Testing and Fielding of the Panther Tank and Lessons for Force XXI

CSC 1997

Subject Area - Warfighting

EXECUTIVE SUMMARY

Title: Testing and Fielding of the Panther Tank and Lessons for Force XXI

Author: John H. Womack, Major, U. S. Army

Thesis: The United States Army is currently developing and testing new equipment in order to leverage technology and become even more efficient and effective on the modern battlefield. When developing new equipment there is always a danger of rushing the equipment through testing and evaluation in order to have it in the field to meet a critical need. Does the U. S. Army possess the potential to rush equipment through testing and evaluation phases of development only to have that equipment actually degrade combat effectiveness once it is fielded?

Discussion: There are several historical instances of the problems caused when equipment is rushed in production and fielded too soon. A great example of this was the German rush to field the new Panther tank before the Battle of Kursk during the Second World War. Unlike the U. S. Army today, the Germans were trying to develop, test and field a major weapon system while fighting a war. It can be argued that the Panther tank was the finest tank built during the Second World War, but it certainly did not make its appearance on the battlefield with great distinction. The study of the Panther tank shows the dangers the U. S. Army faces today as the Army tests equipment that will digitize the battlefield. The Panther clearly shows three potential pitfalls of new equipment. These pitfalls are:

- the user of the equipment must have input to the design and development,
- new tactics were not formulated to capture the advantage of the new equipment,
- logistics required for fielding the new equipment must be in place.

Each of these pitfalls caused significant problems for the Panther tank. They can cause significantly more problems for the Army as the equipment being tested and fielded today will be used largely for command and control.

Conclusion: Today's U.S. Army has the potential to experience the pitfalls of the Panther. As the Army moves to digitize the battlefield it will use information technologies that it hopes will produce disproportional lethality. Equipment like the Army Tactical Command and Control System will be used to send information that will determine the outcome of future battles. The speed at which information technology is developed today gives it the potential to become the modern day Panther. Such systems

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
1997		**00-00-1997 to 00-00-1997**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Testing and Fielding of the Panther Tank and Lessons for Force XXI	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Marine Corps War College,Marine Corps Combat Development Command,Quantico,VA,22134-5067**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

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

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**45**	

will have the potential to mitigate the uncertainties inherent in war. If we do not pay attention to the lessons learned from past fielding of equipment, and more importantly, the possible consequences of introducing equipment not yet fully tested to the field, the Army will create more problems for itself with the new technologies used in Force XXI.

This research project looks at the dangers of employing new equipment that has not been fully tested. The instrument for study was the German Army's employment of the Panther tank at the Battle of Kursk in 1943. This subject was chosen today because the U. S. Army has the potential of using unproven technology in armed conflict. This potential exists because the Army is trying to leverage technology against its force structure. With all branches of the armed services facing budget cut battles today, and expecting budget cuts to continue for the foreseeable future, the U.S. Army as well as the other services, can expect smaller budgets to reduce force structure. The Army will use technology as leverage to make up for this loss in force structure.

The study of the German Army's employment of the Panther tank at the Battle of Kursk in 1943 was chosen as an historical example of an army using technologically advanced equipment that was not fully operationally ready. In just about every reference found on the Panther tank, there was a reference to the tank being employed while still experiencing "teething" problems. These teething problems were generally referred to as mechanical problems. However, the study will show that the teething problems with new equipment can extend from mechanical problems to tactical employment, crew training, and maintenance support. Thus, there is a lesson to be learned from a rush to employ new equipment. Today, while the U.S. Army and the entire Department of Defense debates the modernization of forces, the Army is increasingly buying more materials and equipment off the civilian shelves. Without careful management, the Army can create a situation where it has the potential to run head long into "teething problems". With reduced procurement timelines, the training plans used to train the soldiers on the equipment will have to be developed quickly. In the past, training plans were developed

along with the equipment and there was time to ensure that every aspect of the equipment was covered. This may not be the case with off the shelf items; the learning curve may have to be very steep. Tactics can also be a problem when we are buying items for military applications off the shelf. Without properly wargaming or conducting exercises with this equipment, we may find it can not be used effectively in combat. While off the shelf items were used as an example here, the rush to develop and deploy new technology is certainly not limited to untested items.

The Battle of Kursk and the employment of the Panther tank revealed all of these potential problems. This study and research will bring the potential parallels of 1943 and today to light. The study began with the reason for developing this new tank and continued through the Battle of Kursk where it was first employed. The study focuses on the mechanical reliability of the Panther and other problems experienced on the battlefield, such as a lack of training and not modifying tactics to take advantage of the new tank. It shows how the US Army experienced similiar problems in recent history with the fielding of the M-1 tank, the M-2/3 Bradley Fighting Vehicle, and the AH-64 Apache attack helicopter. This study will highlight instances where the Army could experience similar problems today in a rush to develop and deploy new equipment. When thinking of new weapons one should not necessarily think of large pieces of equipment like a tank. Today the technology that is sought to leverage may not be larger than a hand held piece of electronics. During Desert Storm the soldiers in the desert extensively used the Global Positioning System (GPS). The ground troops came to rely on and have great confidence in the GPS. But what if this piece of new equipment had not performed as advertised? If it failed, what navigational problems would it have

caused in the desert where there are no readily identifiable terrain features? In no way is it suggested that the failure of the GPS would have prevented the movement of the U.S. Army during Desert Storm. The point is simply made that today's technologically advanced equipment can be as small as a hand held GPS; yet, the consequences of its failure may be great as we continue in our efforts to digitize the battlefield. What if the next hand held piece of equipment is a GPS with a laser range finder connected to a transmitter electronically linked to the artillery battalion? With this type of equipment you can lase to an enemy target from a known point, the GPS laser-rangerfinder gives direction and distance to the enemy location and all the information is instantly sent to the artillery weapon systems. The guns now have all the information they need to fire. The Army cannot afford to rush a piece of equipment like this to the field without ensuring that it is ready and will perform as advertised. The U.S. Army owes nothing less to its soldiers.

HISTORICAL PERSPECTIVE - PANTHER PROBLEMS

There are several historical instances of the problems caused when equipment is rushed in production and fielded too soon. A great example of this was the German rush to field the new Panther tank at the Battle of Kursk. Here one finds mechanical difficulties, degraded training, and new tactics were not formulated to capture the advantage of the new equipment.

New equipment is developed to meet certain operational needs and you can't understand the employment of the Panther tank unless you understand that it was

developed to meet the threat posed by a new Russian tank. This Russian tank was the T-34. The T-34 was an excellent tank design that had a far reaching impact on tank development throughout the world. The Russians have long had a reverent appreciation for the T-34.

On the other hand, the Germans thought their tank designs were superior and in fact during the early years of the war (1939 - 1941) there was no reason for them to think otherwise. During this time the Germans put their future tank designs on hold since they ran into no significant obstacle for their PzKpfw IIIs and IVs in Poland or France. At the outset of Operation *Barbarossa* the Germans faced Russian tanks that were not as sophisticated as the German equipment nor were the tactics for the employment of these tanks as developed as the *Wehrmacht*.[1] The Russians greatly out numbered the Germans with some 22,000 tanks, mostly T-26s, BTs, T-28s and T-35s.[1] The Russians, however, had been working on improving their tanks since 1936. Unknown to the Germans, the Russians had developed and had produced about 1000 T-34s prior to the commencement of *Barbarossa*. The T-34 was first used in mass against the Germans at the Battle of Borodino in October of 1941. Not only were the T-34s used in mass but the Russian armor tactics had begun to improve and there were early signs that the "happy times of the Panzers was at an end".[2]

At an Art of War Symposium which took place at Carlisle Barracks, Pennsylvania from 26 to 30 March 1984, General Lingenthal described his regiments first contact with the T-34.

---

[1] When the Germans attacked Russia, the Soviet Army's T-25, T-26 and T-28 tanks used a short gun which produced a very low muzzle velocity for the 76.2mm main gun. The early Russian tank's armour was only 36mm. The German Army had tanks with higher velocity guns and thicker armour. At the

> By chance our regiment met on the second day of the Russian war the first regiment of T-34s that had been in the Russian Army; and we, of course, had no knowledge at all of this tank; and, in the first phase of this battle, my tank was shot; and my driver was killed. Four tanks were in our group, and they all suffered the same fate. ... We had further fighting in the morning and in the afternoon, and then we finally burned some of these tanks by using 76mm high explosive shells with delay fuses (one-fourth second). So because they had all tanks with fuel on the rear we could make them burn. Then, of course, when we approached the wrecks I remember very well that we saw what terrible strength of armor they had, and we were very impressed. I can tell you we reported this immediately to higher echelons, but I do not know how they distributed this information to other divisions.[3]

The terrible strength of the armor General Lingenthal mentions could be the sloping of the armor. This is one design feature of the T-34 that is retained today because sloped armor increases the amount of protection. The T-34 also had a good amount of fire power, speed and mobility. These tanks made a great impression on the *Panzertruppen*; many thought the T-34 should be taken back to Germany and mass-produced for the *Wehrmacht*. Another thing the Russians did to make the T-34 an extremely reliable vehicle was to standardize the relatively simple design, thus enabling the Soviets to mass produce the T-34. The standardization not only in design, but also in production, enabled the Soviets to produce great numbers of interchangeable parts such as the engine, armament, transmission, periscopes. The tank was conventional in its design with the engine and transmission in the rear. It also used a Christie suspension system.[2] The turret presented a low silhouette, a condition which reduced the overall height of the tank, and also limited the depression of its gun. In true Soviet, fashion, the

---

opening of Operation Barbarosa, the differences in the two Army's tanks allowed the German's to enjoy many early successes.

[2] Christie suspension was the design of an American military vehicle engineer Walter J. Christie. The design was accepted more in other countries than here in the U.S. The Christie suspension system basically consists of large roadwheels (equal number on both sides) independently attached to pivoting lever arms in the hull. These arms are supported by heavy coil springs. This system provides for good speed and stability over cross-country travel.

aims were mechanical simplicity and the ability to mass produce the vehicle. These objectives were both successfully achieved.[4]

A testament to the design and durability of the T-34 was its long use after the Second World War. The North Koreans used the T-34 very effectively at the opening of the Korean Conflict. In the Sinai during the 1967 Six Day War, the Israeli Army was still facing the T-34s of the Egyptian Army. In fact, many were captured by the Israeli Army during this war.[5]

As already stated, the development of the Panther was spurred by the appearance of the Russian T-34 tank in July of 1941,[6] and until then, the German Army High Command saw no reason to develop a heavier tank. During the peacetime years the German Army looked at a few drawings for heavier tanks, but none had ever made it past the design of a prototype stage. The T-34 changed the German way of thinking. The Germans found that the T-34 was superior in almost every way to the current *Panzerkampfwagen* (PzKpfw) IV. The T-34's higher power-to-weight ratio, lower ground pressure, higher muzzle velocity, and greater range was enough to shatter the idea of German armor superiority.[7] The problem for the Germans was much greater than mere pride. The *panzerwaffe* was desperate to continue the fight against the Russians, but it needed superior equipment. Without this superior equipment, the clear decisive victory over the Soviets was in danger. If the *panzertruppen* were surprised and shaken by the appearance of the T-34, the German command was more surprised that the Russians could produce a tank superior to the PzKpfw IV in such a short period of time. In fact the Germans had enjoyed such success with their medium tanks from 1939 to

1941 that they had put plans for a heavier tank on the shelf. The T-34 made the Germans realize the error of their ways.

To get a first hand look at the strengths of the T-34, the Germans sent a team to evaluate the situation and send back recommendations to the Ministry of Armaments. This team was composed of representatives from the Army Ordnance Office, the armaments industry, tank designers and tank building firms. They visited the 2nd Panzer Army in November of 1941. The team examined captured T-34s and talked with panzer troops to get their insights from doing battle against the Russian tank. The great respect the troops had for the Russian tank was evident when they suggested that the evaluation team take the T-34 back to Germany and copy it bolt for bolt. This was a high compliment to the Russian tank building industry, but it was not the German way. Germany would design and build its own tank that would be superior to anything the Russians would build.[8]

At the time of the team's visit, the 2nd Panzer Army was commanded by General Heinz Guderian. He too acknowledged that officers in the 2nd Army thought that just copying the T-34 was the thing to do. General Guderian pointed out several production and material reasons why this could not happen. He stated that,

> It was not the designers natural pride in their own inventions, but rather because it would not be possible to mass-produce essential elements of the T-34 -- in particular the aluminum diesel engines -- with the necessary speed. Also, so far as steel alloys went, we were at a disadvantage compared to the Russians owing to our shortage of raw materials. It was, therefore, decided that the following solution be adopted: the construction of the *Tiger* Tank, a tank of some 60 tons, which had recently been started would continue: meanwhile, a light tank, called the *Panther*, weighing between 35 and 45 tons, was to be designed.[9]

As early as spring of 1941 some Germans must have had a premonition that the Russians had the edge on them in tank technology. Guderian mentioned that Russian

delegation had visited German tank production facilities, and as he related it, he (Guderian),

> ...was quite startled, however, by an unusual event in connection with the tank in question (PzKpfw IV). In the spring of 1941 Hitler had given his express permission that a Russian officer's commission be permitted to visit our tank training schools and armor production facilities, and had ordered that the Russians be allowed to see everything. During this visit, the Russians, when shown our Panzer IV, simply refused to believe that this vehicle was our heaviest tank. They repeatedly claimed that we were keeping our newest design from them, which Hitler had promised to demonstrate. The commission's insistence was so great that our manufacturers and officials in the *Waffenamt* finally concluded that the Russians had heavier and better types than we did. The T-34 which appeared on our front lines at the end of July 1941 revealed the new Russian design to us...[10]

Once it was clear that there was a need for a new tank, the design and production of the Panther went forward. Two designs were considered for production. The first design was submitted by the Daimler-Benz (BD) company. This design resembled the T-34. The weight of the BD design was about 39 tons, roughly the same as the T-34 and this tank would mount a 75mm gun. The second design was from the Maschinenfabrik Augsburg-Nürmberg (MAN) company. This tank would be heavier, weighing 49 tons and also mounting a 75mm gun, but this gun would have a longer barrel giving it a higher muzzle velocity. Both designs copied some features of the T-34 such as wide tracks and the sloped armor. Both also used interleaved road wheels mounted on torsion bars.[11]

A Panther committee headed by representatives from the Inspector of the Panzer Troops was established to review the drawings and insure the requirement could be met by the two companies. The committee concentrated on two prerequisites. The first requirement was the ability of the company to place the vehicle into mass production by December 1942. This date was critical if the war industry was to get the tank to the troops in the field. The committee thought this ability to start production was so

important it became the number one consideration. The second consideration was for the tank to be of "superior quality to counter the numerical material superiority of the enemy."[12] Early in the war with Russia this was a reasonable prerequisite. However, after Stalingrad the Germans could never build a tank of the quality necessary to overcome the numerical superiority of the Russians. The standardization of the T-34 allowed the Soviets to mass produce the tank in huge numbers. Russia suffered from no lack of raw material or production capacity as did the Germans.

The following excerpt of General Guderian's memoirs shows why Germany had production problems with not only the Panther but all tank production.

> On January 23rd, 1942, the design(s) for this (*Panther*) tank was submitted to Hitler. It was at this conference that Hitler ordered that German tank production be increased to a capacity of 600 units per month. In May of 1940 our (Germany's) capacity, inclusive of all types, had been 125 units. So it can be seen that increased in productivity of an industry making one of the most vital weapons of war had been extraordinarily small during this period of almost two years of war; this surly provides proof that neither Hitler nor the General staff correctly estimated the importance of the tank to our (German) war effort. Even the great-tank victories of 1939-41 had not sufficed to change this.[13]

Not only would surging production of the PzKpfw III/IV's been difficult, but Hitler was telling the tank producing industries to take the plans, produce the new tank, and do it in numbers five times that of the current production. This was a Herculean feat for any industry, much less for one at war and facing the shortages as noted by Guderian.

On 11 May 1942 the committee made their choice. Professor Dr. Porsche announced the design choice stating "the committee evaluating the designs of the Panther tank...unanimously favors the proposal of the firm of MAN... and recommends that the *Panzertruppe* be equipped with the selected tank."[14] On 13 May 1942 the design was sent to Hitler and he agreed with the committee's recommendation with some comments.

He also ordered the construction of railroad flat cars capable of transporting the heavy tanks being produced, showing a good deal of forthought in getting the tank to the battlefield.[15] In June 1942, Hitler was already asking about changing the requirements of the Panther. He wanted to change the frontal armor on the Panther from 80mm to 100mm and he ordered that all vertical armor on the tank be 100mm[16]. In the meantime, the production numbers for the following May were fixed at 250 Panthers. In September 1942 production numbers for the spring of 1944 were set at 600 Panthers.

When Guderian warned of using the Panthers too soon he did this from a foundation of experience. He told of the first employment of the Tigers in September of 1942. "A lesson learned from the First World War had taught us that it is necessary to be patient about committing new weapons and that they must be held back until they are being produced in such quantities as to allow their employment in mass. In the First Would War the French and British used their tanks prematurely, in small numbers, and thereby failed to win the great victory which they were entitled to expect."[17] He went on to talk about how Hitler, aware of these facts, could not wait for the production of the Tiger in mass before employing them. After urgings, Hitler did agree to employ the limited number of Tigers in a "quite secondary operation". The first attack with the Tigers occured near Leningrad and the results foreshadowed what was to happen to the Panther at Kursk. The Tigers suffered not only "heavy, unnecessary casualties" but the Germans also lost the secrecy of the new weapon system. This same pattern was seen prior to Operation Citadel, but that time Guderian made his fears of employing the Panther too soon known to all who would listen.

Although General Guderain made his fears known to all, he still was not able to convince Hitler that the Panthers should not be employed. With the World War I historical example of how the French and British employed their tanks and the German experience of the Tigers, Hitler still let his fondness for new and bigger weapons get in the way of reason -- of course this was not unusual for Hitler.

If production was rushed to get the Panther to the field, then the training had to suffer. Training in the field during war is difficult but must continue. At the Art of War Symposium mentioned earlier, when asked about what training was conducted prior to the Operation Citadel, Colonel Ritgen replied "... during the war, we actually used every free minute of the day to train the men and the crews again as soon as there was a little bit of rest." Replacements "were distributed amongst the other crews so that never did a green crew come together. A crew had just one or two green people." General Lingenthal answered the same question.

> We had, before 'Citadel,' three months when we were not involved in battle. Only part of our units were close to the front near Tomorovka and Golovchino as a reserve for the infantry divisions which had been there in their position. We could not move at this time because of a lack of fuel so we were forbidden to exercise with our tanks, and were forbidden to have full wireless training because of the Russian ability to hear our wireless transmissions. But we did firing exercises in training gunners and loaders and even to a certain extent training of tank drivers. We especially conducted training in map reading and orientation, and we made what I think is a very basic thing for all of us: we conducted maintenance on our equipment. It was not new equipment like in the *Waffen* SS but rather old equipment, and we brought it up to good standards so that it would work--all of our equipment, the tanks, guns, lorries, and so on. And then we had terrain exercises led by the divisional commander but only for the officers. One aim of this training and work in these three months was to bring the replacements from our reserve armies from home into our companies so that they became real members of tank crews and infantry companies. So after three months we had been very prepared at least at a level that could be reached at that time. We had all we needed. I believe we were correctly equipped, full with personnel, and most of the personnel were experienced in combat.[18]

While these commanders and their units took time in the operational pauses to continue the training of men and maintenance of equipment in the field, the Panther battalions were far from coming together as a unit. In February 1943, the trickle of Panthers being delivered to the *Grafenwöfr* training site continued with the arrival of twelve Panthers. A firing demonstration, with Panthers, was conducted for Albert Speer, Germany's Minister for Armaments and War Production. "Both standing and towed targets were fired upon, but due to inadequate turret ventilation only a few rounds could be fired when the turret hatches were closed."[19] Poor ventilation in a tank is a significant problem. The smoke and fumes become oppressive very rapidly and the crew loses effectiveness after only one or two shots are fired. This has a negative impact on a crew's ability to sustain a rate of fire required in the heat of battle. Because this ventilation problem in the Panther, gunnery training of tank crews was degraded. With the deployment date of the Panthers only five months away, the crews should have been working on their crew drill and proficiency and instead of conducting test demonstrations so close to the combat employment of the tank.

Another example of the training distracters faced by the Panther crews at *Grafenwöfr* occurred during visits from General Guderian between 1 and 15 June 1943, less than a month before the opening of Operation Citadel. Guderian visited both *Panzerabteilung* 51 and 52. He discovered that the Panther's "final drive and engine still displayed serious deficiencies. Of the roughly 200 Panther tanks already produced, only 65 had been accepted as technologically sound."[20] To fix these and other lingering problems some of the tank's components had to be sent back to the manufacturers. Other repairs were made in the *Reichsbahn* repair facility in the nearby town of *Weiden*. The

crews of both *Panzerabteilungens* assisted in the overhauling of the vehicles and were once again taken away from their training on the vehicle.

The two examples above illustrate how the individual crew training suffered from the Panther being rushed through production. It should also be pointed out that it was not only the individual crews that suffered. Shooting and maneuvering a tank is difficult, but the ability to plan for and control the movement of a battalion takes more intensive training as the individual tank crews. With the testing of the vehicle continuing throughout the spring, only 65 Panthers had been accepted by the German Army as fully operational. Moreover, with over hauling of the vehicles taking place less than a month before deployment, the battalion's staff never had a real opportunity to train. Sources documenting the training of the individual battalions during this time period are scarce, however, it is evident that the staffs went through a great deal of training prior to deployment. Neither the staffs, nor the companies for that matter, had the opportunity to maneuver and conduct training exercises on a large scale. Nothing matches actual exercises with the individuals and equipment one plans to fight with. Due to the testing nature of the training and the constant maintenance problems with the Panther, the Panther battalions staff were not optimally trained prior to their deployment to Russia.

At this point it is necessary to move from the Panther to the historical and strategic setting of Kursk. OKW (Armed Forces High Command - who ran the German war effort everywhere except for Russia) wanted to conduct a strategic defense on the Eastern Front during 1943. This would reduce the number of forces required in the east and allow the Germans to shift the then extra forces to the west in expectation of the Allied landings. OKH (Army High Command - who ran the German war in Russia)

agreed with the reasoning for going on the strategic defense, but only after a major offensive had been successfully concluded in order to spoil any planned Soviet offensive for the summer of 1943. Hitler agreed with OKH on the need for an offensive before turning to the defensive. However, Hitler had additional political reasons for a victory in the east during the summer of '43. He wanted to show the world Germany was not beaten, that she still had the resolve to fight on. He also needed to quiet the fears of Germany's allies and ensure them they had not backed a loser. All during the war, Germany made a practice of cutting off Russian thrusts into the German lines and trapping thousands of Russian troops. An assault on the Kursk salient seemed to be the place where the desire of OKW, OKH and Hitler could all be achieved. The German attack would depend on the speed at which they could mass, arm, and launch their troops. However, Operation Citadel was not Blitzkrieg in its planning. Citadel was originally to take place in April, but Hitler kept delaying the offensive for several reasons. These reasons ranged from shifting of units along the Russian Front to positions to launch the attack to the fielding of additional Panthers. The operation would also depend on secrecy, but the Soviets would have almost the complete plan for Citadel prior to the start of the offensive.

The Soviets knew of the German tendency for cutting into salients with concentric pincer moves. They also knew that Kursk was a prime target. Their concerns proved justified as the Soviet "Lucy" spy ring passed the concept and tentative start date of Operation Citadel to the Soviets in early April.[3] This information was confirmed by

[3] The Lucy spy ring headed by Rudolph Rossler. Rossler, in Switzerland, and about ten other men (eight of whom were German generals) funneled information from Berlin, through Switzerland, to Moscow. The Lucy ring was so efficient that copies of the operations order for Citadel reached Marshall Zhukov before

sources in England by the decoding of "engima" messages. In the spring and early summer, reconnaissance of the northern and southern shoulders of the salient confirmed the massive troop build-up. Thus, the strategic surprise so critical for German success was never achieved. The Germans could only hope for tactical surprise such as the time and location of the main effort and this would even be denied them. More importantly, the Germans never knew to what extent they had lost the element of surprise. In fact, because of the advanced warning, the Soviets threw out their planned offensive for the spring of 1943 and went on the defense expecting to bleed the Germans white.

In April 1943, Marshall of the Soviet Union Georgi Zhukov recommended to Stalin and the Soviet High Command (STAVKA), that based on intelligence, a spoiling attack or pre-emptive offensive was unnecessary. The Soviets could turn the Kursk salient into a fortress and wear down any German assault by concentrating on the destruction of the German armor. Once the Germans were defeated at Kursk, the Soviets would immediately use their reserves to launch an all out offensive. Stalin reluctantly agreed with Marshall Zhukov. Thus the Soviets would use the Clausewitzian concept of the defense being the stronger form of war, but then immediately shift to the offense to exploit the advantage gained by the defensive operations.[21]

To understand the degree of defensive preparation by the Soviet Army, one only needs to look at numbers. More than 20,000 guns and mortars were emplaced. Anti-tank guns numbered over 6,000 and 920 *Katyusha* rocket battery positions were prepared. All positions were oriented on specific avenues of approach and the positions could support each other with interlocking fires. Channeling the panzers into these killing fields were

---

the order reach German Army commanders. See Martin Caidin's book *The Tigers are Burning* pages 73-

40,000 mines laid out in the early spring allowing the sunflowers and wheat to grow around them. The density of the minefields was staggering, an average of 2,400 anti-tank mines per square mile, and during the battle the minefields were repaired or replaced with great efficiency by the Russians. Moreover, these numbers of weapons and mines do not show the great number of individual tank positions dug in to hide the tank from the turret down. Soviet tanks moved from prepared position to prepared position and were immediately able to fire on any German penetration.

On the 24th and 25th of June 1943, the Panther Battalion 51 was loaded on trains and sent to Russia for Operation Citadel. Panther Battalion 52 followed on the 28th and 29th. A regimental headquarters was organized with eight Panthers and moved east with Panther Battalion 52. The Regiment was placed under the command Major von Lauchert and assigned to the XLVIII Panzer Corps.

As would be expected, moving out of Germany did nothing to change the luck of the new Panther Regiment. The Regiment arrived in Russia and closed into their assembly area near the town of Kosatscheck on 3 July 1943. The Battle of Kursk began on 5 July. One day does not allow a unit to prepare. With no appreciation of the enemy, friendly situation, terrain, or other elements, this time crunch had the potential of negatively affecting the coming battle. On 4 July the Regiment was assigned to the *Grossdeutschland* Panzer Grenadier Division. Oberst Decker took command of the Regiment which was redesignated as the 10th Panzer Brigade. The two battalions arrived only two days before the battle began and it appears this commander had only one day with his unit before leading it into battle. This was barely time to meet the staff, let alone

work out procedures. More importantly, it appears this commander may not have had an appreciation for the capabilities and limitations of the new tank.

The XLVIII Panzer Corps may have had a premonition of what was to come with the new Panthers as the Corps war diary for 2 July 1943 remarked "that deficiencies existed in the Panther units. They hadn't conducted tactical training as a complete *Abteilung* and radio sets hadn't been tested. Since their assembly areas were so close to the front, permission couldn't be granted for them to test and practice with the radio sets."[22]

There seems to be some conflict as to how the Brigade was actually employed during Operation Citadel. Most historians of the Battle of Kursk say the Brigade acted as a unit consisting of the two battalions; however, in his book *Panzer Battles*, General von Mellinthin states the "*Gross Deutschland* was a very strong division with a special organization. It mustered about 180 tanks, of which 80 were part of a 'Panther Detachment' commanded by Lieutenant Colonel von Lauchert, and the remainder were in the panzer regiment."[23] Another historian of Kursk, Robin Cross (*Citadel: The Battle of Kursk*) also speaks of Lieutenant Colonel von Lauchert but not Colonel Decker. This is not to create a command controversy, but it is important if Oberst Decker took command of the Brigade one day before the commencement of Operation Citadel. At least Lieutenant Colonel von Lauchert had been with the units at the Grafenweohr training site.

The first losses of Panthers in Russia did not come from the vaunted T-34 for which the Panther was designed to counter, but instead from the continuing problems with the design of the motor. While unloading from the train, two Panthers were

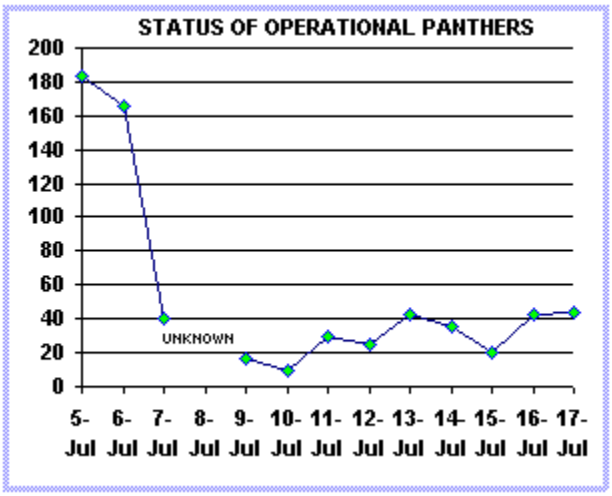
destroyed by motor fires and were classified as total losses. Robin Cross writes of the difficulties of the Panther just prior to its first combat appearance.

> Great hopes were placed in the Panther with its well-sloped armor and powerful 75mm gun. But the mechanical problems which had plagued the Panther's development pursued it to the front. As they moved up to their start lines, the panzer grenadiers of *Grossdeutschland* saw jets of flame belching from the exhausts of the division's Panthers. Several of them caught fire while rolling slowly down the road and their crews were extracted with some difficulty as the new 'wonder weapons' were reduced to blackened hulks.[24]

In his book *Kursk 1943: The Tide Turns in the East*, Mark Healy gives as good of an account of what happened to the 10th Panzer Brigade in their initial employment as I have found.

> The key to the success of General Otto von Knobelsdorff's XLVIII Panzer Corps, in breaking through the Soviet defenses on each side of Butovo and executing a swift advance to the south bank of the Pena, was the massive concentration of power that lay with the 10 Panzer Brigade, equipped with the new Panther. On paper these 200 machines gave the Panzer Corps an unprecedented concentration of armour and firepower. In the wake of the barrage, Panther Brigade 'Decker' moved off from Butovo, but almost immediately ran into a minefield that immobilized many of the vehicles. Others attempting to extricate themselves set off more mines. In front of Cherkasskoye, the initial objective of the offensive and a key position in the first Soviet defense line on their part of the front, more than 36 Panthers lay immobile. The Russians brought down intense artillery fire on the stationary tanks and on the engineers who went into the minefields to clear paths for those Panthers not too badly damaged and able to extricate themselves. In the meantime the infantry, who had been waiting for the Panther support, had attacked the Soviet positions, only to be thrown back with heavy casualties.[25]

After the first day of fighting the Panther was not employed in mass. The operational status of the Panthers during Operation Citadel began at 184 Panthers on 5 July. This dropped to 166 Panthers on 6 July but plummeted to 40 operational Panthers on 7 July. By 10 July there were only 10 operational Panthers in the front lines. Maintenance crews were able to increase the operation rate to 43 by 13 July, but one can see from these numbers why the Panther was not able to be used in mass after the first day of battle.



26

General Guderian made an inspection to Kursk to see the Panther and submitted a report on the operations of the Panthers. In his report he describes the status of the Panthers on the 10th of July as follows:

> By the evening of 10 July there were only 10 operational Panthers in the front line. Twenty-five Panthers had been lost as total writeoffs (23 were hit and burnt and two had caught fire during the approach march.) One hundred Panthers were in need of repair (56 were damaged by hits and mines and 44 by mechanical breakdown). Sixty percent of the mechanical breakdowns could be easily repaired and were on the way to the front. About 25 still had not been recovered by the repair service.

General Guderian goes on in the report to find mitigating reasons for the large number of losses. Some writers suggest this may be an attempt by Guderian to save face as the *Generalinspekteur der Panzertruppen* and for the entire tank production industry.

> The deep, heavily mined, main battle field of the Russians must result in above average losses of material through hits and mines. The fact that the Panther appeared for the first time on the battlefield, focused general interest. Comparison against losses of other Panzer units were not made. Therefore the high command and troops quickly jumped to the conclusion: The Panther is worthless!
>
> In closing, it should be remarked that the Panther had been proven successful in combat. The high number of mechanical breakdowns that occurred should have been expected since lengthy troop trials have still not been accomplished. The curve of operational Panthers is on the rise. After correcting deficiencies in the fuel pumps and the motors, the mechanical breakdowns should remain within normal limits. Without consideration of our own mistakes, the disproportionally high number of losses through enemy action attests to especially heavy combat.

After highlighting the short comings of the Panther in its development and production, one finds it easy to agree with what Brigadier H. B. C. Watkins wrote about the Panther:

> The design was put to Hitler on January 23, 1943. This shows that the Germans knew how to cut corners when the need arose. Even more remarkable was the fact that the first production model was to appear in November of the same year. Despite many teething troubles, this was very competitive timing indeed by a tank building industry that was already bowed down under the strain of equipping new divisions, up-armouring and up-gunning existing models, and creating numerous SP variants. Whilst much of this work had to be under the weight of Allied bombing, work was gradually moved to safer areas in Austria so that it could gain some degree of immunity. Later, the production to both Panther and Tiger B was to owe much to the use of slave labour in the Krupp and Daimler-Benz factories.[27]

Many battlefield lessons were learned from sending the new Panther into this massive Soviet defensive. Certainly changes or adjustments in tactics will occur as a new piece of equipment is employed. Fighting will reveal things the planners and engineers never thought of in the design and development phases. The operational value of any tank is never established until it is tested or employed under combat situations.

The striking parallel between the Panther and the M-1 Main Battle Tank in Desert Storm will illustrate this point. Military circles wondered how this “new” tank would

perform in combat even after nearly ten years of initial fielding by the U.S. Army. The M-1 had proven itself consistently on tank ranges from Grafenwöhr, Germany to Texas yet people were still leery of this "new" piece of equipment because it had not been battle tested. Civilians and reporters remembered the M-1 not performing well in desert environments because sand affected the performance of the tank's turbine engines. This defect and several other problems were identified and corrections made to the tank, but the M-1 remained suspect until it could prove itself in on the field of battle. The same can be said for the M-2/3 Bradley Fighting Vehicle. Although the M-2/3 was not designed to take a blow from a large caliber weapon like a tank, people still remembered the RAND Corporation's report that the M-2/3's armor was too thin and could easily be penetrated by a direct hit from a Soviet tank. Some soldiers even doubted the reliability of the 25mm chain gun used on Bradley. Nothing provides confidence in equipment like success in war and the M-1 and M-2/3 performed very well.

The M-1 and the M-2/3 had something the Panther did not. These newer vehicles had almost ten years to work together and evaluate how best to compliment each other. In fact the two vehicles were designed to work together. This was a luxury not afforded to the Panther. Unlike the M-1 and the M-2/3, the Panther crews had no chance to train with and test the current Panzer tactics to best exploit the Panther's strengths and minimize its weaknesses. In addition, time was not allocated for exercises with other equipment the Panther would be required to fight along side by side. The Panther had a range and speed of 125 miles and 29 miles per hour. The PzKpfw IVs could range 71 miles at speeds of 24 miles per hour.[28] The ranges of their main guns were also quite different. The Panther's gun could reach out and pierce the frontal armor of a T-34 at

800 meter (side and rear at 2800 meters). The Panther could also pierce the frontal armor of the American Sherman at 1000 meters (side and rear at 2800 meters) while the PzKpfw IV gun had a much shorter range.

Without conducting exercises with both vehicles the tactics did not change with the employment of the new tank. The units were still using the standard tank wedge spearheaded by the heavy tanks.[29] Recall there was no time to train with the other equipment used along side the Panther, hence no adjustments were made to the tactics. New equipment is developed to fill a need and to fill this need the use of the new equipment must be well thought out. The thought process must include the tactics. The Panther was employed in the same manner as the PzKpfw IIIs and IVs. The placement of the Panther at the lead spearhead of the wedge ignored and therefore did not take advantage of the new tank's longer range gun. Placing the Panther behind the older tanks would have enabled the tank to fire on the Russians from greater ranges and provide some protection to the other tanks spearheading the wedge.

Placing the Panther further back in the wedge would have also taken away the Russians' ability to minimize the German advantages of the Panther. The Russians learned quickly that charging at the new Panthers (and Tiger tanks as well), and then swarming them with their numerical advantages erased the advantage of the Panther's 75cm gun. The T-34's gun was more than capable of opening up a hole in the side of the Panther from close range. This Soviet tactic worked very well since there was never a shortage of T-34's, and with Marshall Zhukov following his creed "of no casualties are too great if the objective is accomplished" the will was there to send in as many T-34s as were needed to take care of the attacking Germans.[30]

Any tank with a tread blown off by a mine can almost always be repaired for battle once again. At Kursk the Panthers had two things working against them. First operational orders given to the tankers for this battle were "...in no circumstances will tanks be stopped to render assistance to those who have been disabled..."[31]. The second thing working against the Panthers was that the only vehicle powerful enough to pull a Panther was another Panther or a Tiger tank. Without another tank stopping to retrieve the disabled vehicle, the tank was forced to wait on the tank retrieval equipment from the tank maintenance company. The Germans would position the tank maintenance companies as far forward as possible in order to retrieve tanks as soon as possible. In the case of the Panther this tactic was not very successful, because the maintenance company could not pull the vehicle back to its work area. The standing orders of no other tank stopping to render aid made matters worse for the Panthers disabled by the mines and impacted the ability to maintain operational tempo. A Panther stuck in the minefield soon found the Russians bringing devastating fires on the vehicles in the sprawling minefields all along the Kursk front. The Russians had carefully planned to ensure the minefields were covered by fire where any disabled Panthers became easy targets for the Russian Pakfronts.

If the Panther was pulled from the minefield, maintenance continued to be a problem as there was a shortage of spare parts for the tank. Today when the U.S. Army fields a new piece of equipment, particularly a new end item such as a new vehicle, radio, or weapon system, that piece of equipment comes complete with a fifteen day supply of spare parts at the organizational level. Spare parts are an extremely important part in fielding any new equipment. There is expected to be a shake out period whenever

something new hits the motor pools. During this period you will find that certain parts wear out faster than others and frequently some parts not expected to wear out are the first to go. Without the spare parts, the new equipment will not be able to perform the functions it was designed for. This is why it is so important to test the new equipment and have an idea which spare parts need to be included in the fielding package at the organizational level as well as the direct support level. By packaging spare parts which need replacing on a regular basis, a system is created for keeping the new equipment mission capable. At least the problem of expected break downs has been thought through and lessons from the shake down period will be incorporated in the future parts stockage and preventive maintenance programs.

The Germans, however, sent the Panther to the field and did not accompany it with the required spares to keep it running. In fact, because of the lack of testing, they did not know which parts were more likely to wear out. Even if they did have an idea on which parts would need replacing, the spare parts were not available. The tank production industry was not able to build spares in sufficient amounts even had the parts been identified. There were simply not enough spares for the Panther when first sent to the front.

The Department of the Army Historical Study *German Tank Maintenance in World War II* reinforces the problems encountered by the panther units concerning the lack of spare parts.

> A similar mistake (not enough parts) with even more far-reaching consequences took place a few months later when the new Panther tanks game off the assembly line. In a desperate attempt to speed up production, the Ministry of Armaments had ordered the mass production of this new tank model before it had been properly tested. Early in 1943 the first Panther tanks arrived in the Russian theater and were immediately committed. Almost at once major defects in design

> and construction -- particularly of the steering and control mechanism -- were discovered with the result that all 325 Panther tanks had to be withdrawn and returned to the zone of interior for complete rebuilding. To perform the necessary work, a special tank-rebuild plant was established near Berlin. By the time the initial deficiencies had been corrected, the engine proved inadequate. It was not until the autumn of 1943 that a fully satisfactory engine became available. Under these circumstances it was hardly surprising that most of the Panther tanks shipped to Russia arrived without sufficient spare parts. *Many a Panther was lost because of the shortage of some elementary spare part or because it could not be repaired in time*."[32] (Italics added for emphasis.)

RECENT HISTORY: THE M-1 TANK, M-2/3 BRADLEY FIGHTING VEHICLE, and THE AH-64 APACHE ATTACK HELICOPTER

Could the U. S. Army suffer the same fate as the Germans did with the Panther? It is a question that we want to answer with a resounding no; however, there are two new types of equipment that could have met the same fate as the Panther. One is the M-1 tank and the other is the Apache attack helicopter. Having already said that the M-1 performed well during Desert Storm it must be noted that "some experts caution against drawing too many conclusions from a ground war that lasted just 100 hours".[33] Only two years before the M-1 had failed five of six standards for reliability and critical components fail every 152 miles.[34]

Some similarity exists between the Panther and the M-1 in the production of the two tanks. As with the Panther, two companies competed to produce the M-1: Chrysler and General Motors. On 12 November 1976 the M-1 contract was awarded to Chrysler. One must remember that the United States was not involved in a shooting war during the production and the fielding of the M-1. The XM-1 was approved for Low Initial Rate Production (LRIP) on 7 May 1979 by the Secretary of Defense. The LRIP target was 110 tanks. These vehicles were tested at Army posts throughout the United States. These

tests showed a good many defects in the new tank, but none significant enough to delay full production of 1058 tanks at 30 tanks a month starting in February 1981. However, production delays were not long in coming.

As with the Panther, there were production problems involving the engines for the M-1. AVCO Lycoming was producing the engines and the company could not meet the delivery schedule due to production problems. There was also "a large number of defects in the engines that were delivered."[35] The production of the new M-1s also ran into delays due to delivery problems of the thermal imagery systems and from "fabrication difficulties" with the hull and turret at the Lima, Ohio plant. (The M-1 was being produced at the Detroit Michigan Tank Plant as well as at Lima and thirty tanks a month were to roll out of each plant.) Production of the basic M-1 ended in January 1985 after the 2374th tank rolled off the line.

Just as the Germans did not have a tank retriever capable of effectively pulling the Panther tank during World War II, the U.S. Army still does not have a vehicle which can effectively tow an M-1. The M88A1 Tank Recovery Vehicle has been used by the Army since June of 1975. This recovery vehicle is, however, lighter than the M-1. When the vehicle in tow weighs more than the towing vehicle problems will be evident on any surface that is not level. In fact, just like the Panther, the best vehicle to tow an M-1 is another M-1.

What would have happened in Southwest Asia had there been a significant number of M-1s hit and required evacuation? The M88A1s would have surely been put to the test when ordered to move large numbers of M-1s out of the battle area to the maintenance facilities. This was the same problem the Germans faced with the Panther.

Nevertheless, it was only recently that the U.S. Army began a product improvement of the M88A1. The Hercules recovery vehicle is an improved M88A1 with an increased power train and winching capacities. It also has added weight to allow it to safely tow and winch the M-1. The Hercules has been approved for low-rate initial production and the first unit to receive the Hercules can expect them in sometime in FY 1997.

It is perhaps not with the M-1 tank that the dangers of new equipment are most evident, but instead with the latest major end item fielded by the U.S. Army -- the Apache attack helicopter. The Apache was fielded in the late 1980s and like all new equipment had to perform under the scrutiny of GAO. Apache development did not always look promising. As late as 1989 the Government Accounting Office (GAO) was criticizing the Army's ability to keep the aircraft flying. "Like a number of weapons that were developed in the early to mid-1980s, ..., the Apache was rushed into the field before undergoing extensive testing. The Pentagon called this practice 'concurrency,' and it meant that sophisticated weapons were developed and produced almost simultaneously."[36] GAO's Frank Conahan said that "the problems you normally find in weapons development were greatly exacerbated by concurrency".[37]

While the Apache was able to overcome developmental problems, the rush to field this new aircraft exposed many of the problems with concurrency.

> During an exercise in 1989, an Apache commander in the 82nd Airborne Division reportedly lost all 12 of his Apaches to jammed cannons, failed target detection systems and the rotor blade problem. In April of 1990, GAO officials told Congress that because key Apache parts failed so often, the helicopter couldn't perform all its assigned missions half the time, and a third of the time it couldn't perform any missions. The Army was also criticized for understaffing its Apache maintenance crews.[38]

During Desert Storm the Apache performed superbly, but what did it take to keep this tank killer flying? If key Apache parts failed so often the Apache couldn't perform its mission as late as 1989, what did the Army do to get these aircraft to be so reliable in the desert? One explanation is that the Army "shipped up to three times as many spare parts with the Apache battalions as would be the case in normal deployments".[39] The Army's Aviation Systems Command was forced to exercise options on 4,000 contracts to surge the production of Apache repair pairs. These parts were shipped immediately to Saudi Arabia. The average maintenance hours increased from 2.5 hours a day in peacetime to 12 hours a day in the desert. In the Gulf War, the U.S. had the fortune of placing the airfields where the parts and aircraft maintenance came together in very secure rear areas. The maintenance effort could go on with little distraction from the enemy threat and could operate 24 hours a day. The lack of Iraqi air threat allowed 'white light maintenance' that enabled this 24 hour maintenance operation, but it would be a mistake to plan on the U.S. Air Force achieving this level of air dominance in the next major conflict.[40]

The U.S. Army says the next war will be a 'come as you are war', meaning the equipment you have and the condition it is in will be the equipment you will have to fight with. The Apache units had five months to boost the maintenance and readiness rates of the aircraft. The Apache was designed and procured to fight a European war against the Soviet Union. In the European scenario there would have been roughly sixty days warning so there would be some time to surge but certainly not six months. An attack by the North Koreans will not allow for a surge period. The next conflict may truly be a "come as you are war" and the Apaches must be ready without a build up.

In its combat debut, the Apache suffered some of the very same aliments the Panther tank suffered, except the Apache had the luxury of a five month preparation phase. If the Army had not built up repair parts would the Apache have had the same readiness rate it enjoyed in the desert or would it have reflected one more like that of the Panther at Kursk? That question may never be answered but it is clear that had the Germans been able to stock tank engines and other spare parts more Panthers would have been returned to the battle. The Army deployed 270 Apaches to the Persian Gulf out of a total force of 660. To ensure the Apache did not have significant break downs, Mr. Richard Davis, GAO's Director of Army Issues said, "we had on the order of 25 percent of our total combat forces deployed into the Gulf, and in some critical support areas (Apache), we were using 100 percent of everything we had. ... the Army had to bleed its spare parts bins practically dry and cut its flying hours for those Apache not deployed to the Gulf in half."[41] Mr. Davis went on to ask the question, "what if we needed the whole Apache force?" From the GAO's view of the Apache, it appears they would have expected mechanical break downs on the same scale as the Panther at Kursk.

BATTLEFIELD DIGITIZATION - PANTHER LIKE PROBLEM POTENTIAL??

The U.S. Army is committed to harnessing the power of information systems and no one doubts this is the thing to do. The potential for information to provide the kind of victory we enjoyed in Desert Storm is great -- provided all the information systems work as advertised. The following excerpt from an article written by Chief of Staff of the Army, General Dennis Reimer discusses the Army's commitment.

> We are on the leading edge of a whole new way of warfighting. Our current modernization strategy fields a full Corps with information technology by 2010. Evolutionary improvements in combat systems will provide enhanced warfighting capabilities to complement the addition of information technology.

> We are either adding new systems or improving current ones to ensure that we harness the power of information and to ensure the proper balance among dominant maneuver, precision fires, focused logistics and force protection.

To assist General Reimer with ensuring the proper balance among systems is achieved, the Army has scheduled a series of Advanced Warfighting Experiments (AWE). The 4th Infantry Division at Fort Hood, Texas is the Army's experimental force and is the "primary means of experimenting with information age concepts and technologies." The 4th Infantry Division will conduct two AWEs in 1997. Upon completion of these AWEs the Army will "assess the enhanced capability afforded by these new technologies and concepts." General Reimer goes on to say the AWEs will allow the Army to "make decisions concerning the structure of the division and what equipment gives us the best return on the investment." [42]

One such information technology the Army will be testing is the Army Battle Command System (ABCS). This is an "umbrella architecture that has evolved from the previous Army Command and Control systems."[43] The ABCS has several components. The Army Global Command and Control System (AGCCS) is to implement the Army's requirements for C^4I at the strategic (theater and echelons above Corps) level. The Army Tactical Command and Control System (ATCCS) is for command and control from Corps to Battalion. The ATCCS has five subsystems: the Maneuver Control System, the Forward Air Defense Command and Control System, the All-Source Analysis System, the Advanced Artillery Tactical Data System and the Combat Service Support Control System. The ATCCS uses common protocols and systems language for each of the five subsystems to interface.

The Army began testing the ATCCS in 1992 and says substantial progress has been made in software development. The Army also says ABCS "is an evolutionary integration of systems. With the functional subsystems in different stages of technical development. A continuous test cycle will facilitate ongoing assessment of single and multiple systems and the entire ABCS architecture"[44]. The same is said about ATCCS. The ATCCS is an "evolving integration of battlefield automation systems with the subsystems in various stages of development, testing, and fielding." Long periods of production, testing, and fielding are a luxury the U.S. currently enjoys because we have no peer competitor or urgent need to surge testing and fielding. "Evolutionary integration" and "evolving integration" suggests time is on the side of the developer. What if we find our country is forced into a fight tomorrow? Would production, testing, and fielding of these systems be accelerated? Would we use "currency" to field them? Acceleration in the fielding of these systems is where the lessons of the Panther must be remembered.[45]

If time is on our side, the use of "evolutiuonary integration" is the most efficient way to employ new information systems that are composed of various subsystems. This type of system integration allows subsystems to be employed in layers. Building upon layers allows developers and users to ensure a part of the system works properly before adding additional layers. This method of fielding allows soldiers to use part of a system and find the problems, but then allows time to work through problems prior to moving on to the next step.

The Army has had time to estimate the potential that information systems can have on the battlefield. Real-time situational awareness is the level of information the

Army is striving for. These systems may provide the 4th Infanty Division situational awareness never before achieved by a force at the National Training Center. In the early stages of an armed conflict, the decision could be made to expedite the fielding of additional layers of the ABCS and the ATCCS into deploying units with the expectations of achieving what the Experimental Force (EXFOR) achieved at the NTC during tests. This may not be an unrealistic expectation, but a rush to field these systems to the units could result in the U.S. Army reliving the experience of the Panther -- equipment not fully tested, units not fully trained on the equipment, and tactics or procedures that have not been developed to the level of detail required. Introducing these information systems to the field would be easier than fielding a tank, but the consequences could be even more devastating when one realizes these systems control the information flow for the command and control of major operational units. If a conflict did start tomorrow, the Army would be wise to resist any urge to rush production and fielding of information systems not fully tested.

CONCLUSIONS

This paper is a warning. It cautions the U.S. Army must not repeat the experience the Germans had with the Panther. The time will come again when American industry must develop and produce a piece of equipment in a very short time just as the Germans had to do with their tank. Industry will do a marvelous job, but the Army has the responsibility to ensure that every piece of equipment is introduced into our operational forces correctly.

The examples of equipment from today should serve to show that even with long lead times and long periods of development and production we still have problems with

our equipment meeting the desired needs of the Army. The Germans had to field and develop the Panther tank in a very short period of time and under great resource constraint. The time to relearn lessons of the past is not during a war. We must take the lessons learned from the Panther and be ready when the next war comes.

The Panther experience gives us three lessons to remember. The first is the user of the equipment must be in the development and production process. We must also be prepared to change or modify tactics in order to exploit the advanced capabilities of new equipment. New equipment must compliment or maximize the potential of other operating systems. The Army must insure that logistical considerations have been addressed and spare parts, or more likely in the case of digital equipment, line replaceable units are available to ensure the equipment will be able to fully perform its mission and be maintained at an acceptable operational readiness level.

In development of new equipment, the designers, testers, and production managers must pay attention to the hands on operators of the equipment as well as the other subject matter experts. This encludes both daily operation of the equipment and tactical employment. The Army has a responsibility to ensure that the soldier in the field has input in the developmental phases as well as fielding. The Army must seek out and pay attention to the General Guderians who can say that the equipment is not ready, that the unit is not trained, or that it is not time to employ it. The combat user of new equipment is the one to say when the need has been met. The developers may not have an operational awareness of the equipment they are working on.

A personal experience serves as an example.[46] My first troop commander left the Army as a mid-grade captain and went to work for Honeywell Defense Systems. He was

assigned to assist on a project for development of an automatic loader for the M-1 tank. As he worked side by side with the engineers, he discovered that none of the engineers had been inside a M-1. They had only worked on this modification of the tank from blue prints and drawings. Upon making this discovery, the former troop commander, gathered the entire team up and flew them to Fort Knox. In cooperation with the Armor Engineer Board he ensured that all of the engineers were able to get in an M-1 and see the space limitations and ergonomic design of the tank. This enabled the engineers to gain an appreciation of how their designs may impact on the crew of the tank. Equipment must constantly be designed with the user in mind.

The Panther also tells us that we may have to change our tactics upon introduction of a new piece of equipment, or we may have to change the employment of other pieces of equipment because of the fielding of new equipment. Individual soldiers as well as units must be fully trained, not only in the operation of the equipment, but also in how it interacts with the other systems of our warfighting orchestra. The Army must examine what it can change in tactics and organizations to fully utilize the new equipment's strengths and maximize the effectiveness of other equipment it will work along side by side.

The M1A2 has already been to the NTC to test its ability to fight side by side with other digitally equipped tanks. The results have been extremely promising. The M1A2s are equipped with a "digital communication system known as IVIS (Intervehicle Information System). By using digital technology to move words, written messages, and graphics, IVIS greatly increases the amount of information that can be shared between tank crews, their unit commanders, and higher echelons of command."[47] One important

lesson learned from the use of IVIS and other supporting systems is that it is "easy for the task force and company leadership to become enamored and engrossed in the digital world at the expense of shooting and maneuvering fundamentals."[48]

Revisions of tactics resulting from digitization will take time to evolve. One lesson learned at the NTC has been that "old tactics plus new systems equal the same results. Throwing a digitial combat team into a forced deliberate breach still results in burning tanks in the enemy's fire sack."[49] One must also remember there is no increase in the amout of fire power in a digitized tank. The M1A1 and the M1A2 both have a 120mm cannon and a rate of fire of 12 rounds per minute.[50]

An other concern is the ability of the digitized units to intergrate effectively with non-digitized units. In support of Operational Maneuver from the Sea, the Army and Marine Corps have signed a memorandum of understanding for the Army to provide a brigade sized armored force. How will this armored force be able to integrate effectively with the non-digitized higher headquaters? Passing information between digitized and non-digitized units will double the staff's workload. This speaks nothing of the challenges to be faced when operating with our allies or fighting in a coalition. The U.S. Army is still working to field systems that will allow the warfighters to be digitally linked with the warsuppliers. Problems still exist with passing seamless informantion between the combat support and combat service support units and the maneuver units. Once these problems are solved maybe there will be time to work interoperability issues with our allies.

The Army must also insure the logistics required for fielding the new equipment to digitize the battlefield is in place. The Army cannot afford to have a new system

integrated into our current systems and then have that new system go out simply because we do not have an adequate sustainment package. The Army must not allow the potential problems of the Apache come to reality. It is foolish to think that our enemies will be gracious enough to allow it six months to surge production and then stock pile the spare parts we expect to use.

In an article in *Armed Forces Journal International* (Feb. 1996), Mr. Jason Sherman askes the question, "Has the electronic battlefield been oversold?" He gives several examples of problems arising from digitization. Mr. Sherman writes of the same problems mentioned above, "Tank operaters during the Focused Dispatch digitizaiton exercise in Aug [1995] suffered from information overload; they were provided more data than they could process." This is a common experience with users of an improved information technology. The difference with tank commanders is that it interferes with the tank commander's ability to fight his tank and that puts soldiers at risk. The Army is still struggling with these systems to find the optimum workloads for individuals and staffs at all levels.

Has the electronics battlefield been oversold? I don't think it has. The potential of information enhancements through digitization of the battlefield have been proven, but also proven is there is a great amout of work still to do to find the filters that will provide the optimum workloads for staffs and fighting soliders.

As the Army moves to digitize the battlefield it will use information technologies that it hopes will produce a disproportional lethality. Equipment like the Army Tactical Command and Control System will be used throughout the Army to send information that will determine the outcome of future battles. The speed at which information technology

is developed today gives it the potential to become the modern day Panther. The requirement for information during war will continue to drive development of information systems. Such systems will have the potential to mitigate the uncertainties inherent in war. We may never fight a war such as the Second World War again, but the United States will have to fight future wars and it doesn't take a large piece of equipment for the Army to experience the same fate as the Panther. A tank takes a long time to develop, but information technologies development moves at lightning speed. It may only take months of development for the U.S. Army to experience what the Germans did with the Panther.

Bibliography

Books:

Agte, Patrick. *Michael Wittmann and the Tiger Commanders of the Leibstandarte*. Winnipeg, Canada: J.J. Fedorowicz Publishing Inc. 1996

Bender, Roger J. and Warren W Odegard. *Uniforms, Organization and History of the Panzertruppe*. San Jose, Ca.: R. James Bender Publishing 1980

Caidin, Martin. *The Tigers are Burning*. New York: Hawthorn Books, Inc. 1952

Carell, Paul. *Scorched Earth, Hilter's War in Russia, Volume 2*. London: George G. Harrap & Co. Ltd. 1970

Center for Land Warfare *1984 Art of War Symposium, From the Don to the Dnepr: Soviet Offensive Operations - December 1942 - August 1943*: Carlisle, Pa. US Army War College, 1985

Clausewitz, Karl von, On War, Translated by Michael Howard and Peter Paret. Princeton, N.J., Princeton Univ. Press, 1986

Chant, Christopher, *Kursk.* London: Almark Publishing Co. Ltd. 1975

Cross, Robin. *Citadel: The Battle of Kursk*. NewYork: Sarpedon 1993

Crow, Duncan and others, eds. *Armored Fighting Vehicles of Germany*. New York: Arco Publishing Company, Inc. 1978

Department of the Army, *German Tank Maintenance in World War II* Washington D.C, 1954

Department of Military Art and Engineering, "Operations on the Russian Front," in *Campaign Summaries of the Second World War*, 30-31. West Point, New York: United States Military Academy 1945

Forty, George *World War Two Tanks* London, England: Osprey 1995

Guderian, Heinz. *Panzer Leader*. Washington, D.C.: Zenger Publihsing Co., Inc 1974

Healy, Mark. Kurst 1943: *The Tide Turns in the East*. London: Osprwy Publishing, Ltd 1992

Hogg, Ian V. *Armor in Conflict* London: Jone's Publishing Co. Ltd. 1975

R.P. Hunnicutt, *Abrams: A History of the American Main Battle Tank* Navato, Ca.:

Presidio Press 1990

Jentz, Thomas L. *Germany's Panther Tank: The Quest for Combat Supremacy* Atglen, Pa. Schiffer Publishing Ltd., 1995

Keegan, John. *The Second World War*. New York, New York. Penguin Books, 1990

Macdonald, John. Great Battles of World War Two. New York, New York. Macmillan Publishing Company, 1986

Manstein, Erich von. *Lost Victories*. Navoto, Ca.: Presidio Press 1955

MacLean, French L. *Quiet Flows the Rhine: German General Officer Casualties in WWII* Winnipeg, Canada: J.J. Fedorowicz Publishing Inc. 1996

Mellinthin, F.W. von. *Panzer Battles*. Norman, Ok.: University of Oklahoma Press, 1956.

Milsom, John *Russian Tanks 1900-1970*, New York, Galahad Books 1970

Perrett, B. *Fighting Vehicles of the Red Army*. London, Ian Allan Ltd. 1969

Piekalkiewicz, Janusz, translated by Michael Nierhaus. *Operation Citadel, Kursk and Orel: The Greatest Tank Battle of the Second World War*. Novato, Ca.: Presido Press 1987

Scheibert, Von Horst and Ulrich Elfrath. *Panzer in Russland* Friedberg: Podzim - Verlag

Spielberger, Walter J. *Panther and Its Variants* Atglen, Pa.: Schiffer Publishing, Ltd. 1993

Ziemke, Earl F. *Stalingrad to Berlin: The German Defeat in the East*, Washington, D.C.: Center of Military History, United States Army 1968

Magazines:

Bateman, Robert L., Captain, USA, "Force XXI and the Death of *Auftragstaktik" Armor Magazine* (January-February 1996) 13-15

Burke, John D., Major, USA, "Non-Developmental Item Integrantion and System Engineering" *Program Manager* (May-June 1991) 20-25

Capps, Alan P. "Smart Weapons for a Desert War" *Defense and Deplomacy* 8-11

Clarke, B. G., Colonel (Ret) USA, "Leadership on the Digital Battlefield" *Armor Magazine* (July-August 1996) 12-14

Edwards, O.T., III, Major USA, "Digital Battlefield Training and Insights of a User, The Good, The Bad, and The Ugly" *Issues in Armor: An Internet Discussion of Professional Concerns*, (May-June 1995) downloaded using *America Online* (Vienna, Va: America Online Inc.) 5 Feb 1996

Kempf, Karl F., "The Panther Tank" *Armor Magazine*, November-December, 1960, 17-20

Howard, Bart, Major, USA, "Digitization Could Exclude Allies" *Issues in Armor: An Internet Discussion of Professional Concerns*, (March-April 1996) downloaded using *America Online* (Vienna, Va: America Online Inc.) 5 Feb 1996

Manstein, Erich von, Fieldmarshall, German Army, "Operation Citadel" *Marine Corps Gazette*, vol 40, (August 1956) 44-47

"How New Command and Control Technology will affect the Army's Leadership Style" *Issues in Armor: An Internet Discussion of Professional Concerns*, downloaded using *America Online* (Vienna, Va: America Online Inc.) 5 Feb 1996

Kitfield, James, "Weapons Under Fire" *Government Executive* (June 1991) 20-26

Military Review Staff, "The Evolution of the Armored Arm in Germany from 1935 to 1945" Translated from an article in "Revue Historique de l'Armee (France) December 1950, *Military Review*, vol 31, no. 4 (July 1951) 77-84

Mostovenko, V., Engineer Colonel, "History of the T34 Tank" *Soviet Military Review* number 3, 36-37

Parrish, Michael, "The Battle of Kursk" *Military Quarterly*, vol. 99 (October 1996) 39-51

Pengelley, Rupert, "Commercial Off-the shelf Products" *International Defense Review* (February 1995) 47-50

Sherman, Jason, "Rush to Digitization" *Armed Forces Journal International*, (February 1996) 40-42

Woods, John R., Colonel, USA, "Lessons Learned in Information Age Warfare" *Army Magazine*, (February 1996) 32-44

Zhukov, Georgi K., Marshall Soviet Army, "The Battle of Kursk", *Military Review*, vol 49, (August 1969) 82-96

[1] Perrett, B. *Fighting Vehicles of the Red Army*. London, Ian Allan Ltd. 1969 Page 32
[2] Perrett, B. Page 33
[3] *1984 Art of War Symposium, From the Don to the Dnepr: Soviet Offensive Operations - December 1942 - August 1943*, Center for Land Warfare, US Army War College, Carlisle, Pa. 1985 Page 299
[4] Milsom, John *Russian Tanks 1900-1970*, New York, Galahad Books 1970 Page 105
[5] Perrett, B. Page 38
[6] Spielberger, Walter J. *Panther and Its Variants* Atglen, Pa.: Schiffer Publishing, Ltd. 1993 Page 9
[7] Spielberger, Walter J. Page 10
[8] Forty, George *World War Two Tanks* London, England: Osprey 1995 Page 93
[9] Guderian, Heinz.. *Panzer Leader* Washington, D.C.: Zenger Publihsing Co., Inc 1974 Page 276
[10] Guderian, Heinz.. Page 143
[11] Kempf, Karl "The Panther Tank" *Armor Magazine* November-December, 1960 Page 18
[12] Spielberger, Walter J. Page 17-8
[13] Guderian, Heinz.. Pages 276-7
[14] Spielberger, Walter J. Page 22
[15] Guderian, Heinz. Pages 277
[16] Guderian, Heinz. Pages 277-8
[17] Guderian, Heinz. Page 280
[18] *1984 Art of War Symposium, From the Don to the Dnepr: Soviet Offensive Operations - December 1942 - August 1943*, Center for Land Warfare, US Army War College, Carlisle, Pa. 1985 Pages 297-8
[19] Spielberger, Walter J. Page 86
[20] Spielberger, Walter J. Page 87-8
[21] Clausewitz, Karl von, On War, Translated by Michael Howard and Peter Paret. Princeton, N.J., Princeton Univ. Press, 1986 Page 358
[22] Jentz, Thomas L. *Germany's Panther Tank: The Quest for Combat Supremacy* Atglen, Pa. Schiffer Publishing Ltd., 1995 Page 130
[23]. Mellinthin, F.W. von. *Panzer Battles* Norman, Ok.: University of Oklahoma Press, 1956. Page 218
[24] Cross, Robin *Citadel: The Battle of Kursk*.. NewYork: Sarpedon 1993 Page 152
[25], Healy, Mark. *Kursk 1943: The Tide Turns in the East* London: Osprwy Publishing, Ltd 1992 Page 41,
[26] Jentz, Thomas L. *Germany's Panther Tank: The Quest for Combat Supremacy* Atglen, Pa. Schiffer Publishing Ltd., 1995 Page 132
[27] Crow, Duncan and others, eds *Armored Fighting Vehicles of Germany*. (part 2). New York: Arco Publishing Company, Inc. 1978 Page 19,
[28] Crow, Duncan and others, eds. Pages 96 and 116
[29] Parrish, Micheal, "The Battle of Kursk" *Military Quarterly*, Volume 99 October 1969Page 44
[30] Caidin, Martin. *The Tigers are Burning*. New York: Hawthorn Books, Inc. 1952, Page 223
[31] Caidin, Martin. Page 185
[32] Department of the Army, *German Tank Maintenance in World War II* Washington D.C, 1954 Page 25
[33] Kitfield, James "Weapons Under Fire," *Government Executive*, June 1991, 20 - 26
[34] Kitfield, James 20 - 26
[35] R.P. Hunnicutt, *Abrams: A History of the American Main Battle Tank* Navato, Ca.: Presidio Press 1990, Page 204
[36] Kitfield, James 20 - 26
[37] Kitfield, James 20 - 26
[38] Kitfield, James 20 - 26
[39] Kitfield, James 24
[40] Kitfield, James 20 - 26
[41] Kitfield, James 20 - 26

[42] Office of the Assistant Secretary of the Army for Research, Development and Acquisition "Weaponry, Equipment and New Technologies," *Army Magazine*, October 1996 page 22

[43] Office of the Assistant Secretary of the Army for Research, Development and Acquisition Page 264

[44] Office of the Assistant Secretary of the Army for Research, Development and Acquisition Page 265

[45] Office of the Assistant Secretary of the Army for Research, Development and Acquisition Page 265

[46] Thomas O'Connell served as my troop command from 1982 - 1983. He relayed this story to me during the Armor Conference in 1986.

[47] "How New Command and Control Technology will affect the Army's Leadership Style" *Issues in Armor: An Internet Discussion of Professional Concerns*, downloaded using *America Online* (Vienna, Va: America Online Inc.) 5 Feb 1996

[48] Edwards, O.T., III, Major USA, "Digital Battlefield Training and Insights of a User, The Good, The Bad, and The Ugly" *Issues in Armor: An Internet Discussion of Professional Concerns*, downloaded using *America Online* (Vienna, Va: America Online Inc.) 5 Feb 1996

[49] Edwards, O.T., III; Major, USA

[50] Pryor, Michael L.; Captain, USA, "The Dochotomy of Non-Digitized and Digitized Forces" *Issues in Armor: An Internet Discussion of Professional Concerns*, downloaded using *America Online* (Vienna, Va: America Online Inc.) 5 Feb 1996