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THE AIRBORNE FORWARD AIR CONTROLLER: PAST ACCOMPLISHMENTS AND F--ETC(U)

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⑥ THE AIRBORNE FORWARD AIR CONTROLLER:  
PAST ACCOMPLISHMENTS AND FUTURE OPPORTUNITIES

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ABSTRACT

Presently, and into the foreseeable future, close air support aircraft will require assistance in finding, identifying, and acquiring battlefield targets. Classically, this function has been shared by ground-based forward observers (FOs) and forward air controllers (FACs) and by airborne FACs. The latter have proved their worth in three wars (World War II, Korea, and Vietnam) under various and diverse conditions.

But even in some phases of the war in Vietnam, the strength of the surface-to-air defenses was becoming a serious consideration and, for some missions, this led to experimentation with fighter-bomber aircraft in the "fast FAC" or strike control and reconnaissance (SCAR) role. These attempts to alleviate the survival problem did so, however, by means that are inherently unsuitable for surveillance and fire control in the unorganized and cluttered environment of the battlefield. With the continuing development of surface-to-air defense technology, as evidenced by the Israeli experience in the 1973 war, this situation has been exacerbated.

This paper will briefly review the long history of the vital contributions made to military power by aerial surveillance and fire support forces. Moreover, given the current appreciation of the threat to NATO, the need for aerial surveillance and fire support on the battlefield may well have increased as a result of the steady rise in the strength and quality of Warsaw Pact forces vis-a-vis NATO. The difficulty is that the price of providing those needed functions has risen at the same time.

The thesis advanced here is that there may be a way to preserve the critical functions and contributions made by men in the airborne surveillance and fire control roles and, at the same time, to reduce their exposure to hostile action by removing their physical presence

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to safer locations. It is proposed to accomplish these goals by utilizing the rapidly developing sensor and electronic technologies to provide a remotely-manned, real-time surveillance, acquisition, identification, designation and fire direction capability.

The remainder of the paper, then, describes the functional components of the system, suggests how these could be integrated into a joint air-ground team, and speculates on some of the benefits that might flow from its implementation.

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THE DEVELOPMENT OF AIR SUPPORT OF GROUND OPERATIONS

Airborne vehicles, in the form of balloons, were being employed by the French military for observation within a few years of their invention by the Montgolfier brothers in 1783. This use expanded with the advent of telegraphy and telephony, with balloons continuing to serve well into the fixed-wing aircraft era. And scarcely more than a decade after the first flight of a heavier-than-air machine, aircraft were being used (tentatively, to be sure) in combat in World War I to perform most of the functions now considered commonplace in air forces.

In each succeeding conflict of this century, the contribution of tactical air support has been reaffirmed. Even as the conditions on and over the battlefield have changed, so have the tactics and procedures of air-ground cooperation adapted, adding new techniques to keep pace. Consequently, aerial surveillance, target development, and fire support in the battle area are now well-recognized as vital military capabilities.

To be sure, arguments have surrounded the close air support (CAS) function during a great deal of its history. But these controversies did not stem from doubts of its value, rather they dealt largely with the question of who should control, apportion, allocate, and target the CAS forces.

The following broad overview of these tactical and doctrinal developments will serve as an introduction to a discussion of the continuing need for and the potential means of carrying out aerial surveillance and control of close air support operations over the modern battlefield.

The Lighter-Than-Air Years

The military potential of balloons was recognized as early as 1794 when the French employed them in the field against the Austrians.

However, after assuming power, Napoleon made no further use of balloons, allowing the Aerostatic Corps to languish. And in the United States, a similar lack of interest was displayed in proposals to use balloons in the Seminole Indian War of 1840 and the Mexican War of 1846.<sup>1</sup>

However, during the Civil War, Professor Thaddeus S. C. Lowe was more persuasive. After several unsatisfactory efforts by others, he gave convincing demonstrations of aerial surveillance, adding the innovation of rapid communication of the results to the ground by telegraph. Then, Lowe made the first recorded aerial adjustment of artillery fire on September 24, 1861, telegraphing his corrections to the gun battery three miles away.<sup>2</sup>

As a result of these successes, a Union Balloon Corps was organized with a total of seven balloons. Despite sporadic instances of operational utility in the field, the lack of formal military organization and inadequate administrative and logistic support limited the Corps' contributions. Also, few Union generals appreciated the potential value of the balloon as a practical means of aerial surveillance. In the event, apathy and disorganization led to the disbandment of the Balloon Corps in May 1863, almost two years before the end of the war. Nevertheless, progress had been made in developing an aerial surveillance capability as Lowe had tried and demonstrated the utility of several innovations, including the aerial use of the telegraph, artillery adjustment, aerial photography, and a system of signal lights to permit night operations without alerting the enemy.<sup>3</sup>

#### Early Airplane Experiments

In their earliest applications, prior to World War I, military aircraft were unarmed--providing scouting and reconnaissance functions for the ground forces. This was so even though successful bombing had been demonstrated in October 1911 in the United States

when Lieutenant Riley B. Scott of the Coast Artillery had dropped eighteen-pound bombs within ten feet of a four-by-five foot target at College Park, Maryland. Ignoring Lt. Scott's successful demonstration, the War Department decided that, "The continuation of such schemes can serve no practical purpose whatsoever," as one anonymous Army spokesman asserted.<sup>4</sup>

Hence, from 1912, the focus remained on the use of aircraft as mobile observation platforms. This emphasis resulted, very early, in a recognition of the need for a practical system of air-ground communications and led to experiments involving wireless telegraphy. Both the Navy and the Army pursued independent efforts, with the first successful transmission being accomplished by the Navy in July 1912. Successful Army tests followed in November 1912 at Ft. Riley, Kansas, prompting the Field Artillery Board to agree that artillery fire could be adjusted from the air and that radio was the preferred means of communication. With this decision, artillery spotting became a recognized function of the Army airman.<sup>5</sup>

#### World War I

Although the airplane went to war in 1914 solely as a scout, as the war in Europe progressed, so, too, did the capabilities of aircraft as an instrument of combat. Before World War I ended, aircraft were bombing and strafing in and behind the battlefield and artillery adjustment was being routinely accomplished from the air, by telephone from balloons and by wireless from aircraft. The massive offensive air operations in the fall of 1918 under Brigadier General William E. "Billy" Mitchell demonstrated the value of coordinated air and ground assaults. Almost one-third of his 1500-aircraft force was employed in support of the ground forces in their attack on the St. Mihiel salient in September 1918, while the remainder struck at targets behind the German lines.<sup>6</sup>

But even at this early date, the speed and maneuverability of the aircraft in use were such that attacking pilots themselves were in some doubt as to their ability to adequately acquire and identify their targets. Also, when General Mitchell became operational chief of the U.S. Air Service on 1 October 1918, he found that it was necessary to sell the value of airpower to his own soldiers and, particularly, to their officers. Nevertheless, the use of airpower in support of the great battles of St. Mihiel and the Meuse-Argonne that culminated in the Armistice, clearly established the value of close air support operations.<sup>7</sup>

#### Between the Wars

In the years following World War I, integration of air with ground combat capability slowly developed. In the United States, Training Regulation 440-15, 26 January 1926, established doctrine for the employment of air forces. Aviation was to further the mission of the tactical commander to whom it was assigned and, moreover, the ground commander was to assign all missions to air units, including that of close air support.<sup>8</sup>

Notwithstanding this dictum, controversy over the nature and proper doctrine for the employment of airpower continued and overshadowed questions concerning the tactical control of the aircraft used in support of ground forces. However, in 1940, the War Department directed a series of tests that resulted in Training Regulation 52, 29 August 1941, which set up air-ground cooperation parties (AGCP) whose task it was to counsel Army commanders of large ground units on tactical air employment. The role of the AGCP was further defined in War Department Field Manual 31-35, 9 April 1942. But, as U.S. forces entered combat in World War II, all AGCPs were still located only at division and corps headquarters and no change had been made in the position that airpower should be subservient to the needs of the ground war.<sup>9</sup>

\* \* \*

Following Hitler's rise to power, the renascent Luftwaffe had discovered dive bombing through the interest and energies of Ernst Udet, the World War I fighter ace, who had been impressed with the capabilities of the Curtiss Hawk on a visit to the United States in 1933. Despite delays occasioned by opposition from some within the Luftwaffe, when Udet became head of the Technical Office in 1936, the uncertainty surrounding the future of the dive bomber was over and the Junkers Ju-87 *Stuka* became the chosen instrument.<sup>10</sup>

As the first production aircraft began reaching the squadrons in the spring of 1937, the benefits to be gained from testing the new machines and tactics in combat were recognized. Consequently, later that year, three JU-87As were sent to Spain for experimental service with the Condor Legion. The Stukas proved so successful that large numbers of the improved Ju-87B were sent to Spain in 1938. It was from then until the disbandment of the Legion that a Luftwaffe system was developed for enhancing the air support of ground units by establishing the means and procedures to permit direct voice radio contact between pilots and the supported units on the ground.<sup>11</sup>

A further development in technique took place during the German attack on Poland in September 1939. As the idea of air support was relatively new, the Wehrmacht often failed to even consider calling for it. Also, the rapid advance on the ground made it difficult for the aircrews to locate the front and distinguish friend from enemy. Each of these problems was addressed, to an extent, by detailing Luftwaffe liaison officers to leading elements of the Wehrmacht.<sup>12</sup>

Thus, by early in World War II, the doctrine of air-ground cooperation or support had been recognized. But, at this stage in the development of joint air-ground operations, apparently the need for an airborne spotter or controller had still not yet arisen.

World War II

In the early campaigns in Poland and France, Allied air forces were permitted no opportunity to test their own capabilities to provide offensive air support. It was not until the seesaw operations in the Western Desert that such was possible. It was here that the Royal Air Force developed their technique of air-ground cooperation. The army and air commanders, both functioning under an overall force commander, maintained a joint air-ground headquarters featuring the concept of co-equal strike forces. This encouraged the Army and Air Force to focus on a common goal and to become aware of each other's problems. The air commander's co-equal status with the army commander permitted him to avoid having his forces dispersed and tied down in "penny packets" to ground units. This ability to choose appropriate targets and to concentrate forces aided materially in gaining the air superiority necessary to allow the extensive use of fighter-bombers in direct support. Although efficacious employment doctrine had been developed, in the fluid desert battles, communications were a limiting factor and the bothersome problem of identification of friendly troops remained.<sup>13</sup>

When United States forces landed in North Africa in August 1942, their doctrine for the employment of airpower was that embodied in FM 31-35. Its subordination of the air force to ground force needs was in direct conflict with the tactical doctrine developed by the RAF in response to the demands of combat in the Western Desert. The difficulties inherent in the doctrine of FM 31-35 became increasingly apparent in the face of resolute German counterattacks in central Tunisia in January 1943. Control of air by specific ground units severely inhibited the ability to redirect air effort to combat the enemy initiatives.<sup>14</sup>

As a result of the critical state of air support operations, part of the Casablanca-approved command reorganization was implemented. Air Marshal Coningham, one of the architects of the successful RAF tactical air-ground doctrine, became commander of all tactical

air forces supporting the ground forces converging on the Axis forces in Tunisia. Coningham's first step was to order his air commanders to abandon defensive umbrellas and to adopt an offensive role as the best means of protecting ground forces. Shortly thereafter, he described what he considered to be the proper doctrine as follows:

The Soldier commands the land forces, the Airman commands the air forces; both commands work together and operate their respective forces in accordance with a combined Army-Air plan, the whole operation being directed by the Army Commander.<sup>15</sup>

With a restructured and consolidated organization and a common doctrine, operations went forward to regain the initiative and to move into position for the final assault to expel Axis forces from North Africa, but not without gambling on the part of some ground force commanders.<sup>16</sup>

The attack on the Mareth line in March 1943 provided another opportunity for airpower to demonstrate its capability in support of offensive ground operations--one that spawned a further tactical and procedural innovation. The German position was formidable, with extensive minefield and strong anti-tank forces on dominating high ground. To avoid the necessity for a lengthy and difficult-to-supply flanking operation, Air Vice Marshal Harry Broadhurst, commander of the Western Desert Air Force, proposed a massive daylight, low-altitude air assault on a narrow front, a reasonable tactic since the enemy was not dug in and was weak in flak. The operation featured an air controller, located in a forward tank, in direct communication with aircraft overhead. In addition, a creeping artillery barrage assisted in identifying the bomb line. The operation was a complete success, leading directly to breaking the Mareth line.<sup>17</sup>

By the end of the North African campaign, air-ground doctrine had been tested and proven in battle. The principles worked out by the RAF had been accepted by the Army Air Forces within the Allied organization and command structure in North Africa. Moreover, the

new doctrine became official with the issuance, on 21 July 1943, of FM 100-20 under which air and land forces were to be "co-equal and independent," with neither being "an auxiliary of the other."<sup>18</sup>

At this stage in the development of the tactics and techniques of air-ground cooperation, the value of air liaison officers located with ground unit commanders had been recognized and implemented, as had the additional requirement for a forward observer in communication with the supporting aircraft to assist in identifying targets. Despite the long-standing appreciation of aerial surveillance, the additional tactical benefits to be gained from placing the forward observer in the air had not yet been perceived. That perception was to come soon in Sicily and Italy.

\* \* \*

In the air planning for the invasion of Sicily, full advantage was taken of the lessons learned in the North African campaigns. The air forces were kept under single command to ensure their use against the appropriate enemy targets, when and where needed. As a result, the pattern of operations followed the guidelines laid down by Air Marshal Coningham for the Northwest African Tactical Air Force at the beginning of the final push in Tunisia--gain and maintain air supremacy to protect friendly ground troops and to permit air attacks on the enemy rear and in the actual battle area. In the actual event, these missions were successfully carried out, producing several improvements in air-ground cooperation. Among these were U.S. II Corps experiments with jeep-mounted control parties to guide fighter-bombers to their targets via direct VHF radio links, the use of light aircraft to direct artillery fire, and the establishment and employment of communications channels among air and ground headquarters and forward army elements. By the end of the Sicilian campaign, the tactical air control system was beginning to assume recognizable form.<sup>19</sup>

Operations in mainland Italy continued to refine the procedures for air-ground cooperation as new problems introduced by the ever-changing tactical situation were faced and solved. For example, because of the delays involved in communicating army ground requests back to the air headquarters in Sicily, at the Salerno beachhead, air-ground cooperation proved difficult until airbases were secured ashore. One experiment to alleviate this problem (largely confined to the British 10 Corps) involved carrying bombs on fighters assigned to air patrol over the beachhead. The pilots were briefed on their ground targets in flight, bombed, then carried out defensive patrols. Also, in response to a serious German counterattack on the beachhead, reconnaissance pilots in P-51s were used to direct naval gunfire for the first time in the European theater and heavy bombers were employed against enemy troops in the salient. The latter use of airpower clearly pointed up the problem in air-ground identification. Following the establishment of air bases and the movement of air and ground headquarters ashore, close liaison was again possible. The air and ground commanders met daily to choose targets, with the final decision residing with the air commander, and jeep-mounted forward controllers became routine.<sup>20</sup>

Subsequent operations in Italy, at Anzio and in the drive up the peninsula, added another refinement--the use of P-51s and light aircraft (L-4s) in the spotter role. In addition to the immense step forward represented by the jeep-mounted Rover Joes and Davids, it had now been recognized that there were unique benefits to be gained in operating from a vantage point in the air and from a vehicle with the mobility and flexibility of an aircraft.<sup>21</sup>

\* \* \*

Drawing on the experience gained at Salerno and Anzio, in the invasions of Normandy and Southern France, air support for the beachhead was managed from command ships accompanying the invasion forces. This helped overcome the long delays from request for support by

ground forces until its arrival. As in earlier operations, control was shifted ashore as soon as security and facilities permitted. Air support parties (ASPs) with the ground forces and ground liaison officers (GLOs) with air units were a routine part of the air-ground team.<sup>22</sup>

Following the breakout at St. Lo by the U.S. First Army, tactical air-ground support played a major role in the advance across France. Although infantry had played the major ground force role in the breakout, the armored forces led the exploitation. As a result, a new concept in air support--armored column cover (ACC)--was developed. This tactic owed much of its success to the establishment of an air support party (in a tank equipped with the proper radios) in each tank column to permit on-the-spot communications between tanks and aircraft. In practice, the air-tank team worked superbly with each able to complement the other. In this role, the fighter-bombers conducted visual reconnaissance ahead of the tank column, often providing targets for the tanks to take under fire, as well as responding to requests for fire support from the column itself.<sup>23</sup>

In addition to fighter-bomber ACC, air-ground cooperation involved L-4 "Horseflies" acting as controllers for strikes on targets selected by ground forces, assisting in guiding and controlling ground columns, and functioning as airborne observation posts. Fighter reconnaissance aircraft continued in the role, begun in Italy, of spotters for directing naval gunfire and for adjusting artillery fire.<sup>24</sup>

In responding to the needs of the European battlefields, the forward air controller (on the ground and in the air) clearly succeeded in enhancing the timeliness and effectiveness of tactical air support. Coupled with the air doctrine that evolved, air-ground cooperation became a productive reality. When the air-ground operations manual, FM-31-35 was revised (2 April 1946) to include the wartime experience, the functions of the ASPs (now called Tactical Air Control Parties, TACPs) were included, but no specific mention

was made of employing these resources in the airborne FAC role. Thus, it was only by implication that the concept of the control of air strikes from other aircraft survived World War II.<sup>25</sup>

### Korea

Following the reorganization of the military departments in 1947, and creation of an independent and co-equal U.S. Air Force, the joint air-ground doctrine embodied in the 1946 version of FM 31-35 was elaborated on in the "Joint Training Directive for Air-Ground Operation," 1 September 1950, prepared jointly by the Army Field Forces and the USAF Tactical Air Command.<sup>26</sup>

Even before the new training directive was promulgated, however, the need for close air support and forward controllers was made clear in combat following the North Korean attack on 25 June 1950. Within a few days, TACPs were committed to assist in controlling strikes in support of the Republic of Korea (ROK) troops. But the vulnerability of their unarmed jeeps kept the controllers well back from the leading enemy elements. That, combined with the rapid movement of the line of contact and the short on-station time of jet fighters operating out of Japan, made the timely identification of potential targets very difficult.<sup>27</sup>

In an effort to alleviate these problems, in early July, several successful attempts were made to employ liaison aircraft (L-5Gs and L-17s) for airborne control. As several liaison aircraft had already been shot down by Yak fighters, T-6 aircraft were shortly converted to the airborne controller role, as they were then considered to have adequate performance to survive. By mid-July 1950, T-6 controllers were being included in Fifth Air Force fragmentary orders under radio call signs such as "Mosquito Able" and "Mosquito Baker." As a result, for the remainder of the war, the units, pilots, and their aircraft were known as "Mosquitos."<sup>28</sup>

Having proved their worth in operation, although in an unofficial organizational status, on 1 August 1950, the Mosquito unit was designated as the 6147th Tactical Control Squadron (Airborne). The ground portion of the tactical control system grew also as Air Force ALOs began to supervise the work of the TACPs. The Army was somewhat slower to commit itself to the establishment of G2/G3 Air sections at the Joint Operations Center (JOC) and at corps and division headquarters. Thus, the essential components of the system were not in place until the spring of 1951. Throughout the remainder of the war, continuous effort was expended to make the system more effective by providing adequate communications nets and workable procedures.<sup>29</sup>

Interestingly, in addition to the coming of age of the airborne controller, several other tactical innovations and reinventions took place in Korea. Eighth Army personnel rode in the seat of T-6 Mosquitoes to get a first-hand view of the tactical situation and, equally important, to gain some insight into the airborne controller function and to inject the soldier's viewpoint into the process. An airborne relay aircraft, "Mosquito Mellow," was employed to pass surveillance information to the Taegu TACC when the operating area was beyond line of sight. By carrying SCR-300 "walkie talkies," Mosquito controllers could talk directly with tank columns and forward ground patrols. Hence, the World War II ACC mission was reinvented, but with one difference. Mosquito aircraft now provided the continuous cover and surveillance, calling in fighter-bombers only when their firepower was needed. As the enemy built up his concentrations of automatic weapons in the forward areas, experiments with fighter-bomber "pathfinders" were conducted beginning in July 1952. In this operation, two aircraft flew into the target area a few minutes ahead of the attacking aircraft to reconnoiter, find, and mark the target. Finally, during the same period, Eighth Army and Fifth Air Force worked out what were termed "highly successful" procedures, whereby artillery would direct proximity-fuzed, flak-suppression fire on enemy anti-aircraft gun positions just prior to the air strikes.<sup>30</sup>

Even as the Mosquito controllers were proving their essentiality, concern was developing over the growing threat that anti-aircraft fire was beginning to present to the low-performance aircraft (T-6) then in use. This had been the motivation for the "pathfinder" experiments mentioned above. Also, it was clear that future conflicts would not necessarily permit U.S. close support operations under such complete air superiority over the battlefield as was the case in Korea. Nevertheless, the Korean War ended before any of these trends materialized.<sup>31</sup>

#### Indochina-Vietnam

As was the case with the U.S. experience in Korea, in their operations in Indochina, the French Armee de l'Air found that the small, slow observation aircraft was the foundation of the war in the air. This did not obviate the need for nor the utility of other higher performance aircraft for photo and armed reconnaissance but, to get at the dispersed hard core of the Vietminh strength, what was needed (in the words of General G.J.M. Chassin, Commander of the French Air Forces in Indochina in 1951) was an aircraft that could "lift up the leaves on the trees and look underneath."<sup>32</sup>

As the U.S. advisory effort with the Vietnamese armed forces expanded in the early 1960s, the conclusions of the French Air Force were reconfirmed. But despite their demonstrated value in Korea, the USAF had not retained forward air controller units in its force structure, nor did it possess light aircraft suitable for the mission. Fortunately, however, the U.S. Army had continued to use light aircraft for artillery spotting and liaison work that the USAF could borrow. Also, the Vietnamese Air Force (VNAF) contained similar units flying L-19 aircraft.

The pervasive, but sporadic, nature of the ground war in Vietnam dictated a different emphasis regarding the tasks to be performed by the airborne controller. Whereas in Korea, the more or less classical, front line warfare had resulted in the major effort being

devoted to controlling strikes on targets developed by the ground forces, in Vietnam, the character of the Viet Cong operations placed a premium on surveillance and reconnaissance, at least in the early years prior to the massive infusion of USAF fighter-bomber units. Throughout the conflict, airborne controllers continued to be responsible for both functions, with the emphasis of the moment depending upon the tactical situation.

As U.S. air and ground combat forces were committed, two separate operational requirements influenced the development of the role of airborne controllers. First, to combat the guerrilla, the country-wide visual reconnaissance function continued using VNAF, USAF, and U.S. Army O-1 aircraft and pilots. (As the war continued, O-2 and OV-10 aircraft were introduced.) The USAF visual reconnaissance program assigned an ALO/FAC team to each province who, in coordination with the province Sector Operations and Intelligence Center, carried out daily coverage of their area. These so-called "province FACs" also controlled air strikes in support of para-military forces and operations and other air strikes for which TACPs (see below) were not available. Since this function was not contained in the official, tactical doctrine of either the Army or the Air Force, (at least, not in precisely the way in which it was encountered in Vietnam) theater Directives and Regulations established the procedures for these operations.<sup>33</sup>

The second requirement followed from the introduction of organized U.S. ground combat units and the development of large-scale engagements with main force VC units. In conformance with the standing doctrine, TACPs were provided to U.S. units. These served the classical airpower advisory and control functions for their unit, going wherever it went, in contrast to the territorial (and, primarily, reconnaissance) responsibilities of the "province FAC."<sup>34</sup>

Only one of the two kinds of forward air controllers survived the war in Vietnam to become an official component of the USAF Tactical Air Control System (TACS). The "province FAC" passed into history with the end of the U.S. involvement in the war. If it survived

in the VNAF, that life, too, came to an end with the fall of Saigon in April of 1975.

Several other developments of the Vietnam war are pertinent, however. In interdiction operations along the Ho Chi Minh trail and in the coastal region of North Vietnam, ground-to-air defense strength dictated the attempt to use two-place fighter-bombers as "fast FACs." To combat the massive night logistics movements of the enemy through Laos, C-123 and C-130 aircraft were configured to serve as flare ships, carry night sensors, and to function as an airborne command post (ABCCC) to coordinate the large number of sorties flown each night. The development of the C-130 gunships provided with both sensors and weapons led to the "self-FAC" concept. Although these transport-based systems were able to reduce the then-current AA threat sufficiently by overflight, the portent for the future was clear. Flying faster and higher would be a less useful survival measure as SAM capabilities developed and, moreover, would make it more and more difficult to perform the necessary surveillance and fire control satisfactorily.

AIR SUPPORT IN THE DEFENSE OF NATO

As we have seen, the vital contributions to military power of aerial surveillance and fire support have a long history, ranging from the early military use of balloons through the recent war in Southeast Asia. There is no reason to doubt that those contributions should be any less vital in the defense of NATO. But the developing Warsaw Pact threat might well impose conditions that could drastically alter the requirements for surveillance and fire control and could force changes in the means employed to provide those functions. These are the circumstances that must be recognized in considering the future of the airborne forward air controller.

The Developing Warsaw Pact Threat

Although the post-Vietnam USAF force structure has continued to support a modest number of Tactical Air Support Squadrons (TASS) to provide forward air controllers to the TACS, there is a growing uneasiness concerning their survivability over a modern battlefield. Beginning in Southeast Asia and continuing in the 1973 Middle East war, mounting evidence appeared of the growing strength and effectiveness of modern Soviet battlefield anti-aircraft (AA) gun and surface-to-air missile (SAM) defenses. These developments indicate clearly that, in future tactical combat, friendly air forces will face a technologically advanced and dense air defense system with redundant coverage, ranging from low to very high altitudes. In addition, the design trends have been toward mounting these weapons on self-propelled chassis to provide mobility consistent with the armored forces the defense units are intended to protect. Thus, through numbers, a smaller size of less distinctive shape, and vehicular mobility, battlefield defenses are becoming harder to detect and to avoid or attack.

Similarly, the new armored combat vehicles (ACV) introduced into the Group of Soviet Forces Germany have increased speed and battlefield mobility, a greater proportion of the artillery is self-propelled, and both ACVs and artillery are better protected. Greater mobility means that combat forces are more readily dispersed and hidden. This places a premium on the NATO surveillance and fire power systems' ability to achieve short reaction times, approaching the ultimate of real-time surveillance and fire direction. Better protective armor indicates that supporting fires must be accurate to be effective, hence, target tracking and/or homing munitions may be necessary. Finally, because of the numerical superiority of the enemy, it would be important to be able to adjust fire continuously and to determine rapidly when a target had been killed, both to utilize scarce NATO firepower units efficiently and to ease ammunition resupply and conserve stocks. Consequently, the need for effective fire support for NATO ground forces is increasing at the same time that the enemy's battlefield defenses are becoming stronger.<sup>35</sup>

Facing a numerically superior enemy, imbued with a relentless doctrine of the offensive, and well-equipped for mobile, armored operations, the NATO ground commander is confronted with a formidable problem in marshalling sufficient firepower to engage the enemy targets at the rate at which they could appear. The likely hostile surface-to-air defense, which could militate against the extensive use of an airborne FAC over enemy forces, suggests that the need for air support will not be perceived until the leading enemy elements come, at best, within line of sight of forward Army forces. In the absence of aerial surveillance over the battlefield, the ground force commander, together with his USAF ALO, is likely to be heavily dependent upon Army forward observers (FO) in deciding when the enemy strength threatens to exceed the combat capability of his organic and supporting ground fire power.

Further, even under the best of meteorological conditions, the FO cannot be expected to acquire targets more than about 5 km in advance of his location. This means that the limited time and space

available to bring the enemy under fire will severely inhibit the rate of application of available firepower, air or ground. Nor is it at all certain that an FO will always be in the right place at the right time, particularly since the defensive posture adopted by NATO gives the choice of the timing and location of attacks to the Pact forces. Even if he were initially positioned advantageously, enemy use of obscuring smoke and the inevitable battlefield haze, dust, and smoke from exploding rounds could degrade the performance of the FO with his limited ability to quickly change vantage points. Under these circumstances, the full capabilities of neither supporting artillery nor air strikes can be realized. Both suffer from the limited range of vision of ground-based observer's into the enemy rear. As a result, beyond the limited range of the FO, artillery is able to engage effectively only relatively static area targets and, without aerial surveillance, air support would have to look to its own self-contained target acquisition capabilities.

Most, if not all, of these targeting and fire control difficulties can be alleviated by the use of a mobile aerial platform. In accomplishing the necessary tasks of surveillance, targeting, fire control, and damage assessment, there are obvious advantages to be gained from applying man's memory, reasoning, and decision-making capabilities. Similarly, it is clearly of benefit to be able to observe from a low, slow, maneuverable vehicle that is able to stay close to the intended target, thereby greatly reducing the deleterious effects of poor weather, terrain, vegetation, and localized battlefield smoke and dust.

Thus, the desirability of real-time aerial surveillance and control of firepower to exploit the full range of artillery and to enhance the utility of air strikes in direct support of the ground battle seems, clearly, to be still with us. But in view of the increasingly hostile ground-to-air defense environment, neither the airborne artillery spotter nor the forward air controller, as we have known them in the past, is the solution, he is the problem!

Surveillance and Forward Air Control in the Eighties

Two aspects of the problem of providing adequate fire support to defending NATO ground forces stand out. One is that both Army and Air Force fire support systems need aerial surveillance and fire direction and control to obtain the best results. The second is that the vulnerability of the kind of manned system (low and slow) that can do the job is likely to be intolerable, given the Warsaw Pact ground-to-air defense environment. Moreover, even if the ground-to-air defense threat could be suppressed sufficiently, the essential air-to-ground and air-to-air voice communication links could be severely disrupted by enemy jamming with the airborne FAC located in the forward battle area.

To surmount these two types of vulnerability, the USAF has considered alternatives to the classical airborne FAC operation, now mounted in OV-10 aircraft. One suggestion being considered is the use of two-place tactical fighters. While undoubtedly providing some increase in survivability, although at the expense of what could turn out to be a serious decrease in the ability to accomplish the surveillance and control mission, it is not at all clear that a sufficiently large increase in survivability would result, given the capability of modern battlefield air defenses, nor that the effect of enemy ECM would be diminished. A second suggestion is to retain the OV-10 aircraft, but to withdraw its operating location to the rear a distance sufficient to minimize the air defense and jamming threat. By so doing, the surveillance and strike control functions would be largely abdicated, leaving them to the ground FAC, while retaining only the battle management function. Neither of these alternatives appears to be a satisfactory solution to the problem as a whole.

The Army faces a similar situation in attempting to provide the tactical ground commander (e.g., brigade or division) with surveillance of threatening activity to the desired depth in the enemy rear areas and for "over-the-hill" target development and fire control

for artillery (particularly for Copperhead rounds). The limited range of vision of the FO on the ground and of the scout helicopter flying nap-of-the-earth along the FEBA indicates the need for some form of elevated vantage point in the battle area. For these purposes, the Army has embarked upon a developmental program to explore the technical feasibility and operational utility of a mini-RPV system.<sup>36</sup>

The efforts of TAC and TRADOC to develop joint air-ground procedures and tactics are based upon the premise that air support of ground forces must truly be a joint effort to be successful. As described above, the congruence of Army and Air Force needs for aerial surveillance, target development, and fire control in the battle area argues strongly for a joint solution. Further, to preserve the irreplaceable capability of man involving his reasoning and understanding of the combat situation, he should be removed from an environment that leads to working under stress. The latter often leads to errors on non-routine tasks, induces fatigue that limits his powers of observation, and slows his reflexes or, on the contrary, induces jumpiness or over-reaction. What is required is an instrumentality that can perform the necessary functions, will permit removal of man from the hazardous environment over the battlefield, will be sufficiently survivable (either through proliferation or reduced vulnerability), and that can be utilized to serve simultaneously two masters--the Army and the Air Force. It would appear that a suitably designed, organized, and controlled RPV system could satisfy these requirements.

The basic components of such a surveillance and fire control system might be as follows:

1. An unmanned vehicle equipped with suitable sensors and a laser rangefinder/designator.
2. A data link (vehicle status, command and video).
3. A ground control station with access to the Army AGOS and artillery Fire Direction Center (FDC).

4. A data link (relay) from the ground station to an appropriate point in the Air Force TACS.

With the exception of the link to the Air Force TACS, prototypes of equipments matching these needs are included in current Army developments. The Aquila mini-RPV program, after overcoming early difficulties, has demonstrated the feasibility of the launch and retrieval and in-flight control of a small, unmanned vehicle on typical operational-type mission profiles, largely under the preplanned, automatic control of the ground station. Under a separate program, a jam-resistant data link has been designed (using spread spectrum and null-steering antenna techniques) and was scheduled to begin flight tests late in 1977.

If these developments progress successfully, the resultant system could make a major contribution toward overcoming the Army surveillance and firepower limitations noted above. Also, they could assist in more closely coupling the USAF close support capabilities to the real needs of the ground battle without placing FAC pilots at high risk. Neither of these advantages can accrue, however, unless the appropriate level in the Air Force TACS (e.g., the battalion TACP) can be linked directly to the Army echelon that receives the data-linked surveillance video from the mini-RPV. If this were to be done, the TACP FAC would be able to observe the combat area as if he were airborne over it (within the limits of sensor fidelity, field of view, etc. that are technically and operationally feasible) and could then perform his assigned duties in accordance with existing doctrine.

Is such a joint battlefield surveillance and fire control system feasible and practical? Technically there seems to be little doubt that it is. Doctrinally, at first glance, there would appear to be serious questions: How would the mini-RPV be fraged and controlled so that the Army and Air Force each have an appropriate share of the available mission time? But considering the current drawing together of the Army and Air Force on joint fire support problems, this question

may recede in importance, particularly when it is recognized that both organic fire support by the Army and close air support by the Air Force are necessary to enhance the performance of the ground forces in battle.

Operationally, a potentially troublesome feature is matching the number and location of the RPV control stations in, say, a brigade to the number and location of the ALO/FAC personnel with the TACPs assigned to that brigade and its subordinate units. Although an even one-on-one match might be worked out organizationally, it might not prove advantageous to locate each FAC with a RPV control station (even though desirable for easier access to the surveillance video) rather than at his assigned ground unit command post where he can be privy to the ground commander's assessment of the tactical situation and where the necessary communications already exist. Alternatively, if the TACP in question were manned by both an ALO and one or more FACs, the former could remain with the command post as the ground commander's air advisor, while the FACs could deploy to RPV ground stations for direct access to the surveillance video. In this case, all RPV ground stations would have to contain additional necessary display equipment to permit the FAC to work along with the Army intelligence and artillery personnel. Also, the normal TACP communication equipment would have to be provided to allow the FAC access to the Army tactical nets and to the Air Force air request and air-to-air nets.

Instead of adding to the size and complexity of the RPV control station and tying a FAC down to it, another possibility would be to place the FAC in an aircraft (to which the RPV ground station would relay the video) that could then work with any of the RPV control stations operating with the ground unit to which the FAC is assigned. The mobility and flexibility of employment would be welcomed as it would then match that of the attack aircraft themselves (at least, over those battle areas where RPV surveillance units were deployed). In this configuration, the airborne operation might take on more of the character of a miniature ABCCC than that of simply a FAC as it

would be conceptually possible for several RPV stations to be passing video to the same airborne post. By flying relatively low and over friendly territory, sufficient immunity to enemy jamming and surface-to-air defenses should result.

Suppose that appropriate hardware, organization, procedures, and tactics could be worked out to provide a joint surveillance and fire control system over the battlefield. What advantages would result? Several come to mind immediately.

By expanding the horizon of the real-time reconnaissance and surveillance available to the front line ground commander, he should be better able to identify the tactical plan of the enemy attack, thereby allowing him to deploy his defensive forces to best advantage. At the same time, the depth of the killing zone for his supporting artillery fires can be extended to the full range of the guns, permitting a greater volume of fire to be delivered prior to enemy forces closing to engagement range. Also, the accuracy (hence, effectiveness) improvement from the use of Copperhead will allow the engagement of point targets, such as armored combat vehicles and forward command posts, at these longer ranges. Similarly, the quantity and quality of close air support opportunities should be enhanced as a result of the improved target development capabilities and the effectiveness of the missions flown increased by the ability to designate targets for homing munitions well beyond the range of the ground FO. Moreover, the prolonged exposure of fighters attempting the same task with self-contained surveillance and designation systems could be avoided.

The sharing of a joint battlefield surveillance and fire control system could provide the Army and the Air Force with a valuable means for coordinating ground and air supporting fires so as to be mutually supporting. For example, for those fire missions assigned to close air support aircraft, Army artillery could be employed to provide simultaneous suppressive fire on known or suspected enemy ground-to-air defense forces in the area. While not a new idea, having been employed in 1952 during the war in Korea,<sup>37</sup> it is not a

standard joint procedure, either. But with the increasing ground-to-air defense threat, the use of artillery for battlefield suppression should become increasingly attractive.

Recent TAC/TRADOC efforts to develop cooperative tactics for the employment of scout/armed helicopter teams and A-10 aircraft have not only pointed up the critical role played by an on-the-spot battle manager, but his vulnerability, if located in the air close enough to the combat area to do his job properly. The concept of a RPV surveillance and fire control vehicle appears to offer the opportunity to remove the battle manager to a less hostile environment and to retain the indicated benefits to be derived from the cooperative employment of helicopters and close air support aircraft.<sup>38</sup>

In summary, the addition of a joint surveillance and fire control RPV system to the air-ground team could substantially increase the volume, rate, and effectiveness of both ground and aerial supporting fires by bringing the enemy under more accurate fire, beginning at greater ranges from friendly positions, than is now feasible. At the same time, the need to place men in positions of high risk (i.e., the airborne FAC and the air or ground FO) would be sharply reduced. The technology now exists to permit remotely manned systems to perform the needed tasks in many combat situations and environments. What is still needed is flexible, innovative planning and experimentation to exploit the potential capabilities of RPVs for battlefield surveillance and fire control. The Army has taken a giant first step with the Aquila program. The TAC and TRADOC joint efforts are moving in the right direction and, if pursued appropriately, could lead to the development of sound doctrine and effective organizational, operational, and support procedures that could make an airborne surveillance and fire control RPV a fully-integrated member of a joint tactical air-ground fire support system.

NOTES

1. Alfred Goldberg, Editor, A History of the United States Air Force, 1907-1957, Princeton, N.J., D. Van Nostrand Company, Inc., 1957, p. 1. See also Carroll V. Glines, Jr., The Compact History of the United States Air Force, New York, Hawthorne Books, Inc., 1963, pp. 21-23.

2. Glines, pp. 30-32.

3. Foremost among the few Union commanders who foresaw the value of aerial surveillance from Lowe's balloons were Major General George B. McClellan and one of his corps commanders, Brigadier General Fitz John Porter. The latter flew many missions himself. At least one Confederate general, E. P. Alexander, considered the Union balloons effective even if they saw nothing because of the effort it cost him to try to hide his movements. Glines, pp. 33-36.

4. Not content with this unequivocal decision, the same Army spokesman continued: "Any dream of aerial conflict is merely the product of a fertile imagination, a malady often encountered in younger men with insufficient service to recognize certain things as manifestly absurd." Aaron Norman, The Great Air War, New York, The Macmillan Company, 1968, pp. 21-22. Also in 1911, Italy had become the first nation to drop explosives from the air in earnest when bombs were used against Turkish infantry in Tripoli. Contemporary military opinion was not impressed. John R. Cuneo, Winged Mars, Vol. 1: The German Air Weapon, 1870-1914, Harrisburg, Pa., The Military Service Publishing Company, 1942, p. 256.

5. Norman, pp. 21-22.

6. Goldberg, pp. 23-27. See also Wesley Frank Craven and James Lea Cate, Editors, The Army Air Forces in World War II, Vol. I: Plans and Early Operations, January 1939 to August 1942, Chicago, The University of Chicago Press, 1948, pp. 12-16. The difficulties and dangers experienced by balloon observers are vividly described in Arthur Sweetser, The American Air Service, New York, D. Appleton and Company, 1919, pp. 287-288, as quoted in Glines, pp. 84-85.

7. One of the devices General Mitchell used to appeal directly to the soldier in the line was a leaflet that points out the benefits that air support could bring to him and, at the same time, inadvertently reveals some of the difficulties facing the airman in providing that support. Regarding the latter aspect, the leaflet exhorts the soldier to "keep us posted at all times as to where your front lines are....," repeating this admonition twice. This was to be done by showing panels, burning signal lights or, "...if nothing else is available....," by waving a white cloth. The leaflet ended,

"...and remember to show your signal," and was signed, "Your Aviator." Clearly, the man in the air had become aware of the need for assistance in determining when and where his support was required. Norman, pp. 497-498.

8. Craven and Cate, Vol. 1, p. 45.

9. James Farmer and M. J. Strumwasser, The Evolution of the Airborne Forward Air Controller: An Analysis of Mosquito Operations in Korea, Memorandum RM-5430-PR, The Rand Corporation, Santa Monica, California, October 1967, pp. 1-3.

10. Cajus Bekker, The Luftwaffe War Diaries, New York, Ballantine Books, 1964, pp. 32-37. See also John Killen, A History of the Luftwaffe, 1915-1945, New York, Berkley Publishing Corp., 1967, pp. 66-69. Derek Wood and Derek Dempster, The Narrow Margin: The Battle of Britain and the Rise of Air Power, 1930-1940, New York, McGraw-Hill Book Company, Inc., 1961, pp. 45-57. The opposition came mainly from the then-Major Wolfram von Richthofen, a cousin of the famous World War I fighter ace, who was the chief of development in the Luftwaffe's Technical Office. His reasons were that a Stuka could only achieve adequate accuracy by diving below 3000 ft and that, because it was slow and unwieldy, it would be unduly vulnerable to flak. Bekker, p. 35. See also Peter Elstob, Condor Legion, New York, Ballantine Books, Inc., 1973, pp. 22-23; Charles Messenger, The Blitzkrieg Story, New York, Charles Scribener's Sons, 1976, pp. 113-114. Still a civilian when he had visited the United States in 1933, Udet had finally been persuaded to join the Luftwaffe in January 1936, taking over direction of the Technical Office the following June. Bekker, pp. 36-37.

11. Killen, p. 77. See also Elstob, pp. 140, 153. Ironically, it was von Richthofen who, after taking over command of the Condor Legion in 1938, was responsible for developing these tactics of dive bombing and close support that were to become the hallmarks of the German blitzkrieg in Poland and France. See also Wood and Dempster, p. 49; Killen, pp. 100-101; Messenger, p. 114.

12. Bekker, p. 42. One source has the technique of assigning Luftwaffe liaison officers with their own communications to forward ground elements being introduced into the German close air support system by von Richthofen during Condor Legion operations in Spain. Elstob, p. 153.

13. Wesley Frank Craven and James Lea Cate, Editors, The Army Air Forces in World War II, Vol. II, Europe: TORCH to POINT BLANK, August 1942 to December 1943, Chicago, The University of Chicago Press, 1949, pp. 27-29. Underlying the success of the RAF in cooperating with the ground forces was the close physical location of their respective headquarters and the positive spirit of collaboration exhibited by the commanders of the Eighth Army and the Western Desert Air Force. Craven and Cate, Vol. II, p. 28.

14. Ibid, pp. 139-140.
15. From a talk at Army exercises in Tripoli, February 16, 1943, as quoted in Craven and Cate, Vol. II, p. 164.
16. Major General George S. Patton, Jr., and his U.S. II Corps had the responsibility for part (code name WOP) of those operations. Air support for WOP was conducted in accordance with Air Marshal Coningham's doctrine and elicited complaints from Patton that, because of lack of air cover, his forward troops and command posts were being bombed continuously. Coningham's reply reminded Patton that containing and destroying the German air forces on their bases and engaging them by sweeps in the forward area was the best means to prevent what he complained of and that those operations would continue. Craven and Cate, Vol. II, pp. 173-175. Interestingly enough, as commander of the Third Army in France, Patton and Major General Otto P. Weyland, commander of XIX Tactical Air Command (U.S. Ninth Air Force), formed an innovative and effective air-ground team. Wesley Frank Craven and James Lea Cate, Editors, The Army Air Forces in World War II, Vol. III, Europe: ARGUMENT to V-E Day, January 1944 to May 1945, Chicago, The University of Chicago Press, 1951, pp. 243-244, 246-247.
17. Craven and Cate, Vol. II, pp. 178-180. See also Farmer and Strumwasser, p. 2; Field-Marshal the Viscount Montgomery of Alamein, Memoirs, Cleveland, Ohio, The World Publishing Company, 1958, pp. 146-147; General Sir William G. F. Jackson, The Battle for North Africa, 1940-43, New York, Mason/Charter Publishers, Inc., 1975, pp. 456-459.
18. Craven and Cate, Vol. II, pp. 205-206.
19. Ibid., pp. 168, 445, 484-487.
20. Ibid., pp. 527-530, 545. These spotters were known as "Rover Joes" in U.S. parlance and as "Rover Davids" to the British. Craven and Cate, Vol. III, pp. 388, 447, 486. See also Farmer and Strumwasser, p. 3; Goldberg, p. 63.
21. Craven and Cate, Vol. III, p. 356.
22. Ibid., pp. 139-140, 244-245, 430.
23. The idea of placing the air support party in a tank is attributed to Major General Elwood Quesada, commander of IX Tactical Air Command, supporting General Bradley's First Army. Craven and Cate, Vol. III, pp. 238-241. Air support parties had been available previously to corps and divisions, but the armored divisions were each using several fast-moving combat commands in their advance across France, creating the need perceived by General Quesada. Craven and Cate, Vol. III, pp. 245-246.

24. Craven and Cate, Vol. III, pp. 270-271.
25. Farmer and Strumwasser, p. 4.
26. Robert Frank Futrell, The United States Air Force in Korea, 1950-1953, New York, Duell, Sloan and Pearce, 1961, p. 659.
27. Ibid., pp. 76-77. Even earlier ad hoc attempts had been made to control fighter attacks from the ground in Korea. Futrell, pp. 28-30, 32.
28. Ibid., pp. 77-78. For an extensive analysis of Mosquito operations in Korea, see Farmer and Strumwasser.
29. Futrell, pp. 98-102, 332-334, 426-434, 504-508.
30. Ibid., pp. 99, 155, 506.
31. Ibid., p. 662. For a useful summary of air support of ground forces in Korea, including the differing viewpoints and procedures of the Army, Air Force, Navy, and Marines, see Futrell, pp. 658-663.
32. General G.J.M. Chassin, French Air Operations in Indochina, excerpts from Lessons of the War in Indochina, Interavia, VII (No. 12, 1952), pp. 670-675, as printed in Eugene M. Emme, Editor, The Impact of Airpower, Princeton, N. J., D. Van Nostrand Company, Inc., 1959, pp. 410-411.
33. Seventh Air Force Regulation, No. 200-6, Intelligence: Visual Reconnaissance, Headquarters, Seventh Air Force, APO San Francisco 96307, December 16, 1966.
34. Military Assistance Command, Vietnam Directive No. 95-4, Aviation: United States Air Operations in the Republic of Vietnam, Headquarters, United States Military Assistance Command, Vietnam, APO San Francisco 96243, June 28, 1966. Procedures were also established to integrate the Army and the Air Force tactical control systems covering the functioning of both the "province FACs" and those assigned to U.S., Vietnamese, and other Free World military forces. Military Assistance Command, Vietnam Directive No. 95-11, Aviation: Joint Air-Ground Operations System (JAGOS), Headquarters, United States Military Assistance Command, Vietnam, APO San Francisco 96243, June 21, 1966.
35. The International Institute for Strategic Studies, London, "The Military Balance 1977/78," as printed in Air Force Magazine, Vol. 60, No. 12, December 1977, pp. 118-126. See also Lieutenant Colonel David Brog, "Protecting Tactical Aircraft: Which Capabilities are Required?", Electronic Warfare/Defense Electronics, Vol. 9, No. 6, November/December 1977.

36. F. David Schnebly, The Development of the XMQM-105 Aquila Mini-RPV System, Proceedings, Fourth Annual Symposium, June 5-9, 1977, National Association for Remotely Piloted Vehicles.

37. Futrell, p. 506.

38. "A-10/AAH Together Pack More Punch Than Separately, TAC/TRADOC Find," Armed Forces Journal International, June 1977, p. 18.