

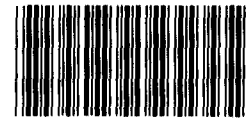
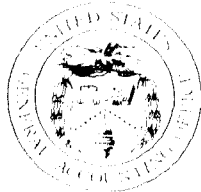
GAO

Report to the Chairman, Committee on  
Armed Services, House of  
Representatives

April 1990

CLOSE AIR SUPPORT

Airborne Controllers in  
High-Threat Areas  
May Not Be Needed



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National Security and  
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B-237393

April 4, 1990

The Honorable Les Aspin  
Chairman, Committee on Armed Services  
House of Representatives

Dear Mr. Chairman:

This report, which was prepared at your request, examines the present and future need for airborne controllers, the effect of increasing air defense threats on the Air Force's ability to perform the airborne controller role, and the force structure and cost implications of reassigning A-10 aircraft from an attack role to a controller role. We recommend that the Secretary of the Air Force expedite the operational testing of a new system to improve direct communications from ground control elements to attack aircraft and use the results to reassess the need for airborne controllers in high-threat areas. We also recommend that the Air Force make the reassessment before more funds are spent to renovate OV-10 and reassign A-10 aircraft.

As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after its issue date. At that time we will send copies to appropriate congressional committees; the Secretaries of Defense and the Air Force; the Director, Office of Management and Budget; and other interested parties.

Please contact me at (202) 275-4268 if you or your staff have any questions concerning this report. Other major contributors to this report are listed in appendix I.

Sincerely yours,

Nancy R. Kingsbury  
Director  
Air Force Issues

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# Executive Summary

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## Purpose

Close air support to friendly forces requires accurate and timely targeting information from forward air controllers to be effective and minimize the possibility of attacking friendly forces. The Air Force plans to replace its old forward air control aircraft with newer and more survivable A-10 aircraft now used in the close air support attack role. Reassigned A-10s are referred to as OA-10s.

The House Committee on Armed Services is concerned that the OA-10s may not be survivable in certain threat environments. The Chairman, House Committee on Armed Services, asked GAO to examine the present and future need for airborne controllers, the effect of increasing air defense threats on the Air Force's ability to perform the airborne controller role, and the force structure and cost implications of reassigning A-10s from an attack role to a controller role.

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## Background

Controllers on the ground and in fixed-wing aircraft identify and mark close air support targets, communicate targeting information to attack aircraft, and coordinate the attacks with friendly ground forces.

As of October 1989, the Air Force's forward air control fleet was comprised of OV-10, OA-37, and OA-10 aircraft. The Air Force plans to retire the OV-10s and most of the OA-37s by the mid-1990s and replace them with A-10s. According to the Department of Defense, the rate at which the OV-10s and OA-37s are replaced by A-10s will be determined by how rapidly the A-10s become available due to reductions in tactical forces, a reevaluation of tactical missions, and budgetary considerations.

The Air Force classifies the threat to airborne controllers as low (small arms fire), moderate (some surface-to-air missiles, anti-aircraft artillery, and attack aircraft), or high (increased number of more advanced weapons than found in moderate-threat areas). Geographic areas are generally classified by the predominant threat level expected in those areas; for example, central Europe is considered a high-threat area because of the large number and sophistication of Warsaw Pact weapons.

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## Results in Brief

The Air Force plans to use most of its forward air control aircraft in a high-threat European conflict. Air defenses in high-threat areas would force airborne controllers away from the target to survive. The Air Force plans to rely primarily on the ground controllers to identify and mark targets and use the airborne controllers to relay information from the ground controllers and other Air Force control elements on the

ground. Although the Air Force ground control elements can communicate directly to attack aircraft through Air Force radio networks, the Air Force considers the airborne controllers necessary in high-threat areas because the controllers may be capable of relaying information when other means of communication are degraded and may be able to add their own battlefield information to assist the attack aircraft.

The Air Force has started to renovate its OV-10s to extend their life until they can be replaced and plans to modify existing OA-10s. It plans to reassess the need to renovate additional OV-10 aircraft every year until all OV-10s are renovated or replaced. The Air Force also plans to modify its close air support A-10s. As A-10s become available, the Air Force plans to stop modifying OV-10s and replace the existing OV-10s and OA-37s with modified A-10s. The Air Force recognizes that the changes to its forward air control aircraft will not improve aircraft survivability enough so that the airborne controllers can get closer to the targets to identify and mark them or provide direct targeting information in high-threat areas.

While the aircraft are being replaced and renovated, the Air Force could test the operational effectiveness of the Automatic Target Handoff System, which is to improve direct communications from the ground to attack aircraft. If the system is found to be effective, it would reduce the possibility of communications degradation due to jamming and the potential need for airborne controllers in high-threat areas.

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## Principal Findings

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### Threat Limits Airborne Controllers' Effectiveness

In low- and moderate-threat areas, the airborne controllers have an advantage over ground controllers in identifying and marking targets because of their greater mobility and visibility over the battlefield and freedom from land impediments to communications. In high-threat areas, airborne controllers are to relay information between ground controllers and attack aircraft by flying close to the ground controllers to overcome communications jamming and receive targeting information and then fly to a rear area to transmit the information to the attack aircraft. They are also to relay updated mission planning information from other air control elements on the ground to attack aircraft.

According to the Air Force, targeting and mission planning information can be passed directly to the attack aircraft from ground control elements. However, communications channels between the control elements and the attack aircraft are subject to degradation caused by jamming, terrain, and other factors. Therefore, according to the Air Force, the airborne controllers are needed in high-threat areas to assist ground control elements by relaying information to attack aircraft when other more direct communications systems are degraded.

The Air Force plans to improve direct communications between ground control elements and attack aircraft using the Automatic Target Hand-off System, which can electronically receive targeting and mission planning information from a digital communications terminal and display the information on an aircraft's cockpit display. The Air Force demonstrated the data transmission capabilities of the Army's version of this system on an F-16 in December 1989. It is currently demonstrating the integration of the system on an A-10 and plans to complete that effort by September 1990. The Air National Guard plans to install the system on 20 F-16s from July through December 1990. The Air Force is developing upgrades to the system's software to increase data transmission rates and provide added flexibility in radio jamming environments. The Air Force does not plan to do operational testing of the system until the upgraded version is developed in late 1991 or early 1992.

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### Cost of A-10 and OA-10 Modifications

The Air Force has \$92 million to modify 385 A-10s and OA-10s to improve their flight safety and targeting systems. In addition, the Air Force plans to modify 498 A-10s and OA-10s to improve their navigation. These modifications are estimated to cost about \$80 million. The Air Force received \$14.5 million for fiscal year 1990 and planned to request funds through fiscal year 1997. Future plans for these modifications are contingent on the number of aircraft in the inventory. Also, the Air Force is evaluating several potential modifications to improve the A-10's and OA-10's communications, navigation, and targeting. These modifications include the Automatic Target Handoff System, which is estimated to cost \$47,000 per aircraft.

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### Cost of OV-10 Modifications

The Air Force is renovating its OV-10s to extend their life. This includes rewiring, corrosion protection, and replacing parts, as necessary. As of October 1989, the Air Force had renovated 17 OV-10s at a cost of about \$640,000 per aircraft and had \$6 million for fiscal year 1990 to renovate an additional 9 aircraft. The Air Force said that it plans to make an

annual reassessment of its need to renovate additional OV-10s as long as they remain in the fleet or until all have been renovated.

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## Recommendations

Because the Automatic Target Handoff System being installed on an A-10 and F-16 aircraft could improve direct communications from ground control elements to attack aircraft, GAO recommends that the Secretary of the Air Force

- expedite the operational testing of the system and use the results to reassess the need for airborne controllers in high-threat areas and
  - make the reassessment before more funds are spent to renovate OV-10s and reassign A-10s.
- 

## Matter for Congressional Consideration

The Committee may wish to consider whether the Air Force's planned changes for its forward air control aircraft should proceed before alternative means of communicating between ground control elements and attack aircraft are assessed.

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## Agency Comments and GAO's Evaluation

The Department of Defense generally concurred with most of GAO's findings. However, it partially concurred with GAO's recommendations and did not concur with GAO's matter for congressional consideration. The Department stated that the airborne controllers are the only airborne element that can control fighters to the battle area. GAO believes, however, that ground control elements can control aircraft using existing communications equipment and that the Automatic Target Handoff System could improve direct communications between the ground and attack aircraft in high-threat jamming environments, thus obviating the need for the airborne controllers in those environments.

The Department did not agree that the Air Force should reassess the need for air controllers in high-threat areas before more OV-10s are renovated and A-10s reassigned. The Department concluded that delaying ongoing programs until after the results of operational tests of the Air Force's version of the Automatic Target Handoff System are analyzed and the role of airborne controllers is reassessed would unnecessarily degrade the Air Force's support to the Joint Forces Commander. GAO believes that operational tests could be conducted in mid-1990 using the Army's version of the system, since the system could be available on an A-10 in September 1990 and on F-16s starting in July 1990.

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# Introduction

The Air Force has traditionally provided close air support to friendly ground forces in proximity to enemy forces. This requires accurate and timely information on the location of targets to maximize the effectiveness of the air support and minimize the possibility of attacking friendly forces. The forward air controllers perform a key role in close air support because they identify and mark targets, communicate accurate and timely information on those targets to attacking aircraft, and coordinate the attack with ground forces.

The Air Force said that it wants to replace its old and less survivable OV-10 and OA-37 forward air control aircraft with A-10 aircraft reassigned from the close air support role. The A-10, developed in the early 1970s, is the Air Force's primary attack aircraft designed specifically to provide close air support. The Air Force began reassigning A-10s in 1987 and plans to have a total of 153 A-10s reassigned to the forward air control role by the mid-1990s. Reassigned A-10s are referred to as OA-10s. According to the Air Force, the A-10s are being reassigned because they cannot survive as close air support aircraft in high-threat areas, such as the central European battlefield of the 1990s, and they are an available and cost-effective replacement for the present forward air control aircraft.

## Role of the Forward Air Controller

Airborne and ground controllers work together to coordinate and control close air support missions and integrate the missions with fire from friendly ground forces. Their basic tasks are to identify targets and mark them with smoke rockets or other devices and coordinate air strikes by communicating accurate and timely target and battle area information to attack aircraft. According to the Air Force, these are the airborne controllers' basic tasks in areas where they can operate virtually unrestricted by the threat. The airborne controllers have an advantage over ground controllers in performing these tasks because their aircraft provide greater mobility and visibility over the battle area and freedom from land impediments to communications. However, in threat areas where the airborne controllers' operations are projected to be severely restricted, the Air Force plans to use the airborne controllers to relay targeting and battle area information between ground forces and close air support aircraft going to the target. In addition to these tasks, the airborne controller may perform other tasks including search and rescue, convoy escort, damage assessment, and area surveillance. Their ability to perform these tasks is also contingent on the threat.

The ground controllers work in teams consisting of an air liaison officer, who is also a pilot, and two enlisted Air Force personnel. The teams are assigned to and maneuver with Army battalions to gather targeting information, advise the commanders on the use of tactical aircraft, and coordinate the air attack with fire from friendly ground forces. They also decide whether the final decision to attack will be made by the air or ground controller.

The airborne and ground controllers are part of a command, control, and communications system that includes air liaison officers, who are collocated with the supported ground forces at the battalion through corps levels, and air control centers, which are located at the Army corps and tactical air force headquarters levels. The air liaisons advise and assist the ground commanders at the various levels on the use of air support. They are subordinate to the control centers and consist of pilots and technicians. They operate ground vehicles and communications equipment required to obtain, coordinate, and control air support of ground operations. The air liaisons at the battalion level are ground controllers. The air control centers at the corps levels are responsible for managing the exchange of combat data between air and ground forces, whereas the centers at headquarters levels are responsible for the planning, coordination, and execution of the support.

The airborne controllers assist the air liaisons. In threat areas where the airborne controllers' operations are projected to be severely restricted, the Air Force plans to use the airborne controllers to relay information between the ground controllers, air liaisons, or air control centers at the corps levels and the attack aircraft.

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## Air Force Forward Air Control Aircraft

As of October 1989, the Air Force's forward air control combat fleet was comprised of 145 aircraft: 48 OV-10s, 46 OA-37s, and 51 OA-10s.<sup>1</sup> The Air Force plans to replace all of its OV-10s and all but 10 of its OA-37s by the mid-1990s because the aircraft are old and are less able to survive in most threat environments. It plans to replace them with more survivable A-10s, designated OA-10s, from the close air support role.

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<sup>1</sup>An additional 24 aircraft are designated for training.

## OV-10 Aircraft

The OV-10s, whose average age was 22 years as of October 1989, are two-seat turboprop aircraft (see fig. 1.1) that were used during the Vietnam war for forward air control. The Air Force considers them excellent reconnaissance aircraft because of their ability to fly slowly and for long periods of time, capability to communicate with ground and air forces, and visibility out of the cockpit. However, according to Air Force officials, their slow speed and extensive cockpit glass make them highly vulnerable to enemy air defenses. Additionally, they cannot be refueled in flight and thus would have to be transported from their bases in the United States to an overseas location.

Figure 1.1: OV-10 Aircraft

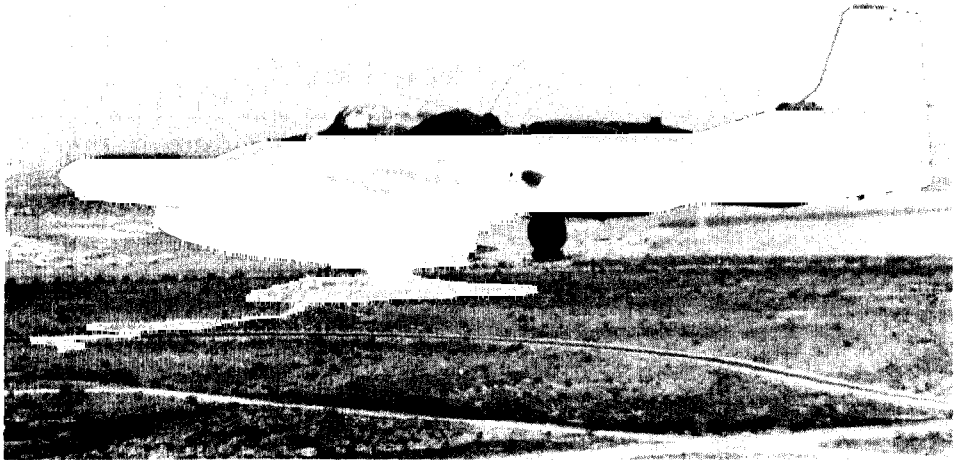


Source: Air Force

## OA-37 Aircraft

The OA-37s, whose average age was 18 years as of October 1989, are converted trainer aircraft (see fig. 1.2) first used by the Air Force for forward air control in the late 1970s. Their side-by-side seating arrangement, although advantageous for training, limits the pilot's visibility. According to the Air Force, the OA-37's effectiveness is limited by its communications equipment and its ability to remain airborne without refueling for 1-1/2 hours.

Figure 1.2: OA-37 Aircraft



Source: Air Force

## A-10 Aircraft

According to Air Force officials, in 1985 the Air Force evaluated the need for a replacement aircraft for the forward air control role and decided that reassigning A-10s to that role would be a cost-effective and immediate solution, since the A-10s were becoming available from the close air support role.

The Air Force plans to have 163 combat aircraft in the forward air control fleet by the mid-1990s,<sup>2</sup> including 153 A-10s reassigned from the close air support role. According to the Department of Defense, the rate at which the A-10s are reassigned will be determined by how rapidly A-10s become available due to reductions in tactical forces, the reevaluation of tactical missions, and budgetary considerations. The remaining 10 aircraft are OA-37s, which will be used in Central America. According to Air Force officials, the OA-37s are compatible with the fighter aircraft used by Latin American countries. The Air Force plans to retire the 48 OV-10s and remaining 36 OA-37s.

The average age of the A-10s and OA-10s as of October 1989 was about 10 years. The A-10 is a twin-engine, single-seat aircraft (see fig. 1.3) that is armored against anti-aircraft fire. The A-10 has an internally mounted 30-millimeter 7-barrel cannon, can carry a wide variety of

<sup>2</sup>An additional 24 aircraft will be designated for training.

weapons, and can be refueled in the air. According to the Air Force, these characteristics make the A-10 more survivable and responsive to overseas deployment than either the OV-10 or OA-37. Although the A-10 has slightly less communications capability than the OV-10, the Air Force is studying modifications to the A-10 to increase those capabilities.

Figure 1.3: A-10 Aircraft



Source: Air Force

## Congressional Concern

The House Committee on Armed Services is concerned that the Air Force's plans to replace or upgrade its forward air control aircraft may not reflect a clear commitment to the close air support mission. The Committee noted that the Air Force is replacing its OV-10s and OA-37s with A-10s, even though the Congress and the Department of Defense have not agreed on the Air Force's future close air support aircraft. The Committee is concerned that forward air control OA-10s may not be survivable in certain threat environments.

## Objectives, Scope, and Methodology

The Chairman, House Committee on Armed Services, requested that we examine the present and future need for airborne controllers, the effect of increasing air defense threats on the Air Force's ability to perform the airborne controller role, and the force structure and cost implications of reassigning A-10s from the attack to the controller role.

To accomplish these objectives, we interviewed and obtained data from officials at the following locations:

- Air Force Headquarters, Washington, D.C., for information on the reassignment of the A-10 to the forward air control role;
- National Guard Bureau, Washington, D.C., for information on the role of the Air National Guard in providing forward air control;
- Tactical Air Command, Langley Air Force Base, Virginia, for information on the role of the forward air controllers, the aircraft to be used, plans to modify the aircraft, and the effect of the threat on performing the role;
- Training and Doctrine Command, Fort Monroe, Virginia, for the Army's perspective on forward air control and close air support; and
- Air-Land Forces Application Agency, Langley Air Force Base, Virginia, for its guidance for Air Force and Army cooperation in controlling close air support.

We obtained operational perspectives on the forward air control role at the 836th Air Division, 602nd Tactical Air Control Wing, and 27th Tactical Air Support Squadron at Davis-Monthan Air Force Base, Tucson, Arizona; and the 110th Tactical Air Support Group and the 172nd Tactical Air Support Squadron, Battle Creek, Michigan. We also obtained information on the role of the forward air controller at the Air Force Air-Ground Operations School, Hurlburt Field, Florida; the Joint Readiness Training Center, Fort Chaffee, Arkansas; and the 22nd Tactical Air Support Training Squadron, Davis-Monthan Air Force Base, Arizona.

Threat data and analyses of forward air controllers in the threat areas are contained in an Air Force Studies and Analysis White Paper, entitled Forward Air Controllers 1985-1995. We had the White Paper updated to 1989 and validated by the Defense Intelligence Agency.

We conducted our work between December 1988 and November 1989 in accordance with generally accepted government auditing standards.

# Increasing Threat Limits Effectiveness of Airborne Forward Air Controllers

The airborne and ground controllers work together to identify and mark targets for close air support missions and communicate information on the location of the targets to attack aircraft. Airborne controllers have an advantage over the ground controllers in performing these tasks because their lines of sight and communications are not as easily obstructed. However, according to the Air Force, the proliferation of lethal weapons in high-threat areas, such as surface-to-air missiles and advanced anti-aircraft artillery, has forced the air controllers further from the targets to survive. Thus, in high-threat areas, the Air Force plans to rely primarily on the ground controllers for accurate and timely targeting information and use the airborne controllers primarily to relay information between ground forces and close air support aircraft going to the targets.

According to the Air Force White Paper report, the OA-10s are more survivable than the OV-10s and OA-37s. Although the OA-10's increased survivability may improve the airborne controllers' capabilities to perform their tasks in low- and moderate-threat areas, the Air Force does not expect that the increased survivability will allow the airborne controllers to get close enough to the targets to identify and mark them or provide direct targeting information in high-threat areas.

## Levels of Threat

The Air Force report classifies the threat to airborne controllers as low (small arms fire), moderate (some surface-to-air missiles, anti-aircraft artillery, and enemy attack aircraft), or high (increased number of more advanced surface-to-air missiles, anti-aircraft artillery, and enemy attack aircraft). Additionally, the enemy is expected to jam communications in high-threat areas.

Geographic areas are generally classified by the predominant threat expected in those areas. The Air Force report generally considers Central America to be low threat, Korea moderate threat, and central Europe high threat. However, according to the Air Force, the threat would be expected to vary over time and within geographic areas of operations due to such factors as the length of the conflict, time of day, weather, and location on the battle area. Also, the threat may lessen over time in an area as enemy air defenses are exhausted or neutralized. Other factors could also impact the threat. For example, the easily transportable surface-to-air Stinger missiles increased the threat level in Afghanistan for Soviet aircraft, according to Air Force and Defense Intelligence Agency officials.

According to the Air Force report, the threat in moderate areas is projected to intensify by 1995 as more sophisticated mobile surface-to-air missile systems and communications jamming equipment are introduced. In high-threat areas, the lethality and ranges of air defense systems are expected to increase and communications jamming equipment are expected to be more sophisticated by 1995.

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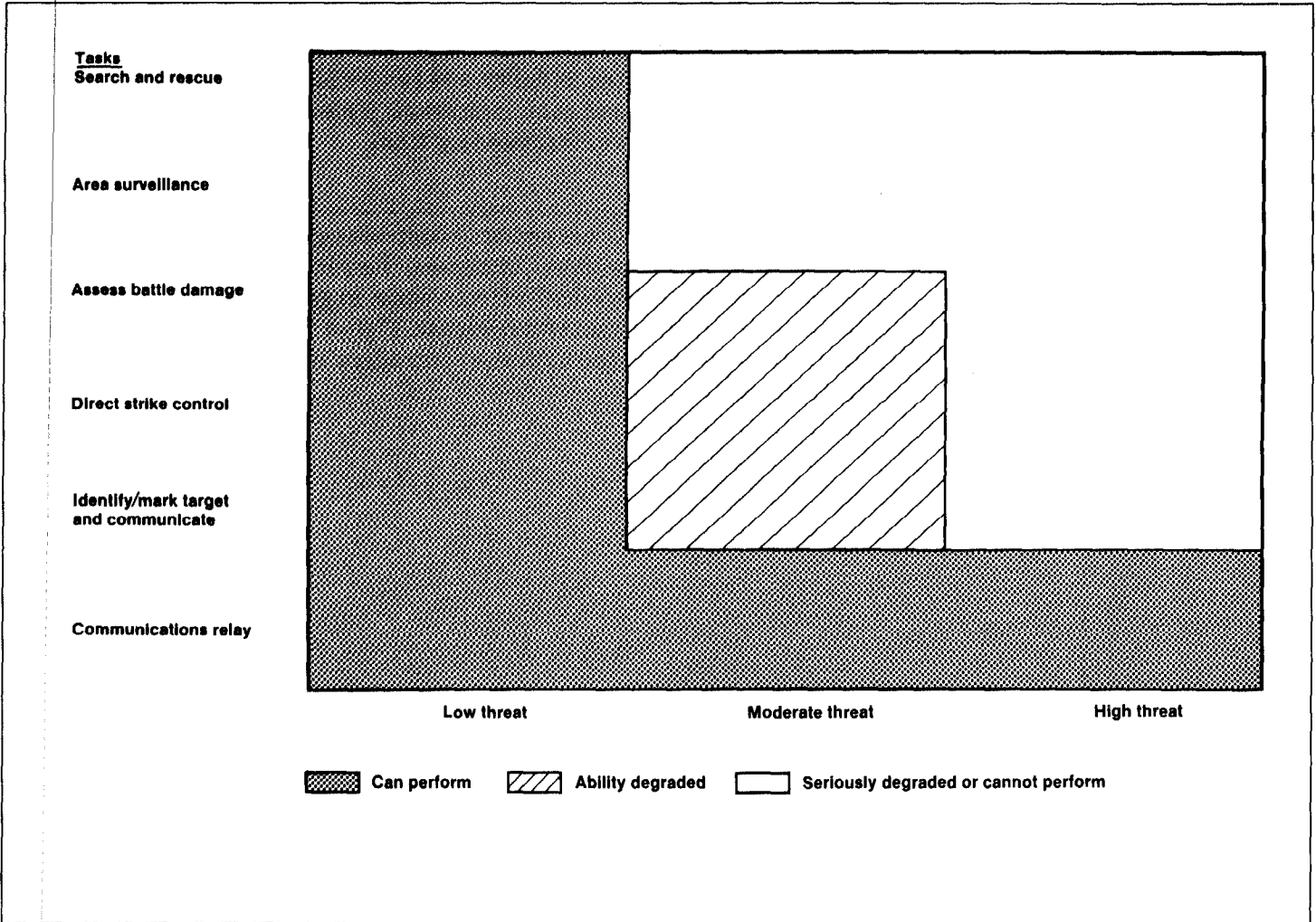
## **Impact of Threat on Forward Air Control Role**

The Air Force plans to use airborne controllers in all conventional conflicts. However, as the threat increases, the Air Force report projects that the airborne controllers' effectiveness in gathering and communicating target information will decrease. Figure 2.1 shows the impact of the current threat on the airborne controllers' effectiveness in performing their tasks.



Chapter 2  
**Increasing Threat Limits Effectiveness of  
 Airborne Forward Air Controllers**

**Figure 2.1: Degradation of Airborne Controllers' Effectiveness Due to Threat Levels**



Source: Our analysis of Air Force data.

Note: According to the White Paper report, the airborne controllers' ability to communicate would not be as seriously degraded as their ability to identify and mark targets in moderate- and high-threat areas. Also, the threat may not degrade the ground controllers' ability to advise the battalion commanders, request air support, and coordinate air attacks with the fire from friendly ground forces.

According to the Air Force report, in high-threat areas where the airborne controllers cannot effectively gather and communicate targeting information, the Air Force plans to shift most of the responsibility for these tasks to the ground controllers. It also plans to use the airborne controllers to relay targeting and battle area information from the

ground to the attack aircraft. In high-threat areas, the airborne controllers would fly close enough to the ground controllers to overcome communications jamming and receive targeting information and then fly to a rear area to transmit the information to the attack aircraft.

According to joint Army and Air Force guidance, targeting information can be passed directly to the attack aircraft from ground controllers or Army fire support teams in the absence of airborne controllers. The targeting information can also be passed from the ground controllers through Air Force communications channels to air liaisons or air control centers. The liaisons or centers can then pass the information to attack aircraft on their way to the target or in rear areas.

The procedure employed by the airborne controllers to relay information is time-consuming and inefficient and requires detailed coordination to be effective, according to the Air Force report. Despite these limitations, the Air Force wants to use the airborne controllers to relay the information because they may be able to add battlefield information that could make close air support more effective. Moreover, voice communications from the ground controllers to attack aircraft during the attack aircraft's approach to the target area or through Air Force communications channels to attack aircraft could be seriously degraded due to enemy jamming and land impediments.

The capabilities of the ground controllers and other ground elements of the air control system to communicate with the attack aircraft could be improved in the future with the Automatic Target Handoff System, according to the Air Force. The system allows personnel on the ground to transfer targeting information electronically from a portable digital communications terminal to a display in the attack aircraft's cockpit.

In December 1989 the Air Force demonstrated the data transmission capabilities of the Army's version<sup>3</sup> of the system on an F-16 aircraft. It is currently demonstrating the integration of the system with other avionics upgrades on an A-10 aircraft. The integration is scheduled to be completed in September 1990. The Air National Guard plans to have the Army version installed on the first of 20 F-16 aircraft in July 1990 and complete the installations by December 1990.

According to the Air Force, its version of the system will provide improved transmission capabilities such as higher data transmission

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<sup>3</sup>The Army is currently fielding the system in the Black Hawk, Apache, and Scout helicopters.

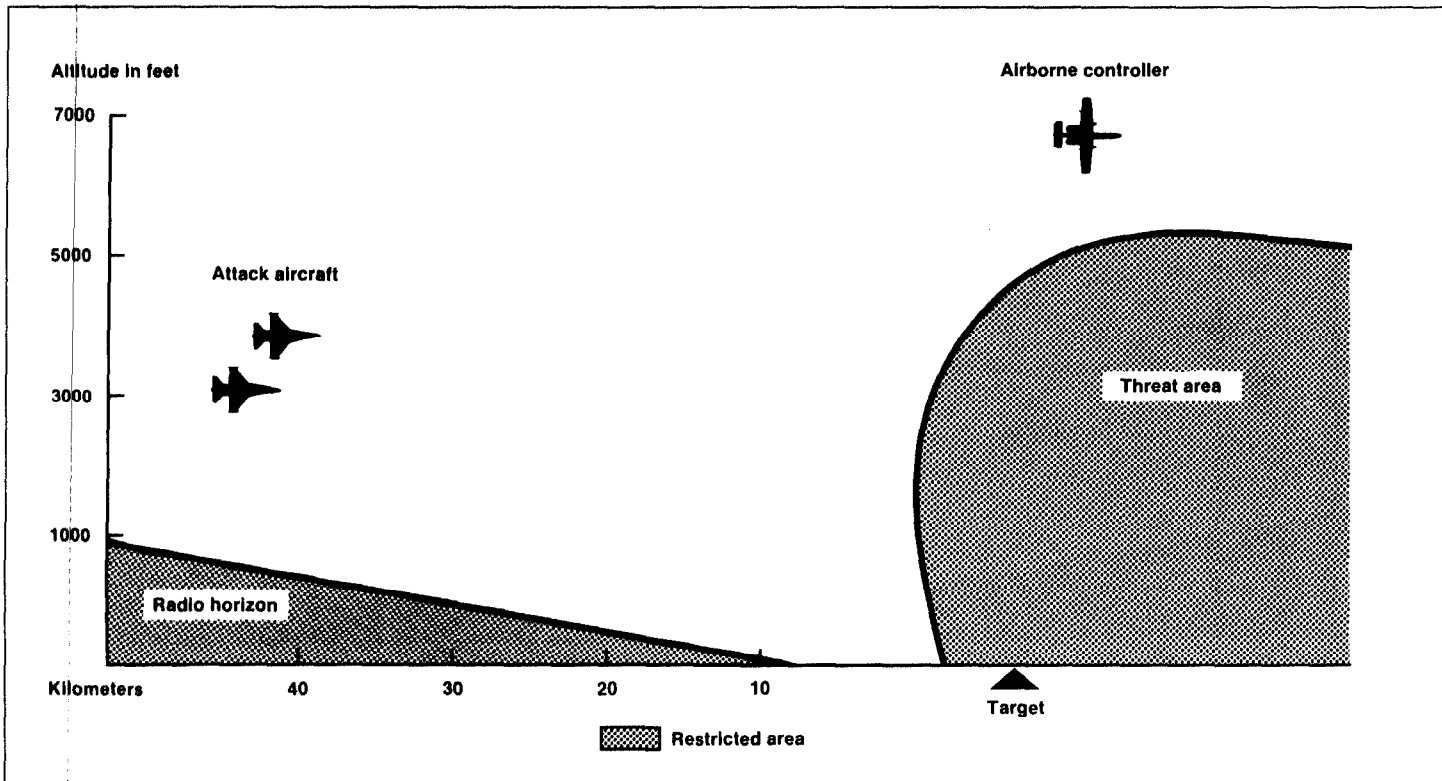
rates, frequency hopping, and multi-radio operations. The frequency hopping and multi-radio capabilities provide added flexibility in radio jamming environments. The Air Force's version will also be interoperable with the Army version. The Air Force's version is in the preliminary design stage with full-scale development scheduled to start in May 1990 and be completed by March 1992. Production of the system and installation in F-16s, A-10s, and OA-10s is scheduled to start in fiscal year 1992. Operational testing of the system will not begin until late 1991 or early 1992.

According to Tactical Air Command officials responsible for the program, the upgrade from the Army version to the Air Force's version will require software changes only; the hardware in the aircraft and the digital communications terminals on the ground will remain the same.

## **Low-Threat Environments**

According to the Air Force report, the airborne controllers are very effective in gathering and communicating information on targets in low-threat environments because they can operate virtually unrestricted, maneuvering over the targets to identify them and mark the targets with smoke rockets or some other device. While above the radio horizon, they also can communicate relatively freely with ground controllers and close air support fighters because communications jamming devices are not expected to be a threat. The Air Force expects that the airborne controllers will remain very effective into the mid-1990s. Figure 2.2 shows the Air Force's projection of the airborne controllers' safe operating area now and in the mid-1990s in low-threat environments.

Figure 2.2: Airborne Controllers' Safe Operating Area in Low-Threat Environments

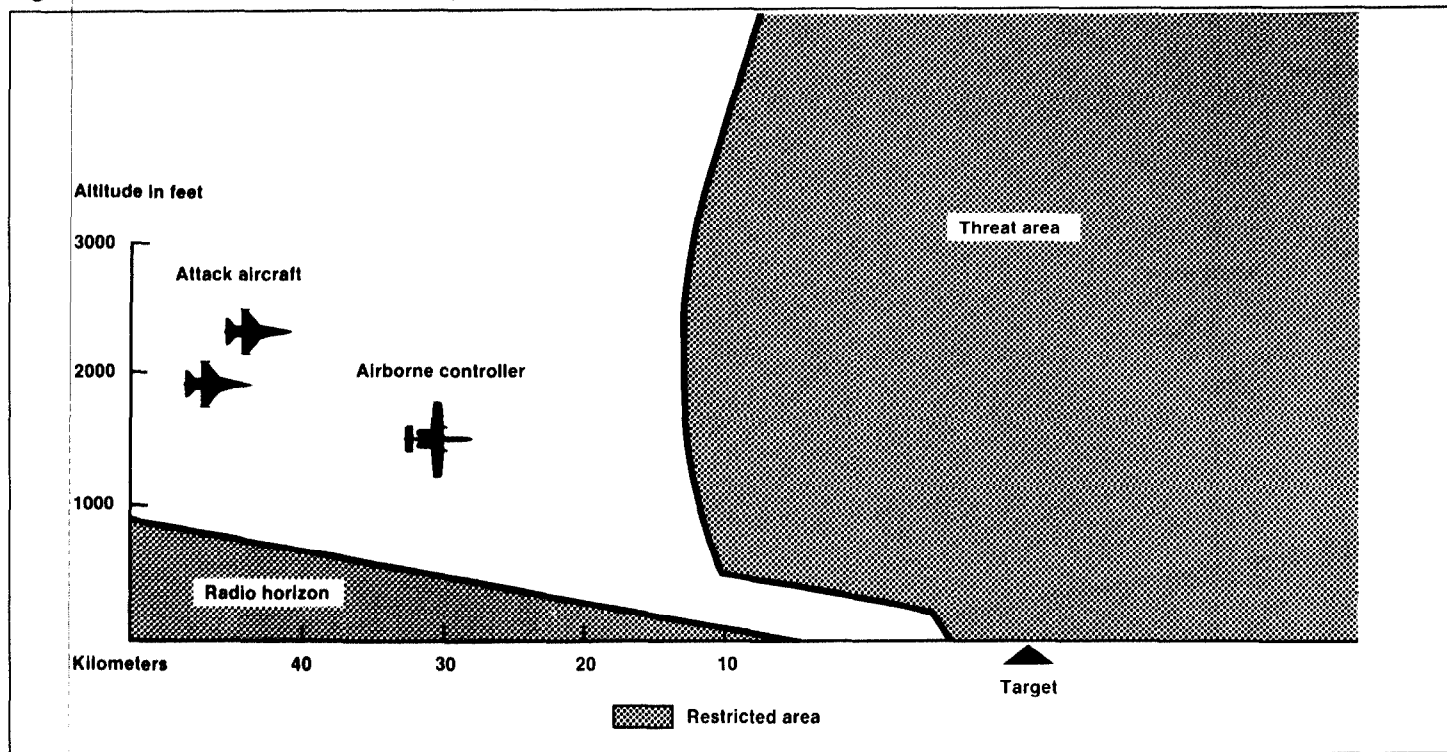


Source: Air Force report

### Moderate-Threat Environments

The Air Force report projected that the safe operating area of its airborne controllers would be restricted in moderate-threat environments and that the area will be even more restricted by 1995. According to the Air Force, the controllers will not be able to maneuver freely over the targets; thus, their ability to identify and mark targets and communicate that information to attack aircraft would be reduced. Figure 2.3 shows the Air Force's projection of the airborne controllers' safe operating area in the 1995 moderate-threat environments.

Figure 2.3: Airborne Controllers' Safe Operating Area in the 1995 Moderate-Threat Environments



Source: Air Force report

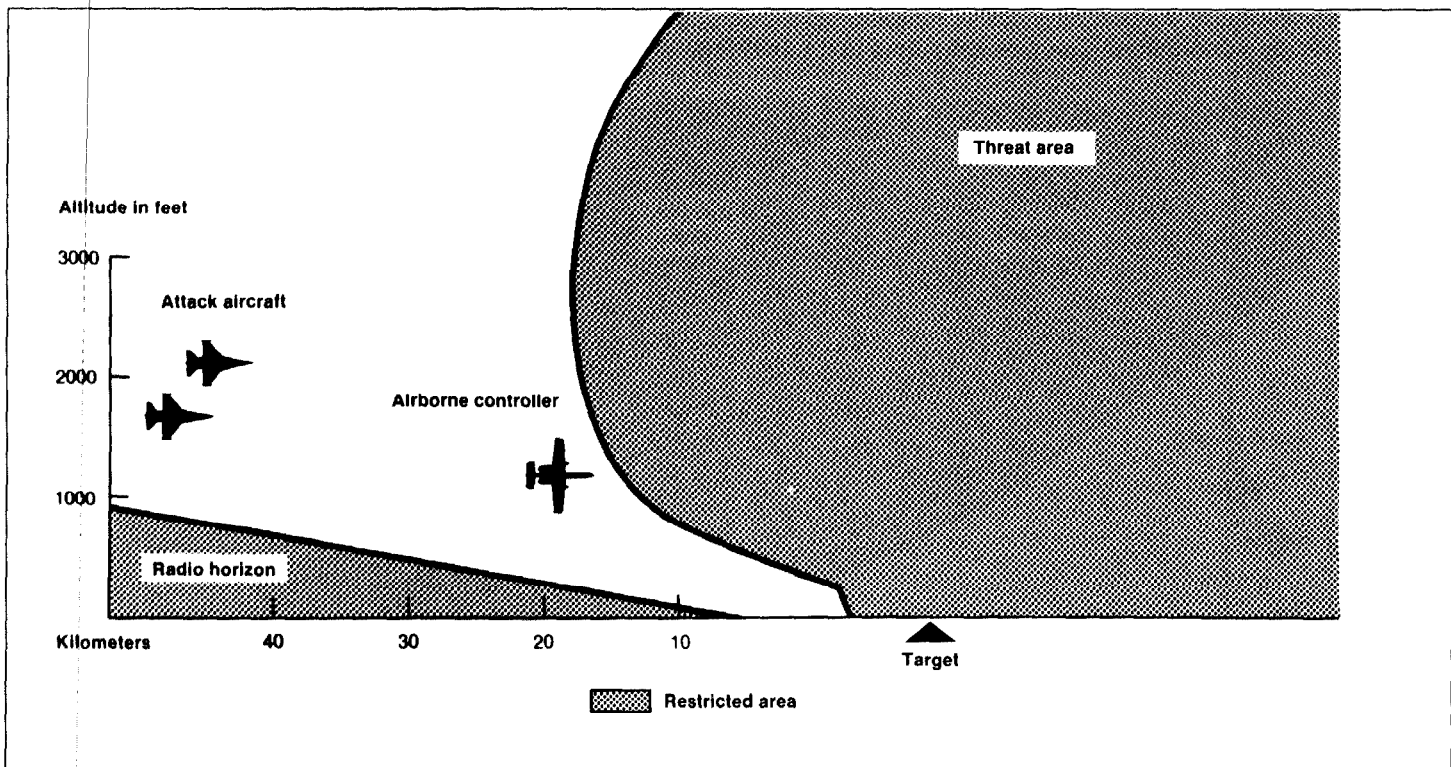
According to the Air Force report, the airborne controllers' effectiveness in accomplishing their tasks would be reduced and the ground controllers' visibility, mobility, and communications ability would be limited. Therefore, the airborne and ground controllers' ability to identify and mark targets and communicate targeting information to attack aircraft would be degraded. Despite these limitations, the Air Force considers the controllers key to the successful accomplishment of close air support missions.

The ground controllers could use Army helicopters and armored vehicles, if available, to overcome visibility and mobility problems. The Air Force also expects that the ground controllers will need assistance from Army fire control personnel to identify and mark targets. These personnel, which provide targeting information to Army artillery, could also provide emergency control of close air support aircraft.

## High-Threat Environments

According to the Air Force report, the airborne and ground controllers' current capabilities are expected to be severely limited in sustained high-threat areas. The airborne controllers would be forced to fly lower and further from the targets to survive. Because of these restrictions, the Air Force expects that airborne controllers will basically be used to relay information between ground and air forces. Figure 2.4 shows the Air Force's projection of the airborne controllers' safe operating area in current high-threat environments.

Figure 2.4: Airborne Controllers' Safe Operating Area in Current High-Threat Environments

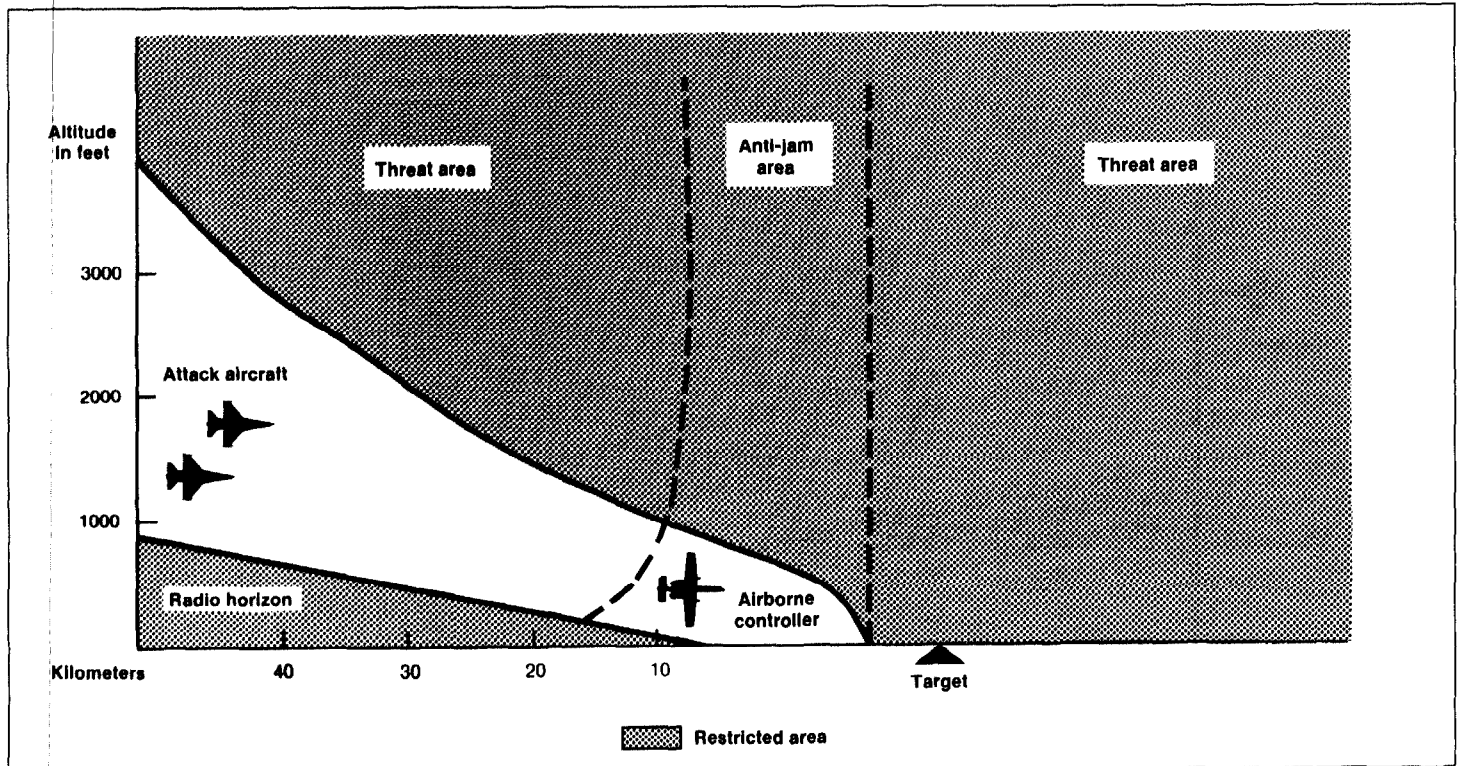


Source: Air Force report

The Air Force report projected that the airborne controllers will have to fly lower and further from the targets to be safe from enemy air defenses by 1995. Moreover, sophisticated jammers will make it difficult for the airborne controllers to communicate with ground controllers who will have assumed responsibility for most basic forward air control tasks. The report stated that jamming can be overcome by having the

airborne controllers fly close to the ground controllers to receive information and then fly to a prearranged contact point to convey that information to fighter aircraft. According to Tactical Air Command officials, when both the airborne controllers and attack aircraft have Automatic Target Handoff Systems, the airborne controllers would receive targeting data from ground controllers and have that data displayed in the cockpits of the aircraft. The airborne controllers would then reenter the data for transmission to the attack aircraft. Figure 2.5 shows the Air Force's projection of the airborne controllers' safe operating area in the 1995 high-threat environment.

Figure 2.5: Airborne Controllers' Safe Operating Area in the 1995 High-Threat Environments



Source: Air Force report

According to the Air Force report, ground controllers will be responsible for identifying targets, communicating accurate information on the targets to attack aircraft, and controlling attack aircraft during their final approach to the target. However, intense threats to ground controllers (including air-to-surface weapons, artillery, chemical weapons, and

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small arms fire) and the controllers' limited visibility, mobility, and communications will moderately restrict their ability to perform these tasks. Consequently, according to joint Army and Air Force guidance, the ground controllers may need to use available assets such as Army helicopters, vehicles, and fire control personnel to perform their tasks.



# Force Structure and Cost Implications

As of October 1989, the Air Force had 145 combat forward air control aircraft in its fleet. It plans to have 163 aircraft in its fleet by the mid-1990s and use most of these aircraft in a central European conflict, which is generally classified as high threat.

The Air Force is renovating its OV-10s to extend their useful life until the aircraft can be replaced. It plans to make an annual reassessment of its need to continue renovating the aircraft. The Air Force also plans to modify 385 A-10s and OA-10s to improve their flight safety and targeting systems and 498 aircraft to improve their navigation systems. The estimated cost of the modifications is about \$172 million. Additionally, the Air Force has begun testing several modifications to improve the A-10's and OA-10's communications, navigation, and targeting.

## Force Structure Changes

As of October 1989, the Air Force had 145 forward air control aircraft in its fleet: 48 OV-10s, 46 OA-37s, and 51 OA-10s. Most of these aircraft are located in the United States. According to the Air Force project manager for the fleet, the Air Force plans to continue to station most of the forward air control aircraft in the United States and deploy from there to meet overseas commitments.

The Air Force's goal is to have 153 OA-10 and 10 OA-37 forward air control aircraft by the mid-1990s. The reassignment of the remaining 102 A-10s will occur as they become available from the fighter force. According to the Air Force, the 163 aircraft will be used to support the Army's operations. Most of these aircraft will be allocated to support a European conflict, which is generally classified as high threat. Air Force officials explained that the aircraft in a high-threat conflict would be used to relay targeting information between control elements on the ground and attack aircraft.

## Cost of A-10 and OA-10 Modifications

To meet its close air support and airborne controller missions, the Air Force plans to modify 385 A-10s and OA-10s to provide the aircraft with targeting systems to improve the accuracy of munitions delivery and with autopilot and ground collision warning systems to improve flight safety. The estimated cost for these modifications, \$92.3 million, has been appropriated. The Air Force plans to buy kits and modify the aircraft during their scheduled depot maintenance. Installation of the kits is scheduled to begin in April 1990 and be completed in December 1991.

The Air Force also plans to modify 498 A-10s and OA-10s to provide the aircraft with global positioning systems, which are expected to provide

accurate information on the aircraft's position and to improve navigation. The projected cost of this modification is \$79.8 million. The Air Force received \$14.5 million for the modification for fiscal year 1990 and planned to request the remainder of the funds through fiscal year 1997. Future plans for this modification are contingent on the number of aircraft in the inventory. Modifications to the first aircraft is scheduled to begin in fiscal year 1993.

The Air Force also has a program to test several potential modifications to the A-10s and OA-10s. One planned modification, the Automatic Target Handoff System, is a communications system in the aircraft that can receive targeting information electronically from ground forces or other aircraft. Its estimated cost is about \$47,000 per aircraft. Another planned modification is the Forward Looking Infrared Radar. The Air Force is evaluating three of the radars for low-altitude day and night navigation and target detection, which could cost from \$450,000 to \$600,000 per aircraft.

The Air Force is incorporating variations of these systems in an A-10 to test their integration into the aircraft. The estimated cost of the test is about \$7 million.

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## Cost of OV-10 Modifications

The Air Force is renovating OV-10s to extend their life until they can be replaced. The Air Force estimates that the renovations will extend the aircraft's service life through 2010. The renovations, which include rewiring, corrosion protection, and replacing parts, as necessary, are being made at the Ogden, Utah, depot maintenance facility. As of October 1989, the Air Force had renovated 17 OV-10s at a cost of about \$640,000 per aircraft and had about \$6 million for fiscal year 1990 to modify nine more aircraft. The Air Force plans to make an annual reassessment of its need to renovate additional aircraft until the aircraft are replaced or the fleet is renovated.

# Conclusions

Current air defense threats would limit the airborne controllers' effectiveness in high-threat environments. The Air Force projects these threats to intensify by 1995, which would decrease the airborne controllers' effectiveness even further. Replacing current OV-10s and OA-37s with OA-10s may not provide the Air Force with measurable improvements in its forward air control capabilities in high-threat environments now or by 1995.

The Air Force's plans to upgrade the OV-10s would extend their service life through 2010 but not improve their ability to perform the airborne controllers' tasks of identifying and marking targets and communicating information on the targets' locations and battle area to the attack aircraft. The Air Force also plans to upgrade its A-10s and OA-10s to improve their communications, navigation, and targeting. Even with the more survivable and upgraded OA-10s, the airborne controllers may not be able to perform their targeting tasks in high-threat environments.

The Air Force plans to shift the responsibility for these tasks to the ground controllers and use the airborne controllers to relay targeting and battle area information between the ground control elements and attack aircraft. This information can be passed directly from the ground controllers or through other Air Force ground control elements to the attack aircraft. The Air Force considers its airborne controllers necessary to add possible battle area information for use by attack aircraft and overcome possible limitations to the ground control elements' abilities to communicate with attack aircraft.

According to the Air Force, the ground control elements' direct communications with attack aircraft could be enhanced in the future with a system that would allow an individual on the ground to transfer information electronically to an aircraft and reduce potential degradation caused by jamming. If found to be effective in operational testing, this new system would reduce the possibility of communications degradation due to jamming and the potential need for airborne controllers in high-threat areas. Thus, the Air Force would not need to renovate additional OV-10s or reassign A-10s. Although a version of the system could be available on an A-10 in September 1990 and on F-16 aircraft starting in July 1990, the Air Force does not plan to conduct operational testing until late 1991 or early 1992. We believe that operational testing could be conducted with these aircraft in mid-1990 to demonstrate improved communications from ground control elements to attack aircraft.

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## Recommendations

Because the Automatic Target and Handoff System being installed on an A-10 and F-16 aircraft could improve direct communications from the ground control elements to attack aircraft and thus make airborne controllers unnecessary in high-threat areas, we recommend that the Secretary of the Air Force

- expedite the operational testing of the system and use the results to reassess the need for airborne controllers in high-threat areas and
- make the reassessment before more funds are spent to renovate OV-10s and reassign A-10s.

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## Matter for Congressional Consideration

The Committee may wish to consider whether the Air Force's planned changes for its forward air control aircraft should proceed before alternative means of communicating between ground controllers and attack aircraft are assessed.

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## Agency Comments and Our Evaluation

The Department of Defense generally concurred with our findings. However, it partially concurred with our recommendations and did not concur with our matter for congressional consideration.

The Department stated that the airborne controllers are the only airborne element that can control fighters to the battle area, thus making them critical elements to the successful completion of close air support missions. It pointed out that airborne controllers can be used to perform search and rescue, convoy escort, and other roles depending on the situation. The Department also stated that developmental tests of the Air Force's version of the Automatic Target Handoff System will not be completed until September 1991 and operational tests will not begin until late 1991 or early 1992. The Department did not agree that the Air Force should reassess the need for air controllers in high-threat areas before more OV-10s are renovated and A-10s reassigned. It concluded that delaying the on-going programs would delay needed renovation of OV-10s and degrade the Air Force's support to the Joint Forces Commander.

The airborne controllers are to control the fighters by providing them with updated targeting and mission planning information. Since the airborne controllers in high-threat areas will be removed from the target areas, they must rely on ground control elements to provide them with

targeting and mission planning information. The ground control elements can communicate directly with the fighters with existing communications equipment and the Automatic Target Handoff System could improve direct communications between the ground and attack aircraft in high-threat jamming environments. Thus, we believe the system could obviate the need for the airborne controllers in high-threat areas.

We believe that operational testing of the Automatic Target Handoff System could be conducted much earlier using the Army's version of the system, which would not degrade the Air Force's support to the Joint Forces Commander. The data transmission capabilities of the Army's system were demonstrated on an F-16 in December 1989 and the integration of that system on an A-10 could be completed in September 1990. The Air National Guard plans to have the system installed on F-16s starting in July 1990. We believe that operational testing could be conducted with these aircraft in mid-1990 to demonstrate improved communications from ground control elements to attack aircraft.

We recognize that the airborne controllers can be used to perform other roles, depending on the threat. However, the Air Force has justified these airborne controller aircraft based on their airborne controller role, and we believe better alternatives may exist to perform the other roles.



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