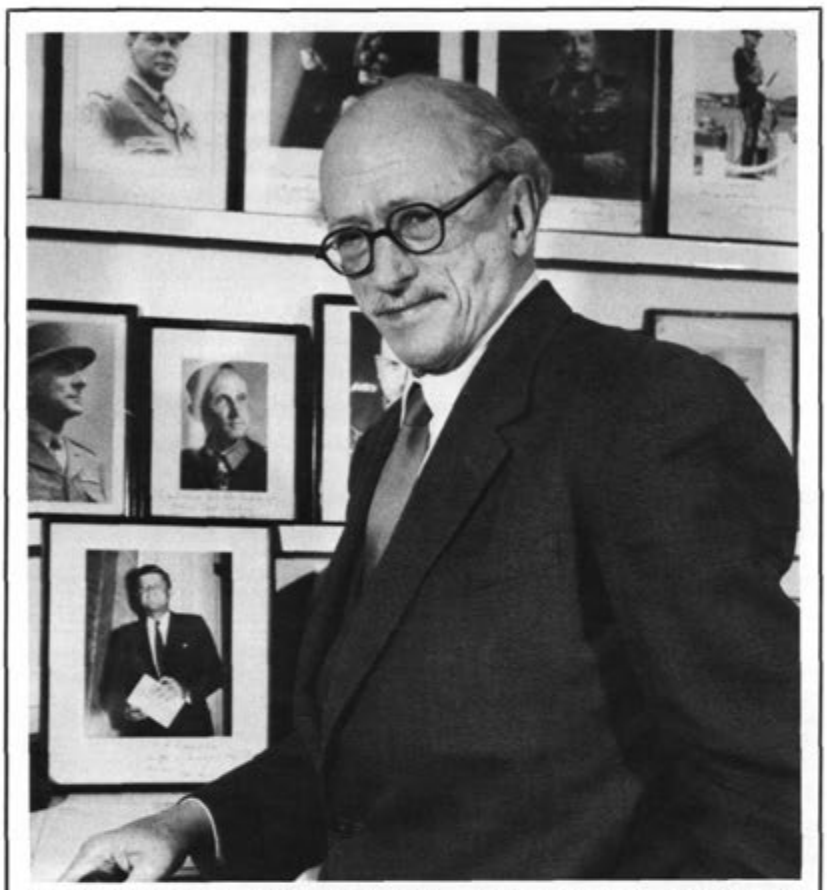
11th Armored Division: 12-15 August, Philadelphia
Raymond S. Buch, Box 108, Pittstown, NJ 08867

12th Armored Division: Myrtle Beach
Harold J. Hendricks, Box 176A, Rt 2, Maple Park, Ill 60151

14th Armored Division: 24-26 July, Ft Smith
Harold L. Denny, 816 E 28th, Des Moines, Iowa 50317

16th Armored Division: 7-9 August, Louisville
Lester Bennet, 5820 Recamper Drive, Toledo, Ohio 43613

1st Cavalry Division; 13-16 August, Boston
Alfred E. Stevens, Box 11201, Albuquerque, NM 87112



CAPTAIN SIR BASIL LIDDELL HART

31 October 1895 -- 29 January 1970

". . . . . It must be considered that there is nothing more difficult to carry out, nor more doubtful of success, nor more dangerous to handle, than to initiate a new order of things. For the reformer has enemies in all those who profit by the old order, and only lukewarm defenders in all those who would profit by the new order, this lukewarmness arising partly from fear of their adversaries, who have the laws in their favor; and partly from the unreliability of mankind, who do not truly believe in anything new until they have actual experience of it. Thus it arises that on every opportunity for attacking the reformer, his opponents do so with the zeal of partisans, the others only defend him half-heartedly, so that between them he runs great dangers."

Of all the statements made in "The Prince" by Niccolo Machiavelli, this one surely must apply to Captain Sir Basil Liddell Hart, who died at his home in Marlow, England on January 29, 1970, at the age of 74.

Like every genuine reformer, Sir Basil's weapons were truth and imagination and the ability to express both in clear, unmistakable language. The urge to reform stemmed from his personal experience with war and how it had been conducted when he was exposed to it during World War I. The occasion of the 50th anniversary of the beginning of that war was marked by the National Broadcasting Company in a Sunday television program in 1964. The program reproduced short comments about the war by Captain Eddie Rickenbacker, André Maurois, Erich Maria Remarque and Captain Liddell Hart. In a few quiet words, Liddell Hart consciously or unconsciously expressed what lay behind his many years of writing about war and its conduct.

He recounted that he had left Cambridge University

by Colonel Robert J. Icks, AUS-Retired

to enter the British Army and that he had been the senior second lieutenant of a group of other second lieutenants sent to France as replacements during the bloody Somme offensive in 1916. One week later, nine were dead, two had been wounded and he was left as the acting battalion commander at the age of 21.

In that brief account he described World War I. As a sensitive man and the son of a Methodist minister, it was to have a great effect on his life.

He later was wounded, became a captain and served in the Ypres salient. In July, 1918, he was badly gassed and was sent home. While convalescing and later while training replacement troops, he developed a new battle drill system which was officially adopted. A staff appointment after the war led to his writing the first post-war infantry training manual. Ill health caused his partial retirement in 1924 and full retirement in 1927 but he had begun writing for publication several years before. Sparked by the writings of Colonel (later General) J. F. C. Fuller, he became interested in the application of armor to warfare.

Fuller at that time was advocating an all-tank army, a sort of land navy. Liddell Hart had given much thought to war in general and to World War I in particular. He modified Fuller's ideas into a balanced force which he called "The New Model Army." As his theories developed he came to propose "tank marines" for Fuller's land navy, the use of airborne troops for what he called "the vertical envelopment," the close cooperation of air and armor, the improved mobility that might be obtained with all-tracked armored units and a shorter "division tail," and the tactical advantages of the narrow front deep penetration attack.

He had become military correspondent of *The Daily Telegraph* in 1925 and continued to be persona grata at the War Office until 1927 when he began to point out the poor manner in which the Experimental Armored Force was being developed and the "rigged" maneuvers in which it was being used. From then on his views no longer were welcomed but his reputation as a military theorist and historian grew.

In 1935 he became military correspondent of *The Times* of London. Two years later he became unofficial advisor to Leslie Hore-Belisha, then Secretary for War, during whose term of office many improvements in military posture were made. Liddell Hart grew in stature and importance; and his studies, his associations, the events of the times and his original thinking led him from tactics to strategy and finally to grand strategy.

He thought seriously about serious problems. He struck out at mass slaughter conducted as though it were war and against its masquerading as military art. He studied war, its causes, its conduct, its results — not because he was a militarist but because he was a realist. For years he opposed senior British officers who continued in the belief that horse cavalry still remained important in warfare. He consistently criticized complacency and the preference for the comfortable rather than facing up to unpleasant truth. He believed in mobility and flexibility of mind as well as in tactics and felt that armor was the key to wars of the future because it encompassed both. Some of the things he said to stir up controversy were hardly calculated to make friends in high places. For example:

> "There are over two thousand years of experience to tell us that the only thing harder than getting a new idea into the military mind is to get an old one out."
>
> "It is a military convention that infallibility is the privilege of seniority."
>
> "Speed may be either of movement or mind."
>
> "A boxer who uses his intelligence . . . aims to strike a decisive blow as early as possible against some vital point — the jaw or the solar plexus — which will instantly paralyze his opponent's resistance. Thus he gains his object without himself suffering seriously. Surely those responsible for the direction of war might be expected to use their intelligence as much as a professional pugilist."
>
> "When a man has climbed, by hard effort, to a ridge from which he gets a fresh vista — if only of further ridges ahead — he will usually find, when he tries to tell of it, that those who have remained contentedly in the valley insist that there is nothing beyond what they can see."

During this period, Liddell Hart's column in *The Times* pressed for greater emphasis on armor, on training methods and on antiaircraft defenses. But his efforts developed fierce opposition in the Imperial General Staff and later in the Cabinet. Eventually his relationship with Hore-Belisha was dissolved and a change in policy at *The Times* caused that relationship to be broken off.

He repeatedly had pointed out that an invasion of France by Germany not only was possible through the Ardennes but was probable. Such views were not well received in France. In England, they were seconded by Hore-Belisha and, as Liddell Hart stated in his *Memoirs*, ". . . became an important factor in his [Hore-Belisha's] ejection from the War Office — four months before they were proved correct."

For a time in 1939, Liddell Hart was associated with Winston Churchill but they disagreed on policy. Controversy, a heart attack and hurt from the criticisms he had received, together with the inability to be allowed to tell the truth as he saw it, caused him for a time to go into seclusion. But, in 1941 he began writing for *The Daily Mail*, covering the war critically and analytically.

In spite of his considerable literary output, he was no recluse. He liked people and enjoyed exchanging

ideas with them. His correspondents, military and civilian, were many, and covered the globe. Some agreed with him and some disagreed. There were both kinds in the United States, some of whom were in a position to blend theory and practice. Among these was the late Major General John S. Wood, who commanded the 4th Armored Division in 1944. General Wood was a correspondent of long standing. In 1948 he commented to Liddell Hart on events of 1944, saying:

> "There was no conception of far-reaching directions for armor in the minds of our people. . . . First Army could not react fast enough. When it did react, its orders consisted of sending the two flank armored divisions back 180 degrees away from the main enemy, to engage in siege operations against Lorient and Brest. August 4 was that black day. I protested loudly and violently, and pushed my tank columns into Chateaubriant, without orders and my cavalry to the outskirts of Angers and along the Loire ready to advance on Chartres. I still believe I could have been in the German vitals in two days. . . . One of the colossally stupid decisions of the war — and most costly in results. . . ."

Liddell Hart continued writing after World War II. *The Tank: The History of the Royal Tank Regiment* was a commissioned work which taxed his strength because of the problems of satisfying a committee and cost him income because of the time it took from his other efforts. His *Memoirs* were published in 1965. Here he could be more free and yet, because he had become more philosophical, these are remarkably objective and an invaluable source of information for the student of the evolution of armor theory. There were other books as well as lectures in Europe, in Canada, in the Middle East and in the United States. His monumental history of World War II had just been completed before he died and has not yet been published.

He was awarded the Chesney Gold Medal in 1963 together with General Fuller, given by the Royal United Services Institution "for furthering the fostering of military literature and military thought," joining the company of such distinguished people as Maurice, Fortescue, Oman, Swinton, Spenser Wilkinson and Winston Churchill. He was given the honorary degree of D.Litt. by the University of California, Davis, where he held a chair in the Department of History in 1965 until a sudden illness requiring surgery took him back to England. It was a long time before he received the official recognition he deserved but that occurred when he was elevated to knighthood in 1966.

Liddell Hart was on a first name basis with the great and the near great in many countries but he never lost the common touch. He was both a gentleman and a kind, gentle man. At the conclusion of a piece I wrote about him in 1952 I said, in paraphrase: "His ideas may not always be palatable but he hoped to make others think, to spark other minds to think, negatively or positively, but to think. One was either for him or against him. One could not remain neutral — and that appeared to be the way he wanted it."

Sir Basil leaves his wife, Lady Kathleen, and one son by a former marriage. His library was bequeathed to Kings College, London. It includes the documents left him by Chester Wilmot, the war correspondent and historian who was killed a few years ago in an air crash near Rome. Liddell Hart corresponded with statesmen as well as civilians and military men all over the world. This correspondence, together with other documents and newspaper clippings forms part of this library. In bequeathing it, he was as generous in death as he was in life. *The Times* reported Kenneth Parker, a director at Cassell, his publisher, as saying: "I don't believe any student arrived at the house to be turned away; they were given a free run of his library. Often a student turned up for an afternoon and stayed three days. He was above all tremendously kind, always prepared to read interminable theses."

As time goes by it will become easier to measure the overall impact of Liddell Hart not only in the military thought but also on the history of our times. In this connection, the February issue of *Army* carried an advertisement announcing the indexing by computer of the "most pertinent concepts in order of importance" of Karl von Clausewitz "On War." Much of Clausewitz is dated. This is not true of Liddell Hart. I predict that the time will come when his concepts will be given similar stature and be similarly catalogued.

COLONEL ROBERT J. ICKS, AUS-Retired served in the Army as an enlisted man in World War I. Upon graduation from Ripon College in 1927 he was commissioned in the Infantry Reserve. During World War II, he served as a colonel in the Ordnance Department. A lifelong student of and writer on armor, Colonel Icks first corresponded with Sir Basil Liddell Hart in 1928. Thereafter a discerning and fast friendship arose between the two scholars of mobile warfare. About a 1952-word profile of himself which Colonel Icks had written for *ARMOR*, Sir Basil is reputed to have said that it was the closest thing to the real Liddell Hart he had ever read.

L'ENVOI

Readers of *ARMOR* will want to know that the United States Armor Association was represented at the final rites for Sir Basil Liddell Hart by Colonel James O. Doulton, the senior member in Great Britain. In a letter to Lieutenant General W. H. S. Wright, Association President, Lady Kathleen Liddell Hart thanked the Association for its remembrance of Sir Basil and stated "He so enjoyed his association with his armor friends in America."

Proponency of Aerial Fighting Vehicles

By Lieutenant Colonel Carl M. Putnam

Late in 1968, the US Army Combat Developments Command proposed that proponency of Army aerial fighting units be assigned within the established roles of the Armor, Infantry, and Field Artillery arms. While this proposal has not been implemented, it is an excellent idea that fits in fully with the spirit of the Army's airmobility concept. In this airmobility concept the Army does not use aerial vehicles to perform new functions but rather to provide a better way to accomplish traditional Army missions. Thus, total integration of aviation into the Army is the proper appproach and should be the final objective. With senior non-aviator officers gaining aviation expertise in Vietnam, there is little reason for separate aviation units and staffs since Armor, Field Artillery, and Infantry officers are fully familiar with the functions and employment of Army aviation. Still, the concept of aerial fire support falling exclusively within the area of Field Artillery proponency continues to be heard.

This discussion is limited to the attack helicopter, or gunship. The escort, reconnaissance, and direct aerial fire support role of the gunship has been proven in Vietnam. Recent studies identify the potential of the attack helicopter as a lethal antitank weapon with Armor's inherent characteristics of mobility, firepower, shock effect, responsiveness, and even armor protection in the case of the *Cheyenne*. The attack helicopter can be as revolutionary to the maneuver element as the tank when it was first introduced into the Army. Yet, there appears to be strong support to assign gunship proponency to the Field Artillery to form part of the base of fire. This support for Field Artillery proponency seems to be based on misconceptions about fire support, the need for fire direction control in the battle area, and the success of aerial rocket artillery in our airmobile divisions.

MISCONCEPTIONS

Fire support is not the exclusive domain of Field Artillery. It runs the gamut from the *M16* rifle to nuclear weapons. For example, one Infantry fire team provides fire support for movement of the other fire team within the squad. The same fire support technique is used by tank sections and platoons. Likewise, a Field Artillery battalion provides a base of fire for a maneuver battalion. Traditionally, direct fire has been the role of Infantry and Armor, the two arms that close with and destroy the enemy. Indirect fire (base of fire) is the role of Field Artillery which seldom, never intentionally, closes with the enemy. Direct aerial fire support is not akin to the latter, but possesses attributes of both. To illustrate this, consider that aerial weapon units may be organic, attached or under operational control of the unit receiving supporting fires, while Field Artillery doctrine stresses direct or general support. Herein lies the danger of this misconception gaining wide acceptance. The artillery fire support coordination center could veto the ground commander's request for gunships in favor of another weapon.

The direct aerial fire support provided by Army attack helicopters is integrated into the ground tactical plan and is controlled in a manner similar to that for other Army weaponry. The gunship is part of the maneuver force (except in the aerial artillery of the airmobile division) and is not normally part of the base of fire formed by artillery, naval gunfire, and close air support. Ideally, the maneuver force would move in mass to the objective. However, should the base of fire fail to neutralize the enemy, then fire and movement must take place within the maneuver force. A distinction is made between "fire and maneuver" and "fire and movement" to emphasize that attack helicopters, like tanks, close with the enemy and are not normally a part of the base of fire. Incidentally, the fact that gunships are a part of the maneuver force also highlights a major difference between direct aerial fire support, which takes place within the maneuver force, and Air Force close air support which is part of the base of fire.

The use of artillery fire request channels to obtain the support of attack helicopters is a necessity only if they are controlled and allocated by the Artillery. It is a complex and time consuming method of obtaining what is more readily available through attachment or operational control. The use of artillery fire request procedures could destroy much of the responsiveness that has made the gunship such an important weapon for the ground commander.

The argument has been advanced that a commander is too busy to coordinate this major weapon

system. This seriously underestimates the ability of our commanders. It is inconceivable that a commander, who already has a microphone in his hand, would prefer to turn to the artillery forward observer to request aerial fires from aircraft that he can actually see flying overhead. There is no doubt that close coordination with artillery cannons and missiles is required but this is true for all elements controlled by the maneuver commander and not just attack helicopters. Excessive radio traffic on the command net is often used to support the Field Artillery argument but this traffic can easily be eliminated by either net discipline or the use of two FM radio nets. In fact, such procedures are used routinely when Armor and Infantry units are cross reinforced. At any rate, the method of communication should not dictate combat arms proponency.

There is no argument about the success of aerial rocket artillery in the airmobile divisions. However, in the light of today's equipment, the precedent established by the two current aerial rocket artillery battalions appears to have the aura of a tactical expedient pending development of a true aerial artillery capability. The functional parallel between attack helicopter fire and artillery fire is less convincing than the parallel between attack helicopter fire and that delivered by tanks, recoilless rifles, and other direct fire support means integrated and coordinated by the maneuver unit commander.

PROPONENCY OF ATTACK HELICOPTERS

The attack helicopter is a major weapon analogous to the combat vehicle and, with its crew, is an integral part of the combined arms team. The variety of armament subsystems available for the gunship facilitates tailoring the weapon system or unit to meet the mission requirements of all three combat arms. However, as part of the maneuver force, the gunship has the potential to drastically alter our current tactics. Yet, the available evidence is apparently being ignored and a serious error in assigning proponency may be made.

Let me illustrate this fear. Witness the 20 initial years of assigning the US Army tank to the Infantry. The mobility of the tank was tied to the pace of the infantryman. As late as 1935, many officers felt that the attempt to fit tanks into new roles was a waste of mobility and sheer suicide. Yet the infantry tanker could not devise a method by which a 30-mile per hour tank could be held to less than 5-mile per hour movement. After years of opposing the armor concept, motorized infantry divisions were finally formed in 1943 for the primary purpose of supporting armored forces.

Proponency is and must be based on demonstrated and continuing need, branch-peculiar expertise, and efficiency in employment. The demonstration of continuing need should not be contrived or artificial. It should clearly establish that proponency is necessary so that the branch can perform its mission better. For example, Infantry is the primary user of personnel carriers and troop lift helicopters. A real, continuing need exists for the Infantry to control those vehicles so that Infantry can better perform the Army mission. In that regard, airmobile companies should be designated Infantry units.

ARTILLERY

Aerial artillery support is extremely critical in airmobile operations outside normal artillery range. These fires are normally integrated into the fire support plan and obtained through normal fire request channels. Nevertheless, as a direct fire, point target weapons system, the attack helicopter cannot accomplish the classic artillery mission of delivering heavy tonnages of sustained area fire. The gunship can fill only partly such an artillery mission in delivering a concentration of explosive rockets on a specified area at a specified time. This is a useful capability only when tube artillery is not in range. Thus, at best, the gunship is only an expedient substitute for artillery. There is no obvious gain in efficiency of employment when attack helicopters are controlled by the Field Artillery. The opposite, in fact, would appear to be true since a veto authority is introduced between the supported commander and his gunships. Attack helicopter fires are expedient fires that respond to the reflexes of their own crewman. As a practical matter, the artillery fire support coordination center cannot control helicopter fires once the helicopters are committed.

In summary, there is no identifiable branch-peculiar expertise, relatable to Field Artillery, in the employment of attack helicopters as aerial fire support. On the other hand, the Army does not have an aerial artillery weapon. Therefore, as an interim solution when aerial units with direct fire weapons replace ground artillery as in airmobile divisions, these units should be designated Field Artillery.

Finally, to place the Army's aerial fire capability under the Field Artillery branch would play into the hands of the tactical air advocates. Attack helicopter command and control would truly be analogous to current Air Force close air support. Equipment

would be in units closely resembling Air Force squadrons, the manner of requesting fire support would be parallel to present air support request procedures, and the mission to provide a base of fire would be similar. Carrying the analogy further, the ground commander would not have direct control of the gunships since the artillery commander would be able to veto a gunship request in favor of another weapon system. If we do separate the gunship from the commander, the Air Force is waiting in the wings to say, "I told you so." The logical way to counter Air Force objections to the airmobility concept is to integrate attack helicopter units both doctrinally and organizationally into existing combat arms which are responsible for the primary function for which the attack helicopter unit was assigned in the force structure. For example, an attack helicopter company with the primary role of antiarmor would be absorbed into the Armor branch. The Air Force could ill afford to object to an Armor unit that performs an armor mission. The same precept would apply to Field Artillery.

ARMOR/CAVALRY

The role of armor is not dependent upon a piece of equipment any more than the cavalry concept is tied to the horse. Traditionally, Armor is the branch of mounted combat which maximizes firepower and mobility. The armor force fights mounted in ground or aerial vehicles which are the principle means of accomplishing their land force mission. Since its inception, Armor has had the primary mission of antiarmor and should retain that responsibility whether using a tank or an attack helicopter.

The versatile gunship combined with the lethality, range, and accuracy of TOW missiles is capable of affecting the entire nature of armor warfare. The helicopter unit can be given an independent mission during the penetration to attack enemy forces moving to counterattack. Furthermore, it can exploit the gains of a successful penetration, cover withdrawals or disengagements, maintain continuous contact with the enemy during a delaying action, serve as a striking force, or block an enemy penetration. In short, the gunship, like the tank, is excellent for independent, antiarmor, and economy of force missions. Its effectiveness is greatly enhanced by its ability to react rapidly and to handle a large number of tasks on a mission basis.

In the escort mission, the attack helicopter is most essential in support of troops during the movement to, and assault of, enemy objectives. The escort helicopter in a role similar to that of the tank, protects the troop carrier in hostile areas, greatly increases firepower in the assault, and then provides antiarmor fires during organizational phases of the operation. The attack helicopter can also give early warning and engage any force threatening the assault unit.

The reconnaissance and security mission encompasses a specialized attack helicopter role which requires the gunship to provide firepower for developing the situation once the enemy has been located. Additional firepower is required to delay the enemy long enough for the main force commander to react to the threat. This is the specialized role of cavalry.

CONCLUSION

Proponency must be assigned based on the primary mission of the attack helicopter unit so that the branch expertise required to execute that mission can be utilized. While the various weapon subsystems available for gunships would allow the attack helicopter to accomplish missions for each of the three combat arms, it is least suited for artillery missions and best suited for the role of armor where firepower, mobility, responsiveness, and shock effect can be maximized.

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ADVANCES in Missile Armed Vehicles

by Richard M. Ogorkiewicz

Guided missiles have often been claimed to spell the doom of armor. However, claims of this kind generally prove to be based on a totally erroneous concept of tanks. To be precise, they stem from the false assumption that the value of tanks depends primarily on their armor protection. This inevitably leads to pessimistic conclusions about their future because antitank guided missiles can perforate any practicable thickness of armor.

Armor protection is not, however, the only or even the primary characteristic of tanks. What is far more important, of course, is their ability to make weapons more mobile and, therefore, more effective. In other words, tanks and other armored fighting vehicles are essentially mobile ground weapons platforms. As such they do not depend for their effectiveness on being invulnerable — which they have never been anyhow.

On the other hand, the development of guided missiles is bound to exert an important influence on tank design. It has already led to much questioning of the relative importance of armor in the design of tanks. So too, it has offered an alternative to guns as tank armament, which has made possible the development of new types of combat vehicles.

Some of the possibilities offered by the development of guided missiles are already well known, having been exploited in several armored vehicles. There are, however, others which are still relatively unknown and which deserve attention. This applies in particular to the armored vehicle missile installations developed recently by Nord-Aviation, the French company which has led in the missile field for so many years, and its German partner the Messerschmitt-Bolkow-Blohm company.

The earlier achievements of Nord-Aviation and Messerschmitt-Bolkow-Blohm were described by the writer in "Missiles for Armor" in the January-February 1969 issue of *ARMOR*. More recent developments can be divided into four categories, the first of which consists of very light missile-armed vehicles.

LIGHT MISSILE-ARMED VEHICLES

One well-known advantage of guided missiles is that they do not impose recoil loads when being fired. This has opened up the possibility of developing very powerfully armed and yet very light combat vehicles. This opportunity has already been widely exploited by the mounting of antitank guided missiles on various light armored vehicles and even jeeps. However, all the early installations of this kind have been of a makeshift nature. To overcome the shortcomings of these, and to produce a more effective type of light missile-armed combat vehicle, Nord-Aviation has developed a special *NA2* turret suitable for installation on a wide range of armored hulls.

The *NA2* is a one-man turret which contains all the missile firing and control equipment associated with the *SS11* antitank guided missile system. In particular, the latest development of this system, with *SS11B1* missiles and automatic guidance (TCA), contains not only the aiming sight but also, mounted directly above it, the infrared tracker. The latter has a large field objective for the acquisition phase of the missile flight and a narrow field objective for the sustained flight phase. The TCA system requires the missile operator only to keep the cross hairs of his sight on the target and relieves him of the need to "pilot" the missile to the target. Because it greatly reduces reaction time, the TCA also shortens the range from which the missiles can be used. Furthermore, it reduces dramatically opera-

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Figure 1. ELC with NA2 turret firing SS11 guided missile.

tor training time. However, under some battlefield conditions it is advantageous to revert to manual missile control (TCM). Provision for doing this, if necessary in flight, is incorporated in the *NA2* turret.

The missiles themselves are mounted externally, at the sides of the turret. Originally the *NA2* turret was designed to mount two *SS11* missiles and its original version is shown in Figure 1 installed on an *Engin Leger de Combat,* or *ELC*. The *ELC* is an experimental, low-silhouette, two-man combat vehicle designed to mount either two 30mm rapid-fire automatic cannons or a smoothbore 90mm antitank gun with an automatic loader. Both alternative gun installations are mounted in an oscillating turret which in the missile-carrying *ELC* is replaced by the more conventional *NA2* turret.

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The *NA2* turret has now been developed further to mount four *SS11* missiles and two 7.62mm machineguns. As an alternative, the pair of *SS11* launchers on either side of the turret can be replaced by a single launcher for the much more powerful *SS12* "artillery" missile. This possibility is illustrated in Figure 2, which shows a Panhard *AML* armored car with a *NA2* turret having two *SS11* missiles on one side and a single *SS12* missile on the other.

At 10,000 pounds the *AML* is even lighter than the 19,000-pound *ELC*. In relation to its size, it is a very powerful armored vehicle. The 90mm gun version of the *AML,* described by the writer in the article "Panhard Armored Cars" in the November-December 1967 issue of *ARMOR,* represented a significant step forward in the development of very light but well-armed armored vehicles. However, the *AML NA2* missile-armed version marks a further important step forward in the direction of increasing the mobility of armor without sacrificing its striking power.

SUPPLEMENTARY MISSILE ARMAMENT

The second significant development is represented by the mounting of the Franco-German *HOT* antitank (Figure 3.) For several years, some of the *AMX13s* used by the French Army have been armed with *SS11* missiles in addition to their standard high-velocity 75mm guns. Moreover, the *AMX13s* with *SS11* missiles have now been modified with the *TCA* automatic guidance system replacing the original manual missile control, (*ARMOR,* January-February 1969). In view of this, the latest development might appear to amount to no more than the replacement of the *SS11* by the *HOT* missile.

In fact, the mounting of the *HOT* missile on the *AMX13* in place of the *SS11* represents a significant advance. First, the *HOT* is a second-generation missile which is much more compact than its predecessor. As a result, the *AMX13* can mount six *HOT* missiles instead of only four *SS11s*. Even more important, the *HOT* missiles are mounted well-protected in clusters of three on either side of the turret. This is in marked contrast to the more vulnerable installation of the four *SS11* missiles at the front of the turret.

The installation of *HOT* missiles on the *AMX13* clearly indicates the attractive possibility of fitting

Figure 2. Panhard AML with NA2 mounting two SS11 and one SS12.

BOLKOW GMBH

Figure 3. AMX13 light tank with a cluster of three HOT missiles on each side of turret.

missiles in detachable weapon pods as supplementary tank armament. This method of using missiles on tanks has several advantages over the alternative adopted, for instance, in the *M551 Sheridan* where the gun and missile systems are permanently combined in the form of a gun/launcher. First, any gun/launcher inevitably represents a compromise between the requirements of the gun and of the missile. The separation of the gun from the missile launching system makes it possible to make its design more efficient. Secondly, the missile system is not needed on all the vehicles of a particular type at all times and the mounting of missiles in detachable pods makes it possible to leave them off when they are not required. Yet this can be done without compromising the multi-mission capability of a given vehicle since the missile pods can always be fitted when required.

The installation of missiles in detachable weapon pods, separate from the gun armament of tanks, can therefore result in a high degree of operational flexibility and economy, which the gun/launcher alternative cannot match.

MISSILE-ARMED TANK DESTROYERS

The third noteworthy development is that of the German *Jagdpanzer Rakete*. Like the *AMX13*, the latest version of this missile-armed tank destroyer has been equipped with the *HOT* missiles developed jointly by Nord-Aviation and Messerschmitt-Bolkow-Blohm.

The original vehicle of this type, the *JPz 3-3*, which is currently in service with the German Army, is based on the *HS30* armored personnel carrier and is armed with *SS11* missiles. The new model has also been armed with *SS11* missiles but it is based

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Figure 4. Latest version of the Jagdpanzer Rakete with a HOT missile raised to its firing position.

on the *SPz (neu),* the new armored infantry combat vehicle which is now going into production for the German Army and which will eventually replace the *HS30* carriers (*ARMOR,* January-February 1970). In its latest form, however, the new *Jagdpanzer Rakete* is armed with *HOT* instead of *SS11* missiles (Figure 4).

The basic concept of a special-purpose missile-armed tank destroyer which is behind the development of the *Jagdpanzer Rakete* is no longer new since several vehicles of this type are already in service. The *Jagdpanzer Rakete* with *HOT* missiles is, however, the most sophisticated example developed so far of this type vehicle. Moreover, it incorporates some particularly noteworthy design features. In particular, it has an improved version of the missile launch system introduced on its predecessor, the *JPz 3-3*. This involves two retractable launchers which serve to lift the missiles from within the vehicle into their firing position well above the top deck. At the same time the sight and infrared tracker of the *HOT* missile system are built into a tall periscope. As a result, the *Jagdpanzer Rakete* can fire its missiles without exposing itself. During the crucial time of missile flight all that it needs to show above ground cover is the head of the periscope.

The solution adopted in the *Jagdpanzer Rakete* is therefore superior from the missile viewpoint to that represented by the gun/launcher of vehicles such as the *M551 Sheridan* and the *MBT70,* which have to expose their turrets to fire their missiles. What is more, they also have to keep their turrets exposed during the whole of the missile flight time.

The gun/launcher solution fails to exploit the important advantage of guided missiles which is their lack of recoil. This enables missiles to be fired from light launchers which, unlike guns, can be raised well above the top of armored vehicles. As a result it is possible for missile-armed vehicles to remain under cover even when engaging targets, just as the *Jagdpanzer Rakete* does. Its missile installation is therefore likely to serve as a model for other designs, not only of armored vehicles armed solely with missiles but also of others armed with guns as well.

ARMORED ANTIAIRCRAFT SYSTEMS

The fourth significant development is that of the *Roland* mobile antiaircraft missile system. Like the *HOT*, the *Roland* is being developed by Nord-Aviation and Messerschmitt-Bolkow-Blohm to meet a joint Franco-German requirement agreed to by the military staffs of the two countries in 1963. It is intended specifically for the battlefield defense of

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Figure 5. French version of the *Roland* antiaircraft system mounted on an *AMX13* type chassis.

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Figure 6. German version of the *Roland* system mounted on a prototype of the SPz *(neu)* armored infantry combat vehicle.

armored units against attack by low-flying aircraft. The complete system is mounted on an armored vehicle. This means that it is as mobile as other armored elements and can accompany them at all times.

In France, the *Roland* system has been mounted on an armored carrier based on the chassis of the *AMX13* light tank (Figure 5). In Germany, on the other hand, the *Roland* system has been mounted on a special armored carrier based on the chassis of the *SPz(Neu).* (Figure 6).

Except for the vehicles, the *Roland* system is basically the same in both cases. It includes a turret with the antenna of the surveillance and target acquisition radar and two missile-launching arms which can be reloaded automatically from the missile storage magazine in the vehicle. The magazine contains eight missiles so that, with the two missiles on the launcher arms, a *Roland* vehicle can launch as many as ten missiles before it needs to be resupplied.

Radar surveillance can be maintained continuously while the vehicle is on the move. Then, as soon as a target is identified, the vehicle stops and the firing sequence commences. The missiles are guided along the line-of-sight either by a semi-automatic guidance system using an infrared tracker in the *Roland I* clear weather version or automatically by means of a guidance radar in the all-weather *Roland II* version. In all cases, the weapon system crew consists of three men: the vehicle commander who selects the target, the missile operator who occupies the turret and the vehicle driver.

The development of the *Roland* promises to fill much of the dangerous gap which exists at present due to the many years' neglect of mobile weapons for the protection of armored units against ground attack aircraft and helicopters. Thus armored units have been deprived of effective organic antiaircraft equipment, even for very close defense which calls for antiaircraft tanks with rapid-fire automatic cannon. Yet the need for such equipment was clear as many as 14 years ago when the writer tried to draw attention to it in an article on "The Antiaircraft Tank" in the November-December 1956 issue of *ARMOR.*

At long last, however, the need for armored antiaircraft weapons is being recognized and this has already manifested itself in several recent developments. They include the installation of two 30mm automatic guns with radar control on the French *AMX13* light tank chassis and of two radar-controlled 35mm automatic guns on the chassis of the German Leopard battle tank.

The development of these antiaircraft tanks complements that of the longer-ranged *Roland* mobile missile system and promises to meet the urgent need of armor for effective organic antiaircraft weapons.

THE TRANSIENT SOLDIER AND ESPIRIT DE CORPS

by Captain James L. Olmstead

Frequent personnel transfers change rapidly the makeup of units within today's army. The one-year Vietnam tour has caused approximately 300,000 soldiers in Vietnam to be replaced at least once a year. This rotation, in conjunction with the absence of mobilization and the Army's other worldwide commitments, has resulted in a great amount of personnel turnover within Army units.

Commanders at all levels recognize that this personnel turbulence affects training of crews and squads, results in a frequent change of key individuals, and increases administrative work loads within organizations.

However, there is an additional adverse effect which is not as readily identified. The modern armor leader must recognize that in a unit consisting of transient soldiers, identification of individuals with each other and with the unit may be slight. The cumulative result is that esprit de corps, which cannot exist without a common identification with the unit, suffers.

The value of esprit de corps, the corporate loyalty and pride in a unit, must not be underrated. Esprit de corps is a common spirit which must be reflected by all members of a unit. It implies devotion and loyalty as well as a deep regard for the unit's history, traditions and honor. Esprit de corps is the very heart of an organization.

Throughout military history, esprit de corps can be identified as a force of considerable strength. In the Chosin Reservoir Breakout by the 1st Marine Division in Korea, and during the "Great March" by the armies of Mao Tse Tung, organizations which were tasked to their maximum were instilled with the will to fight and to win against seemingly insurmountable odds. Their sustaining force? To a great degree — esprit de corps.

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In many foreign armies, the problem of maintaining loyalty to a unit is alleviated by the close ties which exist between organizations and civilian communities. In the British Army, for example, regiments may be located in the same area for many years, and, traditionally, they recruit from the local population. Even before enlistment, a man may well have formed a close bond with his new unit.

After enlisting, the soldier becomes a member of an established organization within the community. And if he remains in the service, he can anticipate serving his entire military career in the same organization. In this case, the words "I belong to Company . . . !" have a special meaning, for this soldier truly "belongs" to his unit.

But what of loyalty and esprit de corps in our Army today? How can armor leaders faced with a turbulent personnel situation gain and maintain a high degree of individual and group identification and loyalty to their units?

Basic to the solution is of course, effective leadership. Individual, as well as group morale is directly related to the leadership exerted by the commander.

But given effective leadership ability, the proficient commander must still establish a definite plan of action to secure and hold the loyalty of his men to his unit. To fail to do so will ignore the disruptive effects which the current rapid personnel transfers have upon soldiers' identification with organizations. Consequently the drop in the level of esprit de corps is close to disastrous.

The commander must first direct a portion of his plan toward the new arrival. First impressions are important and will stay with the soldier. Furthermore, these affect many subsequent situations while he is with the unit.

A positive initial impression of a new unit will assist in forming a well-adjusted soldier. The new arrival who quickly fixes his loyalty to his new unit will not act as an isolated individual, but will be integrated into the established organization.

On the other hand, any degree of maladjustment which lingers for an extended period of time is certain to affect adversely the new soldier's value to the unit. His lack of becoming a part of the organization will not only affect him, but those around him.

In directing his plan toward the newly assigned soldier, the commander should lay down procedures

to be followed to speed the adjustment of the individual to his new unit.

Upon his arrival at the unit, the soldier must first be interviewed and briefed by the unit commander. This interview should be frank, honest, and to the point.

During the interview, the commander should gain as much information as possible about his new man. In gaining facts about the soldier's home, his family, and his background, the commander imparts to the soldier a feeling of being of importance and value to the unit. And the new man is left with the impression that in his new organization he is more than just a number.

After learning about the soldier, the commander next should fully brief the individual about the unit. He should outline its mission, past achievements and plans for the future.

The commander should then tell the man exactly what his job within the unit will be, and what performance standard will be expected. In doing this, the commander assists the soldier in finding his place within the organization. During this portion of the briefing, the commander must also establish within the individual a belief that his particular job is important, and that his talents will be a welcome addition to the unit.

Although on a platoon level, the briefing given by Lieutenant Robert F. Legg of the 572d Engineer Company in Vietnam, as reported in the June 1968 *ARMY* Magazine, expressed the tone which should be utilized in any commander's briefing. In his briefing, Lieutenant Legg said of himself and his men:

> "Besides being my men's supervisor, I must be their teacher, critic, advisor, and representative. I am here to help you solve your problems . . . I want my platoon to be the best platoon in the company, and I believe you do too. All of us must strive to make this possible . . . 'Best By Test' means that we prove we are the best by doing the best job. It means that in this platoon we stick together, back each other up, and kick the slacker in the pants . . . Let's have the best of teamwork and esprit. All that I have said boils down to one thing: do what's right! I will back you to the limit, and you will put out for me."

Lieutenant Legg was right. From the very start he established his position, the position of his men, and exactly what was expected from all concerned.

During his briefing, the use of a unit orientation booklet will assist the commander to instruct the newly assigned soldier properly. This booklet need not be elaborate or extensive. However, it must be prepared at unit level, and contain certain information as a minimum.

A distinctive cover page should make the booklet an eye catcher. Unit crests, armored vehicles, or other drawings relating directly to the unit are appropriate for the cover.

Inside, there should be a short history of the unit. If the unit has any awards, a short history of the action which earned the award will assist in building esprit de corps. Other facts appropriate for the unit history would be places of assignment, as well as information concerning unit insignia or patches.

Another valuable bit of information is the current operational vocabulary of the unit. Each organization has a host of terms and expressions of a semi-official nature which, although used every day, will not be found on any map, or in any official regulation. A list of these terms or expressions will enable the newly assigned soldier to know that a *TR* is a troop requirement in support of the Armor School, and that *Misery* is a hill and not a state of mind.

A list of special services, religious, and recreational activities as well as a map of the post, should also be included within the booklet.

Additionally, the unit should also include information of a current nature, appended to the booklet as additional pages. These pages can be updated as necessary and might include the names and positions of key individuals within the unit as well as information concerning the current *hot* command emphasis projects.

In preparing his orientation booklet, the commander must keep military security in mind, particularly when deciding whether to include list of names or maps within the booklets.

After the commander's briefing, the assignment of a sponsor to an individual is desirable to assist him in getting settled in the unit. The sponsorship program need not be elaborate, and can be tailored to meet the needs of each individual. Tasks assigned to a sponsor could range from assisting an unmarried private first class in drawing his field equipment to helping a platoon sergeant establish his family in quarters.

In assigning a sponsor, the unit leaders should choose an individual equal to or of higher rank than the newly arrived soldier. They should also insure that the sponsor is a person who will represent the unit well.

This sponsorship program has two specific advan-

tages. First, the newly assigned individual is made to feel that his welfare is important to the members of his new unit. And second, his processing into the unit is hastened.

Don't overlook the hometown news release program to assist you in gaining a man's loyalty to his unit. It is a rare person who does not like to see his picture in the paper or his name in print. Effective use of hometown news releases will form a bond between the individual soldier, his family back home, and his new unit.

In making up a hometown news release, don't be restricted to the form alone. Add additional information about the organization, and fit the new soldier into the story by describing the vital function which plays within the unit.

True, not all jobs appear on the surface to be exciting, but consider the following excerpts from possible stories.

> "In his duties as repair parts clerk, Specialist Jones is responsible for ordering, stocking, and issuing over 400 repair parts for the *M60* main battle tank. The total value of his parts inventory is about $9,000."
>
> "As a Field Army Support Command truck driver, Private First Class Brown will drive a 5-ton truck in the 100th Transportation Company, a unit which last month hauled essential supplies over 170,000 miles in the Republic of Germany."

Aimed at the local hometown papers, these stories make good news copy, and may be picked up and printed in full, especially if pictures are added. Don't think that all hometown news releases have to end up as half an inch in the *Where They Are Now* column on the back pages.

Assuming that we have properly integrated a soldier into his new unit, how do we maintain his loyalty? Again, there is no substitute for effective leadership at all levels. But, here are a few techniques that will assist in maintaining loyalty to a unit.

In building esprit de corps, the commander must first ask himself: "What makes our unit unique or better than the others?" The answer may be found in inspection results, a distinctive mission, or in the allocation of equipment. It might also be found in the unique and colorful histories enjoyed by many Armor units.

Armed with this answer, the commander can then form a large portion of his esprit building plan around this unique characteristic.

The commander's hour should be utilized to the fullest by including topics about the unit history. These classes may be supplemented by the use of Army historical films as well as discussions concerning the meaning of unit insignia and traditions.

The commander must also realize that to be proficient, the soldier must be informed. During the commander's hour, unit members should be brought up-to-date on all aspects of the current unit situation. The commander must insure that information concerning field exercises, inspection results, pass and leave policies and so on is rapidly and accurately disseminated. Unfounded harmful rumors cut into a unit's esprit de corps. These must be eliminated by presenting the straight facts inmmediately.

In carrying out a program designed to combat the adverse effects which the current personnel turbulence has on unit identification and esprit de corps, the commander must conduct a two-front campaign. He must aim a portion of his program at the new arrival, and the remainder at gaining and maintaining loyalty and esprit de corps within the unit as a whole.

The proficient commander in today's Army must look at his unit and ask himself the following question: "Do my men really 'belong' to my unit, or am I in effect, commanding a transient company?"

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Combined Arms Are Effective

AWARD WINNER

by Captain Larry D. Graves

ARMOR OFFICER ADVANCED COURSE 4-69

It was 1210, 13 May 1968 in Vietnam. The night was dark with no moon and high scattered clouds. Company B, 4th Battalion, 9th Infantry had had its LPs in position for about three hours. The eerie night was quiet except for the occasional rounds leaving the 105 and 155 howitzer tubes from Fire Support Base (FSB) Pike located northwest of Saigon. The artillery was supporting companies A and D which were about three kilometers to the northwest.

Company C was securing the eastern half of the FSB perimeter. Company B was on the western half where it had had constructed several strong line or perimeter bunkers and one company CP bunker. LP #1, LP #2, and LP #3 were located southwest, west, and northwest of the perimeter respectively. Two *M48* tanks from Headquarters Company, 2d Battalion, 34th Armor were reinforcing the B Company portion of the perimeter. The mission was to defend FSB Pike, three batteries of artillery, the 4/9 Infantry CP, and related field trains inside the FSB.

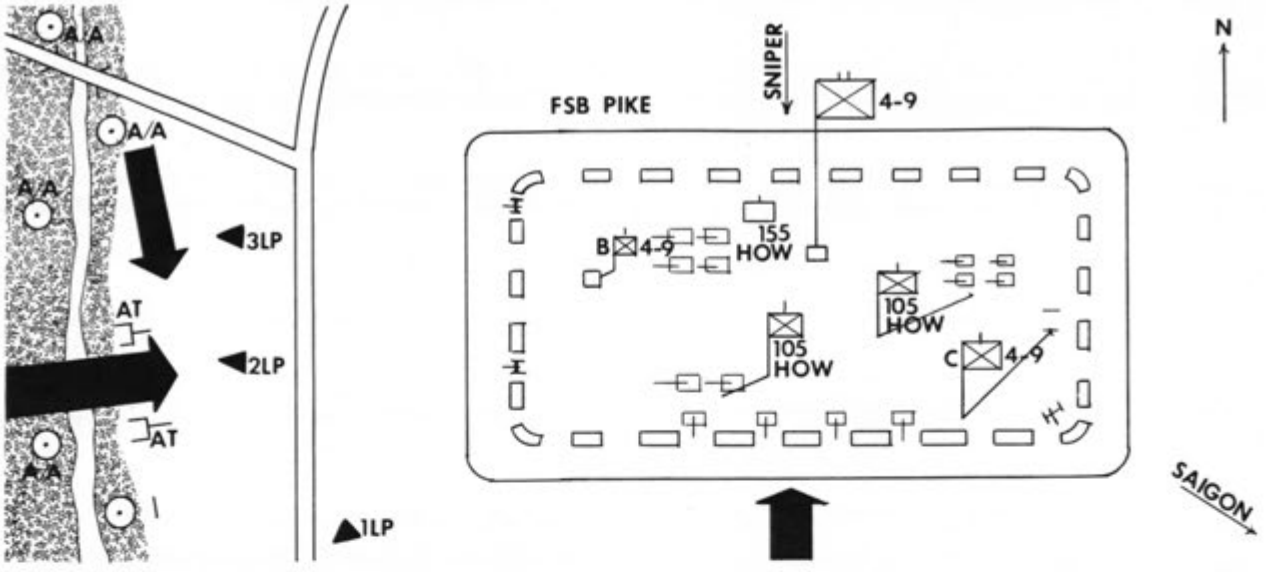
The company commander and executive officer were in the CP bunker working on resupply needs. Suddenly an *AK47* round came singing into the FSB from the north. The XO called LP#3 by radio to get the location of the enemy sniper. The men at the LP could not locate him. During the next 10 minutes, six more sniper rounds were fired into the FSB.

At 1225, LP #3 reported to the CP by radio that they were watching a platoon-size enemy force moving south, approximately 200 meters west of their position. The company commander had the supporting FO request artillery fire, and then reported the situation to the battalion CP. All elements of the company were alerted and made ready for what seemed inevitable. The enemy was going to attack.

The company CP then received a call from LP #1 that there was a lot of movement west and northwest of their position. In retrospect, the sniper rounds appeared to have been a diversionary tactic. The company commander requested permission from the battalion commander to bring the LPs in. Permission was denied momentarily as the LPs were needed to gather more intelligence on the enemy movement around the perimeter. In the meantime, the executive officer had been trying to get LP #2 on the radio, but to no avail. The first round of friendly 105 artillery and mortars left the perimeter approximately three minutes after the fire mission was requested. Those first rounds seemed to release a floodgate from the enemy.

An enemy 57mm recoilless round slammed into the perimeter between two of B Company's line bunkers. Then all hell broke loose! Enemy mortars, recoilless rifles, machineguns, and *B40* and *B41* rocket launchers were firing at an unbelievable rate. During the first minutes of the assault, over 200 enemy artillery and direct fire rounds landed on B Company's defensive position.

Immediately after the first enemy round landed,



the two tanks, in hull defilade, went into action. At first they fired their 50-caliber machineguns. The commander of the left tank then spotted flashes from two of the 57mm recoilless firing positions. Using his range card (with each location of each LP shown on it), he commenced firing his main gun. The tank commander stated later that he could look through his range-finder and see, with the help of flares, two enemy recoilless rifles firing. Thirty minutes after the first recoilless round landed in the FSB, the left tank destroyed both positions. Each tank continued to fire its 50-caliber coaxial machineguns and its main gun at targets of opportunity.

After the scale of the attack was realized by the company commander, he requested tactical air, an *AC47* flareship, and helicopter gunships. Within 20 minutes of the request, a flight of two jet fighters was orbiting overhead with the FAC. Directed by the ground commander, the FAC concentrated the tac air on suspected reinforcement and withdrawal routes. A gunship fire team arrived on station about the same time as the first fighters. Between flights of fighters, the gunships put effective suppressive fires on enemy targets.

The gunships and fighters must have been inflicting damage on the enemy because after the third or fourth fighter pass, five 51-caliber antiaircraft guns started firing at them. The tank commander in the right tank was elated because he could see three of the antiaircraft positions. He called the company CP requesting permission to fire at them. The company commander cleared this request with the battalion commander because of the possible danger of friendly fire to the fighters. Permission was granted. The right tank then silenced two of the five enemy antiaircraft guns.

Small arms fire began coming from the south and became more intense as the enemy started his ground assault. The 105 howitzer battery on the south side of the perimeter levelled their tubes and fired beehive rounds as fast as they could slam them into the chambers. The battery guns, with the help of the helicopter gunships, repelled the assault. The enemy left 17 dead on the perimeter wire and several beyond the wire.

About 0230, the company CP received a call from LP#1 that they had just killed two enemy forward observers and a radio operator. Shortly thereafter the enemy fire decreased considerably. By 0330, the incoming fire had stopped. At 0400, Company B requested and was granted permission to send out two platoons to the three LP positions to retrieve casualites. Upon reaching the LP #1 position, the platoons found that the LP team had had one man killed and one wounded seriously, and that the remaining two had slight shrapnel wounds.

When the platoons reached LP #2, they realized why the company had lost communications with it. Several enemy soldiers had surrounded and attacked the LP. The LP team members had held their fire until the enemy were upon them. In the ensuing firefight two had been killed and the remaining three had been seriously wounded. But, they had killed nine of their attackers.

LP #3 on the right weathered the fight in better condition than the other two. Its six men only had slight flesh wounds. The rest of B Company, on the perimeter had lost two men killed and 18 wounded.

At daybreak, B Company made a sweep of the battle area with five APCs, which were OPCON

from Headquarters Company, 2/34 Armor. It was found that the enemy had left 89 dead, two 57mm recoilless rifles with 23 rounds of unfired ammunition, seven *B41* and six *B40* rocket launchers, two Chicom machineguns, 34 *AK47* rifles, two 51-caliber machineguns, and enough ammunition to fill a ¾-ton truck with stake sideboards above the canvas cab. Information found in documents taken from the enemy bodies revealed that elements of four enemy artillery battalions had been involved in the attack.

What is the importance of telling this story? It is to emphasize the importance of combined arms cooperation to achieve success in night defensive missions.

► The role of the LPs in defense of FSB Pike was an important factor. Early warning and details of enemy movement outside the perimeter were given by the LPs. Although LPs are not designed with the strength or equipment to conduct a delay or defense, they can defend themselves. The three LPs alone accounted for 12 enemy dead.

Normally, the LPs would have been safely inside the perimeter before the enemy attack. In this combat example, however, the enemy attacked within 18 minutes after the first sniper round was fired and within three minutes after the first enemy sighting by the LPs. The enemy unleashed such a tremendous volume of fire that it was impossible for the LPs to return safely inside the perimeter.

► The two tanks were also an important factor in the defense of FSB Pike. Having proper hull defilade, the tanks were difficult targets for the enemy antitank fire. During this attack the 2/34 armor tanks were credited with the destruction of two 57mm recoilless positions and two 51-caliber antiaircraft positions. In addition, they inflicted untold damage on the enemy with their 50-caliber and coaxial machineguns. No damage or injuries were received by the tanks or their crews.

► The artillery battery on the south side of the perimeter stemmed the ground assault with its tremendously powerful direct fire using beehive rounds. This was made possible by advance positioning of each artillery tube so that it could cover a likely enemy avenue of approach at night. In this way, the artillery's direct, as well as indirect, firepower capability could be used effectively.

► The Air Force fighter-bomber attacks on suspected enemy reinforcement and withdrawal routes were another key factor in the defense of the beseiged FSB. A measure of their effectiveness, is that these supporting aircraft were credited with 25 of the 35 dead found in the bomb strike areas. The helicopter gunships and the command and control ship played important parts in the defense of FSB Pike.

The gunship team in this instance carried out two missions. First, between flights of jet fighters it delivered immediate and effective rocket, minigun, and 40mm grenade fire on the enemy reinforcement and withdrawal routes. This prevented the enemy from gaining any momentum for continuation of his attack. Secondly, they delivered telling fire against the enemy ground assault from the south. As a result, 30 of the enemy killed were credited to the gunships.

The CandC helicopter gave the ground commander an airborne CP and thus assisted materially his controlling the companies of his battalion in two widely separated locations. Additionally, by having the CandC ship, the battalion commander was able to control more efficiently the air space, which was crowded with gunships, jet fighters, FAC aircraft, and artillery rounds.

This successful night defensive action serves to emphasize the well-known effectiveness of combined arms. Here, the separate elements combined their efforts with skill and teamwork. Each did what it does best, but all were controlled by one commander. The absence of any one most certainly would have resulted in greater friendly casualties and less decisive results.

CAPTAIN LARRY D. GRAVES, Armor, served in the Idaho Army National Guard from 1952 to 1962. He was commissioned from the Idaho Military Academy and graduated from the Armor Officer Basic course in 1959. He served on active duty with the 1st Infantry Division at Fort Riley, and in Korea with the 1st Cavalry Division from 1962 to 1964. Captain Graves returned to active duty in 1967 and was assigned to the 5th Combat Support Training Brigade at Fort Dix, where he served as a company commander. In 1968, he was assigned to the 4th Battalion, 9th Infantry in Vietnam, where he served as a company commander. Reassigned to the 1st Brigade, 25th Infantry Division, he served as S-3 Air. In 1969, he returned to CONUS to attend Armor Officer Advanced Course 4-69. He is currently assigned to the Armor School.

Strategic Airlift For Armor

AWARD WINNER

ARMOR OFFICER ADVANCED COURSE 4-69

by Captain John B. Roseburg

American military planners have sought a capability to deploy rapidly and to sustain large, varied combat forces throughout the world since World War II. Past deployments in support of national objectives have been hindered by the inability of existing aircraft to transport outsize loads or loads in excess of 25 tons. The aircraft that will solve this problem is now in production, and will shortly be operational with the Air Force.

The use of armed force is the ultimate recourse of a powerful nation which feels its vital interests threatened. It is the remedy used when all other courses of action have failed. Despite the magnitude and potential consequences of this remedy, a nation that feels its vital interests, or the common interests of an ally, threatened by overt military action has little choice but to act with whatever force is necessary to support those interests. So it is with the United States. The United States must be prepared to meet threats with sufficient force to avoid the dangers of overreaction on the one hand, or the spectre of surrender on the other. In turn this concept of flexible response compels our armed forces to maintain a wide variety of units, weapons and doctrine capable of dealing with the whole range of violence. The need to be able to deploy rapidly any or all of these forces, in necessary strength, anywhere on the globe is an integral part of this doctrine.

The United States maintains treaties of defense and alliance with more than forty countries through collective security arrangements, bilateral treaties, or other agreements. A number of these treaty partners are bordered by unfriendly or openly hostile nations. And, while the armed forces of these partners are sometimes advised and aided by United States Military personnel, they are not always capable of adequate self-defense.

Since World War II, the United States repeatedly has been forced to deploy large forces overseas in support of its interests. Large forces were returned to Germany after 1948; several hundred thousand troops were moved to South Korea in 1950-1951 to defeat the North Korean and Chinese invasion of that country; and Army and Marine Corps ground units were deployed to Lebanon in 1958 to prevent that government from collapsing as a result of combined internal and external pressures. Forces were deployed to Thailand in 1961, to South Vietnam since 1961, and to the Dominican Republic in 1965. A characteristic of these operations was the almost total absence of an immediate and significant armor threat. As a consequence, forces did not have to be deployed initially with armor, but rather they could wait for the slow movement of tanks and other very heavy vehicles by ship.

A great number of our treaty partners have terrain which favors the massed employment of armor in rapid, wide-ranging attacks. These countries are in Western Europe, large areas of Africa, the Middle East and in parts of Central Asia. Aside from Western Europe, the areas mentioned have no significant American military presence. Additionally, since most countries in these areas have recently been granted independence, they have been subject to all the pressures, both internal and external, that other developing nations face. Several of the nations in these areas have succeeded in raising and equipping large armed forces with the aid of nations hostile to our aims, and can, therefore, seek solutions to their external problems by the use of military force. As post-World War II history has shown, a conflict growing out of a local quarrel in these areas, and particularly in the Middle East, could quickly draw in the major world powers and precipitate an international crisis. Therefore, if U.S. forces are to be deployed, this must be done rapidly and the crisis quenched before it spawns an even greater and more widespread crisis.

Since the United States has vital interests in these areas, its armed forces must be capable of defeating forces that could be found there. Defeat of opposing armor is the role of the tank, according to current doctrine, and from this follows the requirement for deployment of armor to these areas in the event of crisis. Armor units cannot now be rapidly deployed to these areas. An argument can be made that the light armor battalion equipped with the *M551 Sheridan* could be used in lieu of other armor units in situations requiring rapid deployment; and that because it can be airlifted in existing aircraft, it could meet the requirement posed above. Despite its appearance and armor defeating capabilities, the *M551* is not a tank, was not designed to fill a tank-like role, and is therefore not completely suited as an armor response to enemy armor.

We are left, then, with an inability to deploy large armor forces except by sea, which is at best slow. If a requirement arose for the rapid deployment of armor, movement by ship would prove to be inadequate for rapid deployment to meet the threat, and might well prove inadequate to defeat the attack after it had been launched. The best solution for rapid deployment at present is by strategic airlift. But because of the current limitations of space and load, present aircraft are unsatisfactory for the deployment of armor units.

With the advent of the Lockheed *C5A,* however, this problem will be resolved. This aircraft has an allowable cargo load of 126 tons and a cargo compartment which can hold all equipment found in the armored division. With midair refueling, it can move its cargo anywhere in the world nonstop at 440 knots. Using continuous shuttling, the Air Force could deploy an armored division 8000 miles in less than 10 days and support it by air after its arrival. Such a capability is ideal, but probably will not be realized due to limitations on *C5A* procurement. Instead, *C5As* will be used for heavy or outsized loads, with *C141s* being used for the remaining troops, supplies and equipment.

To demonstrate the tremendous improvement in deployment capability that should be realized by the introduction of the *C5A,* a hypothetical example will be considered. This example envisions a large armored force being deployed to a country in the Middle East. Following the example, a comparison will be made between current deployment capability and the improvements illustrated in the example.

The imaginary Kingdom of Megiddo was carved out of a British Middle East mandate after World War II. It occupies a strategic position on the land bridge of the Middle East, and is bordered by two historically aggressive nations that voice claims upon her territory. The Army of Megiddo is limited in size due to the small population of the country, and has been equipped with American equipment and advised by MAAG Megiddo since 1959. As a result of the aid and training, the army is competent. But it neither approaches the size nor possesses the combat power of either of its neighbors.

The mythical People's Republics of Cana and Qaral have been armed, equipped and advised by outside powers since 1963, and possess large, well equipped, predominantly armored forces. The borders of Megiddo facing these two nations are virtually indefensible except by large, highly mobile forces — forces Megiddo does not now have.

Relations between Megiddo and its neighbors have been poor since 1960, but friction between Megiddo and Cana has increased over the past year to the point of severance of diplomatic relations, economic boycott and fortification on opposing sides of the frontier. Hostilities appear imminent, and joint plans have been made between the Supreme War Council of Megiddo and the Joint Chiefs of Staff for the commitment of American forces should all other courses of action fail and full-scale military action appear certain.

On 5 May 19—, a report from a Megiddean agent in Cana indicated that orders had been issued for an attack on Megiddo to begin on 15 June 19—. Coupled with reports received from reconnaissance aircraft and other intelligence sources over the preceding six weeks, the probability of attack was viewed with such certainty that on 10 May, Megiddean authorities requested deployment of U.S. forces to assist in meeting the forthcoming attack.

Based on a joint assessment of the needs and capabilities, the President, on 20 May, directed the deployment to Megiddo of the 25th Armored Division, stationed at Fort Hood, Texas. The division is organized as shown in the accompanying chart.

Although a support increment from FASCOM would be included in this deployment, for the purpose of this article, only the deployment of the 25th Armored Division itself will be considered. A continuous shuttle will be established from Bergstrom Air Force Base to Megiddo. The division is organized into three brigade slices for movement, each slice being built around a brigade headquarters and combat maneuver battalions with a composite support battalion and combat support units. *C5A* sorties

25th ARMORED DIVISION UNITS

COMMAND AND CONTROL

HHC, 25th Armd Div
HHB, 25th Armd Div Divarty
HHC&Band, 25th Armd Div DISCOM
HHC, 1st Bde, 25th Armd Div
HHC, 2d Bde, 25th Armd Div
HHC, 3d Bde, 25th Armd Div

COMBAT SUPPORT

2d Bn(155SP), 50th Arty
2d Bn(155SP), 51st Arty
2d Bn(155SP), 52d Arty
2d Bn(8inSP), 53d Arty
2d Bn(HJ), 54th Arty
2d Bn (Vulc/ChapSP), 440th Arty
25th Signal Battalion
25th Engineer Battalion
25th MP Company

COMBAT

2d Bn, 10th Armor
2d Bn, 11th Armor
2d Bn, 12th Armor
2d Bn, 13th Armor
2d Bn, 14th Armor
2d Bn, 15th Armor
2d Bn(M), 92d Inf
2d Bn(M), 93d Inf
2d Bn(M), 91st Inf
2d Bn(M), 94th Inf
2d Bn(M), 95th Inf
2d Sqdn, 22d Cav

COMBAT SERVICE SUPPORT

25th Admin Company
25th Medical Battalion
25th S&T Battalion
25th Maintenance Battalion

have been figured only for heavy equipment. Sections of headquarters elements come under slice headquarters control until the remainder of the headquarters closes.

Experience with previous air movements has shown that aircraft can be flown out of improved airfields at 20-minute intervals, provided sufficient parking spaces exist at the airfield to allow five or more aircraft to be on the ground at any one time. At a rate of 72 sorties per day, mixing in *C5A* sorties where required, the division can be closed at Rafa, Megiddo in 18 days, 4 hours.

To meet this schedule, aircraft needed would be computed as follows:

AIRCRAFT REQUIRED FOR BRIGADE SLICE

UNIT	C5A	C141
1st Brigade Slice	108	279
2d Brigade Slice	107	371
3d Brigade Slice	88	304
TOTAL	303	954

C5A. Using mid-air refueling and traveling at a speed of 440 knots, flight time is 16 hours. Round trips can be accomplished in 32 hours of flying time. Allowing 16 hours for stops, maintenance, refueling, etc., a round trip time of 48 hours is possible. The last *C5A* will depart on D+17.5, thereby allowing 17.5 days for 304 sorties, or 17.4 sorties per day. With a two day turnaround time, a total of 35 aircraft at 100% availability would be required in the flow. If an 80% reliability is assumed, 44 aircraft would be required.

C141. With the need for two stopovers enroute, and by maintaining a speed of 485 knots, a *C141* will require 16.4 hours of flying time one way. Allowing 19.2 hours for refueling, maintenance, loading and unloading, a turnaround time of 52 hours can be achieved. A period of 17.5 days will be available for sequencing 954 sorties, or 54 per day. A total of 117 *C141s* at 100% reliability, or 147 at 80% reliability would be required.

Referring to the hypothetical example, the decision to deploy was made on 20 May, some 26 days before the expected attack. Sufficient time existed to deploy the division and to allow some cushion prior to the deadline. In fact, one brigade slice was on the ground in just over six days. Logistical support was furnished initially by an air line of communication from USAREUR and CONUS until such time as a sea line of communication was established. The need to support the division by air had been foreseen, and planning had been completed beforehand to ensure a smooth flow of all classes of supply. Since Megiddo has only one all weather terminal, space for storage and transhipment was not sufficient for Air Force needs, and an air transportable dock was airlifted in on 15 May and held unassembled until needed.

The air transportable dock is designed to be flown to an area that lacks adequate facilities for offloading and transferring cargo to surface vehicles. It can be flown in on two *C5As,* removed and assembled by 75 men in eight hours. It can hold from 330 to 397.5 tons depending on ground characteristics.

25th ARMORED DIVISION
ORGANIZATION AND AIRCRAFT REQUIREMENTS FOR AIR MOVEMENT

	C5A	C141
1st BRIGADE SLICE		
HHC, 1st Brigade	1	11
2d Bn, 10th Armor	31	7
2d Bn, 11th Armor	31	7
2d Bn(M), 91st Infantry	2	53
2d Bn(155SP), 50th Artillery	7	58
A Btry/2d Bn(8inSP), 53d Artillery		
Sec, HHB, 25th Armd Div Divarty		
Btry A&C, 1st Bn(C&V), 440th Artillery	6	25
Sec, HHB, 1/440th Artillery		
1st Platoon, 25th MP Company		5
5th Platoon, 25th MP Company (—)		
Signal Company(Prov),25th Signal Bn	1	17
Sec, HQ and PM Sec, 25th MP Company		
Sec, HHD, 25th Signal Bn		
A Company, 25th Engineer Bn	12	13
1/E/25th Engineer Bn		
Sec, 3/E/25th Engineer Bn		
Sec, HHC, 25th Engineer Bn		
D Troop, 2d Sqdn, 22d Cavalry	4	28
A Troop, 2d Sqdn, 22d Cavalry		
Sec, HHT, 2d Sqdn, 22d Cavalry		
Sec, HHC and Band, 25th Armd Div DISCOM	1	4
Platoon(Prov), 25th Admin Company		
A Company, 25th Medical Bn		9
Platoon(Prov), H&S Company		
S&T Company(Prov), 25th S&T Bn		
Sec, HHC, 25th S&T Bn		
B Company,25th Maintenance Bn	8	17
Platoon(Prov), HQ&A Company		
Small Missile Maint Det		
Platoon(Prov), E Company		
Platoon(Prov), 25th Armd Div HHC	1	3
	108	279
2d BRIGADE SLICE		
HHC, 2d Brigade	1	11
2d Bn, 12th Armor	31	7
2d Bn, 13th Armor	31	7
2d Bn(M), 92d Inf	2	53
2d Bn(M), 93d Inf	2	53
2d Bn(155SP), 51st Artillery	8	82
B Btry, 2d Bn(8inSP), 53d Artillery		
B Btry(Prov), 2d Bn(HJ), 54th Atry		
HHB, 25th Armd Div Divarty		
1st Bn, 440th Arty(—)	6	25
25th MP Company (—)		9
Signal Company(Prov), 25th Signal Bn	1	17
HHD(—), 25th Signal Bn		
B Company, 25th Engineer Bn	12	21
E Company, 25th Engineer Bn(—)		
HHC, 25th Engineer Bn(—)		
B Troop,2d Sqdn, 22d Cavalry	1	24
HHT, 2d Sqdn, 22d Cavalry(—)		
HHC and Band, 25th Armd Div DISCOM(—)	1	4
25th Admin Company(—)		
B Company, 25th Medical Bn		14
H&S Company(—)		
S&T Company(Prov), 25th S&T Bn	3	22
HHC, 25th S&T Bn(—)		
C Company, 25th Maintenance Bn	7	22
Platoon(Prov), HQ&A Company		
E Company, 25th Maintenance Bn(—)		
25th Armd Div HHC(—)	1	
	107	371
3d BRIGADE SLICE		
HHC, 3d Brigade	1	11
2d Bn, 14th Armor	31	7
2d Bn, 15th Armor	31	7
2d Bn(M), 94th Infantry	2	53
2d Bn(M), 95th Infantry	2	53
2d Bn(155SP), 50th Arty	7	65
2d Bn(8inSP), 53d Atry(—)		
2d Bn(HJ), 54th Arty(—)		
Sec, HHB, 25th Armd Divarty		
4th Platoon, 25th MP Company		4
4th Squad, 5th Platoon, 25th MP Co		
Signal Company(Prov), 25th Signal Bn	1	16
C Company, 25th Engineer Bn	5	14
D Company, 25th Engineer Bn		
Sec, HHC, 25th Engineer Bn		
C Troop, 2d Sqdn, 22d Cavalry	1	20
Sec, HHT, 2d Sqdn, 22d Cavalry		
C Company, 25th Medical Bn		19
Sec, H&S Company		
S&T Company(Prov), 25th S&T Bn	1	17
Sec, HHC, 25th S&T Bn		
D Company, 25th Maintenance Bn(—)	5	18
HQ&A Company, 25th Maintenance Bn(—)		
Platoon/(Prov), 25th Armd Div HHC	1	
GRAND TOTAL	88	304
GRAND TOTAL	303	954

Less than six acres are required for all functions, including aircraft taxiing and vehicle loading. With this area available, an aircraft can be taxied in, offloaded and taxied out in twenty minutes. Wheeled vehicles up to class 4 can be handled across the dock, but its primary use is for bulk supply movement. One dock, handling two to three aircraft per hour, can easily handle the supply requirements for the 25th Armored Division.

By using the *C5A/C141* combination of aircraft, and the air transportable dock as required, an armored division can be lifted and supplied completely by air. Sequencing of the brigade slices in the example would put one brigade slice on the ground 6.25 days after the first aircraft had departed Bergstrom. The second and third slices would close on D+12 and D+18.3, respectively. This rapid deployment of self-sufficient armor units achieved strategic and tactical surprise and forced the Canan leaders, in the light of growing American power, to cancel plans for the 15 June attack.

What, then, would have been the U.S. capability had the *C5A* not been available. Personnel, and most of the wheeled and tracked vehicles, of the division could have been carried in existing aircraft. However, because of the load and space limitations, the following vehicles, by number and weight, could not have been transported by air:

VEHICLES NOT TRANSPORTED BY AIR

VEHICLE	NO.	WT (TONS)	TOTAL
Trac, 10t W/tlr	8	31-37.4	277.0
Crane, RT	2	30.50	61.0
AVLB	16	42.00	672.0
Tractor, FT, Dozer	8	24.00	192.0
M88	37	55.00	2035.0
Tank, M60A1	324	48.75	15795.0
Bridge transporter	50	18.25	912.5
Howitzer, 8-Inch, SP	12	26.25	315.0
Howitzer, 155mm, SP	54	22.25	1201.5
Cbt Engr Vehicle	8	55.00	440.0
			21999.0

It is apparent from this list that the division would be ineffective due to a total lack of tanks, all 155mm and 8-inch howitzers and a large proportion of engineer equipment. Total tonnage, as shown, must be spread over at least five liberty ships, due to broken loads and boom capacities. Sailing time from New Orleans to Maraka, Megiddo's only port, is just over 27 days at an average distance of 240 nautical miles per day. Allowing five days for movement from Fort Hood to New Orleans and for loading aboard ship, plus four days unloading and movement time once Megiddo is reached, a total of 38 days is required. Therefore, even with these optimum movement times, deployment to Megiddo would have been too late to be effective during the attack itself.

The introduction of the *C-5A* into the Air Force inventory should, as has been shown, dramatically alter the deployment of armor units to all areas of the world. None of our potential enemies have developed aircraft with these capabilities. Therefore, the United States can deploy heavier equipment more rapidly over longer distances in response to actual or threatened crises than they can. This significant advantage in time and space considerations will probably have a marked impact on those who would foment crises in the future.

CAPTAIN JOHN B. ROSEBERG, Armor, was commissioned in 1965 from the United States Military Academy. He was graduated from the Ranger and Airborne Schools and assigned to the 1st Squadron, 1st Cavalry and Headquarters, 1st Brigade, 1st Armored Division, Fort Hood, Texas, where he was a troop executive officer and then brigade headquarters company commander. Following completion of advisor Training courses at Fort Bragg, he was assigned to MACV in 1967 as the Psywar Advisor, Vietnamese National Military Academy. After his return to CONUS in 1968, he commanded a cavalry troop and served as an assistant brigade S3 in the 194th Armored Brigade at Fort Knox. While in this position, he attended the Air Transportability Course at Fort Eustis. He is a graduate of Armor Officers Advanced Course 4-69 and is currently assigned to US Army Vietnam.

ARMOR IN URBAN COMBAT

by Captain Larry K. Cole

AWARD WINNER

ARMOR OFFICER ADVANCED COURSE 4-69

Reports coming from Vietnam have covered nearly every area of interest to the Armor officer. These reports have ranged from the items of personal equipment which should be carried in combat to new techniques in air cavalry operations. Yet, there is one subject which has not been covered to any great extent — armor in urban combat.

The Viet Cong 1968 Tet Offensive gave many Americans an opportunity to gain firsthand knowledge concerning the capabilities of armor in an urban environment. The Battle of My Tho from 31 January through 2 February 1968 offers an opportunity to study some of the problems encountered by armor in an urban area.

Five days prior to the battle, the 1st Troop, ARVN 6th Armored Cavalry Squadron had returned to My Tho, headquarters of the squadron and of the ARVN 7th Infantry Division. After four months of maintaining road security along Highway 4, troop members had been given leaves to visit relatives, relax, and prepare for the coming holidays, which were supposed to be accompanied by a truce.

By 30 January, the troop's present-for-duty strength was about 50 percent. Rumors of attack had circulated frequently before so no one took them completely seriously. However, before the day ended, the rumors became reality! Ideas of celebrating were shattered by a rash of guerrilla attacks which broke out in part of the northern III Corps area.

Although initially no attacks had been staged in the My Tho area, General Trang, the 7th Division commander, was to take no chances. He alerted the division and ordered the 6th Cavalry to position a troop in My Tho to provide security for the Division Tactical Operations Center (TOC) and the town. This mission fell to the 1st Troop.

Captain Nguyen Vinh, the troop commander, cut short a unit Tet party to organize. By 1930, the troop had moved from its compound east of the city and was in position along Hung Vuong Street awaiting the Communist onslaught.

The wait was not long. Shortly after 0400, mortar rounds began to fall on the 32d Ranger's compound just north of the 1st Troop positions. By 0415, the Rangers were under heavy assault from the Viet Cong 261-B Battalion and were asking for reinforcement. Honoring this request, the 7th Division TOC ordered 1st Troop to send a platoon across the Bao Dinh Canal to assist the Rangers.

When the 1st Platoon arrived at the Ranger Compound, they found the situation desperate.

Shortly after 0500, the 1st Troop's attention was

attracted by another threat. The 2d platoon, positioned at the city's traffic circle, reported sighting elements of the VC 261-A Battalion moving east along Tri Phuong Street. Within seconds, a savage firefight erupted between the two forces. The VC poured a withering volume of *B40* rocket fire into the 2d Platoon position causing the ground to seem to erupt around its ACAVs. Fortunately, heavy fire from the cavalrymen had spoiled the enemy's aim and the platoon's three vehicles were able to withdraw 100 meters east along Nguyen Trai Street without loss.

Captain Vinh immediately ordered the 3d Platoon to counterattack by assaulting north along Nguyen Trung Long. As the platoon approached the traffic circle, it began receiving automatic weapons fire from the VC in the buildings. The cavalrymen returned this fire. As the platoon reached the traffic circle, it ran into a heavy volume of antitank fire and was forced to withdraw to positions on Hung Vuong.

Meanwhile, the 2d Platoon was holding its positions on Nguyen Trai. The platoon leader had moved the platoon's one ACAV which mounted a 57mm recoilless rifle forward and it was, seemingly, holding the enemy back. However, the enemy managed to maneuver *B40* crews through the buildings on the north side of the street into positions which would enable them to fire on the platoon.

Just as the platoon was about to counterattack, the 57mm recoilless rifle ACAV received a direct hit from a *B40*. As the antitank fire increased, the remainder of the platoon withdrew quickly to positions on Hung Vuong. This allowed the VC to move into the Catholic school on the northwest corner and into the hospital on the southwest corner of the intersection of Hung Vuong and Nguyen Trai Streets.

With this sudden success, the Communists began to press their attack, through the courtyards of the hospital and the school, in an effort to enter the city proper. The fight that followed was furious. The VC fired into the fully exposed cavalrymen from concealed positions inside the buildings. Nonetheless, the cavalrymen held their positions and returned an overwhelming volume of fire from their .50 caliber and .30 caliber machineguns. The enemy was no match for the massed firepower of the ACAVs. At this point, the engagement developed into a series of man-to-man skirmishes.

Heroic action was commonplace throughout the skirmish. Men continually dismounted their vehicles

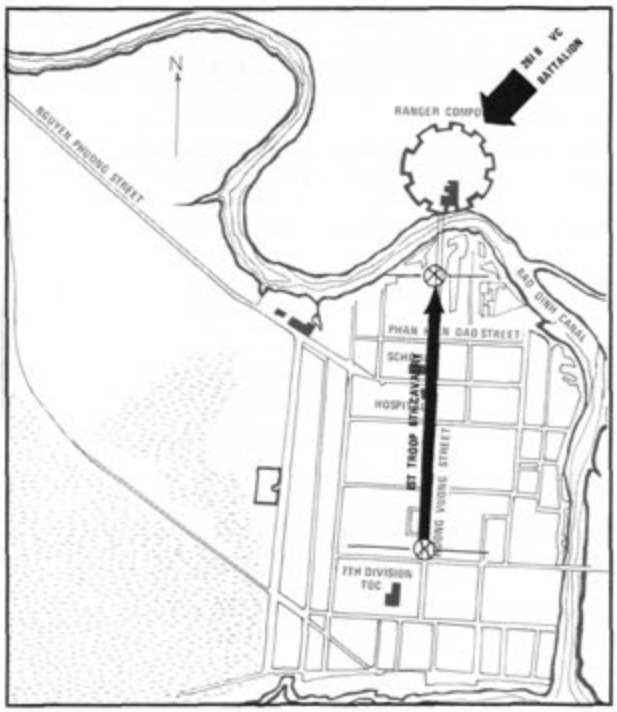


Figure 1.
261B VC Battalion attack on Ranger Compound, 31 January.

to assault VC positions with hand grenades and in doing so remained fully exposed so that they could better fire into the enemy's positions. The heroism displayed can best be described by the actions of one soldier in the recovery of the ACAV which had been knocked out in the initial phase of the engagement.

Attempts were made throughout the morning to recover the damaged 57mm recoilless rifle APC. Finally about 0900, during a lull in the fighting, Corporal Tran Ngoc Ut began to work his way toward the abandoned vehicle. He used the trees along the south side of the street for protection as he moved. The enemy quickly detected his movement and directed a large volume of fire at him in an effort to drive him back. Although bullets were hitting all around him, Corporal Ut continued to move from tree to tree until he was beside the ACAV. By this time, another ACAV had moved to the intersection and was firing suppressive fire into the buildings opposite the disabled track. This was all the distraction Corporal Ut needed. Before the VC could redirect their attention to him, Ut spun onto the track, removed a .30 caliber machinegun from its mount

on the side of the vehicle, laid it across the gun shield on the commander's hatch, and began to fire into the enemy positions. Seeing this, the commander of the APC supporting Ut's actions moved his vehicle into position behind the disabled APC and connected his vehicle's cable to it. Before the VC could direct accurate antitank fire at the two tracks, they were back within friendly lines. For his actions, Corporal Ut was promoted to sergeant.

While 1st Troop and the Rangers were holding the enemy, the rest of the 6th Cavalry and the 3d Battalion, ARVN 11th Regiment moved into positions along Nguyen Trung Long Street near the division TOC. The 3d Troop moved to positions along Thuon Kiet Road to protect Binh Duc Airfield and contain the 263d VC Battalion. The 3d Battalion moved to the division TOC at 0900 and began working its way along the west side of Hung Vuong Street toward 1st Troop.

As the 3d Battalion began its move, civilians living in areas of the city controlled by the VC began evacuating their homes. At first, there were only a confused, reluctant few. They could not seem to decide whether they could look for help from the VC or from the South Vietnamese government forces. They made their decision only after seeing the ARVN soldiers moving forward to assist the civilian wounded. Once they had made their choice, they poured into 1st Troop's positions dragging their dead children by the heels or carrying their wounded grandparents.

The VC took advantage of this mass exodus to escape the advance of the 3d Battalion and the murderous fire of the cavalry. As refugees moved along the streets toward the ARVN positions, guerrillas in green uniforms could be seen withdrawing toward the traffic circle and the rear of the school.

The movement of civilians was a potential threat to South Vietnamese troops for the next two days. No restrictions were placed on them. Therefore, they moved freely between the opposing forces as they shifted their belongings to more peaceful areas of the city.

By 1200, the cavalrymen without infantry aid had completely stopped the enemy's movement down Nguyen Trai and had driven the VC from the hospital and cleared the front rooms of the school's south wing.

By 1300, the 3d Battalion had arrived at the intersection and was crowded behind a small wall along the east side of Hung Vuong waiting to assault the school.

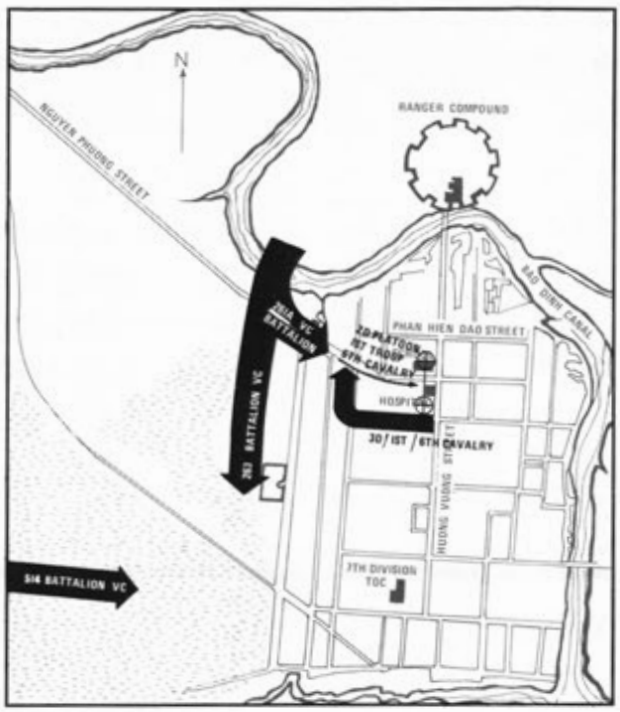


Figure 2.
261A VC Battalion, 263 VC Battalion, and 514 VC Battalion attack on My Tho.

When the signal came, the infantry moved into the school's south wing with remarkable ease. However, this assault was the only movement the infantry made. As they moved past the rooms the cavalrymen had cleared, a deadly battle erupted in the building's corridors. This lasted for four hours.

While the infantry battled for the school, 1st Troop supported them from positions along Hung Vuong. Throughout the fight for the school, the cavalrymen received sporadic fire from the adjacent houses. It was extremely difficult to locate the enemy because they were firing from well within the houses.

By 1700, the school's ground floor had been cleared and the 1st Platoon and 3d Battalion began to push down Phan Hien Dao Street into the enemy's stronghold. The lead elements had gone only 150 meters when they began receiving enemy fire from their rear. The upper floors of the school and of the houses along Phan Hien Dao had not been cleared by the infantry. The firing took the ARVN troops completely by surprise and they pulled back to Hung Vuong to reorganize and try again. They failed in two more attempts to move down the street before dark.

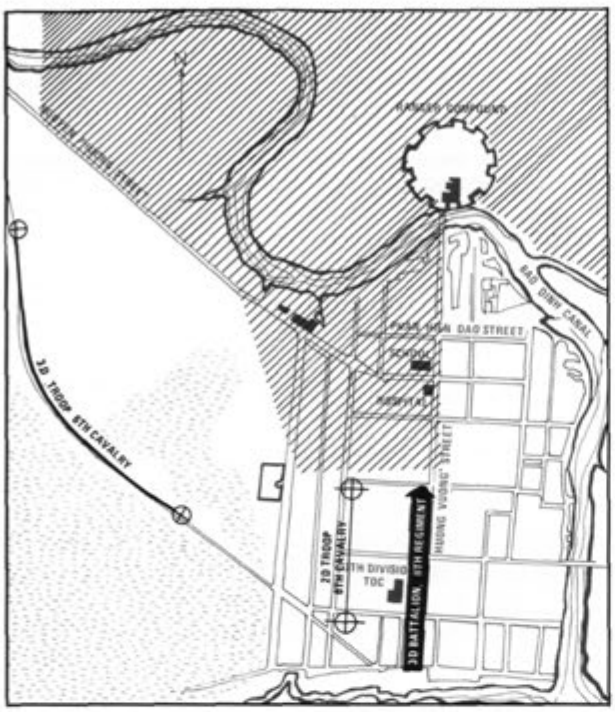


Figure 3.
Positions of 2d and 3d Troops, 6th Cavalry and attack of 3d Battalion, 11th Regiment at 0900, 31 January in effort to regain the captured school and hospital.

Finally, just before dark, the South Vietnamese gave up their attempts to push down Phan Hien Dao and pulled back to regroup for the night. The 1st Troop and the 3d Battalion were ordered to withdraw to the east side of Hung Vuong leaving the ground floor of the school for the VC to re-enter. The 2d Troop, which had not moved all day, was ordered to remain in position on Nguyen Trung Long. The 3d Troop was replaced at Binh Duc Airfield by a company from the 9th Infantry Division. It then moved to secure the MACV Advisory Compound west of the city.

The evening was quiet except for some sniping and the continuous bombardment of enemy positions by artillery firing from the 9th Infantry Division base camp at Dong Tam. This shelling caused devastating damage to the western third of the city and turned the skies a bright crimson.

Meanwhile, the VC had been probing the Ranger positions throughout the evening. At 2400, they assaulted in strength. Luckily, a searchlight mounted on a *M151* jeep had been attached to the Rangers from the 6th Cavalry Advisory Team and "Spookie" (an Air Force flare ship armed with 7.62mm Gatling guns) was nearby. Spookie was called to support the Rangers and was overhead within minutes. However, he could not spot the Ranger positions. To solve this problem, the section leader of the searchlight unit turned on his searchlight and elevated it straight up. When the Spookie pilot saw the light's beam and had identified the friendly positions, the light was lowered to illuminate the enemy. Thus, the assaulting forces were quickly engaged by Spookie and driven back.

The remainder of the night was quiet except for mounted patrolling through friendly areas by 1st Troop.

At first light on 1 February, the US 9th Infantry Division committed two battalions of its Riverine Force to the My Tho Battle. They entered the city's western sector and began to drive the 514th and 263d VC Battalions north.

At 0900, the 3d Troop attacked east down Nguyen Tri Phuong. Their mission was to capture the VC headquarters which had been located in the city's bus station. The troop moved out without any artillery preparation or infantry support. They had moved only 600 meters when the buildings along the road erupted with *B40* and automatic weapons fire.

The troop was deployed in a column and all four platoons were hit simultaneously. Again, the ARVN could not see the well-hidden enemy. Two ACAVs were knocked out by the initial volley. This split the troop in half. The leading elements continued to battle their way forward losing two more ACAVs in front of the bus station. However, four ACAVs managed to drive through to the 1st Troop's positions. The remaining seven vehicles returned to the MACV Compound.

Immediately after the last ACAV had left the bus station area, TAC Air was called in to destroy the knocked-out ACAVs so that the VC could not seize the weapons on them. After the last airstrike on the ACAVs, the Air Force FAC told the 3d Troop advisor that the next flight would make a strafing run against the bus station. Less than five minutes later, before the flight came in, the FAC reported that the VC were moving north out of the bus station by swimming the Bao Dinh Canal. They must have been monitoring the advisory radio frequency. Apparently, when they heard that fighters were going to be used, they decided to clear out while there was yet time.

Throughout the morning, the 1st Troop had remained in blocking positions along Hung Vuong and

had supported the 3d Troop attack with mortar fire. At 1300, the 1st Troop received orders to assist the 3d Battalion to recapture the school and to attack down Phan Hien Dao at 1500.

The two units had learned their lessons well the day before At 1500, 1st Troop fired all its automatic weapons at the school and adjacent buildings while the mortars fired into the area just behind the school. A few minutes later, the infantry rose up from behind the walls across from the school and assaulted. As the first infantrymen entered the building, one platoon of ACAVs drove into the school's courtyards to give better supporting fire. The remainder of 1st Troop and 3d Battalion then started their drive down Phan Hien Dao, bypassing the school.

This drive down Phan Hien Dao encountered the same problem as that of the day before. The upper floors of the buildings were not cleared and sniper fire was breaking out to the rear of the lead elements. However, there was no pullback. The units held fast for a few minutes to determine the enemy positions and then the infantry eliminated them.

At this point, the tempo of the battle changed from one of quick, daring moves to that of slow, methodical action. For the next three hours, the infantry moved slowly and painfully through each house along the street to insure that these were clear of VC. Meanwhile, the cavalry supported them by firing into known or suspected enemy positions.

Although the two units were working together better than they had the day before, some problems were still experienced by the cavalrymen. They were having great difficulty in keeping track of the forward progress of the infantry in the buildings. Many times during this phase of the battle the gunners of the lead ACAVs would start to fire on a suspected position only to find at the last second that it was occupied by friendly infantry. Fortunately, no casualties were inflicted because of this lack of communications.

Another problem was the inability of the ACAVs to maneuver in the narrow streets. This was compounded because the entire troop was deployed in column along the street. Oftentimes, the lead or second vehicle would have to wait for the entire troop to back up before they could maneuver into a better firing position. Fortunately, the infantry had cleared the antitank teams from the buildings before they could fire on the immobile ACAVs. However, a few times the the lead vehicles did back into following vehicles while trying to maneuver into better firing positions.

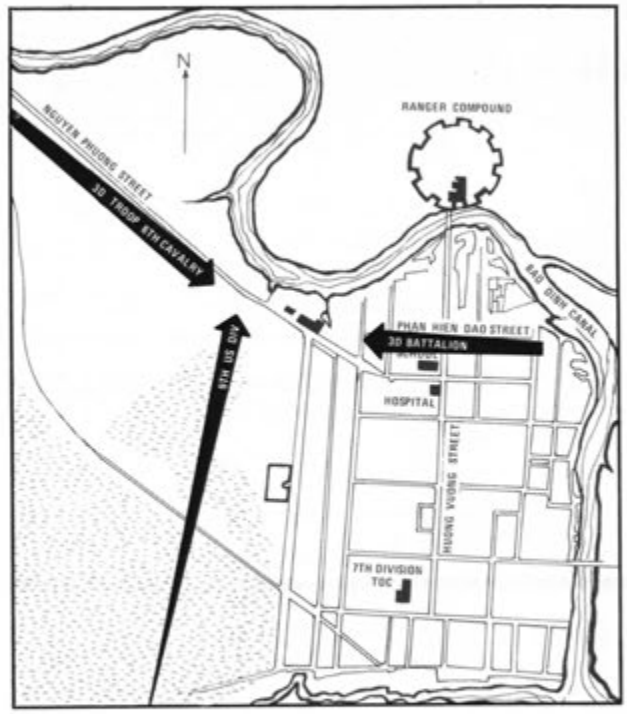


Figure 4.
Allied counterattack 1 February.

Just as the two ARVN units reached their objective at Phan Hien Dao and Tran Quoc Thanh, they received orders to pull back to Hung Vuong for the night. The cavalry reluctantly obeyed. They did not want to give up 500 meters of hard won enemy territory.

When the two units arrived back on Hung Vuong, the 3d Battalion was relieved by the 3d Battalion, ARVN 12th Regiment and 1st Troop took positions along Hung Vuong. The 12th Regiment battalion went into position in the school courtyard.

It was quiet in the city until 0400 the next morning. At that time, a small group of VC crept into the school and opened fire on the 3d Battalion driving them from the courtyard.

Shortly after the last infantrymen left the school, the VC opened fire on an ACAV across from the school. The cavalrymen quickly returned the fire silencing the VC position. The remainder of the night was quiet.

As dawn broke, the city was deadly quiet. Nothing seemed to be moving. Captain Vinh, sensing that the enemy had pulled back, sent out foot patrols to make contact. When the patrols returned after

...only the bravery and "don't give ground" attitude of the cavalry saved the city.

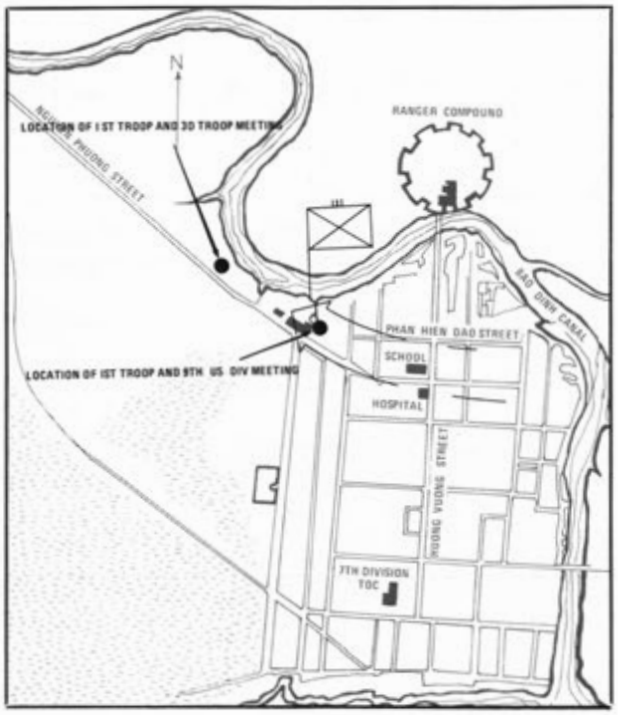


Figure 5.
1st Troop attack at 0800 hours 2 February.

searching the buildings along Nhuyen Trai and Phan Hien Dao Streets without making contact, Captain Vinh ordered the troop to move cautiously along the street dismounting crew members from the ACAVs to clear the buildings.

As the lead elements of the troop passed the city reservoir they met the lead elements of the U.S. 9th Infantry Division. Together, they continued on to the bus station.

As the U.S. Infantrymen and ARVN cavalrymen approached the bus station the few remaining VC broke and ran leaving only a few snipers behind to cover their withdrawal.

The 1st Troop continued along Nguyen Trai until it met the 3d Troop which was moving toward the bus station from the MACV compound.

When the two 6th Cavalry units met, the battle for the urban area of My Tho ended. The South Vietnamese, with the aid of their American allies, had won the city. The battle had been costly in lives (101 killed, 110 wounded, and 24 missing), equipment (three ACAVs with weapons lost and two damaged), and property (over one third of the city was destroyed by artillery). But, the enemy had sacrificed 716 killed and 82 captured. Most important, the VC had not accomplished their mission of overrunning the city.

Although this action was not fought with tanks or American troops several valuable lessons were learned that could well be applied by American armor units.

First, there was again definite proof that an armor force can meet and defeat a numerically superior force — in the initial stages one troop against two battalions — in an urban environment provided that the unit is well-disciplined and makes judicious use of its awesome fire power. This is not to say that armor should be employed without supporting infantry, but rather points out that it can survive in a city unsupported when the situation demands.

The need for supporting arms was well demonstrated during the second morning of the battle when the squadron's 3d Troop attacked down Nguyen Tri Phuong to seize the bus station. Neither supporting infantry nor artillery was used during this attack and the troop was badly shot up as a result. In armor combat, swift and daring action is essential. But without using organic weapons to pin down the enemy, supporting fires to soften up the enemy, and infantry to clear the enemy from buildings, an armored force moving along a street can be cut to ribbons.

A major problem experienced by 1st Troop was its inability to maneuver during its attack down Phan Hien Dao during the afternoon of 2 February. Its experience indicates that in urban combat careful planning is needed to determine how many vehicles

are needed and can be usefully employed to support the infantry. Prime considerations during the planning phase are the width of streets and the ability of vehicles to maneuver off the streets. In this situation, the width of the street would allow no more than three ACAVs to support the infantry effectively and still allow maneuver room. However, because of the damage to buildings caused by supporting artillery, the ACAVs could have maneuvered off the streets to bring more fire to bear on the enemy. Unfortunately, this was not attempted.

During this same action the cavalrymen had some difficulty in identifying the forward positions of the infantry. This points out the need for close coordination and continuous communications between armor and infantry in an urban area. Buildings should be numbered or identified in some other way for ease of recognition by both units. And communications maintained between the two elements must be continuous so that both will know each other's whereabouts at all times. Since FM radio is often unreliable in cities, the use of wire should be planned.

With respect to communications, another problem which had plagued military units ever since radios have been employed on the battlefield beset the squadron — enemy monitoring. This was clearly demonstrated on the morning of 2 February when the Air Force FAC announced the planned use of an air strike against the bus station and the subsequent withdrawal of the VC from that area. The lesson speaks for itself.

The difficulty of marking the Ranger positions during the night of 31 January-1 February points up that a commander must continually check his unit's capability to mark its positions at night. The quick thinking of the American searchlight team in marking the Ranger positions when no other means were available was commendable. But such a makeshift should be unnecessary. Units should plan to have strobe lights available as part of their field equipment. Not only should the availability of strobe lights be planned for but a back up, such as C-ration cans filled with dirt and gasoline, also should be provided.

Consideration should be given to the control of civilian movement in the battle areas of a city. Because of the freedom of civilian movement during the first day of the battle, the guerrillas were able to change into civilian clothes and infiltrate into any part of the city. At least one VC squad in civilian clothes was seen to the rear of the 1st Troop positions. Also, the Communists were probably able to gain information about the ARVN's situation and positions from the people as they returned to their homes. It will never be known if civilian movement was a definite hindrance to ARVN operations or not, but the threat was there. Some restraint should have been placed on the civilians if for no other reason than to keep them in safe areas.

A problem that was not a chief concern of the cavalry but which did affect them was that of clearing the upper floors of buildings. During both attacks down Phan Hien Dao, the infantry initially cleared only the ground floors of buildings. This technique allowed many VC to be bypassed. These pockets of VC caused much confusion when they opened fire on the rear of the attacking South Vietnamese. This can be overcome easily by applying properly, current U.S. Army doctrine which calls for buildings to be cleared from the roofs down.

Finally, the depleted strength of the units in My Tho could have proven disastrous. Even though a unit has been in the field for a long time, or is about to celebrate a national holiday, a commander can never permit it to relax in an insurgent war. By allowing the unit strengths to diminish, the city's defenses were jeopardized to the point that My Tho was almost lost. Only the bravery and "don't give ground" attitude of the cavalry saved the city.

CAPTAIN LARRY K. COLE, Armor, was commissioned in the Texas Army National Guard after graduation from the Infantry OCS at Fort Benning. He entered active duty in September 1963. He was then assigned to the 1st Battalion, 37th Armor, 4th Armored Division in Germany, where he served as a platoon leader and company executive officer. In March 1966, he returned to CONUS and served as a range OIC, chief of the basic training marksmanship committee, and company commander in the Army Training Center at Fort Polk. In September 1967, he was assigned to MACV where he served as an advisor to the ARVN 6th Armored Cavalry Squadron. In 1968 he returned to CONUS and attended Armor Officer Advanced Course 4-69. He is currently assigned to the Combat Surveillance and Electronics Warfare School at Fort Huachuca.

MAN
WHERE ART THOU?

by First Lieutenant Paul T. Merschdorf

A unique system of improved land navigation is being tested for use in armored track and wheeled vehicles. Beneath the snow-covered caps of Fort Carson's Cheyenne Mountain and the Colorado Rockies, the 3d Battalion, 77th Armor along with the 4th Squadron, 12th Cavalry and Infantry and Artillery battalions are testing Magnetic Automatic Navigation (MAN) and Gyro Compass Automatic Navigation (GAN) devices.

Use of such land navigation devices promises a new method of maintaining vehicle orientation. MAN and GAN are designed to give the exact map coordinate location of vehicles in northings and eastings which are shown on a display panel installed within the vehicle. One part of the units, a plotter, gives a pictorial representation of the vehicle's location in the form of a lighted dot and illuminated arrow projected on the underside of a conventional military map. Troops using the MAN-GAN device, it is believed, will always know where they are — be it in the middle of a jungle, desert or polar snow.

MAN and GAN have identical components except for their north-seeking sensors. MAN uses a magnetic header that looks like an antenna when vehicle-mounted, while GAN uses a north-seeking gyro compass orientated on earth rotation. MAN and GAN are adaptable to most army vehicles, but MAN's magnetic system does not work on tanks and other tank-like armored vehicles since turret rotation and the great mass of ferrous metal cause unstable signature. Conversely, MAN should be particularly effective in areas like Southeast Asia where maximum magnetic variation is no more than one degree. MAN has the additional advantage of being field-repairable, while GAN's header assembly must leave the field for repair. In addition, MAN has the capability of in-

stantaneous orientation unlike the gyro warm-up period to adjust to the earth's movement needed by GAN.

The magnetic sensors of MAN define the ambient magnetic field. Because knowledge of true or grid north, not magnetic north, is required for accurate navigation, an on-board computer system receives the information and converts it. This is done in reference to the geographical magnetic declination information which is obtained from a map. The magnetic sensor can be easily installed directly to the vehicle, or, for increased accuracy, a mast assembly can be used to raise the magnetic sensor above the silhouette of the vehicle.

Common to both systems is the heading and position indicator which continuously displays, on two four-digit counters, the position of the vehicle. This is done in east/west and north/south coordinates. The eight digit readout provides an immediate reference without the necessity for manual calculation.

To accomplish this, the exact map reference is set into the counters prior to moving off. During operation, the vehicle's location is indicated in terms of eastings and northings on the indicator front panel. A pointer on the 1.81 inch (46 mm) diameter dial continuously indicates the grid heading of the vehicle, and (dial graduations) can be read in degrees or mils depending on the needs of the commanders.

A switch is provided on the face of the indicator for the selection of map scales of 1/25,000; 1/50,000; 1/100,000; and 1/250,000 which are used on the Vehicle Position Plotter. Lights, on the lower face of the indicator, flash when the illuminated image of the plotter has reached its limit of travel, and in the upper portion when the gyro compass is over-heating. Also on the indicator is a three-position power control switch.

In both MAN and GAN the Map Position and Heading Plotter is a lighted map board which displays automatically the vehicle's position (lighted dot) and heading (illuminated arrow). This 13-pound hand-held unit was designed for use with standard military maps. User flexibility is increased by an ability to switch the north orientation from vertical to horizontal.

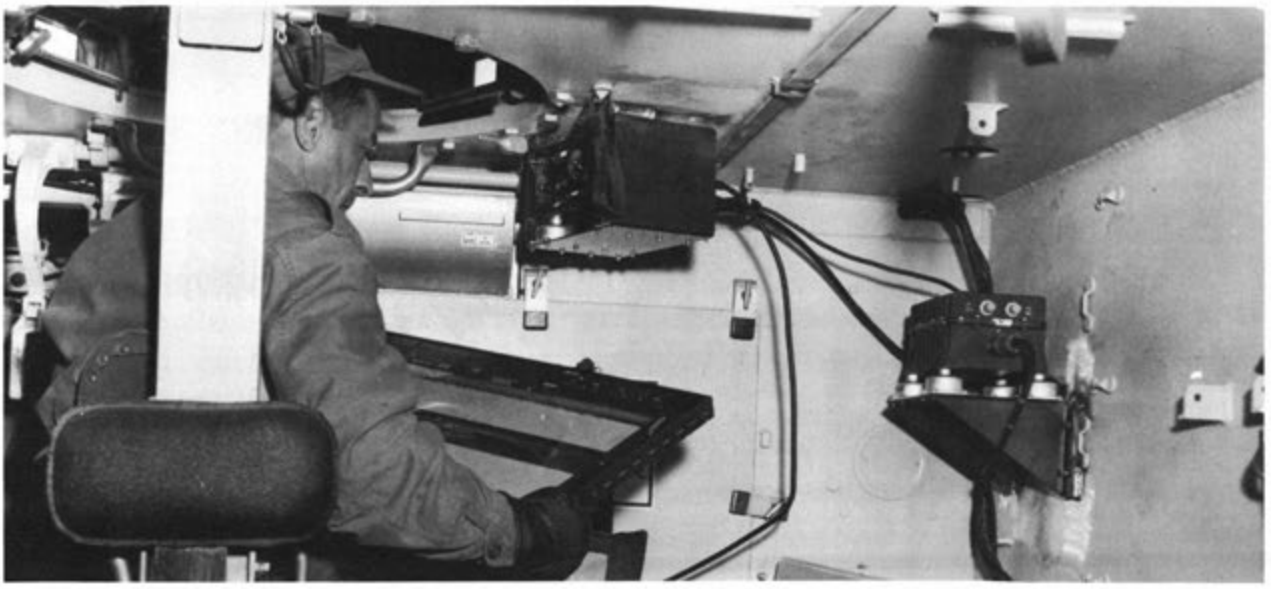
Another component common to both MAN and GAN is the on-board Electro-Mechanical Computer. It converts input pulses which represent the east/west and north/south movements of the vehicle. This is accomplished by the use of a Ball-Resolver — a highly accurate mechanical analog computing element developed by Aviation Electric Limited, Montreal, Canada, a subsidiary of Bendix Corporation. Distance input is obtained mechanically from the vehicle's odometer cable drive. Means are provided to compensate for variations in vehicles and possible error due to slippage and/or tire or track wear. Heading input is obtained electrically from either the MAN magnetic-heading transmitter or the true north-seeking GAN gyro compass. When using a

Top Left. Map Position Heading Plotter when not in use is stored on the *M151* between the driver and the vehicle commander. ***Bottom Left.*** Standard military maps can be used on the Map Position and Heading Plotter, which automatically displays the vehicle position, represented by a lighted dot, and heading, represented by an illuminated arrow. ***Bottom Right.*** During vehicle movement the plotter can be held in the lap of the vehicle commander for constant visual tracking of vehicle location and direction. ***Opposite Top.*** Staff Sergeant Marckini of the 705th Maintenance Battalion makes a final check before releasing an *M113* with the *MAN* device for further testing. ***Opposite Bottom.*** Notice the protective brace protecting the Magnetic Header which acts as the north-seeking sensor.

magnetic heading transmitter, controls are available to compensate for the magnetic disturbances of the carrier vehicle.

Calibration of the computer, whether using the magnetic heading transmitter or the gyro compass sensor, is relatively simple and can be carried out by non-technical personnel. The computer occupies less than 275 cubic inches and weighs less than 12 pounds. For example, a black box with front dimensions 7″ x 4″ and the depth 7½″.

One additional piece of equipment associated with land navigation devices is the Position Interrogation and Transmission System (PITS). This device, an adjunct to MAN-GAN, is designed to enable higher commanders to determine the grid reference of MAN-GAN subordinate stations. Vehicles equipped with PITS will determine the location of units by



transmitting a signal on a predetermined radio frequency. When the interrogator is activated, a four digit audio signal is transmitted to all stations on the command net. Only that MAN or GAN station which is sought will reply by automatically transmitting its grid reference as a six digit audio signal (Each unit has a special call signal similar to a radio net call sign). This is converted into a visual readout on the control interrogator within a fraction of a second without the subordinate's knowledge of the event.

Test plans and criteria were developed by the Army's Combat Developments Command (CDC) whose Armor Agency at Fort Knox is the proponent of the Canadian-built MAN-GAN system. To carry out the evaluations, a directorate at Fort Carson, under the command of Major General Bernard Rogers, 5th Infantry Division (Mechanized), has been formed.

The purpose of the field evaluation developed by CDC will be primarily to determine the relative tactical and navigational advantage, if any, gained by the use of land navigation systems during day and night operations. Also, to provide comparative comments on the suitability of the two different basis of issue (BOI) used during the evaluation; and information on the operability, maintainability and reliability of the MAN-GAN systems plus maintenance and logistical requirements.

General Rogers' special directorate has a strength of 250, of whom most are Vietnam veterans. One combat developer who will pay close attention to the progress of the tests, to include the results, is Major Maynard Nelson of the CDC Troop Test Branch. Nelson is a 13-year Armor veteran who recently worked on a CDC evaluation of the Light Armor Battalion. That test was run at Fort Riley, Kansas last June. During the test he checked the feasibility of air-transporting and swimming the Sheridan reconnaissance vehicle in the Light Armor Battalion. In the up coming MAN-GAN test it has been his responsibility to establish the CDC evaluation plan, and will be his continued responsibility to monitor the progress of the tests.

"The field evaluation of land navigation devices will examine, among other things, the performance of similar elements of a tank battalion," explains Nelson. "A mechanized infantry battalion, a 155 mm self-propelled artillery battalion, and an armored cavalry squadron will also participate in the test. The 3500 troops involved in the evaluation will be organized under Colonel James R. Loome who has

been designated by General Rogers as the Deputy Test Director and whose organization will provide the 'Brigade' administrative and tactical control."

The evaluation will consist of three 48-hour tactical field exercises for each type of organization. Three repetitions of each exercise will insure validity of the evaluation results. A pilot evaluation will be conducted following pre-evaluation training at least two weeks prior to the actual testing. The pre-test is designed to determine the workability of the evaluation, control and collection plans of the test personnel.

What will the evaluation be like? According to the head of the CDC Evaluation Directorate, Colonel Elden "Buzz" Campbell, "the simulated general situation will portray US Forces engaged in a mid-intensity conflict with mechanized aggressor forces. The brigade will provide a control headquarters and logistical backup for the battalion/squadron operations. The aggressor will be made up of elements from two armored cavalry troops. The non-firing tactical situation will require the tankers to conduct reconnaissance, offensive, defensive, retrograde, and economy of force operations during a 24-hour period."

In the Armor evaluation, at H minus six the brigade will issue its initial briefing, followed by a warning order. Four hours later the battalion will move to the assembly area to start the tactical exercise.

At H-hour the battalion will move by multiple axes 15 to 20 km to establish a defensive position. Once established, and some eight to 10 hours into the problem, the battalion will be attacked by Aggressors and be forced to conduct a night delaying maneuver, establish a new defensive position some 10 km away, and conduct a daylight delaying action. This takes up the first 24 hours of activities.

During the second twenty-four hour period, the battalion draws through rearward positions and prepares to night attack. Then, as night falls for a second time during the problem, the battalion moves out to conduct an attack with companies on separate axes. Seizing the objective, they then defended while preparing to continue the attack in the daylight. During the attack the companies again use multiple routes.

Thus ends the first phase of the armor field evaluation. In the two remaining phases of testing the only major variation is in the location of the companies as they attack on multiple axes. For example, Company A, having been on the right flank in the first phase, rotates to the center and left flank for the remaining exercises.

Throughout the field evaluation phases, preplanned spot checks are given vehicle commanders. Their purpose is to test the ability of commanders aided by the MAN or GAN devices to locate themselves against those without MAN or GAN. This is a simultaneous test of people and equipment. Survey teams follow the movement of the battalion as it progresses through the problem to check — accurately to within a few meters represented by a 10-digit coordinates — the location of those spot-check points. Afterwards, the information received from the MAN-GAN vehicle commanders is evaluated against that from those who did not have MAN-GAN and against the survey teams.

According to CDC definition, a field evaluation is a test conducted with troop units under normal field operating conditions over an extended period of time. Such a test could be used to evaluate existing, modified or new proposed doctrine, organization, tactics, techniques or equipment. In this case it will be the latter.

Why is a field evaluation so important?

"This evaluation," says Colonel Campbell, "is the last step in the refining of a product (MAN-GAN) taken before the product is bought and issued to the troops. It is the last time under controlled conditions with troops that the product can be viewed and examined. The next test — the most important one — will be in combat. That is the ultimate test!"

FIRST LIEUTENANT PAUL T. MERSCHDORF, received his commission in Armor as a reserve Officer Training Corps graduate from the University of Wisconsin-Milwaukee. Prior to his current assignment as Deputy Information Officer, Headquarters U.S. Army Combat Developments Command (CDC), Fort Belvoir, Va., Lieutenant Merschdorf attended the Armor Officers' Basic Course at Fort Knox.

MANAGEMENT SIMPLIFIED

by Master Sergeant Leroi F. Bell, III

Good management comes from the top down! It is the sometimes hard to come by art of manipulating one's resources in order to accomplish the assigned task. Good management at any level is essentially a unified direction of effort.

In general, those endeavors which receive command emphasis at the top merit the same priority at lower levels. However, this guidance should not be blindly followed. For instance, a unit should not be required to spend "X" amount of time and resources on something in which obviously it already excels or on some requirement which does not pertain to it. Furthermore, it should be emphasized and double underscored that the prime consideration in initiating new undertakings must be a constant appraisal of the questions: "Is it in keeping with the assigned mission?" and "Do the results merit the required effort?"

Good units do everything well; bad units do everything poorly. What spells the difference? The answer is always the same, application of the principles of good management. At unit level these principles may be narrowed down to:

- Ascertain the complete requirement
- Be aware in detail of all resources
- Decide what portion of the "effort and resources pie" will be required to accomplish the task
- Plan and execute keeping the imposed suspense and attention to detail constantly in mind.

Throughout the entire process "creative" supervision will enhance the chance of success. Creative supervision allows and encourages "middle management" people to initiate, improvise and perfect techniques which will improve efficiency. However, beware of the short cuts, it is one thing to be flexible and quite another to be sloppy in the name of flexibility.

MANAGEMENT TECHNIQUES

Every administrator is involved in management. Every battery, company or troop commander and first sergeant is an administrator. So too are the battalion and squadron commanding officers, sergeants major, and personnel, intelligence, operations, and supply/logistics officers and NCOs. Within these different fields, techniques vary slightly but the basic principles are the same.

The first and primary consideration is organization. Be it individual or office, it is essential. Good organization is achieved through the proper use of these tools:

- Suspense files
- The Army Functional File System (TAFFS)
- Reference publication library
- Prompt and accurate reports

SUSPENSE FILES

There are several methods for recording upcoming events, requirements, inspections, and so on. Each has its own purpose. First and most important is the daily suspense file. Needless to say a good suspense file assists in good management planning.

This file consists of 31 folders, one for each day of the month. It is usually kept in a standard file cabinet, but it can easily be stored in a desk drawer. Tomorrow's folder is always up front. The first activity of the day is to remove the current day's folder and its contents. Place the folder in the rear of the suspense file and begin work on the requirements.

Each folder should contain a report reminder in the form of the last report submitted. This copy should be placed in the suspense file far enough in advance of the due date to allow enough time to accomplish the action required on time. The suspense file should contain notes and research documents which require additional work before being finalized. Documents which require revision at regular intervals should be placed in this file as reminders to attend to them at the proper time. These will further serve as drafts for the revision. The last action of the day is to clear desks and in and out boxes and to place appropriate papers in the correct place in the suspense file. This will reduce the number of lost and misplaced documents.

DESK AND WALL CALENDARS

These management tools augment the suspense file. The desk calendar affords a place to record day-to-day special requirements and personal appoint-

ments. Proper use of this prevents committing yourself to be in two places at the same time. The desk calendar should be oriented toward personal requirements, workload and reports.

The standard three-month wall calendar is a valuable part of long-range planning and programming. The use of colors may be used to emphasize maximum effort or order of priority.

COMMITMENT CHART

At unit level this can indeed be a useful chart. It is used to record all details concerning personnel and equipment. It should include, but need not be limited to: date & time requirement was received; the actual requirement; coordination required, if any; coordination accomplished and with whom; OIC/NCOIC; location to report; names of personnel who may assist; and unit task assignment. This chart should be mounted where all key personnel can check it daily.

DAILY JOURNAL

For accurate and efficient message recording there is no substitute for the standard staff journal. Completeness and legibility is a must. It may serve as a reminder or as a basis to present informal up-date briefings.

THE ARMY FUNCTIONAL FILE SYSTEM

There is no substitute for complete, detailed and accurate files. TAFFS provides the best possible and most logical arrangement. Organized into the current year files, last year's files and others where appropriate, this system not only gives you a record of past events, but provides examples as well. Additional guides, diagrams, and aids should be placed in the file if needed or desired to insure simplicity and ease of operation.

REFERENCE PUBLICATIONS

Regardless of the activity, mission or nature of the office, section or unit, a complete set of pertinent reference publications is imperative. These publications include field manuals, technical manuals, regulations from all levels of command, pamphlets, lesson plans, subject schedules and all other published sources of information. A good reference library is very easy to acquire but somewhat difficult to maintain properly. Once established, there must be a constant effort to keep it current. Nothing remains unchanged.

Keeping the reference material on hand may present problems since fellow users may not return documents to the files promptly or ever in fact. There will always be that individual or unit that will habitually borrow from your library rather than getting their own references. This may necessitate establishing a hard and fast policy of "use it here" which will lessen the number of friends, but maintain your library intact.

PROMPT AND ACCURATE REPORTING

Decisions are in many instances based on reports. Every administrator owes it to himself to submit reports which contain detailed, accurate, truthful and useful information. These must be submitted on time. It is a bad reflection of the first magnitude on the commander whose unit fails to report promptly and accurately. Failure to report results from one of the following:

- ► The unit is not familiar with the requirement.
- ► The unit chooses to ignore the requirement.
- ► Individual responsibility was not assigned.

IMPROVING UNIT MANAGEMENT TODAY

Good units operate smoothly, but not without considerable well-targeted effort. Some poor units exert greater effort but with less results. Perfecting and improving as you go along naturally will cause your operation to smooth out. Gradually, as the situation and techniques improve, the unit discovers more and more time has become available. This can be used for further improvement.

EXPERIENCE

Needless to say, the standard of management is usually consonant with the level of experience. During the past few years the Army has expanded so rapidly that its growth in strength has by far outdistanced its growth in experience. There is an experience gap between the master of procedure, with his polished skills and the hard-won knowledge, and today's unit management people. Perhaps this gap is greater than we are prepared to acknowledge. It is natural that it developed. But it is highly undesirable that it remain.

The problem of the experience gap is intensified by the personnel turbulence which derives from levies, transfers, and the ever increasing pace of retirements. Overstaffing can not overcome lack of experience except during an extended on-the-job learning period with qualified instructors available. Likewise, experience can not overcome understaffing. There is a proper number of qualified soldiers for every func-

tion. It is up to us to see that the right number of men are properly trained and assigned for each function.

MILITARY SCHOOLS

Schools provide the best possible solution to the experience/management problem of having available properly trained unit management people. There are several ways to carry out a good school program. Army service schools are excellent and produce a good finished product, but not everyone can attend. Theater, Army area, and post schools are designed to augment the service schools but even they are insufficient to produce all the needed trained men and women. The correspondence courses offer a wide range of MOS training and subject matter, but results are directly related to the number of individuals who seek self-improvement.

In desperation, many units attempt to organize and conduct unit battalion, brigade, and division level courses of instruction. This unit effort usually originates as a result of serious shortcomings. Sometimes it is a product of necessity characterized by planning and execution less well done than they must be. The success of such a program is limited by the proficiency of the writers and instructors available.

The Department of the Army should initiate a program of prepared packets designed to provide units with the most complete and accurate material for unit schools. Units could then conduct short courses of instruction on the following and other subjects, with minimum effort and maximum results:

- CBR
- Operations Officer/NCO Duties
- Intelligence Officer/NCO Duties
- Tank Gunnery
- Ground Surveillance
- Materiel Readiness

The packets should contain a standard training schedule with text references, lesson plan outlines, examinations and quizzes, and any special material required for effective presentation.

OTHER MANAGEMENT AIDS

The Department of the Army could assist in improving management at the unit level by producing three other standardized tools. To be effective, these must be in sheet or looseleaf format, must be revised whenever changes occur and must reach units in sufficient numbers and on time.

Abbreviated management guides for various unit levels would be most helpful. The scope and content could follow the model of the now outdated and unobtainable *Company Duties* and *Battery Duties* which were privately published some years ago.

Handbooks for specific offices and functions would also be helpful. These might well be patterned on current civilian do-it-yourself literature. Titles such as "The Unit Mail Clerk," "The Tank Battalion Operations NCO," and "The Cavalry Squadron S2" will serve to indicate the coverage proposed.

Closely related would be checksheets, prepared in detail and citing references. These could be used by inexperienced soldiers as study guides and by all to insure that important matters were not overlooked or left undone.

It is recognized that many such aids are locally produced. Some are superb. Some are less so. It would seem that many hours and dollars would be saved, and the usefulness of the product improved, if these management tools were centrally prepared and distributed for Army-wide use.

THE ULTIMATE FACTOR

The foregoing notwithstanding, when all is said and done it is the commander or supervisor who gets done what is done. If he demands high standards, he will get superior results.

However, if uncorrected, today's mistakes will become tomorrow's accepted procedures. Therefore, in addition to setting proper standards, we must continually teach sound unit management techniques.

MASTER SERGEANT LEROI F. BELL, III enlisted in the Army in 1952. Following Infantry basic training at Fort Dix, he joined the 112th Infantry, 28th Infantry Division in Germany. He next served as an armored infantry battalion and combat command intelligence NCO in the 4th Armored Division in both CONUS and Germany. Returning to the US, Sergeant Bell joined the 3d Armored Cavalry Regiment at Fort Meade. He accompanied that unit to Germany in 1960. Next, he returned to the 11th Armored Cavalry Regiment at Fort Meade. In 1966, he became operations NCO of the 1st Battalion, 64th Armor, 3d Infantry Division in Germany. Sergeant Bell joined the 6th Reconnaissance Squadron, US Army Training Center Armor as operations NCO in 1968. He is now enroute to Vietnam.

ARMOR TASK FORCE to KHE SANH

by Lieutenant Colonel Carmelo P. Milia

Few Armor units in Vietnam have received a more exciting or challenging mission than "get through to Khe Sanh and conduct a reconnaissance-in-force to the Laotian Border." This was the assignment given on 14 March 1969 to the 1st Battalion, 77th Armor by the XXIV Corps Commander, Lieutenant General Richard G. Stilwell. Necessary armor assets were to be provided from the 1st Brigade, 5th Infantry Division (Mechanized), the largest and most versatile armor command in Southeast Asia.

Highway 9, the only road to Khe Sanh, had last been used in early July 1968 when the last vehicles of the 3d Marine Division traversed it after the siege had been lifted in the spring of 1968. The road was 26 kilometers of deteriorating asphalt laid along a twisting mountain defile. Every bridge and culvert had been destroyed; numerous landslides had cut the one way surface. The first 10 kilometers from the fire support base at Calu was a relatively flat road. But for the next eight kilometers the road contained many hairpin turns as it climbed the 45 percent slope to the Khe Sanh Plateau. In most stretches the road was so narrow that the tank turret could not be rotated and the tank gun could not be elevated to cover the ridge lines on either side of the gorge.

Before the main body of the task force could move, it was necessary to reconnoiter and reconstruct the road while providing security and continual fire support for the lead elements of the force.

As Commanding Officer of the Task Force (since named Task Force Remagen), I was given complete freedom in selecting the task organization needed to accomplish the mission. In addition to the organic assets of the 1st Battalion 77th Armor, I requested and received a mechanized infantry company (Co B, 1/61 Inf), a 105mm SP artillery battery (Btry C,

1/40 Arty DS), a reinforced platoon of armored engineers (Co A, 7th Engrs) and a section of 40mm "dusters," (Btry C, 1/44 Arty). Although gunships and command and control ships were requested, they were not available from the 3d Marine Division, the senior headquarters controlling the operation.

The concept of the operation was to scout, clear and rebuild the road through to Checkpoint Golf (see map) before any heavy combat vehicles would be allowed on the narrow road. Checkpoint Golf was critical because it was the first point on the road where one vehicle could bypass another and was, in fact, a clearing large enough for the artillery battery and 4.2 mortar platoon to occupy firing positions.

The mission was a classic for an armored force; the execution was "out of the book." The first unit to run the gauntlet was the battalion scout platoon mounted in *M113* ACAVs. This platoon, ably commanded by 1LT Bruce J. Goldsmith, reconnoitered by fire every potential ambush site, swept the road for mines, and provided security to the armored engineer platoon which followed.

1LT Lawrence H. Marlin, the engineer platoon leader, used every technique in his engineer bag of tricks. Every gap was quickly spanned by the armored vehicle launcher bridge (AVLB). This permitted passage of an engineer squad and a bulldozer to the next obstacle which might require construction of a bypass or culvert, or the reduction of a roadblock or landslide. By leapfrogging two AVLBs, it was always possible to work on at least two obstacles simultaneously. When a bypass around the AVLB site had been constructed, the scissor bridge was picked up on the far side and carried to the next gap. The engineer feats of this one platoon were prodigious. Working nearly 18 hours a day for two days, the platoon mineswept 26 kilometers of road, constructed 13 bypasses capable of carrying Class 60 loads, launched and recovered the AVLB six times and reduced 10 obstructions. Two enemy antitank mines were detected and destroyed.

Progressing faster than the most optimistic forecast, the scout/engineer team reached a night laager position at Checkpoint Golf by twilight of the first day, 17 March 1969. The bivouac position was ringed by artillery defensive concentrations fired from the main body assembly area at Calu 10 kilometers away.

At dawn of the second day, CPT Dave Porreca's mechanized infantry company and the 105 SP artillery battery began their displacement forward to Checkpoint Golf. At this point, the infantry dismounted and quickly secured the high ground while the artillery made available the fire support necessary for the continued trail blazing of the scout engineer team. Checkpoint Golf was the last checkpoint on the valley floor. From here the road ascended steeply to the Khe Sanh Plateau, a rise of 1250 feet. The scouts were now starting up "Ambush Alley" where the NVA a year earlier were able easily to sever the ground line of communication to the beseiged Marines at Khe Sanh.

One extremely critical obstacle remained. Checkpoint Hotel had once been a high level truss bridge. It had been destroyed and the bypass pontoon bridge had since been washed away. The raging river at this point was far too deep for fording. If the gap were too wide for the 60 feet AVLB, the requirement for major bridge construction would grind TF Remagen to a halt. Because the bridge abutments had also been destroyed, aerial photos could not be used to measure accurately the gap. When the AVLB opened its scissor bridge, all fingers were crossed. A hearty cheer went up as the bridge touched the far side with three feet to spare. TF Remagen was almost ready to roll.

By darkness of the second day the scout/engineer team was on the plateau, at attack position Hawk. Lieutenant Marlin radioed back that he must be looking back down the most beautiful valley in Vietnam. Lieutenant Goldsmith radioed that ahead lies what must be the eeriest battlefield in the world. The ground, honeycombed by B52 strikes, looked like the surface of the moon. Mines, duds, fortifications, barbed wire and rotting parachutes were everywhere. With the artillery and mortars in position at Checkpoint Golf, and the high ground between Golf and Hotel secured by the mechanized infantry, we were ready to pass the armor through.

In spite of the engineer effort expended to improve the road, it had been laid down that only track laying vehicles would go on TF Remagen. Any type of wheeled vehicle was prohibited. The force consisted of 86 track-laying vehicles including tanks, APCs, armored mortar carriers, bulldozers, *M88* tracked recovery vehicles, *M577* CP vehicles and a combat engineer vehicle.While wheeled vehicles may have simplified the control and logistics challenges the terrain was such that they never could have made the trek.

CPT Darrell Blalock's C Company 1/77 Armor jumped off at 0800 on the third day. His tank company was followed by the task force command group and combat trains. In anticipation of ambush and

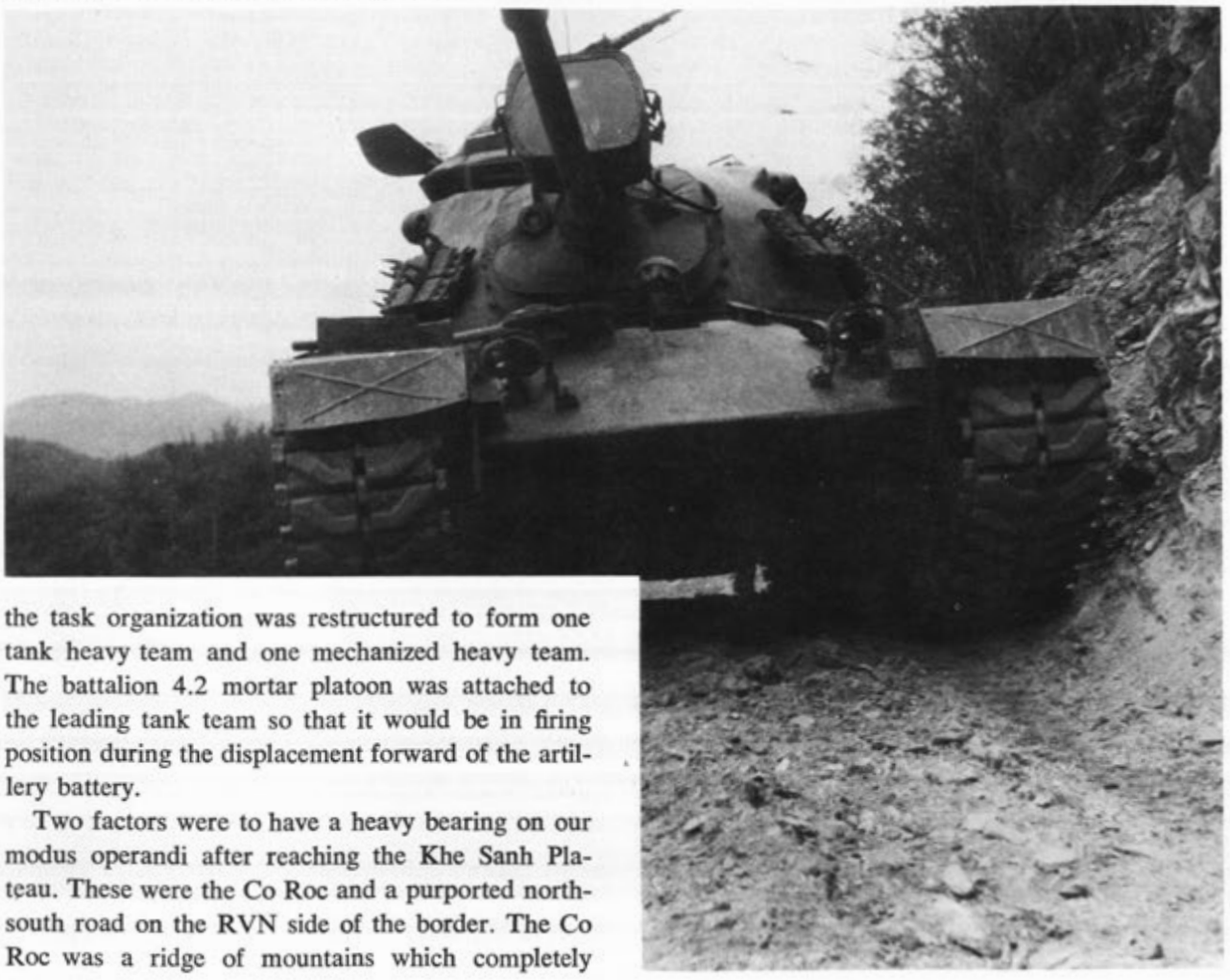
mechanical breakdown, the order of march was arranged so that similar weight class vehicles traveled as buddies. This assured that a disabled vehicle would always have an adjacent vehicle that could push or pull it. All crews had been alerted to be prepared to push disabled vehicles off the road into the chasm below.

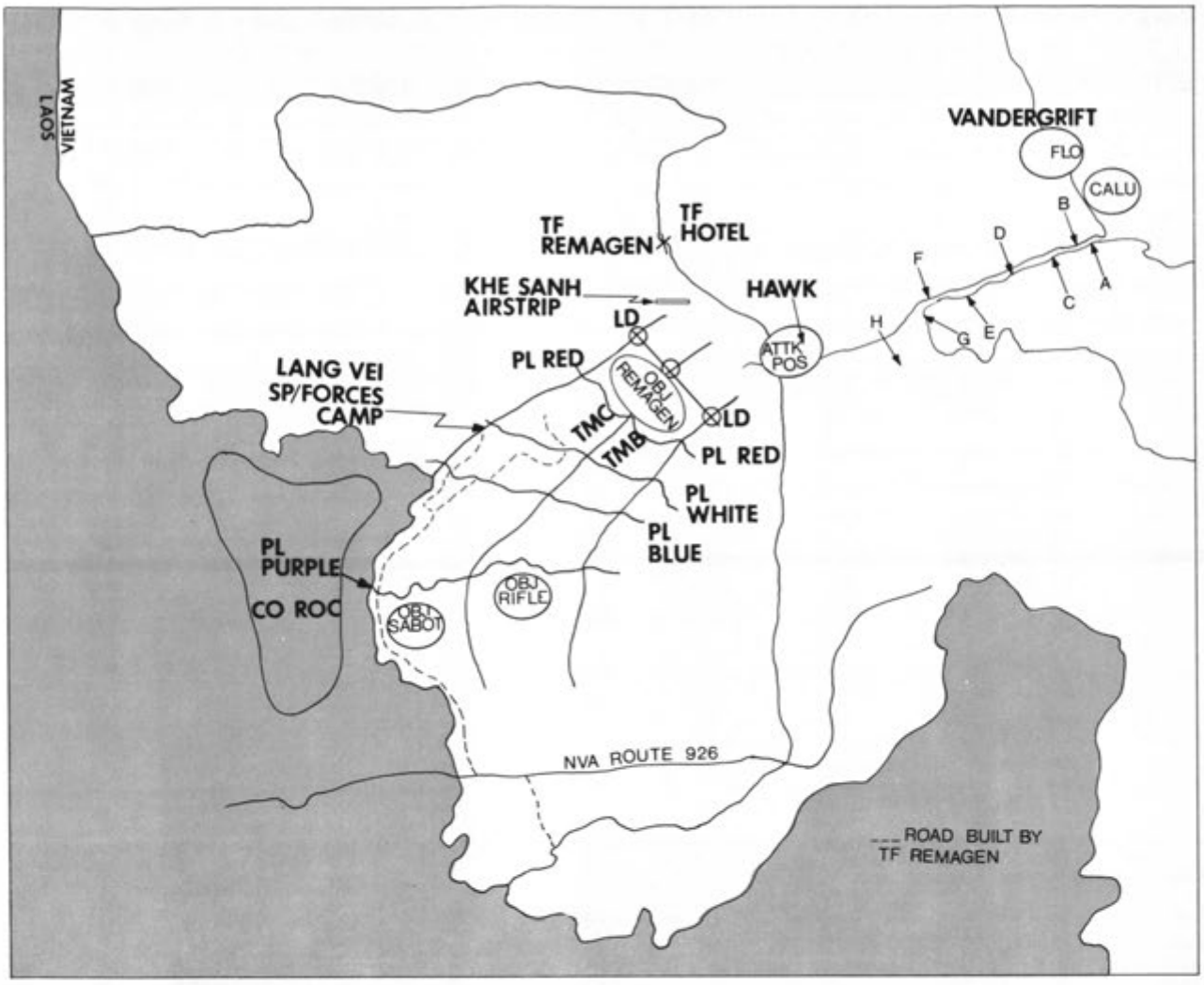
The march went without incident. By 1100, the scouts had reached Khe Sanh City. All task force elements had closed on the plateau within five hours. By noon on 19 March, TF Headquarters at Khe Sanh City was visited by the XXIV Corps Commander. Within minutes US Army armor was racing for the Lang Vei Special Forces camp and the Laotian Border. With the removal of the AVLB at Hotel, the ground line of communication was once again cut. The 1/77 Armor was an independent task force operating deep in enemy territory and being supplied completely by helicopter.

After reaching Khe Sanh, the Task force was given a new mission — to turn southward in order to cut Highway 926 which was an enemy road leading from the Laotian Border. For the new mission, the task organization was restructured to form one tank heavy team and one mechanized heavy team. The battalion 4.2 mortar platoon was attached to the leading tank team so that it would be in firing position during the displacement forward of the artillery battery.

Two factors were to have a heavy bearing on our modus operandi after reaching the Khe Sanh Plateau. These were the Co Roc and a purported north-south road on the RVN side of the border. The Co Roc was a ridge of mountains which completely dominated the intended axis of advance. The Co Roc lies in Laos, parallel to the border and the Xe Pon River. From this dominant ridge, the enemy could observe every vehicle. In fact it was the caves of the Co Roc that sheltered the long range 130mm field guns which pounded the Khe Sanh airfield during the historic siege. Enemy possession of this critical terrain demanded that the task force move continuously before enemy direct and indirect fire could be brought to bear.

The second factor stemmed from an intelligence report which indicated that a road existed along the Xe Pon River and the intended route of advance. If true, such a road would materially assist progress and allow the leading tank heavy team to cut Highway 926 in a few hours. As it developed, the reported highway did not exist. The search for this road committed the tank team to blaze a trail within a few hundred meters of the Laotian border and the Co Roc. The new pioneer road thus exposed the entire task force as it displaced southward. If the road had been built further to the east, the TF would have been less vulnerable to enemy dispositions on





the Co Roc. As the task force pushed on closer to the Laotian Border, its lead elements passed through the abandoned Lang Vei Special Forces Camp. The tankers took the opportunity to inspect four *PT76* tanks, all of which had been destroyed. Also found was an abundance of old munitions and destroyed equipment of both NVA and friendly forces.

It took five more days of scouting, trail blazing and road building to reach and cut Highway 926, the enemy road from Laos. From 26-30 March, both teams conducted extensive search and destroy operations north and south of Route 926. Approximately 100 square kilometers were searched with only small enemy contacts.

It would have been desirable if TF Remagen could have simply kept going west into Laos, or southeast back into the A Shau Valley. Political considerations prevented the first course of action; an impassible mountain ridge discouraged serious consideration of the latter. Accordingly, the task force had to withdraw over the same route upon which it had ad-

vanced. The enemy knew this. He could permit the advance in the full knowledge that sooner or later the TF would have to run the Xe Pon gauntlet again.

For the next month, TF Remagen reconnoitered at will all over the Khe Sanh Plateau. Fire support bases which had heretofore been accessible only by helicopter were assaulted and occupied by tank/infantry companies. During this phase, elements of 1/77 armor were relieved in place by the 1/61 Infantry (Mech) and an ARVN armored cavalry troop. At one time five armored companies (2 tank, 2 mech and 1 cavalry) and two SP artillery batteries were operational in a 200 square kilometer area. During this period one large ammunition cache was found and two major engagements were fought in which 73 NVA were killed.

Because the bridges behind TF Remagen were removed, the operation was a test of the ability to resupply and maintain armored forces without a ground line of communication. The Brigade established a forward support element (FSE) at Vandergriff Combat Base where supplies and repair parts were staged for shipment by helicopter. Combat trains consisted of tracked medical, maintenance and resupply vehicles, the majority of the mechanics and a portion of the battalion support platoon. Field trains were located at Vandergriff.

Not once was the commander's operational concept restricted because of logistics. This logistical achievement can be credited to the S4, CPT Neil Howell, and the Company D Commander, CPT Emerson Addington. It should be noted here that the 1/77 Armor is organized with a separate support company (Company D) which has the effect of splitting the old headquarters and service company. With CPT Howell operating from the field trains area, and CPT Addington operating with the combat trains, every logistical requirement was fulfilled. The operation proved the wisdom of the separate support company concept.

An average of 15 Chinook loads per day was required for resupply. Following is a summary of the major supplies required to support the task force:

- 93 pallets of rations
- 76,000 gallons of Mogas and Diesel
- 2000 gallons of assorted POL
- 18,000 rounds of major caliber ammo
- 225,000 rounds of small arms ammo
- 50 major component repair parts (e.g., engines, transmissions, track, final drives, starters)

Vehicular maintenance, and organizational and direct support repair were continuous. With the tactical need to move almost daily, crews and mechanics worked around the clock and often under enemy fire to repair and evacuate damaged vehicles. In one three-day period, mechanics of the 1/77 Armor pulled 13 power packs for maintenance. *M48A3* power packs were flown in by *CH47 Chinook* and direct exchanged with monotonous regularity. Five vehicles (one *M48A3* tank, one *M88* VTR, one *M113* APC, one *M548* and one bulldozer) were combat losses and were solemnly buried near the Khe Sanh airstrip.

Task Force Remagen withdrew from Khe Sanh Plateau on 28 April after having proved its value. For 47 days a conventional Armor/Mechanized force had operated in the northwestern mountains of South Vietnam along the Laotian border. One large cache was found, numerous small skirmishes and two significant engagements were fought. The 1st Infantry Brigade, 5th Infantry Division (Mechanized) had proven again that armor can operate over extended distances without a ground line of communication. In moving at will from Khe Sanh to Route 926, and along the Laotian border, TF Remagen has given the enemy cause for concern. His lines of communication in Laos are vulnerable. A tank/infantry/artillery force, which is totally supplied by air and therefore severed from its logistical tail, could enter Laos, turn south and strike along the Ho Chi Minh Trail.

LIEUTENANT COLONEL CARMEN P. MILIA, General Staff (Armor), is a 1950 graduate of the United States Military Academy and holds a Master of Science in Aeronautical Engineering from the Georgia Institute of Technology. He served in the 64th Tank Battalion, 3d Infantry Division during the Korean War. He has served in seven tank battalions, in USATCA, as an instructor at the Armor School and with the CDC Armor Agency. Prior to commanding the 1st Battalion, 77th Armor in Vietnam, he was the DA Systems Staff Officer for the *Sheridan/Shillelagh* and ACSFOR project officer for air cushion vehicles. He is now assigned to the Office of the Chief of Research and Development.

SHORT, OVER, LOST or...TARGET

A range for firing novel ideas which the readers of ARMOR can sense and adjust. This is a department for the new and untried from which the doctrine of tomorrow may evolve. Items herein will normally be longer than letters but shorter and less well developed than articles—about 750 words maximum is a good guide. All contributions must be signed but noms de guerre will be used at the request of the author. ON THE WAY!!

"SOME CRITICAL NOTES" NOTED

By Colonel George S. Patton

Congratulations to Colonel Hugh Bartley, my comrade-in-arms of long standing, on his "Critical Notes" which appeared in the November-December issue. We need this type of article in *ARMOR*. And I, for one, have taken his bait and "primed the writing pump."

Colonel Bartley's comments on counter-mine activities are tragically true. I cannot agree, however, that all Armor people have been complacent about this important subject. We simply could not be so and continue to hold our heads up. In this connection, when the 11th Cavalry lost over 100 combat vehicles (to include a number of medium tanks) during the first half of FY70 to enemy mines alone, complacency was not the name of the game. We solicited engineer advice at all levels; we held special training sessions; we increased the number of mine familiarization hours in our in-country indoctrination courses and we required our engineer company commander and at least half a dozen combat experienced officers to devote much valuable time to the problem.

Perhaps our most effective action was to publish a detailed study of mine experience in our area of operations (AO). The study addressed such subjects as "Where should units be most watchful?" and "What really happened to include type mine employed, time of detonation, friendly formation etc." This information was made available, in the form of an overlay, down to and including platoon level. I must emphasize that our countermine actions were related to the specific geography of the assigned AO. We developed no maxims like, "Watch for them on the edge of rice paddies" but rather employed notes that pointed out a specific area such as west of Phuc Hoa or south of Chanh Luu. This helped but was certainly not the final solution.

The solution Colonel Bartley stipulates is one of ". . . dedicated men bringing the latest scientific techniques to bear on the problem." My only request is that they keep their devices simple and easy to repair. Perhaps it would be appropriate if *ARMOR* requested from the Office of the Chief of Engineers an unclassified progress report on this subject describing what has been accomplished and what is planned for the future.

I agree with Colonel Bartley's thoughts on unit integrity. However, I will say that a comparable problem was probably faced by Hannibal's elephant force commander when those staunch Carthaginian staff officers decided to parcel out his force and "give everybody some elephants." Perhaps the same comment can be made about Chinooks, Huey companies, or Zippo flame throwers today. Truly, the education and the promotion of understanding is one answer. Detailed and continuous study of the capabilities and limitations of the organization is another. Development of free exchange between participating commanders is yet another. Pursuit of these policies should make the situation more manageable.

I cannot concur with Colonel Bartley's thoughts on jungle busting. I found, after some experimentation, that the medium tank elements with a proper mix of armored cavalry and infantry, and used in the conjunction with air cavalry, was a very effective base camp force.

Led and advised by air cavalry elements known as pink teams (one gunship and one light observation helicopter,) the reinforced tank unit was able to approach an enemy base camp, encircle it and then completely destroy the installation and those enemy soldiers who felt that they should remain. A force for this type of operation might consist of a medium tank company, an infantry rifle platoon and an armored cavalry platoon. And in support, at least one, and probably two, pink teams. The approach phase finds the ground force moving (generally in column or two close columns) toward the reported

base camp. Pink teams move ahead of the heavy element at a distance of not more than one-half mile to a mile and always operate at the lowest possible altitude.

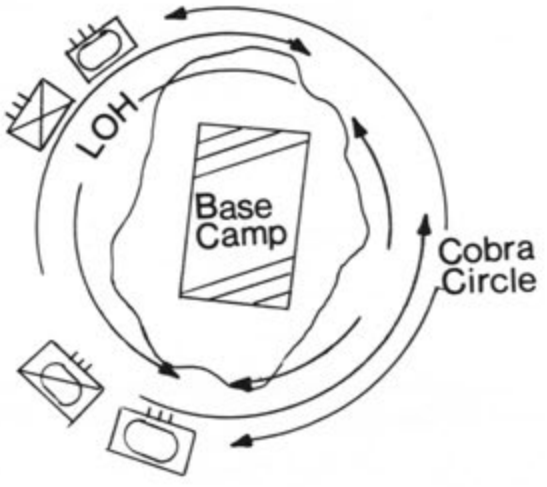
There are two choices available for command arrangements. Obviously the entire force, to include aviation, can be under the command of the tank company commander, or as an alternative, the air cavalry troop commander. In all cases however, these relationships must be carefully stated before contact is gained. The command arrangement depends on the then current situation and particularly upon which commander is most familiar with conditions in the objective area.

Upon initial contact with the enemy base camp, the tanks halt momentarily, split into two encircling elements and, guided and advised by the scouts, cut a circular swath around the area. This swath should ideally be about two tank widths wide. The *LOHs* continue to point out targets and advise the tank elements; and, most important, communicate directly with the lead tanks in all cases. They fly the outer circle. This we called "swath tactics."

The tanks generally cut a swath around the objective area which then becomes a fire lane or clear observation area for both armor and gunships. In the classic sense, the battle field is now isolated.

Experience has shown that these crushed jungle areas will burn quite readily in the dry season. Thus the next logical step is to set them on fire by using incendiary grenades or white phosphorous or a combination of both. I can state from experience that the formula of medium tanks and *Cobras* and scouts encircling together with the fierce burning, smoke and general destruction in the swath has some deleterious effects on the morale of the base camp occupants. The degree of their motivation is greatly reduced.

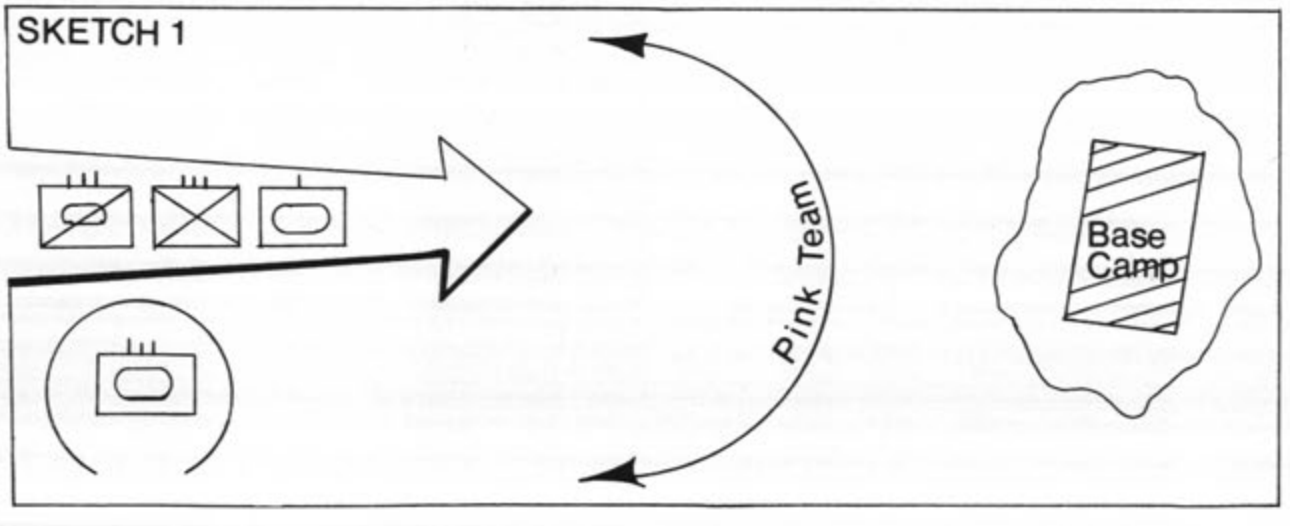
SKETCH 2



A cursory examination of Sketch 2 will indicate that the link-up of the encircling tank elements and their infantry is most critical. It must be very carefully coordinated. Communications and communications discipline must be perfect and movement should be deliberate and quite slow. To do otherwise is to court disaster from friendly fires. Again, the scout plays a key role. He advises, keeps the participants informed and coordinates the link-up. His action at this point is key. When possible, he may, and should, land to pick up the commander on the ground who can do vital coordination.

Our experience was that when the link-up is completed, a few of the less determined hostiles, by this time quite nervous, will attempt to break and escape

SKETCH 1



SKETCH 3

from the circle. If they select this course of action it is 90mm or 152mm cannister time and *Cobra* roll-in time. Charlie must cross the swath to get away. Tanks are in position and have the fields of fire to fire along the swath and the *Cobras* can see to fire at anything in it. Here I must emphasize that in each of literally dozens of operations of this type we undertook, a certain percentage of the enemy did decide to depart in haste. This then is also an excellent time to secure a POW who will perhaps save much blood and sweat by causing his comrades to come out or who will assist in the further identification of enemy positions and dispositions. Normally, some NVA will come out.

Vietcong are usually a different proposition. They usually have to be destroyed in their bunkers. This is done by chopping up the area. The tanks, APCs and infantry turn inwards and systematically slice up the camp complex by flattening the underbrush, crushing the bunkers, and blowing up all the enemy structures. The scouts and gunships remain airborne throughout. When the exploitation of the area terminates, it is often rewarding to leave stay-behind infantry elements on position to snatch up the few enemy soldiers who were able to escape and are now trying to return for a host of different reasons.

Armor is well suited for swath operations. In order, the *M48A3,* the *Sheridan M551* and the *M113A1* ACAV are effective. A rifle platoon working with the company team adds an important capability since the infantry soldiers can do what infantry has always done: protect, provide extra sorely needed observation and handle such fine weapons as the *LAW* and shaped charge in the bunker destruction operation.

I am the first to agree that this technique is hard on the armored equipment. But, I will also say from personal observation that it is also very hard on the enemy. The potential returns in enemy eliminated and equipment captured when related to friendly losses (especially infantry) is overriding. However, it must be emphasized that in this type of operation there is a continuing requirement for air cavalry action as described herein. Here, as in many other combat examples in Vietnam, aviation makes the difference.

In conclusion, when consideration is given to the advantages and disadvantages which result from using this tactic, it seems far better to use, move and fight the armor in operations which have repeatedly proven remunerative than to hold it at the firebase protecting the mess truck and escorting Red Cross representatives on their periodic visits to the field.

I am hopeful that the above comments offer alternative viewpoints to those so strongly put forth by Colonel Bartley which are worthy of the full consideration of those of us privileged to serve with Armor. To stimulate such professional thought and discussion has been my sole purpose in putting forth these observations.

By Lieutenant Colonel John C. Bahnsen

I take exception to a portion of Colonel Hugh J. Bartley's comments in the November-December issue of *ARMOR* concerning jungle busting.

During my last year (Sep 68 — Sep 69) in Vietnam in successive command of the Air Cavalry Troop and the 1st Squadron of the 11th Armored Cavalry Regiment, I witnessed numerous successful examples of getting to the enemy by jungle busting. As the Air Cav Troop CO, I spent much time directing tanks and ACAVs to base camps found by my aero-scouts. As the 1st Squadron Commander, I was even more successful in killing enemy troops by jungle busting using both *Sheridans* and *M48A3s.* The *Sheridans* are not as good as the *M48A3s* in jungle busting. The cost in maintenance is high and we did lose some vehicles to RPGs. However, we did get to the enemy and sustained small casualties. I don't consider jungle busting "ridiculous."

In response to Colonel Bartley's desire to "prime the writing pump" I am preparing articles for *ARMOR.* Having led a few fiascos, I don't plan to avoid the bitter lessons learned.

HOW WOULD YOU DO IT?

US ARMY ARMOR SCHOOL PRESENTATION

SITUATION

You are platoon leader of the 2d Platoon, Troop A, 1st Squadron, 201st Armored Cavalry Regiment. Your platoon, minus the support squad, is escorting a 15-truck resupply convoy north along Highway 10 from Tuy Dap to the regiment's basecamp near Phu Chanh. You are the convoy commander. Before beginning the escort mission you briefed the truck drivers thoroughly on the mission. The 3d Platoon, Troop A has been assigned as a reaction force for the mission. You coordinated with the platoon leader as to your route of march and discussed the problem areas, probable ambush sites, and actions on enemy contact. The convoy order of march follows: Two Sheridans, 5 trucks, rifle squad and yourself, 5 trucks, 1st Scout Squad, 5 trucks, 2d Scout Squad, and the platoon sergeant mounted in his Sheridan. Air support is available through a forward air controller (FAC) who is covering you as the convoy moves along the route of march. Artillery is also available through an airborne observer.

PROBLEM

As the convoy arrives at a point 6 kilometers from Phu Chanh, the lead Sheridan is rendered immobile by a command detonated mine. At the same time, a heavy volume of automatic weapons, antitank weapons, and mortar fire rakes the convoy. It is evident that at least part of the convoy is in the kill zone of an enemy ambush. One of the trucks attempts to move around the Sheridans in an attempt to escape the kill zone, but strikes a mine and is severely damaged. Apparently both sides of the road are mined, and the damaged vehicle blocks the road.

WHAT ARE YOUR ACTIONS AT THIS TIME?

SOLUTION

The first response to an ambush is to return fire immediately in an attempt to achieve fire superiority. Notify higher headquarters of the ambush immediately. Attempt to clear the road by having the second Sheridan push the damaged vehicle off the

AUTHOR: MAJ FREDERICK W. SHIRLEY

ILLUSTRATOR: SP4 EDMUND M. ENOMOTO

road and move the convoy out of the kill zone of the ambush, while your platoon provides covering fire for the trucks. As your platoon returns the enemy fire, call in all supporting fires available to you. Direct the supporting fires to both sides of the road, placing the majority of the fires on what you determine to be the location of the main force.

DISCUSSION

When the armored cavalry platoon alone is ambushed, it has the flexibility to strike the enemy as quickly as possible to disrupt and disorganize him and to pursue if the terrain and tactical situation permit.

When providing convoy security, however, the trucks must first be moved to a safe area and secured before pursuit of the enemy is possible. In the initial coordination with the drivers of the convoy, you should have briefed them regarding the actions on contact.

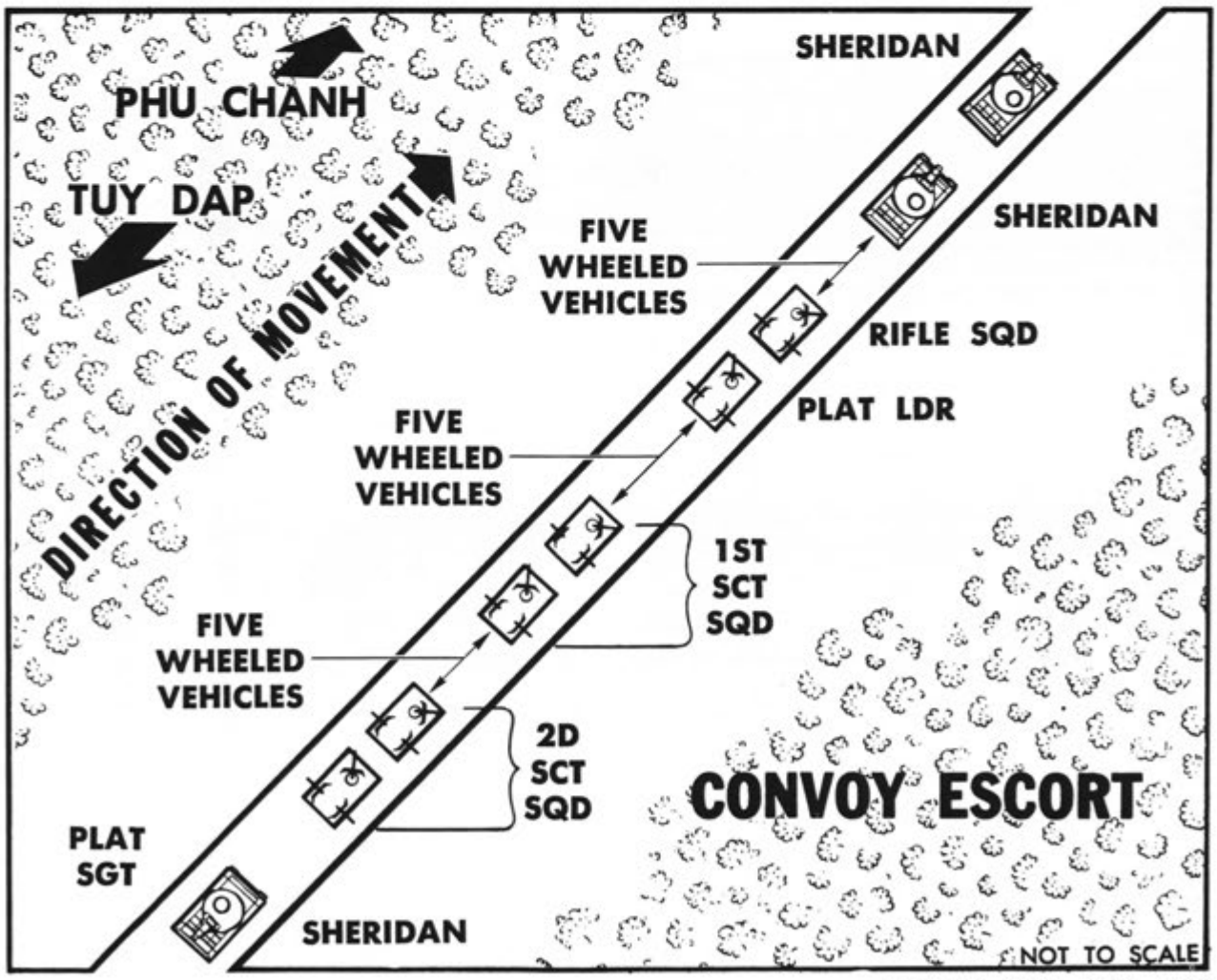
Specific guidance for the reaction force can be given as the unit moves to reinforce.

The first response to an ambush by the armored cavalry platoon is to return fire immediately and to achieve fire superiority. Pyrotechnics may be used to warn vehicles not to enter the kill zone.

The importance of maintaining a proper vehicle interval becomes increasingly more evident when a convoy is ambushed. If a planned interval of 100 meters has been decreased to 20 meters during movement of the convoy, it is obvious that there will be five times as many vehicles in the killing zone of an ambush.

When vehicles are disabled in the kill zone, the platoon must move its elements into that area, distributing its firepower to counter the enemy threat, to protect the vehicle and assist in the evacuation of any casualties. In a large kill zone the armored vehicles may have to move back and forth along the column in order to protect the trucks and ensure proper distribution of fire.

The platoon leader in this case is responsible for coordinating and directing available fire support against the enemy positions and notifying headquarters of the situation. Only when all vehicles are secured will the armored cavalry platoon have the option of pursuing the enemy.



From The Armor Branch Chief...

Appointment as the new Chief of Armor Branch was a most welcome surprise to me.

Throughout many years of association with our Armor officer personnel branch, I have heard consistently the highest praise for the wisdom and maturity shown by those making assignments and giving us all counsel and guidance on career matters.

As your new branch chief, I shall strive to see that the same high standard of service prevails. Our doors remain open, as do our minds, to all Armor officers. We seek your support to assist us to do an even better job of helping you as you progress in your careers. To achieve this goal, we solicit your questions and comments by letter, telephone or personal visit.

My initial orientation here at Armor Branch has impressed me that Armor is one among many branches filling Army assignments. Most are considered desirable. Some are thought to be less so. Some seem to take an officer out of the main stream for a while. But, all are essential to achieving the Army-wide mission. In every case, it is essential that each of us perform our assigned duty in the best possible manner regardless of the type of job or where it may be. Many of the seemingly strangest assignments are the most valuable in our professional development.

We will continue to offer, in each issue of *ARMOR*, a thought or two on career matters for your information and consideration. Frequently, this feature will be based on questions that many of you have asked. In other cases, it will serve to draw attention to new policies.

I am honored to serve you, the courageous and talented professionals of the Combat Arm of Decision — Armor.

JAMES H. LEACH
Colonel, Armor
Chief of Armor Branch

EDUCATION PROGRAMS

With continuing and increasing emphasis being placed on education throughout the Army, more and more questions are being asked about various programs that are designed for educational development. The purpose of this article is to review and update previously published information and to touch on the advanced degree program.

AR 621-5, *General Educational Development*, and AR 350-200, *Training of Military Personnel at Civilian Institutions*, are the two primary references pertaining to the various education programs.

TUITION ASSISTANCE PROGRAM

This program is conducted under the provisions of AR 621-5. Under this program, the Army will pay 75% of tuition costs for personnel attending off-duty classes conducted by an accredited civilian educational institution. This is a very popular program. More detailed information can be obtained by visiting your local education center.

UNITED STATES ARMED FORCES INSTITUTE (USAFI) PROGRAM

Details for USAFI are set forth in DA Pamphlet 350-1. Over 200 courses may be taken directly from USAFI. The initial fee of $5.00 allows a participant to take as many of the courses as he desires as long as progress is satisfactory. In addition, over 6000 correspondence courses are available through USAFI from the extension divisions of 46 colleges and universities. These courses are offered at reduced prices

to active duty military personnel. More detailed information on USAFI may also be obtained from local education centers.

The next three programs are designed to allow individuals to earn a degree. The first, the Degree Completion Program (DCP), allows for resident study to earn either an undergraduate or a graduate degree. The Officer Undergraduate Degree Program (OUDP) is oriented toward attaining a baccalaureate degree and The Officer Graduate Program (OGP) is designed for graduate study.

Armor Branch applicants must have completed a Vietnam tour, company command and the advanced course prior to entry into any of the programs.

DEGREE COMPLETION PROGRAM ("BOOTSTRAP")

The Degree Completion Program is a part of the General Educational Development Program outlined in AR 621-5. The program is designed to enable personnel to satisfy requirements for a degree by full-time attendance at an accredited college or university for up to one year.

Attendance under this program is on a full-time, permissive TDY basis. Participants receive full pay and allowances but attend school at no expense to the government which means no travel or TDY funds are involved. Even though no tuition assistance is directly involved with the "Bootstrap" program, most participants can qualify for Veterans Administration benefits while attending school.

Participation in this program is normally in conjunction with a PCS move on a "TDY en route" basis. However, attendance is also possible while temporarily absent from an assigned duty station on "permissive" travel orders.

OFFICER UNDERGRADUATE DEGREE PROGRAM (OUDP)

The newest education program is the Officer Undergraduate Degree Program. The OUDP allows for up to two full years of attendance at an accredited college or university for the purpose of undergraduate degree completion.

Selected participants are assigned to the appropriate CONUS Army student detachment with duty at the school of their choice. This is a PCS move and officers receive all normal pay and allowances to include PCS travel pay and shipment of household goods.

Contingent upon the availability of funds, the Army also provides full tuition support and reimburses up to a maximum of $100 per fiscal year for textbooks and supplies.

Basic eligibility criteria for the OUDP include the following:

- Must be Voluntary Indefinite or RA prior to entry into program.
- Must have completed two but not more than seven years of active commissioned service at time of entry into school.
- Must be able to complete requirements for a degree within two years of entry date.
- Must agree to accept an active duty service obligation, upon completion of school, of two years for each year or portion of a year of schooling. The minimum obligation is three years.
- Must agree to pay all expenses including tuition, textbooks and supplies in the event government funds are not available.

Selections are made by Armor Branch. Military performance of duty, particularly in combat, and demonstrated potential are the primary selection criteria.

The Armor Branch contact on this program is Major Warren J. Walton, OXford 6-8507.

OFFICER GRADUATE PROGRAM (OGP)

The Army Educational Requirements Board (AERB) establishes requirements for graduate level schooling annually. Quotas for various fields of study are then allocated to the career branches.

The OGP program allows for up to two years of study at an approved institution for the purpose of earning a graduate degree. Officers will normally serve a utilization tour in the AERB position upon completion of schooling.

Applications for graduate level education can be made under the provisions of AR 350-200. Selection for the program is on a best qualified basis among applicants and is based on performance of duty, academic background and needs of the service.

Armor Branch receives most of its quotas for graduate level training in hard science curricula such as engineering, physics, ADPS, ORSA and similar fields. Fewer quotas are received in the social sciences and business related fields.

In addition to the OGP program, the "Bootstrap" program is also available for the attainment of a graduate degree. . . . According to Change 4, AR 621-5, the graduate degree candidate must be able to obtain his degree within one calendar year.

Armor Branch contact for OGP and "Bootstrap" is LTC Joseph C. Lutz, OXford 6-8509 or OXford 7-1210.

ARMOR INNOVATIONS CENTER

LASER RANGE FINDER

The Armor School's Weapons Department is now developing techniques for laser range finding. A new range finder, the *AN/VVS-1,* is designed to provide accurate range data to the electro-mechanical *XM19* ballistics computer found on the *M60A1E2* Tank. A similar range finder package is being considered for the *M551* armored reconnaissance/airborne assault vehicle.

One of these ranger finders was recently installed on an *M37 (M60A1E2)* turret trainer. As an integral component of the fire control system the *AN/VVS-1* determines range by transmitting a pulse of laser light to the target, which is then reflected back to the laser source converting the time lapse from transmission to reception into the range. The range finder can select ranges at two-second intervals with a maximum of three rangings per minute possible when it is operated continually.

The tank commander and gunner both having the capability to range, may preview as many as three targets intercepting the laser beam, and manually select the correct range for input to the computer. These crewmen may also elect to set up their system for automatic transmission of range data to the computer.

The range finder consists of five primary components: the *Laser Receiver-Transmitter,* which develops the laser pulse, converts reflected light into an electrical signal, stores range data and has its own self-test and power capabilities. The receiver transmitter is mounted coaxially with the main gun immediately above the *XM126* telescope. The receiver-transmitter is boresighted with both the gunner's and commander's pericopes. The *Display Command Indicator* provides the tank commander a control panel which indicates operating status and reads out range data. The Gunner's Control and Digital Indicator being two separate components provides the same controls as does the commander's display unit. These components have an additional capability of detecting malfunctions in any one of several constantly monitored circuits. Both tank commander and gunner have control switches for operation of the range finder. However, the gunner's capability may be overridden by the tank commander. The last component is the *Power Supply Control.* The *AN/VVS-1* uses vehicle power primarily. If, for some reason, the vehicle power becomes inadequate the laser power system automatically activates and operates the system.

Organizational maintenance will be limited to trouble-shooting and fault-isolation within major components and connecting cables. The tank turret repairman may then make necessary repairs merely by replacing the faulty component or cable.

Immediate tasks facing the Weapons Department include preparation of a laser safety SOP, instructor training and development of tank gunnery techniques peculiar to the use of the laser ranger finder.

MSG Bobby L. McAbee, Project NCO describes the AN/VVS-1 laser range finder trainer to LTC Richard P. McLean, USAARMS Weapons Department Deputy Director.

LEADERS MAINTENANCE EXERCISE

"What can I expect when I report to my first unit?" This question, asked most frequently by the new lieutenants who attend the Armor Office Basic Course, is being answered in part by the "Maintenance Exercise for Leaders" currently taught by the General Subjects Department of the Armor School.

The purpose of this instructional unit is to cor-

relate the leadership and management techniques the students were taught in the various school departments. Television is used extensively to portray scenes from the first week in the life of a typical officer, "Lieutenant Armor," when he arrives at his first unit. During the presentation, a series of problem situations are depicted. These require the student officer to combine previously learned principles and techniques to arrive at acceptable solutions.

Completing the four hours of instruction just prior to graduation, the Basic Officer is given a questionnaire to answer and return after 30 days on the job in his first assignment. Based on the feedback generated by these questionnaires, the "Maintenance Exercise for Leaders" is further improved to help bridge the void between the academic environment of the classroom and the realities of the unit world.

CDC ARMOR AGENCY

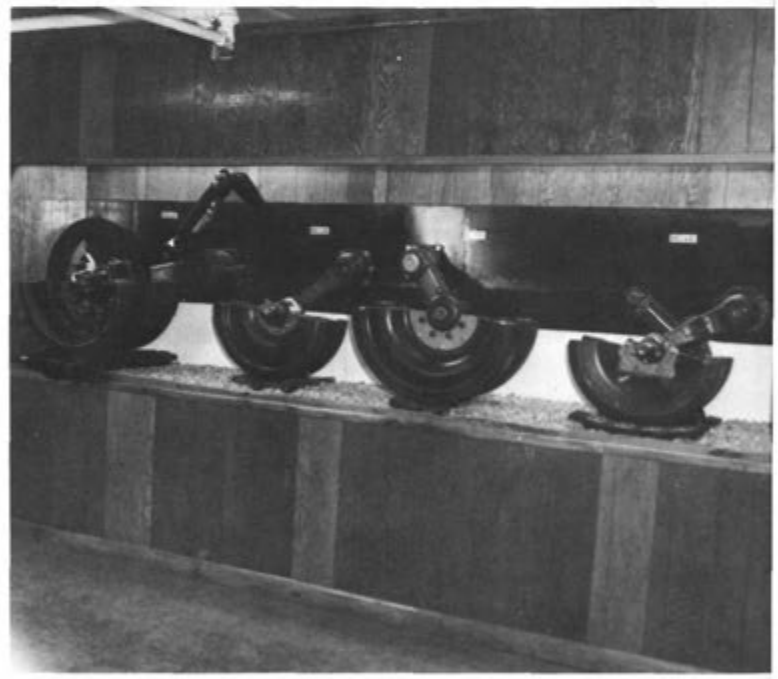
The Materiel Division, Combat Developments Command Armor Agency is responsible for preparing new materiel requirements and monitoring Armor proponent materiel through its life cycle. This extends from the initial requirement, through development until the equipment is fielded, and subsequent phase-out of the item from the active inventory. The Materiel Division also assesses materiel requirements and equipment of other combat arms and services that will be used with or in conjunction with Armor units.

The Materiel Division has three branches — Main Battle Tank Systems Branch, Reconnaissance and Air Cavalry Systems Branch, and Systems Support Branch. The Main Battle Tank Systems Branch is responsible for main battle tank systems to include the vehicles, weapons and munitions. The current Main Battle Tank Program includes the *M48, M60* and *MBT70* series tanks. The Reconnaissance and Air Cavalry Systems Branch is responsible for the combat vehicles, weapons and munitions of reconnaissance systems. At this time, this branch is concerned with the Armored Reconnaissance Scout Vehicle (ARSV) and the Vehicle Rapid Fire Weapons System-Successor (VRFWS-S). In addition, it monitors aircraft and armament systems which are to equip Armor's air cavalry units. The Systems Support Branch is responsible for the Combat Vehicle Night Vision System and those functions of the Materiel Division which pertain to electronics logistical support, CBN-related equipment, and clothing and equipment for combat vehicle crews.

The Materiel Division, in conjuction with the entire Armor Center team, is currently preparing new and more dynamic approaches to establish an even more effective operational test and evaluation program for Armor equipment.

USATCA M551 TRAINING

A four week *M551* Transition Course is conducted by USATCA for selected men after completion of Armor Crewman Advanced Individual Training. The future *M551* Crewman learns the characteristics and capabilities of the *Sheridan* and how to drive it on land as well as in the water. The main portion of the training course is devoted to familiarizing the trainee with *M551 Sheridan* gunnery techniques. Emphasis is also placed on communications and maintenance. He learns to fire the missile on the *M40* weapons trainer which simulates the flight and strike of a missile, and then fires six rounds of conventional ammunition. After completing the course, the graduates with the newly acquired "T" suffix added to their 11E10 MOS, are prepared to assume their places in *Sheridan* crews throughout the world.



A new training aid, locally designed and constructed is being used by the Chassis Branch, Automotive Department, USAARMS in conjunction with practical work on actual vehicles. The aid permits easy comparison of the major components of the M60A1, M113A1, M114A1, and M551 vehicles which must be serviced during organizational maintenance. The cutaway design enables the student to see the operation of lubrication seals, bearings, and to better understand the requirement for proper assembly and adjustment.

PISTOL "QUICK KILL"

Small plastic silhouettes in the foreground (quick kill training device) are used with CO_2 BB pistols during preliminary marksmanship instruction for the Combat Pistol Qualification Course (CPQC).

USATCA cadre practice firing on the Combat Pistol Qualification Course currently undergoing validation testing at Fort Knox.

Armor School instructors demonstrate "quick kill" firing techniques on the Combat Pistol Qualification Course (CPQC) recently completed at Fort Knox.

The Armor School is coordinating a test to validate the effectiveness of the Combat Pistol Qualification Course (CPQC) recently constructed at Fort Knox. An evaluation team composed of members from the Armor School, USATCA and HumRRO, are monitoring the test program to determine if "quick kill" methods of teaching Cal .45 pistol marksmanship will be more effective than aimed fire training in the time currently available to teach handgun employment. The results could indicate need for replacement of the present standard pistol course, or establishment of "quick kill" training as a supplement to the present training methods. A basic assumption of the test program is that the pistol is a defensive weapon giving close-in protection against man-sized surprise targets.

During Phase I testing, four MOS 11E10 Advanced Individual Training cycles are divided into two groups by random selection. One group receives pistol training less range firing as outlined in the current FM 23-35, *Pistols and Revolvers;* the other receives instructions proposed in the draft manuscript of the revised field manual. After both groups fire the standard course and CPQC, HumRRO will analyze the comparative results. Qualification training includes two hours of practice with a Quick Kill Training Device (QKTD), employing CO_2 pistols against miniature plastic silhouettes to teach quick kill techniques. CPQC record firing requires the soldier to engage single and multiple targets at various ranges (up to 30 meters) using quick kill fundamentals. On the Fort Knox course, firers receive 40 rounds to engage 30 surprise targets. The course includes ten 7-target electrically operated lanes. If Phase I results are not conclusive, Phases II and III will test NCO instructors from the Armor School Staff and Faculty, officers from an Officer Advanced Course, and a section of Advanced Marksmanship Unit personnel qualified as Master Pistol Shots.

FAMECE

The Army is making a feasibility study for a standard Family of Military Construction Equipment (FAMECE — pronounced fam-ee-key.)

The FAMECE system consisting of a standard power module and a family of compatible work attachments, is designed to accomplish such construction tasks as dozing, scraping, grading, excavating, loading, hauling, dumping, spreading soil, stabilization, and soil compaction. The equipment is to be used by airborne, airmobile, combat, construction, and service organizations. A proliferation of existing

commercial equipment currently is being used for these tasks. Tentative distribution plans envision ultimate replacement of these commercial items by the FAMECE on a phased basis wherever qualitative mission requirements will permit and wherever such replacement can be shown to be cost effective over the life cycle.

The FAMECE will consist of two major functional modules. Each vehicle is to have a standard power module and a construction attachment. To achieve maximum maneuverability, the vehicle will be of an articulation or hinged-frame type providing the maximum practical steering angle. The power module will be self propelled and capable of moving short distances and maneuvering, under its own power, to facilitate rapid coupling to and uncoupling from the construction work attachments. There will be one power module for each work attachment. The power module and all construction work attachments are to have pneumatic tired wheels capable of being equipped with tracks or traction assist devices for work in slippery or low ground pressure areas.

NEW USAARMC STAFF

A recent change saw the Armor Center adopt a director type staff. The Assistant Chief of Staff, G1 became the Director of Personnel and Community Activities, G2 the Director of Security, G3 the Director of Plans and Training, G4 the Director of Industrial Operations. Other directors include the Comptroller, Director of Facilities Engineering and Director of Electronics. Special staff sections have been grouped under each director along functional lines.

WELCOME, WELCOME!

Earlier in this issue, the article "The Transient Soldier and Esprit de Corps" treats the problem of unit orientations. The 194th Armored Brigade has recently instituted a novel procedure to help newly assigned soldiers get the "feel" of the brigade. A video-tape program produced by the brigade's information office in conjunction with the Armor School's television division, presents a half-hour preview of the Brigade.

The closed circuit TV presentation begins with a welcome by Colonel Harry C. Smythe Jr., brigade commander, and a short synopsis of what the brigade does. He then introduces another video-tape, highlighting many brigade activities. The second portion of the feature is like a network television news feature. Major George P. Kuechenmeister, the brigade's training officer, and 1st Lieutenant David J. Goode, the brigade's information officer, narrate this presentation.

The structure, mission and overall responsibilities of the brigade are highlighted through the use of still photographs, art work and sections of other video-tapes selected from Armor School instructional aids.

The show doesn't stick solely to the mission and function of the brigade; it also tells the new soldier what sports and other recreational facilities are available at Fort Knox. He is also shown and told about the American Red Cross, the Army Community Services and the Education Center. Later, safety and maintenance, both of primary concern to all members of the brigade, are emphasized. This section ends with a fanfarish climax "that's the way it is, the 194th Armored Brigade . . ."

Colonel Smythe returns to the screen to stress personally certain items presented in the preceding orientation. He gives his own views on safety and maintenance, AWOL and the use of chain-of-command. He ends with a restated warm welcome to the brigade.

NEWS NOTES

MG COBB LEADS FAMOUS FOURTH

MG William W. Cobb, promoted from brigadier general assistant division commander, has assumed command of the 4th Armored Division in Germany. General Cobb entered the Army in 1941 as a soldier in the 112th Cavalry, 56th Cavalry Brigade, Texas Army National Guard. Within four months he was commissioned. In 1942, he became airborne qualified and went on to serve in the Southwest Pacific Theater as a platoon leader and company commander in the 503d Parachute Infantry Regiment.

Following World War II he was Director of Parachute Training at the Infantry School. He returned to Armor in 1947 to attend the Officer Advanced Course at the Armor School. Following an ROTC instructor assignment, he participated in four Korean War campaigns as a member of X Corps. After graduation from the Command and General Staff College in 1952, he became S3 of the 81st Reconnaissance Battalion, 1st Armored Division and later Assistant G3. Next came a tour in Austria where he commanded the 4th Armored Reconnaissance Battalion.

From 1955 to 1958, General Cobb was an instructor at Leavenworth which he left to attend the Army War College. Thereafter he was an Army Missile Command weapons system project officer at Redstone Arsenal. As a colonel, he served as Deputy Civil Administrator of the Ryukyu Islands in Okinawa. In October 1965, General Cobb assumed command of the 11th Armored Cavalry Regiment at Fort Meade. Ten months later he took the regiment to Vietnam where he led it in combat until May 1967.

In September 1967, General Cobb became Assistant Commandant of the Armor School where he served with distinction until he joined the 4th Armored Division in the fall of 1969.

BG IRBY HEADS ARMOR CENTER

Brigadier General Richard L. Irby has returned to Fort Knox to become its new commanding general. General Irby began his military service as a soldier in the Virginia National Guard. As an honor graduate of the Virginia Military Institute, he was commissioned in the Cavalry in 1939. Early assignments include commanding a troop in the 5th Cavalry, instructing at the Cavalry School and commanding a squadron of the 124th Cavalry. Later in World War II and until March 1947, General Irby served in India, Burma and China. Following graduation from the Armor Officer Advanced Course in 1948, he returned to VMI to become an Assistant Professor of Military Science for two years. During Korean War combat he commanded the 2d Battalion, 5th Cavalry for a year. Returning to the US he next commanded the 13th Tank Battalion, 1st Armored Division.

Upon graduating from the Command and General Staff College in 1954 he became an instructor there for three years. Thereafter in 1957 he joined the Seventh Army G3 Section in Germany. In June 1958, he assumed command of the 3d Armored Division Trains and then, in February 1959, of Combat Command A. He next attended the Army War College graduating in June 1961. General Irby then was assigned to the Office of the Deputy Chief of Staff for Operations. In 1963, he joined the NATO Military Committee and Standing Group. From October 1966 until February 1967, General Irby was Deputy Assistant Commandant and Director of Instruction of the Armor School which he left to assume command of the US Army Training Center, Armor.

An Army aviator, General Irby then served as Assistant Division Commander of the 1st Air Cavalry Division in Vietnam from August 1967 until February 1969. From March to October 1969 he was Deputy

Commanding General of the US Army Training Center, Infantry at Fort Lewis. His last previous assignment before assuming command of the Armor Center was as commanding General of the US Army Training Center, Infantry at Fort Polk.

MG GROW HONORED

Over 100 members of the 6th Armored Division Association and their wives were able to stage a complete and authentic surprise 75th birthday party for Major General Robert W. Grow, USA-Retired, at Washington's National Airport Holiday Inn on 14 February. The winter weather was miserable, with icy snows covering most of the East and Northwest on that Valentine Saturday. However, the Super Sixers came to Washington from New England, New York, Philadelphia, Pittsburgh, Chicago, Detroit, Cincinnati, Louisville — and even as far away as Nebraska, Texas and Colorado.

General and Mrs. Grow thought they were attending the annual mid-winter meeting of the Washington Chapter, and were expecting to see perhaps 15 or 20 of their friends. The 75th birthday party was a complete surprise. The visiting Super Sixers, all of whom served under General Grow when he commanded the 6th Armored Division in World War II, included the following Honorary Vice Presidents of the United States Armor Association: Senator J. Caleb Boggs; Congressman John J. Flynt; and Colonel John L. Hines, Jr., USA-Ret. General Grow is also an Honorary Vice-President. Toastmaster for the program was Edward F. Reed of Louisville, Secretary-Treasurer of the Sixth Armored Division Association.

FOR THE ARMOR NCO

In a continuing effort to make available the best possible educational materials to the Armor noncommissioned officers of the Active Army and the Reserve Components, the Armor School has completely revised its NCO Career Courses.

The Armor Noncommissioned Officer Correspondence Course, having 240 credit hours of work emphasizing platoon and company level, is now ready. This course contains 30 new subcourses aimed directly at the junior NCO or potential NCO whose duties or prospective duties pertain to Armor.

The Armor Senior Noncommissioned Officer Correspondence Course now contains 238 credit hours of work emphasizing battalion and brigade level instructions. This course has 17 new subcourses written for the Armor NCO who is a platoon sergeant/ sergeant first class or above.

Recent changes in the Army Regulations allow enlisted personnel to earn up to 125 promotion points at the rate of ½ point per credit hour of correspondence course work satisfactorily completed. The ambitious soldier who seeks promotion and greater responsibility can increase his chances and professional competence greatly by correspondence study.

Detailed information can be obtained from the Director, Instructional Services Department, US Army Armor School, Fort Knox, Kentucky 40121.

GAMA GOAT REPLACES M37

The *M561* 1¼-ton cargo truck, commonly known as the "Gama Goat," will be replacing the *M37* ¾-ton truck in maneuver brigades. The vehicle will be in two versions — *M561* cargo truck or *M792* frontline ambulance.

The first of these vehicles will undergo extensive initial production testing by agencies of the US Army Test and Evaluation Command. CDC will be monitoring the tests and evaluating reports to insure that the vehicle is suitable for troop issue.

The *M561* program has been unique in that special purpose kits were tested in conjunction with pilot models of the vehicle. As a result, kits and vehicles were type classified at the same time. Some of the special purpose kits are 81mm and 4.2-inch mortar (stowage only), frontmounted winch, radio (cab and carrier), 7.62mm machinegun, arctic and winterization, and slave receptacle.

CHALLENGING THOUGHTS

In delivering the class response at the recent Armor Officer Advanced Course 4-69 graduation, Captain James E. Lawson, Jr. said ". . . world peace will only be insured while our nation maintains powerful armed forces trained and led by men of courage and professional ability. . . . As we pass beyond the portal of academics into varied fields of professional endeavor . . . all of us . . . the gunship pilot and the ground unit commander, the combat signalman and the MACV advisor . . . accord to the Armor School Faculty our gratitude for their time, their patience and, above all, for imparting precepts and principles of tactical expertise, academic excellence and professional integrity."

Captain Lawson continued, ". . . without the augur's ability to foretell the whole of the anxious, challenging years ahead, it might prove difficult to define exactly those contributions which we as a class will make to the school, to the service, to the country and to our families. Nonetheless, I submit that each of us . . . will go from here today charged again with the awesome responsibility of "Duty, Honor, Country," in the words of the Old Soldier. May I call it simply keeping the faith — keeping the faith of our oaths as officers and thereby in some small measure guaranteeing the protection of our country and of our families . . . as soldiers and citizens in the most free and the greatest nation in the world, we can do no less for that we hold so terribly dear."

When Captain Lawson had finished there was a short silence which was followed by a tremendous ovation.

FMs BEING PRINTED

The U.S. Army Combat Developments Command (CDC) has announced that the new FM-100 "Army Aviation Utilization," giving doctrinal guidance for employment of Army aviation in support of military operations, will soon be distributed. About the same time, FM17-37 "The Air Cavalry Squadron," which treats air cavalry doctrine from platoon through troop to squadron, will make its long-awaited debut. A revised FM17-30, "The Armored Brigade" sets forth the latest doctrine for both divisional and separate armored brigades.

The Tarpaulin

Covers a bit of everything gleaned from the service press, information releases, etc. Contributions are earnestly sought.

TAKE COMMAND

LTG Michael S. Davison, II Field Force, Vietnam . . . **MG George M. Seignious,** II, US Command, Berlin . . . **BG George G. Cantlay,** USATCA . . . **BG Albin F. Irzyk,** Ft Devens . . . **COL Raymond H. Beaty,** 5th Bde, USATCA . . . **COL Charles H. Brown,** USA CDC Armor Agency . . . **COL W. W. Gresham, Jr.,** 1st Bde, 30th Armd Div Miss ARNG . . . **COL Donald J. Hassin,** Inf, 4th Bde, USATCA . . . **COL John A. Maurer,** FA, DivArty, 2d Armd Div . . . **COL Kenneth D. Mertel,** Inf, 11th AVN GP, 1st Air Cav Div . . . **COL G. V. Reberry,** 3d Bde, USATC Ft Leonard Wood . . . **COL John L. Waldrip,** 49th Armor Gp Tex ARNG . . . **COL Besor D. Walker,** 31st Bde, 30th Armd Div, Ala ARNG . . . **COL Matthew R. Wallis,** 2d Armd Cav Regt . . . **COL George S. Webb, Jr.,** 6th Armd Cav Regt, Ft Meade . . . **LTC Thurman E. Anderson,** 2d Sqdn, 9th Cav, 24th Inf Div . . . **LTC Servetus Ashworth,** 1st Squdn, 10th Cav, 4th Inf Div . . . **LTC Niven J. Baird,** 1st Bn, 77th Armor, 1st Bde, 5th Inf Div, VN . . . **LTC Edward B. Benedit,** Inf, 1st Bn, 54th Inf, 4th Armd Div . . . **LTC Robert G. Bond,** 2d Sqdn, 1st Cav . . . **LTC William M. Bradberry,** 3d Sqdn, 5th Cav . . . **LTC Frederick J. Brown,** 1st Sqdn, 4th Cav, 1st Inf Div . . . **LTC Morton C. Bulkley,** Inf, 1st Bn, 51st Inf, 4th Armd Div . . . **LTC Clark A. Burnett,** 1st Sqdn, 9th Cav, 1st Cav Div . . . **LTC Ernest J. Davis,** 1st Bn, 66th Armor, 2d Armd Div . . . **LTC Joseph A. De Angelis,** USA Armor Human Research Unit . . . **LTC William Greenberg,** 2d Bn, 34th Armor, 25th Inf Div . . . **LTC Robert Hannas,** 2d Bn, 7th Cav, 1st Cav Div . . . **LTC Preston D. Hix,** SC, 142d Sig Bn, 2d Armd Div . . . **LTC Ivan H. Howitz, Jr.,** 3d Sqdn, 14th Armd Cav Regt . . . **LTC John W. Hudachek,** 6th Sqdn, 1st Cav, 2d Armd Div . . . **LTC George H. Isley, Jr.,** 1st Bn, 1st Bde, USATCA . . . **LTC William M. Jewell,** 3d Bn, 32d Armor, 3d Armd Div . . . **LTC Thomas W. Kelly,** 1st Bn, 70th Armor, 24th Inf Div, Ft Riley . . . **LTC Joseph A. Langer, Jr.,** 2d Bn, 81st Armor, 1st Armd Div . . . **LTC Richard A. Lilly,** 3d Bn, 1st Bde, USATCA . . . **LTC Robert J. Luck,** 1st Bn (M), 50th Inf, 4th Inf Div . . . **LTC Don A. McKnight,** 2d Bn, 1st Bde, USATCA . . . **LTC John M. Misch,** 3d Bn, 21st Inf, 4th Inf Div . . . **LTC Glenn Petrenko,** 3d Sqdn, 12th Cav, 3d Armd Div . . . **LTC James B. Reed,** 1st Sqdn, 11th Armd Cav Regt . . . **LTC Robert T. Reed,** 3d Sqdn, 2d Armd Cav Regt . . . **LTC George W. Rostine,** 1st Sqdn, 2d Armd Cav Regt . . . **LTC John W. Shannon,** Inf, 7th Bn, 2d Bde, USATCA . . . **LTC Robert J. Sunnell,** 2d Bn, 8th Inf, 4th Inf Div . . . **LTC Clifford F. Terry,** FA, 1st Bn, 27th FA, II Fld Force VN Arty . . . **LTC Bill T. Thompson,** 5th Bn, 68th Armor, 8th Inf Div . . . **LTC James P. Van Sickle,** Inf, 2d Bn, 52d Inf, 1st Armd Div . . . **LTC Kenneth D. Steckly,** 5th Recon Sqdn, 2d Bde, USATCA . . . **LTC Ted G. Westerman,** 1st Bn (M), 5th Inf Div, 25th Inf Div . . . **LTC Maurice L. Willis,** 18th Bn, 5th Bde, USATCA . . . **MAJ David McMillion,** 3d Bn, Sch Bde, USAARMS

ASSIGNED

MG Donald H. Cowles, US Army, Vietnam . . . **MG Stephen W. Downey, Jr.,** CofS, Central Army Group . . . **MG James W. Sutherland, Jr.,** US Army, Vietnam . . . **BG James R. Duren, Jr.,** Ala ARNG, ADC, 30th Armd Div . . . **BG Lawrence V. Greene,** J1, USMACV . . . **BG Charles J. Simmons,** ADC, 3d Inf Div . . . **COL Walter G. Allen,** Senior Officers Aviation Training, Ft Wolters . . . **COL Edward P. Crockett,** CofS, 1st Armd Div . . . **COL James R. Dew,** Dir of Plans and Tng, USA Armor Center . . . **LTC John J. Casidy,** Inf, G3, 1st Armd Div . . . **LTC H. Gilbert Schmid,** SGS, USATCA . . . **MAJ Jay D. Watson, Jr.,** CML, G4, 2d Armd Div

VICTORIOUS

Armor Officer Advance Course 4-69 Distinguished Honor Graduate is **CPT Thomas W. Stewart.** Second Honor Graduate **CPT William M. Connor, Jr.,** Third Honor Graduate **CPT Lee F. Green** and Fourth Honor Graduate **CPT John E. Kelsey** were also cited. Armor Association writing awards went to **Captain Larry K. Cole, CPT Larry D. Graves, CPT James C. Olmstead** and **CPT John E. Rossberg** whose articles appear in this issue . . . Distinguished Armor Officer Basic Course Graduates: 8-70 **2LT Robert R. Johnston, Jr.,** 9-70 **2LT William J. Gregor,** 10-70 **1LT Richard D. Marks** . . . The 3d Infantry Division "Frontline" reports that **LTG George G. O'Connor** recently visited the Marne Division to present the Corps Best Mess Award to **SFC Elmond H. Neuman, 4th Bn, 64th Armor (LTC Ralph C. Waara).** After that the general, accompanied by ADC **BG Charles J. Simmons,** inspected the 1st Bn, 7th Inf. During his tour of the Co C dayroom he looked over the reading material

and asked "Where is INFANTRY?" The news item did not state if LTG O'Connor, an artilleryman, asked about ARMOR at the 4/64 Armor, but it seems likely.

AND SO FORTH

MAJ Gordon M. Clarke, CE, is now executive officer of the 16th Engineer Bn which his father **Gen Bruce C. Clarke,** USA-Ret, commanded nearly 30 years ago . . . **SP5 Albert Stinson,** Co A, 2d Bn, 67th Armor, **(LTC Charles W. Mooney)** 2d Armd Div is now rated fastest quarter-miler in the US Army. During the past year, Stinson has won gold medals in Ireland, at the CISM meeting in France, in Sweden and in the Pan-American Games at Winnipeg, Canada. Who says tankers can't use their feet? . . . Reports that replacement of the last of the **M48A1 tanks** of the **1st Bn, 13th Armor, 1st Armd Div (LTC William E. Hattaway)** sounded the knell for the old workhorse were exaggerated. The **4th Bn, 69th Armor (LTC Richard W. McKee), 197th Inf Bde,** Ft Benning is quick to point out that its 51 M48A1s are alive and well along the Chattahoochee as they charge on in support of Infantry School requirements . . . Further memorial windows in the CGSC's Bell Hall at Ft Leavenworth (ARMOR Newsnotes Nov-Dec 69) will soon include those of the **2d Armored Cav (COL Mathew R. Wallis)** and **3d Armd Cav (COL Sidney Hack).** Five Cavalry, three Field Artillery and eight Infantry regiments will be commemorated upon completion of this phase . . . The Pentagon has announced that the **MBT70** is being renamed the **"Tank, Combat, Full-Tracked 152 mm Gun-Launcher XM803."** For about one year the dual designation MBT70/XM803 will be used. Later a popular name such as "General M or N" will probably be chosen . . . Suggestions to improve **field manuals** should be submitted directly to US Army Combat Developments Command ATTN: CDCCD-P, Ft Belvoir, Va 22060 . . . Initial Project MASSTER (Mobile Army Sensor System, Test Evaluation and Review) test unit is **2d Bn, 52d Inf, 1st Armd Div (LTC James Van Sickle).** Reinforced by **Co A, 4th Bn, 46th Inf** the Old Ironsides unit is testing new equipment and techniques to gather intelligence input. Future trials will involve other type units . . . Recent Army order of 170 AH1G Huey Cobra gunships from Bell Helicopter Co. brings total purchase of this weapons system since 1966 to over 1000. Deliveries of latest increment will run between July 1971 and August 1972 . . . Newly Commissioned **2LT Charles C. Hagemeister,** who won the Medal of Honor as an enlisted combat medic with Co A, 1st Bn, 5th Cav, 1st Air Cav Div in Vietnam, has joined Trp B, 6th Sqdn, 1st Cav, 2d Armd Div . . . **The Army Sounding Board,** USACDC Infantry Agency, Ft Benning, Ga 31905, is seeking recommendations to improve combat clothing and equipment. Direct communication is authorized.

FROM THE BOOKSHELF

NO EXIT FROM VIETNAM

by Robert Thompson. David McKay. 208pp. 1969. $4.50

When Sir Robert Thompson retired in 1965, he had completed 26 years of civil, military, and civil-military service in the Far East. During the 12-year struggle (1948-60) against the Malayan Communist insurgents, he had been the civil government representative to the military staff of the British commanding general. His last assignment in Malaya had been Secretary of Defense to that newly independent nation. Because of his experience, in 1961 he was persuaded to head the British Advisory Mission to the Republic of Vietnam. He served as advisor to President Diem and his successors until 1965, when he retired and returned to England.

Sir Robert has published two books since "retirement," the first of which (*Defeating Communist Insurgency*. London: Chatto and Windus. 1966) dealt with Malaya and the early years in Vietnam. This second book, *No Exit from Vietnam,* covers the American war from February 1965 to November 1968. It is, in the author's words, "not a history but rather a commentary on the war as conducted on the one side by North Vietnam and on the other by the United States, showing some of the alternative lines of policy and strategy which faced both sides." It includes a support of the American role in Vietnam, a brief and — for a change — easy to read explanation of People's Revolutionary Wars, a sharp critique of American conduct of the war, and a realistic look at future American strategy. President Nixon was evidently impressed to the point of sending Sir Robert Thompson back to Vietnam last year, and quoting Sir Robert's assessment of the war in his December 1969 troop withdrawal announcement.

The basic question that Sir Robert asks is: "Could the Americans win a victory in accordance with their concept of the war unless at the time they inflicted a defeat on the enemy in accordance with his concept of the war?" This question presupposes — correctly, I would say — that Americans and their enemies are fighting different types of war. Sir Robert's answer is disturbing. Accepting that they could win no decisive military victory, the enemy's kind of war still offered four possible channels to victory in the summer of 1968. And after three years of fighting our kind of war, we had not yet closed any of the four channels by that time.

This leads naturally to an evaluation of American strategy and operations. It is this portion, titled "Squaring the Error," that is most personally and professionally interesting to the thousands of Americans who have sweated and fought and puzzled over the war in Vietnam. Sir Robert asks "whether or not the war was fought in the right way and the [American] power correctly applied." His answer is a firm negative. He supports his answer with the unemotional analysis of an old and experienced professional. He traces errors in our war aims, our strategy, and our tactics. He questions the bombing of the North, our use of helicopters, and the 60-hour week at MACV. He may or may not be right, but he is clear and logical in his exposition, fresh in his viewpoint, and definitely worth reading.

The last five pages of this short book summarize Sir Robert's view of the current American alternatives in Vietnam. He sees only two: defeat or victory, and he offers a strategy for the latter. This presumably is the portion of the book that was of most interest to President Nixon.

If you are concerned about how our Army has been doing in answering the challenge of wars of national liberation, *No Exit from Vietnam* will give you some thoughtful moments. Sir Robert Thompson's critical analysis is the sort of informed, unemotional comment on the war that has been needed for so long. LTC THOMAS W. COLLIER, USMA

MacARTHUR AS MILITARY COMMANDER

by Gavin Long. D. Van Nostrand Co., Inc. 243 pp. 1969. $8.95.

General Douglas MacArthur presents an ideal subject for military biography. His followers have been reverent, his detractors hypercritical; therefore one approaches Gavin Long's *MacArthur as Military Commander* with anticipation. The author is a well-known Australian historian, qualified by talent, knowledge and perspective to produce an objective profile of one of America's most heroic figures. His well-illustrated book does not fully live up to expectations, but it cannot be disregarded.

No story is any better than its telling, and the MacArthur epic has to be especially well done to be convincing. The author barely sketches the formative years of MacArthur's life. For these years, MacArthur's own *Reminiscences* is the author's principal source, yet the selections used hardly reveal MacArthur's personal code, his dedication to purpose, and his concept of duty. Perhaps the private papers recently deposited in the MacArthur Memorial at Norfolk can help to illuminate this period. In Gavin Long's book, MacArthur remains a shadow for the first 55 years of his life.

Long's interesting views cross swords with many widely held conceptions of MacArthur's tactical and strategic mastery. He challenges the belief that the defense of Bataan materially delayed the Japanese timetable for conquest, emphasizing instead MacArthur's failure to plan realistically for the air and naval defense of the Philippines. He ascribes to the Joint Chiefs of Staff, not MacArthur, the decision to isolate the Japanese fortress of Rabaul, and to Admiral Halsey the concept of deep amphibious turning movements that bypassed enemy island strongholds. He minimizes the importance of MacArthur's generalship in the Papuan Campaign, choosing to highlight the setbacks suffered in the theater and the fighting qualities of the Australian troops. Perhaps his most telling charge is of MacArthur's failure to credit the Chinese threat to advancing UN forces in Korea. These indictments are necessary to restore balance to the legend, but they are not new, and the standard references used to support them will not satisfy the serious reader.

The two chapters on the advance from New Guinea to the Philippines are extraordinary for their grasp of history. Perhaps no other historian has more succinctly chronicled the complicated events in the Southwest and Central Pacific that governed the progress of Allied strategy. The author uses American interservice rivalry as a continuous thread to connect these events, but at the expense of his central task: how did MacArthur command? Only occasionally does the author provide a glimpse of the man, and only once does he capture the commander in action. Long's inability to come to grips with his subject is evident in the way he examines MacArthur's decision to go ashore during the risky reconnaissance in force at Manus. Rather than recreate the climate in which the general operated, the risks, the tension, and the importance to the mission of making the proper decision — to reinforce or withdraw — the author concentrates on the accommodations provided by the Navy for MacArthur, and on the decoration MacArthur received for the action. The author's inference, often restated, is obvious: that MacArthur was motivated primarily by desire for glory. In like manner, Long glides over the decision to undertake the Inchon landing. This neglects the significance of combat decision making and portrays lack of insight on the very nature of command.

A chapter on MacArthur's role as military governor of Japan will delight those who acclaim the general's statesmanship. The chapter on Korea offers convincing evidence (in the words of General Matthew Ridgeway) that MacArthur and other generals did not appreciate the limitations of airpower in limited war.

On balance, this book should be read. The author writes with authority on the campaigns in the Southwest Pacific, although he adds little to the understanding of MacArthur, or of command. MAJ ALBERT SIDNEY BRITT, III, USMA

THE PROTRACTED GAME:
A Wei-chi Interpretation of Maoist Revolutionary Strategy. *By Scott A. Boorman. Oxford University Press. 1969. 242 pp. $7.50*

The mind of the enemy is among the significant unknowns in war. Not only is there the question of what he may do with his forces, but there are the deeper problems of how he sees victory and defeat, how he views his long term goals, and what principles of strategy and tactics he applies to achievement of his aims. Scott Boorman has tried to lay aside part of the veil that shrouds how the Oriental mind thinks about war. He does so by developing a formal analogue between the Chinese game of Wei-chi (Go in Western parlance) and Maoist theories of revolutionary war. His analogy is well drawn, scholarly, and carefully applied with appropriate qualifiers. The analogue is applied successively to the Communist-Nationalist struggle in China in three periods: the Kiangsi era 1927 to 1935, the Sino-Japanese war commencing in 1937, and the Civil War 1945-49. In each instance the theory of Wei-chi is applied to the moves of the antagonists to demonstrate how opposing conflict systems functioned and why the Maoist doctrine prevailed. The terminology, strategy, and play of Wei-chi provide a convenient framework for examining Maoist doctrine at work. Boorman alludes to possible extensions of his analogue to Maoist sponsored insurgencies outside China proper. To a Westerner, especially one totally unfamiliar with the interminable procrastina-

tions of the game Go, Borman's analogue may seem far-fetched. To anyone who has made a conscious effort to plumb the Oriental mind, and who has tackled the frustrations of Wei-chi in the process, Boorman opens new vistas of investigation. Here is a tantalizing glimpse of a whole field of investigation, two-thirds of which remains to be discovered and described. This volume is recommended for all who seek a deeper understanding of how the Maoists look at conflict systems, and who work at developing strategy to counter, and tactics to oppose, the Maoist brand of insurgent war. COL. DONN A. STARRY, 11TH ARMORED CAVALRY.

THE ARMY ADDITIONAL DUTY GUIDE

by Major Theodore J. Crackel. Stackpole. 1970. 144 pp. $2.95

These days the military book reviewer gets stacks of books that can be classified as good professional background, entertaining, thought-provoking or just plain worthless. But it is a rare thing when the sort of book appears that should be in every leader's or commander's "fly-away kit" of always to be taken with him references. Armor Major Ted Crackel's oversize pocket guide is such a book.

Short chapters have such titles as Area Beautification Officer, Communication Officer, Fund Custodian/Recorder, Range Safety Officer, Unit Fire Marshal and Voting Officer. In all, over 40 additional duties are covered thoroughly but concisely. References are accurate and complete and can easily be updated or added to. The approach is thoroughly sensible. No mere compilation of regs this. The author has obviously eaten off the mantel when he goofed up some of these duties and learned the hard way. And equally evident, he is a good teacher who has helped his subordinates greatly.

At first glance, this may look like a handbook solely for the lieutenant with troops. Not so at all. It will be invaluable to the NCO who ultimately really gets the various jobs done. So too, it will serve well as a checklist or *aide memoire* for commanders from company to army, and inspectors general and particular. In fact, it will be a boon to all who must get quickly to the meat of unit administration (without leafing endlessly through the plethora of published wisdom and non-wisdom on managing unit resources) in order to get the job done — and right.

In sum, take it from an old soldier who has served as a leader or commander from squad to squadron, and been an IG, your $2.95 will be well spent if you buy and use this handy guide. DECURIO EQ.

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