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THE AERIAL VEHICLE: TECHNOLOGICAL  
THREAT TO ARMORED WARFARE

Joseph H. Masterson

Army War College  
Carlisle Barracks, Pennsylvania

28 February 1972

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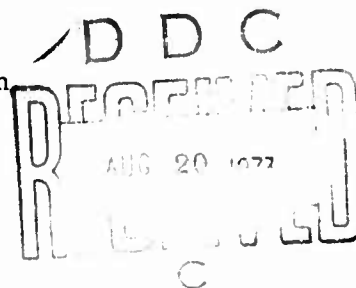
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THE AERIAL VEHICLE:  
A TECHNOLOGICAL THREAT TO ARMORED WARFARE

MONOGRAPH

by

Colonel Joseph H. Masterson  
Infantry .



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The basic question is, will an aerial vehicle due to advanced technology, replace the tank in the 1970's? In developing this theme a historical event, the General Mitchell case, was used as a catalyst to stimulate the reader's ability to think about this idea, rather than arbitrarily dismiss it. The challenge to the tank's status quo is discussed in view of its increasing cost, versus its effectiveness and vulnerability. As a challenge to the tank as an offensive weapon, new types of attack helicopters' characteristics are described. Non-technical research data was obtained from library literature, periodicals and reports. Technical data on weaponry, laser use, infra-red devices, etc., were obtained from personal letters to industry as well as library technical material.

A discussion of attack helicopters in combat (Laos 1971), is covered in detail. A comparison of the Cheyenne attack helicopter with the M551 Sheridan tank accentuates certain advantages that the helicopter now possesses. The conclusion suggests that the attack helicopter in view of its increasing utility, may with its rapidly growing technology, replace the tank as offensive weapons system in the next decade.

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THE AERIAL VEHICLE:  
A TECHNOLOGICAL THREAT TO ARMORED WARFARE

Aerial vehicles have threatened established modes of warfare at various times throughout this century. These threats have not always been readily accepted and more often they have been initially disregarded.

In 1925, Brigadier General William "Billy" Mitchell, U.S. Army, was court-martialed. His crime, or as it was perceived by the United States Military at the time, was insubordination, based on his insistence to fight for a cause. That cause was his desire to form a viable air corps for the defense of the United States.<sup>1</sup> On July 18, 1921, in a test, General Mitchell with his experimental bomber-type aircraft had sunk the five thousand ton prize of war, the German cruiser Frankfurt. Mitchell had been allowed to attempt to sink this ship only in an effort to show the folly of his ideas. The Army and Navy officers who viewed the sinking of the cruiser were convinced that it was only a quirk of fate and this bombing technique would not work against a battleship. Therefore, to prove their convictions they scheduled another test to be held on Thursday July 21, 1921.<sup>2</sup>

General Mitchell and his bombers were to attempt to sink another German prize of war, this time the battleship Ost-Friesland. United States naval experts had assured Army critics of Mitchell that it was unsinkable. In 1916 during the Battle of Jutland this battleship had survived eighteen hits from twelve and fourteen inch guns of other ships and in retreating from that battle had struck a mine and still

did not sink. The Ost-Friesland had eighty-five water-tight compartments of hardened steel armor and totaled twenty-seven thousand tons in weight. General Mitchell and his bombers sank the dreadnaught with ease. The sinking was observed by a large audience from a near-by ship which included U.S. Army and Navy officers, Diplomats, Cabinet Members, Senators, Representatives, military and naval attaches of foreign nations and cynical newspaper reporters.<sup>3</sup>

In light of this astonishing achievement one would be led to believe that a complete and thorough review of U.S. military doctrine would have been effected in order to take full advantage of this technological breakthrough in the science of warfare. Unfortunately, this was not the case. Old viewpoints, service parochialism in favor of outdated methods, and a reluctance to change totally disregarded this proven new concept and refused to accept it. General Mitchell, in attempting to appeal to men's reason, eventually drew their ire and was court-martialed for his efforts.

How does the foregoing event impact on our Army of today? In the past decade we have spent over 100 million dollars in an attempt to develop a "Main Battle Tank." To date we do not have one of these tanks operational in any of our armor units. Although the initial cost of one of these main battletanks was to be substantially less, the cost of producing one of the latest prototype models was approximately one million dollars. Irked by the Army's ineffective effort to develop a new tank, Congress has directed the military to reevaluate its requirement for a new main battle tank, to go back to the drawing

board and develop a new type.<sup>4</sup> Will the cost of this new tank justify its development and production?

#### Psychological Climate of the United States

In order to evaluate that question, we must first evaluate the psychological climate of the citizenry of the United States at the present time. As can be seen from our withdrawal from Vietnam, it is obvious that the psychological climate of this nation has effected a change in our nation's will and objectives. With the drawdown of our forces in Vietnam and the sharp reduction of the Army's manpower, national priorities for Congressional expenditure of tax monies are focusing on the nation's internal, economic and social ills. Future appropriations for the Army, therefore, will continue to be reduced.<sup>5</sup>

#### North Atlantic Treaty Organization Commitment

Concurrently, however, as indicated by President Nixon in his numerous statements to the press, the U.S. armed forces in Western Europe that complement the North Atlantic Treaty Organization (NATO) must be strong and credible to retain the confidence of our Western European NATO allies.<sup>6</sup>

The main threat against NATO countries in Europe is the Russian-led Warsaw Pact Coalition, with its preponderance of tanks which number in the vicinity of fourteen thousand.<sup>7</sup> NATO forces have six thousand tanks. Present U.S. military doctrine states that the best defense against a tank is another tank. If this doctrine is accepted as valid, then we apparently must develop, produce, and in some way

deploy eight thousand tanks to Europe to combat this threat. It is not likely that Congress will authorize any future peacetime appropriation in the amount necessary to the manufacture of these tanks on a one-to-one ratio.

Since the United States must still protect its forces stationed in Western Europe as well as help defend the NATO countries, our primary deterrent to this Russian tank threat is the development of a new type antitank weapon or face the threat of using nuclear weapons, either tactical or strategic.<sup>8</sup>

World civilization cannot accept the use of nuclear weapons as the only alternative to this threat and modern technological advances indicate that tanks today are as vulnerable as was the battleship in 1921.

Armored warfare has been employed by different armies throughout the world since World War I, gaining its greatest stature in World War II in North Africa and Europe. The U.S. armored warfare doctrine indicates a tank provides the utmost in mobility, firepower and shock action. This may have been true in 1945 or even in 1950, but in comparing the tank with other types of newly developed weapons systems, this is not the case today.

#### Challenge to the Armor Status Quo

There is emerging a group of military officers in different armies throughout the world who are challenging the status quo of the tank. The U.S. Armor magazine has recently appeared with an article that will

be a sacrilege for those committed to the tank. In a revised version of an article that appeared in the Australian Army Journal, LTC Warren W. Lennon, an Australian Army officer, says:

. . . the tank of today is as anachronistic as medieval body armor. Though it has evolved to the state of imminent extinction because it has become increasingly inefficient in an age which demands more of machines than ever before. It has become the Juggernaut of modern military technology demanding high capital outlay and enormous logistical support in return for fire support not much more effective than that of the lone enemy guerrilla who destroys the tank with a well placed rocket.<sup>9</sup>

Colonel Lennon also touched briefly on the high armor losses in Vietnam against a relatively unsophisticated enemy.

Major General Orwin C. Talbot, Commandant of the United States Army Infantry School, in a recent presentation to the Army Aviation Association of America, expressed his views on armor, stating:

. . . we see a clear-cut requirement for the Infantry to have its own aerial antiarmor to complement its ground systems. We visualize the employment of a light attack helicopter system with an integral anti-tank weapons system. . . We see the need for a small inexpensive and simple helicopter, one comparable to the present LOH (light observation helicopter).

. . . , our present-day LOH takes on more importance in the current timeframe as we identify Infantry needs for the helicopter. We make no attempt to minimize the need for the heavier tank killing helicopters. In fact, we fully support the requirement for that capability in the Air Cav (Aerial Cavalry) and Aerial Artillery. . . . /What/ the Infantry needs, as I have discussed above, is a system that is light, inexpensive, and simple to operate, one that can help the Infantry find and fix the enemy and kill armor within the Infantry's areas of influence.<sup>10</sup>

Although General Talbot and Colonel Lennon clearly indicate their desire to see a replacement for the tank, each was evaluating the tank's usefulness within different parameters. General Talbot's evaluation centered on a future need for an aerial antitank weapons system, whereas Colonel Lennon simply stated that tanks were outdated. Colonel Lennon's evaluation of the logistical support necessary to maintain tanks is particularly worthy of future discussion. With the present withdrawal of our armed forces from Vietnam and the scaling down of the size of the Active Army, more efficient management of our logistical resources has become paramount. The acquisition of a large number of new tanks, at a cost of \$1 million each, in itself has caused second thoughts in Congress. Let us consider the additional costs of transporting tanks to Europe, the majority of which, due to their weight and size will most probably go by sea transportation. Once this equipment arrives in Europe it must have facilities whereby adequate maintenance can be performed to insure the tanks are kept in an operational status. The personnel to operate the tanks must have adequate ground training areas and tank ranges on which to fire their weaponry. If tank maneuvers are to be held, even on a very small scale, there will likely be damage to roads, trees, and farmlands. The U.S. Government is liable for reimbursement should any damage occur; however, this does little to allay the hostile attitude engendered in the citizens who suffer such damage.

As with the tank, aerial gun platforms also require professional maintenance to remain operational. However, their flying capability

allows them to participate in maneuvers without any destruction to roads, farmlands or other property.

Perhaps one answer to this problem is to hold very few armor maneuvers in Europe and to rely on Active and Reserve units who will be predominantly trained in the United States. These units would be airlifted periodically to Europe for short periods of training in that environment. In this case, the tanks would be prepositioned in depots in Europe, and the Stateside units in times of a European emergency would be airlifted overseas to draw their tanks from storage in order to meet the hostile threat.

Storing of tanks in forward depots makes them very vulnerable to enemy attack. It must be assumed that the enemy has our overseas depots targeted and possesses the capability to attack and damage them prior to the arrival of our stateside forces.

Can we afford the cost of maintaining these expensive pieces of equipment in storage at a time when we are considering closing down and consolidating our European overseas depot system to meet the financial constraints imposed by a smaller military budget? The United States Army today stands at the threshold of investigating the idea that it can no longer afford the tank in view of its high cost and limited usefulness as a weapons system.

#### New Technology in Aerial Weapons Systems

Just as armor replaced the horse cavalry, the tank, due to new technological advances may be replaced by an aerial vehicle, a

helicopter gun platform. Immediately, opponents of such thinking will state first, "that it is not technologically feasible," and secondly, even if it were feasible, a helicopter gun platform or armed attack helicopter "is too vulnerable to survive in a mid-intensity battlefield environment."

The argument against the technological feasibility of producing a sophisticated helicopter aerial gun platform is no longer valid. Just as the hypothetical arguments against the validity of making a rocket trip to the moon were disproved after the first landing, a variety of helicopter aerial gun platforms are now in existence. Some are very sophisticated and others relatively simple.

One of the more sophisticated is the Cheyenne attack helicopter developed by Lockheed Aircraft Corporation under a Research and Development contract for the U.S. Army. This helicopter has a crew of two. The copilot gunner sits in the forward cockpit area and the pilot sits in the rear cockpit which is elevated about a foot and a half higher than the forward cockpit. Either crew member can fly the aircraft and either can operate the helicopter's weapons system. The Cheyenne's weapons system is centrally controlled by a small computer. Input data to the computer is received from the gunner's sight, a laser range finder, and doppler radar position plotting system. The computer processes the input data, solves the fire control equation, and directs the weapons to achieve maximum accuracy.<sup>11</sup>

A unique feature of the gunner's forward cockpit is the mounting of his seat and periscopic sight on a turntable seat that can swivel

360° in either direction once it locks on a target. The periscopic sight with its twelve-power magnification allows the gunner to precisely identify targets and enables extremely accurate firing from long ranges. Since the on-board weapons ballistics are stored in the computer's memory unit, all the gunner need do to precisely fire either his guns or his antitank missiles is keep his sight lined up on the target and the system does the rest of the work, with the rounds hitting where the gunner has aimed. The swiveling gunner station for the Cheyenne attack helicopter was designed and developed by the Aerospace Instruments and Control Systems Department of the General Electric Company.<sup>12</sup>

The Aircraft Division of Hughes Tool Company that designed and developed the Army's Light Observation Helicopter is currently engaged in an engineering study to provide a light, less sophisticated aircraft than the Cheyenne, to provide an around-the-clock antiarmor helicopter. Such a machine would carry up to four TOW (tracked optically wire-guided) missiles and would provide night vision systems for both the pilot and gunner.

Sikorsky Aircraft has participated in armed helicopter development since 1954 when the Army began installing .30 caliber machine guns and rockets on early model helicopters. At the present time, Sikorsky has developed the S-67 Blackhawk heavy gunship. This helicopter is powered by two turbine engines and has a cruise speed, with all of its armament on the ship, of 163 kts.<sup>13</sup>

In September of 1971, Bell Helicopter Company unveiled its third generation of armed helicopters. The newest of their helicopter gunships is called "the King Cobra," and is an improved model of its AH-1G Cobra which is the latest model of armed helicopters being used by the U.S. Army in Vietnam. The new King Cobra will be able to accept a wide variety of current and advanced weapons systems. Its flexible front turret weapon is a General Electric 20 mm or 30 mm gun.<sup>14</sup> Pylons on each wing allow for two or four tube TOW missile pods and seven or nineteen tube 2.75" folding firing aerial rocket pods. There are also provisions for 7.62 mm miniguns on the pylons.

The night vision system includes two independent night vision sensors. The copilot gunner sight will use a Forward Looking Infrared (FLIR) system. The Forward Looking Infrared system operates in the far infrared region to give the gunner a high resolution picture in total darkness. It may also be used in the daytime to penetrate smoke, light fog or camouflage. The pilot's sight will incorporate a low light level television system (LLTV) using an exteriorly mounted LLTV camera to aid in low altitude night flight. Adjustment of the camera's light control extends the operating span from starlight to bright sunlight.<sup>15</sup>

All of these helicopters as opposed to armor can easily traverse rivers, marshy areas, hilly or wooded terrain. Not so the tank; it becomes helpless when bridges are not available over rapid flowing rivers and must rely on specialized Engineer units to build bridges in order for them to cross these rivers. A tank's mobility is impaired in marshy areas and some wooded areas are just too dense for them to

travel through. Large gullies and sharp hilly inclines also severely restrict their speed and mobility, if not completely stopping them.

#### Attack Helicopters vs Armor in Laos

Most opponents of the armed attack helicopter will state that it cannot survive on a battlefield against tanks or in a mid-intensity combat environment. It already has. During the latter part of March and early February 1971, United States and South Vietnamese Army units participated in Operation Lamson 719. This was the cross-border operations into Laos to disrupt the North Vietnamese infiltration of supplies and equipment on the Ho Chi Minh Trail and to force the enemy out from the sanctuary of their base camps. U.S. armed attack helicopters were used to seek out and engage enemy armor.

The following is an account written by the officer who commanded the armed attack helicopters in this operation:

. . . the weaponry we encountered around the enemy armor was the full range of their capability. Primarily we encountered small arms fire, 12.7 mm, 14.5 mm dual barrel truck-mounted antiaircraft, limited 23 mm and extensive 37 mm guns. The 57 mm AA was present, however, at the time of the armor engagement, we had destroyed one radar and were too low for the 57 mm guns to be effective. The first engagement was from Russian-built PT 76 tanks. They were protected by their own 12.7 mm AA guns and additional ground force 12.7 and 37 mm antiaircraft guns. We destroyed 3 tanks with 2.75" High Explosive rockets and 20 mm cannon. Fleschette (Folding Fire Aerial Rockets) and the 7.62 minigun and 40 mm were also used, however we felt the 2.75 HE did the damage. The next encounter was a Russian T-34 tank which we stopped, blew pieces off of it, but did not record as destroyed. Again the 2.75 FFAR with the 17 lb. HE warhead did the damage. The largest reported encounter was two separate columns of tanks, eight in one, six in the other, both protected by ground

forces and 12.7 and 37 mm antiaircraft guns. Tac Air wasn't available but we did at this time have the 6.9 lb High Explosive Antitank warhead for the 2.75 rockets. It took two hours and twenty minutes for us to stop all tanks with Cobras. (AH-1G Cobra Armed Helicopters) We observed direct hits with the HEAT rockets, but were unable to report damage other than the tanks stopped; nine stopped firing.

I think I should clarify our reporting procedure here. Because we were used as an intelligence gathering unit I held the Squadron to strict criterion (sic). A tank must either blow up or burn to be recorded as destroyed, only these tanks which we could observe as having parts blown off were reported as damaged and only after we received the 6.9 lb High Explosive Antitank Warheads did we report a tank as immobilized.

We reported a total of forty-seven tank engagements. In all cases the tank used its 12.7 mm gun in defense. In some cases the tank used its 76 mm or 85 mm gun in defense. Most tanks were protected by troops and other weapons. We did not lose an aircraft or crew member from a helicopter-tank encounter. . . . We reported only six tanks destroyed, nineteen immobilized and eight damaged by helicopter. Where possible we stopped the tank, put Tac Air on it and gave the kill to the USAF, since at the time we just wanted to get on with the war.

The majority of the enemy tanks seen were T-34's mounting either an 85 mm or 100 mm main gun, a 12.7 mm and a 7.62 mm turret machine gun. The remainder were PT 76's mounting what we believed to be a 76 mm main gun and a 12.7 mm AA gun and a 7.62 mm turret machine gun. There were reports of Russian T-54 tanks, however we were only able to confirm the presence of the T-54 recovery vehicle and the Russian SU-76 Assault gun. We confirmed the use of radar only with the 57 mm and larger weapons. The antiaircraft fire was described by the USAF as the most intense in all of Southeast Asia. . . .<sup>16</sup>

The Army Vice Chief of Staff, General Bruce Palmer, Jr., in citing the Air Cavalry Squadron that participated in the LAMSON 719 operation into Laos stated:

Everything was against them, weather and terrain favored the enemy. . . . This was the most hostile

air environment Army Aviation has ever operated in. They (enemy) had everything--small arms, 50 cal machine guns, 20 mm, 37 mm, and 57 mm automatic weapons. Certainly it was what some people call 'mid-intensity'  
.....  
17

From the foregoing accounts, it is obvious that even our present-day interim armed attack helicopter, without sophisticated weaponry, has proven its ability successfully to attack and immobilize armor. This has been accomplished by an armed attack helicopter that was not developed as an antiarmor weapons system.

#### Cheyenne Helicopter/Sheridan Tank Comparison

The Cheyenne has been developed as an attack helicopter with the capability to be used in a primary antiarmor role. Although some of its characteristics were discussed previously, a comparison of certain performance aspects of this advanced attack helicopter system with an operational U.S. Army tank, the M551 Sheridan, is quite interesting, as depicted below:

#### M551 Sheridan Tank

Speed -- 43 mph maximum forward to 7.5 mph backward (5.5 mph in water)

Range -- 350 statute miles

Mobility -- Land (including types of marshy-muddy terrain, sand and snow), inland and protected waters; move forward, backward, pivot and stop.

Deployability -- Surface and air transportable, air droppable from C-130, C-141.

Manning -- (4) Cmdr, Weapons Gunner, Weapon Loader, Driver

Armament -- Two 45 Cal submachine guns  
7.62 mm machine gun, coaxial with gun launcher  
50 cal machine gun - flexible on commander's cupola  
152 mm gun launcher  
Shillelagh antitank missiles

Cheyenne Attack Helicopter

Speed -- 234 mph maximum  
Range -- 3 hrs combat fuel endurance, 1100 nautical mile ferry range  
Mobility -- Vertical and short takeoff and landing, all weather day and night; moves forward, backward, sideward, pivot, up, down and hovers.  
Deployability -- Self-deployable  
Manning -- Two pilots  
Armament -- 40 mm turret grenade launcher  
30 mm long range point fire system  
2.75 folding fin aerial rockers  
TOW antitank missile system

Comparing the maximum speeds (43 mph for the Sheridan tank and 234 mph for the Cheyenne), the speed or shock action for which the tank had previously been renowned is seriously jeopardized. Another tank trademark, its "mobility," is also being challenged, since the tank is primarily land oriented and provides its greatest mobility as it travels forward. The attack helicopter's mobility, in addition to the tank's, allows it to move up, down, sideways or hover. Additionally, the

Cheyenne has an 1100 nautical mile ferry range and is self-deployable.<sup>18</sup> With a cruise speed in the vicinity of 190 kts, this is 50 kts more than the C-47 aircraft that our Air Force ferried to Europe and other areas throughout the world during World War II.

The Cheyenne's versatile ordnance carrying capability gives it a lethal firepower payload. The nose turret grenade launcher carries 780 rounds of 40 mm ammunition and the belly turret cannon carries 2010 rounds of 30 mm ammunition. This 30 mm round is dual purpose ammunition. The nose of the projectile is shaped charged for light armor piercing, while the body of the round fragments for anti-personnel effect. Both guns are flexibly mounted with the belly cannon capable of firing in any direction around the Cheyenne. The external pylon stations may be used for various mixes of TOW guided missiles and aerial rockets. For example, in conjunction with the turret grenade launcher and the belly turret cannon, the following can be mounted for use: twelve TOW guided missiles and seventy-six 2.75 aerial rockets; or 152 rounds of 2.75' aerial rockets.<sup>19</sup>

#### Skepticism Continues

Skepticism, as to the survivability of the helicopter as an aerial gun vehicle still persists. Lieutenant General Robert R. Williams, Assistant Chief of Staff for Force Development, Department of the Army, indicates that:

We are transitioning from the conduct of a limited war of low intensity in the jungles of Vietnam to preparation for a conflict on the land mass of Europe.

At least that is the contingency against which our force structuring and development programs are projected. Now, in carrying out this transition, there is one key element that may drive the shape of our future force structure and aviation . . . .

With what we have demonstrated in Vietnam through the employment of helicopters, there would be no question that we could use helicopters and other aircraft to an equal extent against a sophisticated enemy in a higher level conflict, if people were convinced the birds (helicopters) could survive. But they aren't convinced. Rather, there are those who are convinced of the logic that a slow moving, low flying object such as a helicopter will be 'duck soup' for any number of enemy weapons.<sup>20</sup>

There also prevails an attitude today that is not new but very analogous to the past. In 1941 there was a group of Army pilots who felt they could fly a 65 HP fabric-covered aircraft in combat. Simulated combat studies proved that these aircraft would never survive and would be shot down with ease; they were not. After World War II, surface-to-air missiles were to outmode manned aircraft; they haven't. Today the Army has become the victim of television and press reports concerning helicopter losses. Almost daily people hear reports about helicopters being shot down in Vietnam. This has created a mental image that helicopters cannot survive in combat. The facts prove just the contrary. In hundreds of thousands of combat hours flown in assaults and fire support, helicopter losses are less than "one helicopter in 12,000 sorties."<sup>21</sup>

## CONCLUSION

In 1921 General Mitchell sank the two naval vessels in a test with experimental bombers. It was the beginning of the end for the battleship. In 1971 armed helicopter gunships successfully attacked, immobilized and destroyed enemy armor under actual combat conditions. This latter fact, coupled with the potential technological development of this new aerial vehicle in the coming decade, will see it challenge the tank's supremacy as an offensive weapons system in the armies of the world.

  
JOSEPH H. MASTERSON  
Colonel, Infantry

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