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NAVAL WAR COLLEGE
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ENDING THE CLOSE AIR SUPPORT CONTROVERSY

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Operations.

The contents of this paper reflect our own personal views and are not necessarily endorsed by the Naval War College or the Departments of the Navy or Army.

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INTRODUCTION

During our research for this paper, the United States has joined against the forces of Iraq in what is rapidly developing into an Air Land Battle. Many if not all doctrinal tenets refined since the Vietnam War are being put to the ultimate test--the crucible of combat. We find ourselves in a unique situation as a result. The who--what--when--where--and how of tactical close air support (CAS) has now, as so many other issues, moved abruptly from the safety of an academic discussion to the empiricism of a lethal battlefield.

As with most wars, the Persian Gulf War is a "come-as-you-are affair with little or no notice . . . [one in which you have] to play the cards you are already holding,"[1] i.e., the fight is to be waged with those weapon systems in the inventory. One such card held by the U.S. military is the Fairchild Republic A-10 Thunderbolt II. More affectionately known on the flight-line by its unofficial moniker, "Warthog," the A-10 is an attack aircraft specifically designed to perform a close air support mission. First flown and fielded by the Air Force in 1972, she is not only "pug-ugly" on the battlefield, but an "old lady" in the world of high-tech engineering and procurement. Indeed, the crisis in the Mideast has temporarily given the A-10 a reprieve from a flight plan terminating in an Arizona airplane graveyard.

> AN AIR BASE IN SAUDI ARABIA - On the way to the bone yard, scores of pug-ugly mud fighters have landed at this dusty desert base to do what they were born to do -- kill tanks . . . the A-10 . . . was created more than two decades ago to destroy Soviet tanks in Europe . . . Now that the threat of war there has eased, the venerable A-10 is being phased out. Some will be used as observation aircraft for forward air controllers, but the A-10's days as the Air Force's close air support aircraft are coming to an end. A twist of fate has given [them] at least a temporary reprieve. Long rows of the

> obsolescent attack planes line the ramp here in the fierce desert sun, standing ready for combat. Iraq's conquest of Kuwait, spearheaded by its armored forces, sent U.S. military planners scurrying for appropriate weapons to use against tanks. The ungainly A-10 got the call, because it is both hardy and deadly.[2]

Because the A-10 is undergoing a baptism-by-fire, the issues, ideas, and recommendations postulated in this paper must be examined in the context of the Gulf War battlefield experience. After-action reports regarding the timely availability, combat losses, command, control and effectiveness of CAS provided to ground maneuver commanders will have to be objectively reviewed. The "Hog" is not the only aircraft to render CAS, nor was it ever intended to be, so particular attention will have to be paid to those variety of missions performed by the A-10. One possible outcome: the aircraft cannot survive on the modern battlefield and is therefore obsolete, but interoperability between the Air Force and the Army regarding command and control of CAS is validated. In essence, critics of the A-10 are correct. The aircraft should be retired and replaced. Command and control of CAS is adequate and effectively exercised. The old adage, "if it ain't broke . . . don't fix it" may well apply. However, we suspect another possible outcome will result and our thesis will be validated:

(a) the U.S. Air Force has demonstrated throughout its history that it does not want the CAS mission, but has never overtly admitted it because of the fiscal resources the mission commands.

(b) the A-10 may be old but is no more obsolete on a modern battlefield than a M-14 rifle with a bayonet would be (although the rifle has been replaced). Technology does not fight wars; people with sound, innovative tactics do. It's how you use that rifle and bayonet that counts; how you employ, command and control the A-10 is what counts.

(c) that the A-10 is an extraordinarily effective weapons system and should be retained and upgraded with available, off-the-shelf technology as a minimum technical risk CAS aircraft.

(d) Although now required by federal statute to accept the A-10 into its inventory, the Army should be proactive rather than reactive. It should be proactive in assuming responsibility for providing its own primary CAS, particularly in the opening rounds of the Airland Battle. The Air Force should cooperate fully for an efficient transition and Congress should allocate the required resources so that a blending of the service roles is detrimental to neither.

It is important to state what our paper is not. It is not a collation or summary of our research, but rather it is intended to be an analysis of a controversy that has been going on for forty-plus years. It is a recommendation overall to end the debate by compromise. More importantly, our paper is not an indictment of "jointness" or combined arms fundamentals. We predict that the Persian Gulf War will clearly validate service interoperability. What will be required in the aftermath is a refinement and fine-tuning of some procedures. We have focused on CAS as one area that can be fine-tuned by upgrading a system and streamlining its command and control. The command denominator is mission accomplishment.

Chapter One sets the stage for analyzing the controversy by defining the battlefield missions performed by aircraft, and illustrating some of the friction inherent between Army and Air Force doctrine. We recommend a return to basic principles of war as an aid to understanding the requirement to blend service roles regarding CAS.

Chapter Two examines the origin and history of the CAS controversy. We support our conclusion that the Air Force has always approached CAS as a low, if not last, priority. We recommend a blending of roles and some steps to be taken in a proactive approach to resolving the debate, faced with Congressional action forcing the issue. The alternative is retiring an aircraft with unlimited potential for continued service.

And finally, Chapter Three is an in-depth, though unclassified analysis of the A-10 itself, supporting our contention that the aircraft be retained and upgraded using a minimum technical risk approach. We review its technical strengths and weaknesses; its mission capabilities and limitations.

CHAPTER I

BATTLE MISSIONS PERFORMED WITH AIRCRAFT

To keep our analysis of the CAS controversy in perspective, it is necessary to create a sense of the battlefield environment by refining three associated terms: close air support (CAS), air interdiction (AI) and battlefield air interdiction (BAI). Of these three, close air support is the most difficult to clarify because the reader's orientation and natural bias to what constitutes 'close' enters into the picture. It is comparable to defining the differences among low, medium or high intensity conflict. It is hard to find a soldier involved in a firefight who will accept the fact that he may be involved in a 'low' intensity conflict. To him the intensity borders just below the threshold of nuclear warfare. Similarly, what constitutes 'close' to a hostile ground target has a whole different connotation to a pilot vice a ground commander. Paradoxically, a yard and a mile become synonyms, yet retain their entirely different meanings.

> Close air support (CAS) is an attack against hostile targets that are in close proximity to friendly forces. It requires detailed integration of each air mission with the fire and movement of these forces. CAS missions are flown to blunt an enemy attack, to help friendly forces gain and maintain an offensive, or to provide cover. These missions emphasize joint air-land operations. To be successful, CAS must be responsive to the needs of the ground commander.[3]

Note in this definition that 'close' refers to the proximity of the enemy target to the friendly force, not to the distance from the target of the aircraft performing the mission. Many writers on the topic of CAS seem to overlook this subtle distinction. Consequently, the logic of proponents of multirole aircraft, who contend that an aircraft designed to perform an air superiority mission can perform CAS just as well as a

CAS-specific aircraft, seems flawed. To them it makes no difference whether the target is destroyed from satellite orbit or tree-top level, as long as the mission is accomplished. Unfortunately, history indicates the mission is not always accomplished. CAS is not that simple. The advantage of a tough, maneuverable aircraft like the A-10, which is capable of low speed and altitude tactics, ensuring more accurate destruction of targets located close to friendly troops, even from stand-off ranges, are discounted. Furthermore, we believe that regardless of who is performing the CAS attack, responsiveness and integration are key to the ground commander, i.e. availability - command and control.

"Air interdiction (AI) operations are conducted against enemy military potential before it can be effectively used against friendly surface forces."[4] The enemy's lines of communication are targeted, i.e., his war making capabilities, supply sources, depots, and means of transportation. The AI portion of a campaign is conducted simultaneously with the suppression of enemy air defense (SEAD) and air superiority missions, or follows closely on the heels of these important Air Force functions. "The Joint Force Commander initiates the interdiction campaign. He determines the area to be interdicted and the effects desired, and he also establishes some priorities. The Air Force component commander is responsible for executing the campaign."[5] The air interdiction campaign conducted against Iraq will become a textbook example.

> Battlefield air interdiction (BAI) is a subfunction of air interdiction. A principal objective is to defeat second- and third-echelon forces before they close with friendly forces. BAI is that portion of the air interdiction mission that may have a direct or near-term effect on surface operations.[6]

The targeting of the Iraqi Republican Guard Divisions is a classic demonstration of BAI even though friendly ground forces are not involved in a movement to contact (as of this writing). In consonance with the Air Force's basic aerospace doctrine expressed in AFM 1-1, Army doctrine echoes that

> the land forces identify and rank targets, the tactical air control center (TACC) plans BAI in the same manner as air interdiction. These targets are nominated to the TACC through the battlefield coordination element (BCE). In this manner, BAI and the corps organic attack helicopters constitute the corps commander's deep operations assets.[7]

One of the issues that has rankled Army commanders over the years is this nominating process. Although there are doctrinal differences by definition between CAS and BAI, in reality the differences become blurred by the fog of war. One arm of service identifies what needs to be hit; another arm decides whether or not it is going to be hit. As a result, many ground commanders simply do not plan on CAS because they cannot rely on its being responsive unless it has been integrated in detail (and approved) beforehand. We don't believe there is a military operation in history with the possible exception of a parade that has ever gone according to plan. Commanders have to make decisions quickly in response to what happens during battle. CAS sorties dedicated to 'immediate response' are not a satisfactory answer. CAS has to be integrated in the maneuver scheme from the outset just as attack helicopter assets are integrated. Commanders use the means readily available and under their control to accomplish their mission.

For example, it may suddenly become critically important to a brigade commander that a bridge five kilometers to his right, front flank be taken away from the enemy. Is this a CAS or a BAI mission? Should the commander be bogged down trying to answer this question? The bridge

is terrain-masked from artillery; 'immediate' CAS is dedicated to another brigade. A discussion ensues through an unnecessary air control bureaucracy trying to shift air assets, during the heat of battle. Meanwhile, enemy armor is crossing the bridge.

The brigade commander in this example has to have CAS integrated in his scheme of maneuver from the beginning and not nominated, hoping for priority. Unless the commander has a short, immediate 'string' on his tactical air assets, he will not use them. "The Army's emphasis [as we shall further illustrate] on decentralized execution . . . makes responsive support by the centralized control methods of the Air Force difficult, to say the least."[8]

As a result, it appears to us that the political decisions regarding service roles and who owns and controls what piece of equipment flies in the face of time-tested and proven principles of war. Both services count 'simplicity' among their principles. The Army's doctrine states it outright.[9] In Air Force doctrine it shows up under the heading of command, control, communications and intelligence (C^3I).

> Commanders, at every level, are better equipped to make correct decisions and to implement those decision when they have an effective command and control structure that is simple, secure, and based on unity of command. This structure must provide the mechanism to survey and assess the battlefield situation accurately and to conduct offensive and defensive air actions to achieve objectives. . . . The most effective means for directing and executing an air effort is centralized control and decentralized execution . . . [which] helps to make aerospace forces responsive, serves to ensure that forces are properly used and integrated, and fosters initiative at the action level. Centralized control allows an air commander to focus on air effort or those priorities which will lead to victory . . . centralized control guides actions to support a board plan of action, decentralized execution provides the flexibility for subordinate commanders to use ingenuity and initiative in attacking targets.[10] (emphasis ours)

As the battle unfolds, the air and ground commander's priorities regarding CAS often change independently of one another. Army commanders take issue with who is in the best position 'to survey and assess the battlefield situation accurately,' particularly in an immediate sense, when it involves their developing scheme of maneuver. Air and ground cavalry scouts provide him with real-time information. 'Decentralized execution' to an Army commander means precisely what it says, unimpeded by unnecessary bureaucracy. An armor brigade commander, for example, does not tell his battalion commanders how to maneuver and fight their tanks other than in a conceptual, mission-oriented sense. Command, control and initiative are closely linked concepts in Army doctrine, the essence of which is perhaps best captured by the phrase 'power down.' In order to effectively exercise initiative you must directly command and control, or have a very short 'string' on the assets you need to accomplish your mission. We believe this same philosophy is captured in the Navy's warfare commander concept. You do not make decisions based on assets you think you might have, because the speed and lethality of modern battle does not permit the gamble. Risk-taking based on guesswork rather than calculated, possible outcomes is, in our opinion, a recipe for disaster in the midst of chaos.

We believe these subtle differences in doctrine have aggravated the CAS controversy through the years. Part of a practical solution is to blend responsibilities for who does 'what' with air assets, but most specifically who is responsible for CAS 'where' on the battlefield.

CHAPTER II

ORIGIN AND HISTORY OF THE CAS CONTROVERSY

Most students of American history are familiar with the history and traditions of the respective service components. During two centuries of history occasionally emotional, often bitter parochial arguments regarding roles and missions have been tempered by the realities of modern warfare. The Army insists that in the final analysis, wars can only be won by the application of land power; by seizing and controlling the enemy's real estate. The Navy contends sea control and power projection are essential. The Air Force argues for air supremacy and the concentrated application of air power. These are familiar themes to all of us.

What we have learned over the years, however, about the art and science of warfare is that in order to be successful, a carefully coordinated blend of combined arms is required. Indeed, the lethal technology and scarce resources available to wage modern warfare have prompted a formalization of this concept. It's called 'Jointness.' It's here to stay.

Nevertheless, the three basic, driving philosophies of the services are assiduously promoted. Land, sea, and air power proponents parry and weave around each other like three boxers in a ring--each in quest of the lion's share of the federal tax dollar purse.

The synchronization of combined arms[1] toward a common goal is a precise exercise in command and control. Fine-tuning this precision is going to require a blending together of sacrosanct roles and missions where feasible. We believe one such possibility exists regarding close air support.

"Roles and missions are the most sensitive and jealously guarded prerogative of the services. Presently, the Air Force will provide primary CAS for the Army, with the Navy and the Marine Corps included when needed."[2] What has aggravated these jealously guarded prerogatives over the years is what President Eisenhower tried to warn us about when he left office--the military-industrial complex. Our research indicates the close air support debate has its origins in the larger "roles and missions" debate and the annual fight for scarce tax dollars. Our political system, crippled as it is by various industrial lobbying interests, has played a crucial role throughout the debate. As a result, the services' quest for weapon systems over the years to adequately perform their roles has had to bend to political realities. Our politics of course, are based on compromise. There is an incipient dilemma because even if a particular weapon system "satisfies our needs militarily, it may not be the political system of choice."[3] This dilemma will be amptly illustrated in the debates on Capital Hill regarding the defense budget following the Persian Gulf War. Service and industry proponents will be pushing hard for even more sophisticated, expensive weapon systems where in many cases all that is reasonably required is to maintain and improve upon the ones we currently possess.[4]

The amount of literature available on close air support--who should provide it, when, where and with what--is as plentiful as the debate has been long. When men took to the sky and discovered (circa 1917) that machine gun fire could be directed downward, and grenades tossed out of a cockpit could make an enemy soldier's life more miserable, air support of ground forces was born.

The earliest, most interesting commentary we discovered, however, appeared in a 1945 issue of the Marine Corps Gazette.[5] The author recounts the efforts of Marine Corps pilots supporting their ground counterparts in operations against Japanese-held islands. An intriguing aspect of this article is that by substituting a few names of places and updating the nomenclature of weapons, it could be republished today. Our point is that the Marine Corps has never lost sight of the fact that their air assets' primary mission is to support the men on the ground. Air superiority and deep interdiction are equally important but can take place simultaneously (with some help from their friends in naval aviation).

The most recent article appeared in the December, 1990, issue of the Army War College Parameters. The author, Colonel Thomas Garrett, is the Brigade Aviation Commander with the 101st Abn DIV (Air Assault) currently deployed in Operation Desert Storm. In the forty-five years between these authors' efforts, literally scores of articles have appeared in periodicals, textbooks, field manuals, newspapers and the like. Wading through all of the material to trace the origin of the debate and to discover threads of consensus has been a challenge.

> Prior to World War II, the Army and the Navy lived separate lives, waging their own battles against civilian isolationists, pacifists, and economizers. With respect to Congress, they had separate legislation, separate service committees, and separate appropriations subcommittees. Competition between the services was almost nonexistent.
>
> Even though the Air Force had risen to a semi-independent status during World War II as the Army Air Force . . . the thirst for total autonomy never really abated . . . the AAF formed a planning cell in 1943 . . . to produce plans for gaining autonomy for the postwar Air Force.
>
> Central to Air Force thinking, both then and now, were the premises espoused by Guilio Douhet:

- Air power can be the decisive instrument of war.
- The decisive use . . . requires air superiority.
- Achieving air superiority requires centralized control of air power.

Centralized control equated to being independent and autonomous: freedom to prosecute the air war as the air warriors saw fit.[6]

In 1948, the United States Air Force became a separate component. Air Force history is courageous and proud, but in the close air support arena it's been a story of playing "catch-up ball." In the late 1940s, in conferences regarding roles and missions of the services, the "Air Force . . . was assigned the airlift and close air support missions in support of the Army. The Navy managed to keep its aircraft, as did the Marines."[7] As a result of these conferences, the Army was prohibited from procuring or operating any "fixed wing aircraft weighing more than 5,000 pounds."[8] The traditionalist Army ground commanders were content to be free of the irritant Air Corps. They even court-martialed one rambunctious lieutenant colonel who believed strongly in air power (Billy Mitchell). An attitude was fostered: 'if it flies . . . it must belong to the Air Force." But wait. . . .

It was during this post war era that the partnership between American industry and the military was truly forged. As new capabilities and technologies emerged, competition for weapon systems among the services became keen.

> Which service would constitute the strategic force? Which would control nuclear weapons? Were rockets and missiles [developed by the Army] artillery or aircraft? Whose 'turf' was space? Each service had its own answers. With such fundamental issues holding center stage, one can understand the shrinking interest a support mission such as CAS might generate within a service like the Air Force, which literally [by virtue of extraordinary technology] was going for the moon.[9]

Our research indicates that CAS indeed became of secondary concern over the years just as it appears some would argue, strategic airlift capabilities have as well. Scarce resources have been devoted to strategic air weapons platforms and air superiority weapons. The Air Force set its priorities early and hasn't wavered since; neither have the increased costs of weapons.

> The national emphasis on strategic priorities left little DOD funding to support the CAS mission. Thus, at the start of the Korean conflict, there were serious deficiencies in the communications equipment, aircraft types and the ordnance needed. . . .[10]

The jetfighters of the Korean War were designed primarily to accomplish the air superiority mission and not to perform close air support. The F-84 and F-86s had minimum station-time. They burned inordinate amounts of fuel at low altitudes. Weapons systems were ineffective against ground targets. Communication systems were almost totally incompatible between air and ground forces. These aircraft were, however, highly successful in the air-to-air battles.[11] The Korean War did, nevertheless, force the creation of a methodology for providing close air support. Strike control units, forerunners of the present TACCs, were created and would later be refined during the Vietnam War.[12]

> After the Korean War, the Air Force again pushed CAS to the back burner. As the war heated up in Vietnam, the Air Force's ability to provide adequate close air support was so bad that it prompted a congressional investigation by the House Armed Services Committee. The Air Force had to borrow 25 L-19 light observation aircraft from the Army to serve as forward air controller aircraft. The Air Force had none of its own, despite the demonstrated need from Korea.[13]

The liaison apparatus between the Army ground units and Air Force fighters was further improved, but <u>during</u> the Vietnam War rather than in the thirteen years prior.

> An Army/Air Force chiefs of staff memorandum of agreement, 'Concept for Improved Joint Air-Ground Coordination,' signed in 1965, created the corps-level direct air support centers and outlined the dual Army/Air Force CAS request net. It defined the tactical air control system, streamlined CAS request procedures and increased the number of Air Force liaison officers used to coordinate and control the airpower. In their airborne control role, these Air Force pilots were called forward air controllers (FACs).[14]

With the FACs airborne in Army L-19s, what about the aircraft available to provide the close air support? There were none and apparently not much thought had been given to the mission requirements between wars, let alone in the seventeen years since acquiring the CAS mission.

> [The Air Force] had to borrow A-1 Skyraider attack aircraft from the Navy. And it had to convert a trainer aircraft, the T-37, to an attack plane, the A-37 Dragon Fly, to carry out its close air support mission.[15]

Playing 'catch-up ball' on the FAC-side of the equation, "two new types of FAC aircraft were procured or developed [during the war] specifically for the CAS mission, the O-22 and OV-10;"[16] however, as most Army ground commanders will attest as well as Army aviators trying to act as heliborne liaisons, the ground-to-air communications problem remained essentially unsolved. It was virtually impossible to talk to a CAS aircraft without going through an Air Force FAC. Radios were mismatched. Army pilots, in desperate attempts to support ground units in the absence of a FAC, would resort to the universal emergency, or "Guard" UHF frequency to contact CAS pilots. The problem was, if the atmospherics were right, you were liable to be answered by a Pan Am pilot flying between San Francisco and Honolulu telling you to "have a nice day"; not much help to the ground commander grappling with people all around him in the wrong colored uniforms.

In the early years of Vietnam, in addition to borrowed or converted aircraft, prop-driven T-28s, A-1s and even venerable B-26s were used for CAS. These aircraft were soon followed by jet-powered F-100s, F-4s and A-7s. With the appearance of the jets on the scene, the stage was set for an intriguing twist in the controversy. A distinguished Air Force officer has commented that all of the jets

> with the exception of the A-7 . . . were manual bombers, meaning their weapons were delivered without the aid of computer-directed weapons-delivering systems. . . manual weapons-delivery solutions, computed by the pilot's eyeball and the seat of his pants, were much more accurate at 250 knots than at 550 knots . . . the slower-moving prop fighters had the delivery accuracy edge. When this accuracy edge was combined with a slight advantage in target acquisition ability, resulting from the lower attitudes at which they operated, the slow-movers were preferred by the FACs and ground commanders when employed in close proximity to troops. As a result of these Vietnam CAS preferences, based on 20-to-30 year-old technology, the 'slow-mover myth' was born. This myth runs something like this: In order to be effective, all CAS must henceforth and forever more be delivered by slow-moving, and preferably propeller-driven, aircraft. This myth has been refined by critics of Air Force tactics to the point where speed is now detrimental to air-to-ground tactical operations. . . ." [emphasis ours][17]

We believe that instead of listening carefully to what their own FACs and the Army ground commanders were saying, the Air Force retrenched and created the pariah of the "antispeed camp." Rest assured, many a ground commander was elated to see F-4s screaming out of the sky to lend support. The point being made was not an indictment of speed, but rather a judgment-call that in some close proximity situations a slower-moving, more maneuverable aircraft is more effective. This is particularly true in the close combat of Jungle Warfare or over, through and around the smoke and dust-covered mechanized clash. Slower-moving does not necessarily mean prop-driven. Why not design a jet-powered aircraft that can fight at both ends of the

spectrum--fast or slow--depending on the situation? This was the essence of an idea; not the formation of an antispeed conspiracy.

The Army, having made strides in battlefield mobility with development of the airmobile concept, and frustrated by accusations of being "antispeed" with CAS, began to seriously develop attack helicopters. Development was rapid--from OH-13s with M60 machine guns strapped to the skids--to UH-1s with a grenade launcher hung on the nose, door guns, and WWII vintage aerial rockets--to the development of the AH-1G Cobra gunship.

The Cobra helicopter carries a gattling gun and grenade launcher under her nose, a 20 mm cannon on her wing, and rocket wing-stores in various configurations. Developed and fielded in a year's time (it takes 10+ years to procure a new aircraft today), the Cobra was a 'minimum technical risk' creation, i.e., it was conceived, designed and fielded using proven components and systems already 'on-the-shelf.' The pilot's rocket sight, e.g., came from the Korean-vintage F-86 Saber Jets parked in the Arizona Desert. In the closing months of the war, a new innovation appeared. TOW (Tube-launched Optically sighted-Wire guided) missiles were clamped to the sides of 90-knot UH-1s and with Cobras providing suppressive fires, Russian-NVA tanks were introduced to the air-delivered antitank missile.

> As the Vietnam War drew down, the Army began to adapt the helicopter to the antitank role and started work on the Cheyenne, an expensive, high-tech attack helicopter capable of carrying 8000 pounds of external ordnance, flying aerobatic maneuvers, and achieving high air speeds.
>
> The Air Force then got worried about its CAS role and reluctantly fielded the A-10, the only dedicate close air support aircraft ever bought by the Air Force. Cheyenne was canceled. The Air Force then tried to back out of the A-10 commitment, but Congress made them go ahead with it.[18]

A good argument can be made that the Army was being shrewd (parry and weave?) about threatening the Air Force's CAS role with the Cheyenne project. The Cheyenne was a monstrous helicopter. We believe only three were actually built. Two crashed and took their test pilots down with them. The third has been parked ever since in the Army Aviation Museum, Fort Rucker, Alabama. The project would have been canceled regardless because the aircraft design was fatally flawed. The Army was to have better luck modifying the AH-1 series to accept the TOW missile system (1973) while beginning research on what would become the AH-64 Apache (1985).

Colonel Garrett cites Carl Builder's new book regarding service perspectives, The Masks of War, to provide a summary of the CAS dilemma:

> Close air support has been the most consistently neglected mission of the Air Force. Flying down in the mud instead of up in the blue and taking directions from someone on the ground are encroachments upon the freedom of flight that is so cherished by airmen . . . Coordinating with other airmen in a complex strike, centrally controlled by airmen, is one thing. But losing the freedom to apply air power independently to decisive ends is to lose that which pilots have striven so hard to achieve for much of the history of the airplane. . . . Thus, close air support will always be an unwanted stepchild of the Air Force. The job will not be given back the Army lest it create a rival air arm; and it will not be embraced because it relinquishes the central control of air power. The Air Force has the dilemma of a rival air power or a sharing of its control, neither of which is acceptable. So the Army tries to make do with helicopters.[19]

The Army has more ships than the Navy.[20] We don't believe that anyone in the Navy seriously considers the Army a rival sea arm. No, we believe the real issue is the competition for scarce resources which blocks a rational review of missions and roles; prohibits a blending of roles toward the common goal of defeating an adversary. On one point, at least, everyone seems to agree: "the need for combat aircraft to

give support to troops in battle is self-evident,"[21] but that is about the limit of any consensus. From that point on, the discussions have evolved into "inter-service rivalries for power and resources at the cost of the main object, that of fielding men and weapon systems capable of winning battles."[22]

Although we conclude that the CAS mission has been 'consistently neglected' and that the A-10 is an ugly, unwanted stepchild of the Air Force, a consideration and analysis of contrary arguments is appropriate.

> The Korean War saw a newly formed Air Force retain responsibility for the CAS mission area . . . . both new and older World War II propeller-driven aircraft performed CAS in Korea. Overall effectiveness of the different types of aircraft was not rated during the conflict; therefore, different conclusions must be drawn carefully. However, it is worth noting that although the older propeller-driven P-51 Mustang had superior loiter time, the jet-powered F-84s and F-86s carried heavier bomb loads, suffered only half the attrition during CAS missions and generated more sorties than the propeller-driven Mustangs. The jets were also able to swing to air superiority and interdiction missions, where the Mustangs were unable to survive or perform effectively.[23]

Our research has noted that overall effectiveness was evaluated, but not necessarily by the Air Force. There is no discussion of the effectiveness of the heavier bomb loads, yet our research indicates these weapons were ineffective. It is an important fact to note that the jets did suffer a lower attrition rate and we conclude that the minimum station time and airspeed were the major contributing factors. Are we suggesting the aircraft were supposed to hang around and absorb ground fire? Of course not. But we believe that in evaluating effectiveness, accomplishment of the primary objective--that of placing steel on the target--is what really counts. The jets on a comparative basis simply did not accomplish the mission as conceptualized. Was this

airframe or tactically-induced? Probably some of both. But effectiveness was not, in the Air Force view, what really mattered. Their primary missions of air superiority and interdiction were what really counted. Thus, "the jets were also able to swing to air superiority and interdiction missions, where the Mustangs [slower, lower and more effective in performing CAS] were unable to survive or perform effectively."[24] As the Air Force author we are quoting states, "different conclusions must be drawn carefully."[25] One conclusion we have drawn carefully is that it was during the Korean War era that it became subtly obvious CAS was to be a secondary mission and the conceptual basis for a "multirole" jet aircraft was established. This concept has persisted to the present day, even though later events were to underscore the necessity for a CAS-specific aircraft. We conclude that had the Air Force really intended to procure a truly multirole aircraft, it would have done so between the Korean and Vietnam Wars. The "mud fighters" versus the "multirolers" accurately defines the controversy today[26]--the A-10, according to the Air Force, is obsolete. We think not.

Regarding the Vietnam era, we have described the ill-prepared posture of the Air Force to perform the CAS mission and the creation of the "slow mover myth." Yet, according to an Air Force commentator, "by any standard, the Vietnam CAS effort was a success."[27] In response to evaluations by both Air Force FAC pilots and Army commanders that a tough aircraft capable of slower speed and maneuverability was desired for optimum results came the accusation of an "antispeed camp, composed of some bureaucrats and a small number of civilian consultants . . . [who] it appears . . . will add anything to the paper airplane except

thrust[!]."[28] And an additional volley: "it may be worth noting that all Marine Corps CAS is performed by fast-moving jet aircraft."[29] As noted, attack helicopters appeared to be the only recourse available to the Army. As to calling upon the Marine Corps experience to buttress the speed-first argument, a review of Marine air doctrine supports our earlier musing about the 1945 article that could be re-published today. "Rather than a last-priority mission, CAS is the main mission, with air-superiority de-emphasized but still a necessary prerequisite...."[30] Marine air supports the Marine on the ground; first, last, and always. Army aviation does the same for the ground commander.

Content to let CAS fall by the wayside once again after Vietnam, but intimidated by the Army's innovation with attack helicopters, the Air Force finally proposed a CAS-specific aircraft. Congress forced the issue.

> Within the limited context of South Vietnam, where the threat was relatively low and the quality of air resources high, there was a high demand for CAS, leading to the development of an aircraft specifically designed to perform the 'South Vietnam CAS mission.' The result was the Air Force AX-program and its product, the A-10 'Warthog,' a point design for the Vietnam CAS mission. [After the war] the Army focus returned to Central Europe, and the Vietnam CAS requirement was replaced by the need for a tank buster . . . The A-10 never was the optimum solution for CAS in a high-threat environment. It was a low-threat CAS aircraft, modified to meet the Army requirements of the time.[31]

Curiously, there is no mention of the fact that Congress had to force the development of the A-10. We contend that modifications to the aircraft since its fielding, and those that can and should be made to the existing airframe (refer to Chapter 3), make the A-10 as close to the 'optimum solution' as we are going to achieve. Threat that cannot be countered by technology has to be countered by refinements in tactical employment. In the austere times ahead, a proven, rugged

example to be followed is the modification and upgrading of the AH-1 attack helicopter. Nearly twenty-three years after its initial fielding, the Cobra is still an effective, formidable battlefield system employed by both the Army and Marine Corps. As formidable as the attack helicopters are they cannot, however, carry neither the variety or the weight of a fixed-wing airframe.

Congress has once again entered the debate.

> The Air Force will have to give the A-10 . . . to the Army . . . requiring the Army to operate large fixed-wing aircraft for the first time since the Air Force became an independent service . . . under the defense authorization act signed into law Nov. 5 [1990], the Army . . . will get one A-10 as each OV-1 Mohawk observation aircraft . . . is retired. The Air Force has resisted attempts to turn over the A-10 for fear the plane's mission, providing close air support for the Army . . . also might be taken away . . . [further], the Air Force has argued that giving large, fixed wing aircraft to the Army would not be cost-effective because the move would require a dramatic shift in logistics and training resources, an argument the Army accepts . . . the new defense law, however, leaves no choice in the matter.[32]

Considering the history of the whole debate, it appears to us that Congressional action has again been a catalyst for change rather than agreement between services. In our opinion, both branches of the service should seize the opportunity to resolve the issue once and for all. The Air Force has clearly demonstrated in a historical context that it does not want the mission. It does not want the mission for the sake of the mission itself, but rather for the attendant resources it commands. We believe the Air Force should cooperate fully and support not only transfer of the airframe, but the resources required (both present and future).

Congress has got to allocate the appropriate resources to support its legislation and to modify and upgrade the A-10. We believe that in the final analysis, such a modification program that capitalizes on

existing technology will be more cost-efficient than fielding an entirely new system. Chapter Three examines the possibilities.

The Army, on the other hand, should be proactive about accepting the aircraft and the mission of providing its own primary CAS. In conjunction with current studies regarding Air Land Battle Future, a new division of responsibilities on the battlefield, keyed to the corps commander's area of influence, should be considered. The Air Force can supplement the Army CAS effort just as naval aviation does the Marine Corps effort, after concentrating on gaining air superiority and conducting deep BAI. Missions and roles are thus blended and accomplished by the appropriate aircraft simultaneously without detriment to either service.

An inquiry should be immediately initiated, perhaps as part of on-going force modernization studies, as to the training, logistics and employment issues involved. We propose that a feasibility study be conducted that evaluates the formation of Tactical Air Regiments to be assigned to each Army Corps. With approximately 600 A-10s in-service, regiments could be organized with enough assets for the A-10 squadrons to perform a variety of mutually supporting missions, i.e., so many configured for reconnaissance, attack, suppression of enemy air defense, etc. The tactical combinations are limited only by imagination. In addition, the procedures that have been so meticulously developed over the last decade for the Joint Air Attack Team (JAAT)[33] should be fully integrated.

And lastly, for streamlining command and control, a quote from General Eisenhower is appropriate. Discussing his decision to exercise

direct command of the air forces during the invasion of Europe he stated, "when a battle needs the last ounce of available force, the commander must not be in the position of depending upon request and negotiation to get it."[34]

The Marine Corps Air Combat Element (AE) should be carefully studied as a model.

> The MAGTF's [Marine Air Ground Task Force] versatility, as well as its responsiveness, are to a great degree the result of the close integration between its aviation and ground elements. Aviation command and control systems are tied in to ground units. Because of common training, doctrine, and background, time is not lost developing operating procedures during employment. This integration produces a synergism of combat power in which air support is immediately responsive to the MAGTF Commander.[35]

The Army Corps commander, with complete control of his CAS assets (rotary and fixed-wing) can plan and employ them in a timely, decisive manner influencing the battle where and when he deems necessary. Army-trained and led CAS pilots and support personnel, fully knowledgeable of the needs of the ground commander will in the long run we believe, be a formidable addition to Army Aviation and a combat-multiplier for the corps.

CHAPTER III

UPGRADING THE A-10 THUNDERBOLT II

The A-10 Thunderbolt II or "Warthog" was designed by Fairchild Industries as a dedicated Close Air Support (CAS) fixed-wing aircraft to be used in an anti-armor role. Built around the GAU-8A Avenger 30mm cannon, it has the ability to destroy front-line main battle tanks (MBT's) with a two-second burst. Additional armaments such as the AGM-65 Maverick missile and the GBU-10 laser guided bomb (LGB) add lethality to this airborne weapon.

The A-10 was designed to support the ground commander providing substantial firepower to oppose advancing enemy armor and personnel. Survivability was paramount in the design due to the lethal nature of the modern battlefield. The threat includes small arms, heavy anti-aircraft fire (AAA), and surface-to-air missiles (SAMs). Data on aircraft survivability was readily available due to the Vietnam War experience. Fairchild Industries had a quantity of data from the F-105 Thunderchief, another Fairchild product with a lengthy war record, which provided useful knowledge to lend in the design.[1]

Survivability

Due to its low altitude combat role the A-10 was designed to absorb a considerable amount of damage and live to fly again. Described as a titanium bathtub with wings and a gun, the A-10, compared to other airplanes is the most combat damage survivable aircraft in existence. Almost 2,887 pounds or 14 percent of the aircraft dry weight (aircraft weight without fuel) is dedicated to armored protection.[2]

a. Airframe.

The A-10 was constructed with a single-piece straight wing with 10 hard-points for underwing stores. Common speeds for the CAS role are lower and require a tighter turn radius for a quick return-to-target. The advantage of a straight wing vice the classic jet swept wing neatly fits the bill. A large wing with thick camber provides enormous lift which in turn produces an exceptionally tight-radius turning aircraft. The large wing also allows for larger, heavier ordnance loads than standard jet aircraft. At the A-10's combat airspeeds (300-330 kts) the effects of drag are minimal so internal ordnance loads, wind fairings, or even elaborate streamlining of external stores are not necessary.[3]

The empennage is a twin-tail design. Each vertical stabilizer is situated to provide exceptional control of pitch and yaw even with one side of the twin-tail missing; so far in the Gulf War, one A-10 has even returned safely with a large portion of a main wing missing. The twin-tail also yields added protection to the engines from small arms fire at different angles and from heat seeking missiles by shielding the engines' heat signature in most ground aspect quadrants.[4]

The A-10 is equipped with self-sealing fuel tanks filled with "reticulated rubber" foam. This foam protects the aircraft from catastrophic fire due to the spillage of fuel from perforated tanks into the exposed airframe cavities. Fuel cells conventionally carried in the wings are located on top of the single piece wing within the fuselage itself which inherently provides the fuel cells additional protection from small arms fire. Fuel lines and valves are protected by having them located within the fuel tanks themselves. Fuel lines between the tanks

and engines are short to allow minimum unprotected exposure. If all efforts to contain a fuel leak fail, the main tank is divided into two small self-sealing sump tanks which will provide a 200 nm fuel reserve for safe return to base or emergency landing area.[5]

The Flight Control System is actuated by control cables vice rods to the hydraulic flight control actuators. Cables are less likely than rods to jam with structural damage. The entire flight control and hydraulic system is duplicated so that no single hit will cause the complete loss of control (a significant lesson learned with the F-105 in Vietnam). However, even with a loss of both hydraulic systems (loss of hydraulic boost to move the flight control surfaces) back-up electronic servo tabs are installed on the ailerons themselves to allow the pilot to maintain roll axis control.[6] The landing gear system retracts forward into underwing pods vice sideways which would occupy space for ordnance loads. The landing gear operates on hydraulic power but is designed to be extended in an emergency by free-falling backward, locking in place by wind and airstream force.[7]

The pilot is surrounded by a titanium 'tub' which has been tested to withstand direct hits from 37mm cannon fire. The pilots windscreen is hardened to withstand 7.62mm small arms fire. Additional protection is gained by the placement of the GAU-8A Avenger cannon in the fuselage. The pilot sits atop and slightly forward of the gun and magazine which is titanium armored to withstand 23mm fire.[8]

Power is supplied by two General Electric TF-34-100 high-bypass turbofan engines (each with titanium protection) producing 9,065 pounds of thrust each. They are mounted aft either side of the fuselage airliner-style separated to minimize collateral damage. The situation of

the engines aft and relatively high on the fuselage enables protection from FOD (Foreign Object Damage) when operating from unimproved or debris ridden surfaces.[9] Additionally, the engine placement provides accessibility for maintenance personnel to vital avionics systems even when the engines are turning. An Auxiliary Power Unit (APU) is installed in a titanium armored box located in the aft section of the fuselage between the engines to provide electrical power and air pressure for engine starting. The APU eliminates the need of extra ground support equipment, i.e., electrical power carts and engine "huffer" carts, and provides the ability for the aircraft to "ground loiter" close to the front conserving fuel and providing quick reaction time.

The A-10 with a full load of fuel and weapons is capable of taking off in 3,600 feet and landing in 1,140 feet.[10]

Armaments

a. GAU-8A Avenger.

The main battery of the A-10 is its 30mm cannon. The GAU-8A will fire a maximum of 4,200 rounds per minute (RPM) from its seven barrel Gatling gun. Its magazine holds 1,350 linkless rounds. The round itself is an 11.4 inch 1.5 pound aluminum bodied round encasing a 15mm "penetrator" of super hard depleted uranium.[11] The high cost and weight of elaborate shaped-charge warheads is precluded by its ability to fire the hard penetrators with extremely high muzzle velocities. The accuracy of the gun is due in large part to its phenomenal muzzle velocity. Kill ranges extend out to 4,000 feet. The effects of wind, gravity, and weight of the shell are overcome by the high muzzle velocity. The heavy weight of the bullet, besides adding lethality, induces better ballistic

properties losing only 10 feet in a 4,000 foot shot. This equates to mean ". . . 80 percent of rounds fired at 4,000 feet will hit within a 20 foot radius."[12]

The gun is mounted in the fuselage slightly left of the centerline of the aircraft. The left-side mounting is compensated for by having the firing barrel of the gun at the nine o'clock position centered on the longitudinal axis. The positioning of the guns firing line on the aircraft's centerline eliminates the need of elaborate aiming systems other than fixed-point sights. The bullet travels at Mach 3 from 4,000 feet and impacts in 1.2 seconds. The flat trajectory and speed of the rounds means that ground targets, even moving main battle tanks, are fixed in a straight line in relation to the A-10 on its firing course.[13] The ease of aiming the gun means more rounds on target for optimum kill ratios. Coupled with the relatively cheap costs of bullets vice expensive guided missiles or LGB's make this weapon all the more practical in battlefield scenarios. Loading the GAU-8A requires the only piece of unique support machinery needed for the A-10. The Automatic Loading System (ALS) is a trailer mounted version of the GAU-8A magazine and works on the same principle as the gun itself. A full ammunition load can be achieved in less than 13 minutes.[14]

b. AGM-65 Maverick

The AGM-65 Maverick missile is an exceptionally accurate air-to-surface weapon which increases the A-10's stand-off range against hostile targets. It is designed for use against tanks or other hardened, mobile targets. However, the cost per kill rises dramatically with this weapon. In 1981 dollar figures, Maverick use versus a two-second GAU-8A burst is

approximately $60,000 versus $1,800 for a similar probability of kill (PK).[15]

The AGM-65B Maverick is a TV guided missile with a 2.5 degree magnifiable field of view. Image projection is provided in the cockpit by a video monitor with adjacent controls for slewing the seeker to the selected target. The missile has an 85 percent success rate but is range limited by naturally occurring obscurrations such as precipitation, haze, dust, and battlefield smoke. Hence, a 2-3 nm range is the nominal target lock-on distance.

The AGM-65D Maverick with an Infrared (IR) seeker is a significant addition due to its increased range lock-on ability. The IR seeker is not as affected by obscurrations as is the TV guided Maverick. Normal IR lock-on range is approximately 6-8 nm, or approximately the maximum range of the SA-8 Gecko Air Defense System. The image provided to the pilot is of better quality than the TV guided AGM-65B and provides the same image in night as it does in daylight. Additionally, the AGM-65D requires no special instrument modifications to the aircraft already fitted with avionics for the AGM-65B (TV guided) system.[16] A typical anti-armor load for the A-10 would consist of six Mavericks and a full load of 30mm ammunition.

c. Additional Armaments

The A-10 can carry a wide variety of weapons including the Mk-80 series bomb, Mk-20 series Cluster Bomb Units (CBU), GBU series LGB's, rocket and flare pods.

d. Targeting

Targeting for the A-10 to employ its weapons is usually via simple visual sighting or radioed map coordinates. However, additional targeting data is available to the A-10 equipped with the Martin Marietta AAS-35 Pave Penny laser target-identification set. Pave Penny is the link between the A-10 and a ground or airborne laser target-designator equipped Forward Air Controller (FAC) such as the Army OH-58D scout helicopter. When the selected target is laser-illuminated by the FAC, Pave Penny "picks up the reflection of the coded beam and places a HUD [Heads Up Display] symbol over the target."[17] The A-10 pilot then chooses which weapon to use and attacks the target in the standard manner. Pave Penny is mounted on the starboard side of the fuselage just forward and below the cockpit. It does not occupy a weapon station. Pave Penny is day and nigh capable and is resilient to obscurrations of clouds, smoke, dust, and rain in all but the most concentrated levels.

The A-10 does not possess precision accuracy avionics for measuring ground velocities, distance-to-targets, loft angles, or computed release points.

Upgrade the A-10

The A-10 is a mission and airframe specific close air support (CAS) aircraft designed to fight and survive amongst the hills, trees, and even dunes of the battlefield. The aircraft is NOT obsolete and is very capable of contributing on today's battlefields. The combination of the highly accurate GAU-8A and AGM-65 weapon systems poses a serious threat to enemy armor and provides powerful fire support for the ground commander. This capability must not be cast aside. The controversy

surrounding the A-10 is whether the F-16 (as the A-16 variant) could fill the shoes of the A-10 in the dedicated CAS role. We do not agree that the F/A-16 could fulfill this primary CAS role but rather should supplement close air support after the air superiority and air interdiction missions are accomplished. Upgrading the F-16 to perform as the A-10 does would require: armoring/hardening of the F-16 airframe and cockpit to absorb the battlefield punishment as described earlier in this chapter (thereby adding considerable extra weight); the AAS-35 Pave Penny system, and a 30 mm gun (which would be only a 400 round, off-centerline, pod-mounted gun that requires frequent bore-sight calibrations). However, none of this is necessary because the A-10 already possesses these qualities and is performing exceptionally well. We believe after-action reports from the Gulf War will underscore this fact. The A-10, however, does need upgrading to increase its night attack capabilities. Off-the-shelf technology is available and can be configured to fit the A-10. These devices are currently in production and are being used/installed in production aircraft such as the AV-8B Harrier and F-16.

a. Navigation Forward-Looking Infrared Sensor (NAVFLIR)

Produced by British GEC Avionics and being installed on the Marine Corps AV-8B Harrier II, the NAVFLIR system performs the dual functions of night navigation and targeting. Mounted on the nose just forward of the cockpit windscreen (to retain the use of all wing weapon stations) NAVFLIR provides a field of view of 13.3 degrees to 20 degrees in a fixed, forward orientation. The FLIR image is projected onto the pilots HUD in a 1:1 ratio overlay. White or black image display is available. NAVFLIR senses hot objects and cues the pilot with a symbol projected on

the HUD over the target. The size and temperature thresholds of the target cueing parameters can be adjusted by the pilot to meet certain target characteristics.[18]

b. Night Vision Goggle Sensor (NVGS) "Cats Eyes"

Another GEC Avionics product, the NVGS has a 30 degree by 30 degree field of view and amplifies the ambient light by a factor of 30,000; near daylight conditions. Mounted on the pilots helmet, it allows the pilot to keep his target in view while still permitting the scanning of instruments with minimum head movement. Cockpit instrumentation lighting is adjusted to compensate for "blooming" effects and blinding the pilot. The lighting adjustments also prevent compromise of the aircraft position to outside observers.[19]

c. Martin Marietta Pathfinder

The navigation/attack FLIR pod mounted under the fuselage is basically a derivation of the "low-altitude navigation/targeting infrared for night (LANTIRN) system . . . a laser guidance system for laser-guided bombs and a target correlation feature for Maverick missile deliveries. . ."[20] This system is a straight forward looking system which can be slewed "within a 63 degree by 65 degree field of regard, and is limited to a field of view of 21 degrees by 28 degrees in a wide field of view."[21]

These devices are proposed as possibilities to enhance the A-10's night fighting capabilities. They are available in kit forms for ease of installation. Even with limited funds available these improvements can be retrofitted onto existing A-10 airframes relatively cheaply.

CONCLUSION

The A-10 is the weapon of choice to support front-line combat troops. Removing the A-10 from this duty would be a step backward. The A-10 fits nicely into the front-line aviation design and operates superbly with Army aviation assets as seen in the JAATS field training exercises.[22] In an Armed Forces Journal International article about the race for the close air support role aircraft, it suggested:

> Retaining the A-10 force, and upgrading three of the existing six wings of A-10's with FLIR and automatic target handoff systems to improve their target acquisition effectiveness. Noting that the average age of the A-10 force is under 10 years, Frederickson [Deputy Under Secretary for Defense for Tactical Warfare Programs Donald N. Frederickson] said 'it is difficult to see how we can afford to throw away these aircraft with many years of life remaining and good growth potential.' The aircraft would be ideal for air-to-ground missions in Third World contingencies, he concludes.[23]

We conclude that the A-10 can effectively accomplish the CAS mission in all contingencies. The Department of Defense and the Congress would be wisely capitalizing on a tough, proven warrior with many years of service remaining by retaining and upgrading the existing airframe. Efficiently transferring the A-10 and the primary CAS mission to the Army will streamline command and control and ensure confident use of the A-10 by the ground commander as a combat-multiplier.

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[24]Ibid., p. 53.

[25]Ibid., p. 52.

[26]Blackwell, NATO Sixteen Nations, p. 56.

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