THE GENERAL BOARD

United States Forces, European Theater

REPORT

ON

STUDY OF ORGANIC FIELD ARTILLERY AIR OBSERVATION

MISSION: Prepare Report and Recommendations on the Operation and Employment of Organic Field Artillery Air Observation.

The General Board was established by General Orders 128, Headquarters European Theater of Operations, US Army, dated 17 June 1945, as amended by General Orders 182, dated 7 August 1945 and General Orders 312, dated 20 November 1945, Headquarters United States Forces, European Theater, to prepare a factual analysis of the strategy, tactics, and administration employed by the United States forces in the European Theater.

US ARMY CENTER OF MILITARY HISTORY
PROPERTY OF US ARMY
AUG 04 1998
LIBRARY

File: R 370/6

Study Number 66

Property of
Office of the Chief
Military History
General Reference Branch

TABLE OF CONTENTS

SUBJECT	PAGE
Chapter 1: Tactical Operation and Control	1
Section 1 - General	1
Section 2 - Operation and Control	2
Section 3 - Primary Mission	4
Section 4 - Secondary Missions	9
Section 5 - Landing Fields and Strips	12
Section 6 - Air Observers	15
Section 7 - Organization and Equipment	18
Section 8 - Communications	21
Section 9 - Special Operations	24
Chapter 2: Technical Operations	28
Section 1 - Replacements	28
Section 2 - Combat Fatigue	29
Section 3 - Administration	31
Section 4 - Maintenance and Supply	33
Chapter 3: Conclusions and Recommendations	35
Section 1 - Conclusions	35
Section 2 - Recommendations	35
Bibliography	37

THE GENERAL BOARD
UNITED STATES FORCES, EUROPEAN THEATER
APO 408

STUDY OF ORGANIC FIELD ARTILLERY AIR OBSERVATION

Prepared by:

Brig Gen J. D. Balmer - Chief, Artillery Section

Col L. J. Compton - - - Executive, Artillery Section

Lt Col P. W. Thornton - Artillery Section

Principal Consultants:

Lt Col J. W. Keating, 019800, Commanding, Field Artillery Glider Battalion, 17th Airborne Division.

Lt Col R. M. Leich, 0258194, Artillery Air Officer, Ninth Army.

Lt Col C. L. Shepard, 021931, Artillery Air Officer, Seventh Army.

Major C. W. Lefever, 0409406, Artillery Air Officer, 12th Army Group.

Major D. L. Bristol, 0386551, Artillery Air Officer, First Army.

Major Bryce Wilson, 0364893, Artillery Air Officer, Third Army.

THE GENERAL BOARD
UNITED STATES FORCES, EUROPEAN THEATER
APO 408

CHAPTER 1

TACTICAL OPERATION AND CONTROL

SECTION 1

GENERAL

1. Purpose. The purpose of this study is to analyze the tactical operation and technical aspects of field artillery air observation as employed in the European Theater.

2. Role. The primary mission of organic field artillery air observation as stated in FM 6-150 is to supplement ground observation for field artillery by locating targets and adjusting fire. The liaison aircraft of a unit together with the personnel assigned to operate and maintain them are designated as the "Air OP".

3. Developments.

a. Late in 1941 the War Department authorized field tests to determine whether liaison type aircraft could function in the field as an elevated air observation post for field artillery units. Personnel were trained by the Field Artillery School during January 1942. Field tests began in February 1942 with one flight of ten aircraft operating with the 2d Infantry Division Artillery and one flight of ten aircraft operating with the 13th Field Artillery Brigade. Aircraft were flown by field artillery pilots and maintained by field artillery pilots and mechanics.

b. The War Department approved the results of the field tests and authorized the Field Artillery School to train personnel necessary for the operation of air OP's. The first class for pilots and mechanics started in August 1942.

c. Initially, both enlisted and officer student pilots from Army Ground Forces were secured for advanced training from volunteers who held Civil Aeronautics Authority Private or Commercial pilot's license. After this source had been exhausted, officers who volunteered for pilot training were sent to Army Air Forces Liaison Pilot Training Schools for basic flight training. Advanced pilot training was taught at the Field Artillery School to include advanced artillery flying, gunnery and air OP tactics. The Field Artillery School also trained enlisted personnel as airplane and engine mechanics.

d. Artillery air OP's first saw action during the African invasion. Combat experience gained in that theater was the basis for development of new and improved tactics.

4. Assignment.

a. Organic field artillery air OP's were provided

by T/O&E assignment which included two pilots, two liaison type aircraft and necessary maintenance personnel, vehicles, equipment, and supplies. Each field artillery headquarters echelon from the battalion to and including corps artillery was provided one such air OP section.

b. An artillery air officer was later added by T/O assignment to the artillery staff of each group, brigade, division, corps and army. The air officer advised the artillery commander on all matters pertaining to air OP's.

5. Aircraft in European Theater.[1]

a. Total field artillery aircraft operational in the European Theater on 8 May 1945 numbered 1380. This number included both the L-4 Piper Cub type and the L-5 Stinson Sentinel type.

b. Each division contained 10 organic aircraft.

c. Each corps contained 50 to 70 aircraft, depending upon the amount of field artillery present.

d. Each field army contained 200 to 300 aircraft, depending upon the amount of field artillery present.

SECTION 2

OPERATION AND CONTROL

6. Infantry Division Artillery.

a. The organic air OP's of divisional field artillery battalions usually operated from a common or base airfield. This technique resulted in centralized control of air OP operations on the division artillery level. Battalion commanders lost tactical control of their organic air OP's. Battalion requirements were accomplished by the aircraft operating on a scheduled division artillery patrol flight (paragraph 11). Air OP's were always available on request for battalion missions that could not be accomplished by a patrol aircraft. This type of operation and control of air OP's was representative of division artillery in the European Theater.*

b. Field artillery battalions attached to division artillery generally followed the division artillery procedure by pooling their air OP's with the division at its base airstrip.

*NOTE: The 100th Division Artillery reported in History of Air OP Operations that upon landing at Marseille, France, on October 20, 1944, the division decided that the Air Section should operate as one Unit or Squadron, following the suggestions of troops already in combat.[2] The Commanding General, XII Corps Artillery, stated that division airstrips were generally employed by all except two divisions which frequently decentralized to battalions.[3]

7. Armored Division Artillery.

a. The nature of armored division tactics generally precluded centralized control of air OP operations. The procedure followed was for armored field artillery air OP's to operate with their respective combat commands to provide constant air cover.

b. Extracts from a discussion of combat operations submitted by the Artillery Air Officer of the 4th Armored Division are typical of operations in armored units in fast moving situations:[4]

* * *

"Ever since this division started its rapid movements our Cubs have been used to make reconnaissance for the heads of our columns. This has proved to be one of our most important jobs. We operate on patrol on a common channel, and any unit is free to call on us direct for information. This has been especially helpful to the tanks and cavalry. On many occasions we have landed in a field next to the column and taken the Combat Commander up. He was able to weigh the situation in a matter of minutes and issue orders from the plane. This has saved us much valuable time. The pilots have all noticed an increase in the speed of our advance, either on foot or in vehicles, if a plane is near the head of the column. One of our big difficulties has been keeping the landing field up with the column. Enemy closed in behind us as soon as the tail of the column passed, making it necessary to move the field often.

"All of the above are problems peculiar to only armored divisions but I believe that reconnaissance is a job at least as important as our artillery work."

8. Airborne Division Artillery. Operation and control of artillery air OP's in airborne divisions followed the same principles employed by infantry divisions. Operations were centralized under the control of the division artillery air officer, and scheduled division patrol flights were maintained during daylight hours to provide constant observation.

9. Corps Artillery.

a. Non-divisional field artillery battalions attached to a field artillery group headquarters operated from a common or base airfield. Operations at the group level were supervised by the group artillery air officer who maintained scheduled patrol flights and coordinated additional missions required by the attached field artillery battalions. When non-divisional field artillery battalions were shifted between corps, the battalion commanders regained tactical control of their organic air OP's. Field artillery battalions operating under corps control retained tactical control of their air OP sections except during periods when scheduled corps patrol flights operated on the corps level.

b. The Artillery Air Officer, 183d Field Artillery Group, described the advantages of centralized operations as follows:

> "Experience in this headquarters has shown that grouping and close coordination among local field artillery units has resulted in a more efficient coverage on this front. Pilots have flown less hours and on a definite schedule, thus enabling the section to coordinate time and repairs. What is most important is the control of traffic along the front. On many occasions the sky along the front has become dangerously cluttered with L-4's. As many as ten Cubs have been noted flying in an area which allows no more than three."[5]

c. Operations in XIX Corps are described by extracts from letter, Headquarters XIX Corps, file 373.14, dated 23 May 1944, subject: "Tactical Employment of Organic Field Artillery Air OP".[6]

* * *

> "The following is published as a guide for employment of the Artillery Air OP by units of this command.
>
> "1. a. Ordinarily not more than one-half the airplane strength of any unit should be held in the forward areas. Spare aircraft will be stationed at rear area fields designated by the Corps or Division Artillery Commanders available for call of the respective unit commanders.
>
> "b. Whenever the situation permits, artillery aircraft of a Division or Group will be operated from a common base field. This method facilitates economical use of aircraft and personnel, and is more suitable for the proper maintenance and servicing of aircraft. In situations where the base field is too distant from the battalion command post to allow sufficient liaison between Air OP and battalion commander, a landing strip in the vicinity of the command post should be established and used for combat missions. The aircraft continuing to use the base field for maintenance.
>
> "c. The Battalion Air OP should remain under control of the battalion commander for tactical operation except under such conditions as the Division or Group Artillery Commander grouping all unit Air OP for special missions, e.g., continuous surveillance or reconnaissance patrol flights."

SECTION 3

PRIMARY MISSION

10. General. The primary mission for field artillery air OP's was the location of targets and the adjustment of artillery fire.

11. Technique Employed.[7]

a. To accomplish the primary mission, the various echelons of field artillery air OP's adopted a system of continuous dawn-to-dusk air patrols over their respective areas. Direct daylight observation into enemy territory was maintained except when weather conditions restricted visibility or when enemy aircraft were active. Such patrol missions, varying from one hour to one and one-half hours duration, provided the air observer with sufficient time to study terrain for enemy activities. The patrol technique resulted in increased efficiency for air OP's in locating targets, prevented duplication of effort, conserved personnel and equipment, and reduced the number of aircraft over forward areas.

b. An unexpected advantage developed from the dawn-to-dusk air patrols. The German artillery soon learned that when they fired they were observed by the air OP's and that immediate counterbattery fire could be expected. The result was that hostile artillery fire was reduced and sometimes completely eliminated by an air OP remaining in the area.

12. Locating Targets. Actual battle experiences reported by field artillery air OP personnel are hereby quoted:

> "Many times the enemy will not fire his artillery while we are in the air. However, when making a turn, we have noticed gun flashes and have been able to locate them. The enemy evidently believes we are blind during a turn." - 282d Field Artillery Battalion.[5]

> "It has been found that enemy artillery becomes active during the hours when daylight is just breaking and at dusk in the evening. At these times gun flashes can be seen best by air OP's. To take advantage of this, air OP's begin operations as soon as possible in the morning and stay up as long as light permits in the evening. Many counterbattery missions have been successful by use of this procedure." - Artillery Air Officer, 80th Infantry Division.[5]

> "We make it a practice to put an additional cub plane in the air just before evening twilight and keep it up until last light. Hostile batteries are spotted most easily at this time of day. The pilot's only mission is spotting and plotting the flashes. As soon as he lands he transmits the information obtained to the counterbattery intelligence section." - Division Artillery Air Officer, 28th Infantry Division.[5]

> "A form of flash warning for enemy artillery or mortar fire is being used with good results. The message originates with the forward observer,

goes by radio direct to Battalion CP, then to air OP. Message is brief and gives coordinates of point where shells are falling to nearest 500 yards and the suspected direction of the enemy battery. The air OP then has a direction in which to look, and can sometimes pick up the enemy battery before the concentration is completed." - Artillery Air Officer, 80th Infantry Division.[5]

"When patrolling cub planes were unable to detect any hostile batteries, they flew toward home at a high altitude. After flying a few miles the cubs returned at such a level that they were not silhouetted against the sky but were still able to observe. Frequently the enemy had opened fire, thinking he was not under direct air observation." - 410th Field Artillery Group.[5]

"It is becoming more difficult to pick up enemy guns by their flash; however, we have picked up some guns by their smoke rings rising behind woods and treelines on calm days. The enemy appears to be using more defilade for his artillery, requiring us to fly higher in an effort to pick them up. When flying at comparatively high altitude, it is extremely important that air OP's get flash warning of all enemy aircraft in vicinity." - Air Officer, 23th Field Artillery Battalion.[8]

"The pilots and observers have found that the Corps Artillery photo interpretation team can give them excellent aid in finding targets. After a flight in which several suspicious areas have been pin pointed the pilot and observer visit the photo interpretation team and study recent photographs of those areas. Several times enemy batteries have been located or suspected command post locations verified by this means." - 182d Field Artillery Battalion.[9]

13. Adjustment of Artillery Fire.

a. The forward observer method for adjusting field artillery fire was employed by the air OP. Sensings were expressed in yards right or left and over or short of target. Air OP's preferred smoke or white phosphorus for the first few rounds during the adjustment to prevent loss of initial rounds.

b. The 5th Infantry Division reports that most of the air OP adjustments of fire were registration and counterbattery with some adjustments being made on enemy personnel with excellent effect. This Division further reports that the approximate results of air OP operations during the month of September 1944[4] were:

Enemy guns destroyed	10
Enemy batteries located	61
Enemy batteries neutralized	50
Enemy casualties	Unknown

c. Air OP's on patrol missions operated directly with the fire direction center of the headquarters responsible for that particular patrol flight. When targets were located, the fire direction center assigned a battalion to take the target under fire and notified that battalion of the proper channel to contact the patrol aircraft. The designated battalion established communication with the air OP, and the fire mission proceeded until effect was obtained.

d. The pilot-observer who sees an enemy gun flash is the logical one to adjust fire on that target. The air OP's operating in V Corps recognized this fact and established a procedure for either division or corps artillery air OP's to adjust any field artillery battalion located in the corps zone. This procedure was covered in Operations Memorandum No 11, Headquarters V Corps Artillery, dated 3 August 1944.[10]

e. The extent to which air OP's were employed to adjust field artillery fire during combat is shown by the following table:[1]

Organization	Number of Fire Missions	Total Number of Missions Flown
First Army	16,110	62,201
Third Army	22,972	87,569
Seventh Army	13,778	43,406
Ninth Army	9,446	45,439
Fifteenth US Army	334	5,732
Total	62,640	244,397

f. The ability of air OP's to adjust fire was dependent upon visibility and the observer's range to target. When weather conditions were perfect, the depth of visual observation into enemy territory was increased by flying at higher altitudes. Reduced visibility and low clouds restricted observation from air OP's in the same manner that it restricted observation from terrestrial observation posts.

g. The adjustment of heavy artillery fire deep into hostile territory was not a satisfactory mission for air OP's. Targets could not be identified from air OP positions above friendly territory. Vulnerability to antiaircraft fire prevented air OP's from flying over hostile territory. High performance (artillery/reconnaissance) aircraft operating over the target area were employed to adjust such long range fire missions.

14. Adjustment of Mortar Fire.[1] The Commanding General, 29th Infantry Division Artillery, stated the following on adjusting mortar fire:

> "Success has been obtained in adjusting mortar fire by air observation using the L-4H type of aircraft. The air observer is assigned a target selected by the infantry. The mortars are laid and an initial round of smoke fired. At this point the air observer conducts the fire, sensing deflection in mils and the range in yards.

The procedure differs from the standard air-ground system only in transmission technique; for example, '50 right, 200 up' is the command for the mortars to fire 50 mils right of and 200 yards over the last round observed. Adjustments have been made on pillboxes, trenches, buildings, and road junctions (for night harassing fires) with excellent results. Rapid and dependable radio communication has been accomplished by placing the Artillery Liaison Officer's SCR-610 radio at the mortar position and operating it directly with the permanently installed SCR-610 radio set in the aircraft."

15. Briefing Air OP's.

a. The success of air OP missions depended to a great extent upon adequate briefing of the personnel involved. Observers were briefed with the latest S-2 information, acquainted with all known or suspected enemy activity or installations, given the location of enemy anti-aircraft emplacements, and familiarized with the latest tactical situation. Information gained by pilot-observers from previous missions was tabulated and utilized for subsequent briefings after being reported to the S-2.

b. To provide an adequate system for briefing pilot-observers who operated from a common division airfield, the 28th Division Artillery Air Section was organized with a complete staff comprising the S-1, S-2, S-3, and S-4 functions for the Air Section. The senior air observer was the S-2 officer whose duties were to gather all intelligence data, maintain an operations map, and brief personnel prior to each flight. This officer also provided maps and photos necessary for the mission.

c. The 133d Field Artillery Group adopted a system that was described by the Group Artillery Air Officer as follows:[3]

"The commanding officer of this headquarters has instituted a plan which has shown excellent results for a period of one month's operation.

"The command post tent is installed on the field, complete with stove, and is used as an immediate headquarters for pilots and observers. Inside the tent is a bulletin board on which are kept an operations map and all latest G-2 and air information data. Pilots and observers inspect the board and map before each flight and return after each flight to leave a written report of their observations.

"An operations man is kept on duty in the tent and has the job of briefing the pilots on the situation, both enemy and friendly. He keeps an overlay of the front lines, unit boundaries, and gun positions with their lateral limits of fire. All enemy information is kept on this map too. As a result, each pilot and

observer makes his flight with complete and late knowledge of the situation and can move intelligently, observe and shoot.

"The operations man keeps close liaison with Group headquarters for S-2 and S-3 information.

"I believe that this system will alleviate one of the major troubles of the air OP. Air sections are normally far removed from their OP's and personal contact for pilots and observers is too often lost. Losses in air OP's have been the result, in many cases, of ignorance of the situation. Pilots must know where the front lines are, the plan of attack, and the mission of the battalion, those sections of the front where enemy activity with small arms and AA is apt to be heaviest, and information of the enemy's capabilities in his terrain.

"Given this information, the air OP can fly with a marked degree of improved observation and safety."

SECTION 4

SECONDARY MISSIONS

16. General. Field artillery air OP's provided innumerable secondary missions for all branches of the service.

17. VI Corps Artillery Air Officer reported the following types of secondary missions:11

a. Selecting traffic routes.

b. Traffic control.

c. Selecting forward command post locations.

d. Observation of specific enemy attacks or retreats.

e. Observation of all types of bridges and roads.

f. Personnel of General Staff Sections observing front line terrain and installations.

g. Scheduled patrols along entire corps front.

h. Directing flights of fighter-bombers on close-in targets.

i. Photographic missions.

j. Adjusting naval gun fire.

18. Photographic Missions.

a. The air OP sections in artillery headquarters

of corps and divisions of First Army were issued aircraft type K-20 cameras prior to the European invasion.[12] Third, Ninth and Fifteenth US Armies were not authorized the K-20 type camera until 4 April 1945.[13] Although not authorized at the time, K-20 cameras were obtained by some field artillery air OP sections from Army Air Forces Depots or by temporary loans from Army Air Forces Liaison Squadrons.

b. The procedure followed by VI Corps Artillery is quoted from Summary of Air Observation Post Operations, 15 August 1944 - 9 May 1945.[11]

> "7. Aerial photos were taken with the K-20 aerial camera, and were then developed and printed by the air OP section, which was equipped with a photo trailer. The equipment and personnel were furnished by the Army Air Force Liaison Squadron serving Army Headquarters. This too proved successful. The air section was able to deliver the finished photo to Corps Headquarters within four to six hours from the time the photo was taken."

c. A study by Headquarters XV Corps Artillery covering the employment of air OP's on photographic missions is quoted:[14]

> "e. Were artillery air OP's used in making air photos? On three separate occasions during stabilized situations low altitude ungridded obliques were taken by Corps Artillery at the request of Division Artillery. Arrangements were made with Corps Engineer for the developing of these obliques. Field Artillery Groups also took ungridded obliques on several occasions during a stabilized situation as an additional means of target location."

d. The S-2, XIII Corps Artillery, felt that the K-20 type camera was inadequate for field artillery use because of the small size photo obtained. Quoting from Army Ground Force Report No 779:[15]

> "1. Photos. a. Field Artillery should set up to produce its own gridded obliques. Those produced by the Air Corps Tactical/Reconnaissance aircraft are not entirely satisfactory, primarily because they are flown over enemy lines. Casualty rate is high and therefore altitudes vary between 3000-4500. Altitudes must be uniform (1200-3000 feet) for grid accuracies. Obliques for the field artillery as well as the infantry can better be flown from the front lines. Equipment necessary is the L-5 or L-4H plane, and the K-22 camera. This camera produced a 9 x 9 print with a 12" focal length. They should be issued, 1 per corps artillery. Points can normally be restituted from this gridded

oblique within 100 yards. The photos are of immense value for air, forward, and static observation post observers.

"b. A second camera, the K-17 with 36" focal length, also seems most desirable for issue to field artillery. Experimentally this camera has been successfully mounted in an L-5 plane to take obliques. It can be used in two ways: (1) Take low obliques from a low altitude of front lines. Camouflage of close-in mortar, machine guns, and artillery positions will be broken down with the telescopic effect obtained. (2) Take high obliques of the distant target area for gridding. Telescopic effect gives a clear horizon and brings in distant details which an observer can see but cannot distinguish. A second run with the 36" camera, following a run with the 12" camera will give most satisfactory results for use of both field artillery and infantry. They can be flown from front lines on short straight strips of level flight without undue hazard, although protection by fighters may sometimes be essential. This cooperation is usually easy to obtain as fighter-bombers are generally in the area when observation is good."

e. The 78th Division Artillery Air OP Section used a K-20 camera to produce front line obliques for use by the infantry.

f. The Monthly Air OP Status Reports by Ninth Army lists the number of photographic missions flown per month as follows:[1]

Oct 1944 - 9	Feb 1945 - 21
Nov 1944 - 11	Mar 1945 - 15
Dec 1944 - 10	Apr 1945 - 10
Jan 1945 - 14	

19. Supply and Evacuation. Actual cases of emergency resupply and evacuation of wounded through the employment of field artillery air OP's are quoted:[16]

"Flew supplies to infantry, and evacuated wounded from positions isolated behind enemy lines (347 missions)" - Artillery Air Officer, 95th Infantry Division.

"Necessary to supply troops assaulting Fort KOENIGSMACHER (during flooding of Moselle River). Cubs dropped 5000 pounds of supplies to infantry assault battalions. Of these supplies 1500 pounds were a high explosive compound, fuzes and detonators to be used in blowing doors and pill-boxes. Rest of supplies was food, blankets, radio batteries, medical supplies, and maps with a plan of the fortress. All flights were made at housetop height over the town of BASSE HAM, about one-third of this town was in enemy hands at the time the flights were made. Two reasons made it impractical to fly higher, first, the

explosives had to be dropped from a low altitude to keep them from exploding, second, the fortress was protected by 20mm antiaircraft. We found the guns could not be depressed sufficiently to attack the ships when they were hedgehopping." - Artillery Air Officer, 90th Infantry Division.

20. Radio Relay. The air OP's were profitably employed to maintain radio contact with scattered units who were out of communication range. This was accomplished by using the air OP as an aerial radio relay station. Communication range was increased considerably by the use of such an airborne relay station.

21. Terrain Studies. Many units found it beneficial, when the situation permitted, to have infantry officers and enlisted men make an aerial reconnaissance of the area in which they were to lead night patrols. Several patrol leaders in the 29th Infantry Division stated that checking the terrain from the air afforded an opportunity for better planning of the mission and instilled greater confidence in the key personnel conducting patrols. The value of such flights are enhanced by the use of oblique photographs of the area.

22. Adjusting Naval Fire.[1] Air OP's in the VII Corps successfully adjusted Naval gunfire during the bombardment of the Cherbourg defenses. Standard artillery procedure was followed for sensing each burst. The sensings were reported by radio to a Naval Shore Party which applied naval gunnery technique to control the mission.

23. Antiflak.[1] Air OP's were successfully used to neutralize enemy flak installations during Air Force bombing attacks in the drive on Cherbourg. Air OP's flying "Antiflak" patrols were able to spot flashes from enemy antiaircraft artillery. It was then a routine matter for the air OP's to adjust artillery fire which effectively silenced those installations.

SECTION 5

LANDING FIELDS AND STRIPS

24. Selection of Airstrips. The main considerations in selecting airstrips were size of field, obstructions, and protection from hostile artillery fire. Failure to observe these factors resulted in excessive losses to aircraft. Third Army established the following policy as published in Air OP Bulletin No 5:[16]

* * *

"b. Selection of Airstrips. Unnecessary exposure to a variety of hazards through injudicious selection of airstrips has been a major contributing factor to the total of aircraft destroyed or damaged recently. Flying accidents, due in large part to inadequate or dangerous airstrips, and enemy artillery have caused losses which preclude the maximum employment of air OP's demanded by current operations. Procurement of replacement equipment is expected to be increasingly

difficult. To reduce avoidable losses the following considerations must govern the selection of airstrips.

"(1) Airstrips must be adequate. Pilots landing and taking off in overloaded aircraft in sometimes difficult flying conditions should not be confronted with a field that is either too small, too wet or muddy, unmarked with panels, obstructed by fences, trees, deep ruts or holes, laid out on a difficult slope, or one which has a constant cross-wind. It is appreciated that available fields meeting such specifications are difficult to locate but failure to improve established fields by removing obstacles and reducing other hazards cannot be condoned. Fences and trees adjacent to the strip should be removed when advisable, and holes filled in.

"(2) Air OP installations are high priority targets for enemy artillery. Loss of nineteen aircraft of Third Army units to enemy artillery or mortar fire is ample evidence of the necessity for reduction of this hazard. Defilade of the airstrips and dispersion of the aircraft must be consistent. Some losses occurred from stray rounds incidental to the shelling of other targets adjacent to the airstrip. Do not locate near bridges, towns, crossroads, or other likely targets.

"(3) A once long dormant Luftwaffe is no guarantee of freedom from air attack. The activity of the GAF is unpredictable, and recent attacks in force are possible of repetition in other areas. Standards of camouflage and concealment, and efficiency of local defense measures have long been permitted to deteriorate. A well located, properly prepared machine gun must be constantly ready for aggressive use.

"(4) Proximity to the unit command post must be of secondary importance to the requirements listed above. The consequent difficulties of communication, messing, shelter and supply which may be involved must not influence the selection of an airstrip to the extent that aircraft and personnel are in constant jeopardy. When safety exists only to the rear, then airstrips should be so located. It is not desired to restrict the aggressive employment of air OP's; however, conservation by all possible means of both pilots and aircraft has become necessary in order that the now indispensible function of the air OP's continue undiminished."

25. Terrain Limitations.

a. Much of the European countryside is broken into small plots of ground which are generally too small to serve as a satisfactory airstrip without considerable pioneer work. When such conditions occurred, the employment of engineering equipment such as bulldozers and

roadgraders was necessary.

b. Operations on muddy airstrips resulted in aircraft bogging down so that take-offs became extremely hazardous. Muddy fields could be made operational only by laying pierced steel planking or captured wire mesh of the Sommerfeld type.

26. Roads and Highways. Although preferred, roads and highways could not always be considered as suitable airstrips. European roads are narrow and bordered by such obstructions as power lines, trees, hedges, and fences. Heavy motor traffic resulted in additional hazards. Third Army reported the use of a road as follows:[16]

* * *

"The III Corps Artillery Air Section has for over a week's period used a hard surface road for an airstrip. Muddy fields have hampered our artillery air OP operations considerably during the last month. The use of a hard surfaced road for operation has proven excellent. Our planes have well camouflaged positions on the road siding and can quickly be taxied to the road strip. The use of this road has given us an all-weather strip and we have found that maintenance has almost been cut in half as we no longer have to pull wheels and clean brake drums weekly, or clean pyralin and fabric after every flight, or clean the mud from the air filter daily. Our use of the road has not tied up normal traffic operations for periods exceeding three minutes." - Artillery Air Officer, III Corps.

27. Selecting and Occupying Airstrips. The procedure for selection of new airstrips varied between organizations and was dependent upon the situation at the time of displacement. Selection would be by either the artillery air officer, one of the air observers, or designated personnel of the unit involved. Occupation of a new airstrip varied from piecemeal displacements to complete displacement by the entire air section. Some situations permitted air OP sections to continue operations from a base field after their units had displaced forward. As field artillery units moved forward, their air OP sections continued to maintain constant air observation which generally resulted in piecemeal displacements by the air OP sections. The procedure followed by the 28th Division is quoted:

* * *

"When the advance of the division requires selection of a new airstrip, I (Division Artillery Air Officer) send a jeep with an SCR-610 to the vicinity of the new division command post. I fly to the area with an observer, select a field from the air, and direct the jeep to that field by radio. The jeep crew reconnoiters the field and, if it is suitable, I land. If the field is satisfactory I send the jeep back to the division command post and have a telephone line run to the field. Leaving the jeep crew there, the

observer and I return to the old field where the observer acts as guide to move the ground crews and vehicles forward. Planes are dispatched from the old airstrip and land at the new. The SCR-610 with the jeep provides communication for the new strip until the arrival of the other equipment." - Division Artillery Air Officer, 28th Infantry Division.

28. Advanced Airstrips. Advanced or battalion airstrips were prepared as quickly as the situation permitted. These advanced fields were used for missions requiring the air OP to land near the battalion command post.

29. Other Airstrips. Division, corps, and army headquarters maintained landing strips in the vicinity of their command posts.

30. Field Installations. Installations at the base or common airstrip were generally dispersed in sections of battalion air OP's. An operations center was established which included maps, wire, and communications equipment. The operations center was established in a command post tent or in available nearby buildings. Wire was used for local communications. Messing and billeting facilities were provided for personnel. Exposed installations were camouflaged.

31. Security. Local security of the airfield against ground attack was obtained in some cases by augmentation with infantry personnel. In most cases the guard details were obtained from field artillery air OP personnel. Security against hostile air attack was obtained either by siting .50 caliber machine guns in the area or by the services of a platoon from an antiaircraft artillery automatic weapons battalion. Most division artillery airstrips were protected by such a platoon.

SECTION 6

AIR OBSERVERS

32. Necessity. Patrol flight missions were commonly used for locating targets. This type of mission required a qualified air observer. The observer's job was to locate targets and adjust artillery fire. The pilot's job was piloting the aircraft and maintaining a watch for enemy aircraft. When the same observer and pilot worked together, a team spirit which produced the best results was developed. Field artillery pilots in V Corps were not permitted to fly combat missions without an observer.[17]

33. Flight Status for Observers. In August 1944 the Theater Commander was authorized to place on flight status certain ground force personnel who participated in regular and frequent aerial flight.[18] On 12 September 1944 the Commanding General, 12th Army Group, authorized one field artillery air observer on flight status per T/O pilot.[19]

34. Source of Observers.

a. No additional personnel were authorized to provide air observers. As a result, air observers were

obtained from T/O personnel depending upon availability within the field artillery units.

b. Air observers in XV Corps were initially selected from service battery motor officers and assistant communications officers or reconnaissance officers of firing batteries. These officers became regular air observers on a fulltime basis.

c. The 78th Division Artillery did not employ regular air observers but did obtain satisfactory results by rotating the forward observers periodically to serve as air observers. The 78th Division Artillery Headquarters utilized two officers from the attached tank destroyer battalion as air observers for the air OP's of division artillery headquarters.

d. Shortage of officer personnel in field artillery units resulted in some enlisted personnel functioning as air observers. This was the case in the 100th Division Artillery, where one officer and one enlisted man were provided from each of the artillery battalions.

35. Training Requirements.

a. Efficient air observers must be highly trained for their mission. Many air observers received training prior to combat, others were trained through trial and error methods during combat.

b. The following is quoted from First Army Artillery Information Service, dated February 1944:[20]

> "Methods of training (air observers) will vary with the policies of the division artillery commanders, the time, the areas, terrain and facilities available. Only suggestions of more or less general application can be laid down. Definitely, selection of instructors should be made with the utmost care and the training program outlined by them should be worked out in the fullest possible detail to cover all phases from basic instructions to completion of the observation course by intensive aerial firing.
>
> "Certainly a brief period should be allowed for 'conditioning' flights in which the candidate will learn the maneuvers of a plane, its flight characteristics, and how physically and mentally to accustom himself thereto. These preliminary hops should gradually merge into orientation flights during which the student will learn the differences in the appearance which varying terrains present when viewed from the air. He will learn to judge distances from various altitudes and will gradually acquire the knack of tying in ground patterns as seen from the air with the map depiction of those patterns. His aerial map reading will begin to be automatic rather than studied.

"Here extensive training should be started in point identification. The observer must be taught and must learn how, speedily and accurately, to locate on a map an indicated point on the ground as well as the easier task of spotting on the ground from the air, an indicated map point. The length of time necessary to teach this will vary with each individual. Highly skilled instruction is necessary but no candidate should be considered qualified until he is thoroughly competent in this most important phase of aerial observation.

"Observation of maneuvers and emplacements of friendly troops from normal altitudes and distances will aid the development of the all-important knack of target identification. Talks by battle-trained observers and study of aerial photos, obliques in particular, will help. The student must be shown how to search an area for the usual evidences of enemy batteries and other emplacements. He must be told their tactical disposition. He should be taught to 'spot' a gun's flash and how, hastily but accurately, to pin point it on the ground as a preliminary to locating its position on a map. This he will learn is vital, because of the many times flash will be seen but once, while the gun itself is difficult, even impossible, to detect.

"When this stage of training is successfully completed, and not until then, the student will be ready to begin actual observation and conduct of fire from the air. First he should be shown burst patterns, should learn what smoke, high explosive, ricochets, and time fire look like from the air. He should learn the appearance of a normal sheaf and become accustomed to judging bursts and range deflection deviations from widely varying angles and altitudes. He will learn the difference between range bounds of 50, 100, 200, 400, and 800 yards as viewed from a plane, and should be able to fix the gun-target line on the ground and in his own mind regardless of the banks and turns he may be making. He will begin to estimate time of flight and when to indicate to his pilot the approaches desired to permit best observation.

"Once all this has been mastered the actual conduct of fire will prove simple. The very few variations from normal forward observer procedure and technique will present no difficulties to the student who, as he must, already knows how to shoot.

"In the final analysis, of course, only actual missions in combat will produce skilled and

experienced observers. Completion of a course such as has been briefly sketched will, however, develop trained officers who will readily, quickly, and smoothly assimilate battle experience.

"The artillery of any division should have a constant available pool of from six to twelve observers so trained, in addition to such pilots as may also be trained artillery officers. (Experience has shown conclusively, incidentally, that it is almost impossible for a pilot to fly a plane in combat and observe for artillery purposes at the same time, hence no reference is made to efforts which have been made to combine the two functions). Whenever possible, training should be carried out to increase this nucleus or to provide for replacements to maintain such a quota."

SECTION 7

ORGANIZATION AND EQUIPMENT

36. Personnel. The centralized type of operation at base airfields necessitated that artillery air sections function as self-sufficient units. Additional personnel was obtained from T/O strength within field artillery groups and division artillery and varied only to the extent of availability and necessity as determined by the artillery commanders. The strength of field artillery group and division artillery air sections varied from forty to sixty individuals. Additional personnel were used to perform the following functions:

a. Field artillery air observers.

b. Drivers for 1/4-ton, 4 x 4 trucks.

c. Cooks to operate unit mess at base airfield.

d. Radio operators and technicians for continuous operation and maintenance of communication equipment.

e. Guards for local security of airfield.

37. Equipment provided by unit. Field artillery groups and division artillery established unit messes for their respective air sections, necessitating that cooking and messing equipment be provided by the unit. The messing equipment was the only major item that was procured from T/E organizational equipment.

38. Equipment authorized by European Theater of Operations, United States Army. Equipment in excess of T/O&E for field artillery air OP sections was authorized by Headquarters European Theater of Operations on 2 July 1944.[21] This consisted of additional vehicles and communication equipment. The assignment to field artillery air OP sections was as follows:

	Corps Arty Hq & Hq Btry	FA Gp Hq & Hq Btry	Div Arty Hq & Hq Btry	FA Bn Armd Div	FA Bn	Armd FA Bn
Trucks: 1/4-ton, 4x4	1	1	1	1	1	1
3/4-ton, W/C	1a	1a	1a			
Trailer: 1/4-ton, cargo	1	1	1			
1-ton, cargo	1	1	1	1	1	1
Radio Set: SCR-510				1		1
SCR-608	1	1	1b			
SCR-610					1	

NOTE: a. For Air OP Section SCR-608 (or 508) radio set, required 12-volt conversion.

b. SCR-508 in Armored Division.

39. Other Equipment. From time to time the following additional items of equipment were made available by Army, Army Group or European Theater of Operations, United States Army, for issue to the air OP sections:

a. Type K-20 aerial cameras.[13] Headquarters 12th Army Group authorized the type K-20 camera for issue on the basis of one per headquarters corps and division artillery and included one developing set per corps artillery headquarters.

b. Plywood case for SCR-610.[22] A light-weight plywood case was constructed locally to reduce the weight of the SCR-610 radio installed in field artillery aircraft. The correct nomenclature was: "Stock number 2S610/C Case, light wood, for SCR-610 to be installed in FA Aircraft." Basis of issue was one per T/O&E airplane authorized the set SCR-610.

c. Radio Set, SCR-593.[23] Third Army authorized one radio set, SCR-593, for each headquarters field artillery group, corps artillery, and division artillery air OP sections. This radio set was employed to monitor antiaircraft artillery warning nets.

d. Shoulder holsters.[24] This holster was issued in lieu of holster, pistol, M1916, on the basis of one per T/O field artillery pilot and one per air observer assigned to such duty.

e. Flying clothing for air observers.[25] Field

artillery air observers were authorized the same type of flying clothing as were the pilots with exception of the summer flying suit, helmet, and winter flying shoes.

40. Air OP Conference.[26] A conference attended by Army, Army Group, and European Theater of Operations artillery air officers was held at Paris, France, 27-28 January 1945. At that time T/O&E for the artillery air sections of battalion, group, brigade, division, and corps was prepared. The report was based on combat experience of individuals in attendance and a summarization of recommendations made by senior field artillery commanders. Essential changes to T/O&E included:

a. Air Observers. Two air observers (1st Lt) were added to the air section of each field artillery battalion, field artillery group, and division artillery. One air observer was added to the air section of each field artillery brigade and corps artillery.

b. Mechanics. The grade of the senior airplane and engine mechanic of each battalion air section was changed from technician grade 3 to staff sergeant to provide a chief of section for ground personnel.

c. Radio operator-technician. Each air section was provided one technician grade 5 to operate and service radio equipment at the airstrip.

d. Cooks. Two cooks were provided for the air sections of each field artillery group, field artillery brigade, division artillery, and corps artillery.

e. Drivers. Each air section was provided one driver for the liaison pilot's 1/4-ton truck.

f. Equipment.

(1) A truck, 2-1/2 ton, long wheel base, with winch was substituted for truck, 2-1/2 ton, short wheel base.

(2) A truck, 3/4 ton, weapons carrier, with 12 volt electrical system was provided air sections of corps, division, brigades, and groups to serve as a mount for SCR-608 radio.

(3) A truck, 1/4 ton, was provided each air section for reconnaissance and transportation between airstrip and command post.

(4) A trailer, 1 ton, cargo, was added to all air sections; and a trailer, 1/4 ton, cargo, was added to the air sections of each corps, division, brigade and group.

(5) Cooking and messing equipment was provided air sections of each corps, division, brigade and group.

(6) Communication equipment was increased to

provide one SCR-593 radio set for each air section; and one SCR-603 radio set for the air sections of each corps, division, brigade, and group.

41. Field Artillery Liaison Type Aircraft. The Artillery Air Officer of First Army was sent to the Zone of the Interior in late March 1945, to coordinate liaison type aircraft requirements for the European Theater. Two types of liaison aircraft (L-4 and L-5) were then arriving in the European Theater with prospects of a third type (L-14) being shipped without combat tests. The mission resulted in the preparation by Army Ground Forces of desired military characteristics required of field artillery observation aircraft. The L-14 type of liaison aircraft was not used in the European Theater.

SECTION 3

COMMUNICATIONS

42. Air Warning Net.

a. Air OP's should receive timely warning of the approach of hostile aircraft. Warning from forward observers and static ground observation posts were generally received too late, because the hostile aircraft, operating in excess of 300 miles per hour, were not observed until they were in the locality where air OP's were operating. An air warning system capable of locating hostile aircraft before they became visible in a given area and preferably at distances in excess of ten miles was required.

b. In September 1944 the Corps Artillery Air Officer, XX Corps, secured the cooperation of local antiaircraft units to provide warnings on the approach of hostile aircraft. The system was described as follows:

* * *

"Since it was impractical to move the SCR-263 frequently, a direct telephone line was run from the airfields to the nearest gun battery command post (antiaircraft artillery). As the majority of planes operating over the area are friendly, and cannot be identified as such, since they rarely use Identification Friend or Foe, the field artillery thought that they would be 'Scrambling' frequently and unnecessarily if they were given warning of these unidentified planes. Therefore, the field artillery preferred warning only on definitely hostile planes.

"This information has been provided them in the following manner. Designated SCR-268's are on daylight watch. When a 268 picks up a target, the height finder is put on this same target as soon as possible. If the target is recognized as hostile, the air OP is notified immediately by phone and there the information is relayed to all cubs

in the air over the battalion and army channels by the code word 'Scramble'. On the receipt of this warning, the Cubs seek contour level or land. The radar-height finder team is supplemented at the gun battery by personnel on watch at the director, by the battery outposts, and by the Brigade Antiaircraft Artillery Information Service.

"When Cubs are in the air from dawn-to-dark, a second 268 is tied in by phone from the battery nearest the one furnishing the air OP with information so that one radar will not be in continuous operation. This system has been worked out with the two largest air OP fields in the Corps.

"An air OP officer of a Field Artillery Brigade stated that on four occasions he knew that Cubs had 'Scrambled' before enemy aircraft had come into sight. Field artillery officers are firmly convinced that air OP's are now receiving the best possible information under the conditions prevailing. Further, the field artillery is well satisfied."

c. An SCR-593 receiver, netted in with the Antiaircraft Artillery Information Service warning system, was used by XV Corps Artillery to receive warnings of hostile aircraft.[27]

d. An air warning system was established in VI Corps by Operation Memorandum Number 27, Headquarters 35th AAA Brigade.[28] Flash messages on all aircraft flying below 1000 feet (except Cubs) that were approaching the Corps area were broadcast by the Antiaircraft Operations Room. This information was received at base airfields and relayed over the SCR-608 air OP net.

e. Third Army authorized the issue of one radio set SCR-593 to each headquarters field artillery group, corps artillery, and division artillery air OP sections.[23] Enemy aircraft warnings were received on the SCR-593 operating in the Antiaircraft Artillery Information Service net. All warnings were then rebroadcast on air OP channels.

43. Air-Ground Nets.

a. Each group, division, brigade, and corps artillery air OP section used a SCR-608 radio at the base airfield as an emergency means of communication with aircraft and for relaying warnings of approaching enemy aircraft or changing weather conditions. Fire missions were handled direct from a SCR-608 at the fire direction center to the aircraft involved.

b. Communication channels used on the SCR-610 aircraft radios generally consisted of the fire control channel of the organization's fire direction center and that of the next higher field artillery headquarters.

c. The patrol type of mission resulted in air OP's adjusting the fire of various field artillery

battalions. Headquarters V Corps Artillery established a communications system by Operations Memorandum Number 11, dated 3 August 1944,[10] which established a procedure for any air OP to adjust the fire of division or corps artillery units.

44. Special Nets. The 144th Field Artillery Group established a communication net to operate when flying "anti-flak" patrols during an Artillery/Reconnaissance aircraft mission. A '600' series radio was located near the very high frequency radio that communicates with the Artillery/Reconnaissance aircraft. Communication between the two aircraft was then as short as possible and enabled the air OP to fire with maximum speed on enemy antiaircraft batteries reported by the Artillery/Reconnaissance aircraft.

45. Ground Communications.

a. When the base airfields were located near their headquarters, wire communication proved most satisfactory. However, the base airfields were generally a considerable distance from the command post and wire communications were not dependable. The Artillery Air Officer of Seventh Army stated that airfields were so far from the headquarters that wire communication was inoperative 50 percent of the time.

b. The SCR-608 located at the base airfield was necessary in order to maintain continuous communications with the fire direction center and command post. In some situations the power and range of the SCR-193 was required.

46. Aircraft Radio.

a. The SCR-610 used in field artillery liaison aircraft proved highly satisfactory for air-to-ground communications; however, this set was too heavy for safe mounting in the L-4 type of liaison aircraft.

b. An interphone system for communication between pilot and observer while in flight was desired. The 5th Armored Field Artillery Group was able to improvise an interphone system by modifying the SCR-610 through the use of a switch to remove the voltage from the plates of the buffer and power amplifier tubes.

47. Pozit Warning System.[29]

a. Use of the proximity type fuze made necessary a warning system that would clear air OP's from those areas through which pozit fuzed projectiles were being fired. The Pozit Warning System used in XIII Corps was typical of others used in the European Theater.

b. The corps zone was divided into numbered areas designated by current overlays. Each fire direction center and each air OP pilot maintained issues of the overlays properly posted on appropriate maps. Division artillery or group headquarters transmitted over the Corps Artillery Net (SCR-193) pozit warning to include areas to be cleared.

c. Artillery air officers of all units with the

corps then notified all aircraft over the air OP (SCR-608) net to clear the danger zone during the pozit mission.

SECTION 9

SPECIAL OPERATIONS

48. Amphibious Operations. Amphibious landings in Normandy and Southern France found air OP's operations on D-Day. Three methods were employed for moving air OP's to the beachhead.

a. Aircraft were disassembled and loaded on 2-1/2 ton, 6x6 trucks for movement by landing craft to the beachhead for assembly.

(1) This method was employed in Normandy for the initial landings. Several hours were required to assemble an airplane. The 1st Infantry Division Artillery was able to place an air OP in operation during the afternoon of D-Day.

b. Movement by aircraft carrier to permit immediate operations from a flight deck.

(1) Cooperating with Seventh Army, the US Navy improvised an aircraft carrier by constructing a flight deck on a landing ship tank (LST).[30] Ten field artillery aircraft could be transported. Six aircraft were available for immediate take-off while four were carried in a partially disassembled condition. Field artillery units selected and prepared landing strips on the beachhead, inasmuch as the flight deck was usable only for the take-off. Type L-4 aircraft were then dispatched from the LST and continued operations until required to land for refueling on the beachhead. VI Corps had air OP's operational on H-Hour plus sixty minutes on D-Day.[9]

(2) Delivery of type L-4 aircraft to Southern France continued with the landing ship tank (LST) aircraft carrier operating between Corsica and France.

c. Ferry flights from friendly territory direct to improvised landing strips on the beachhead.

(1) During the Normandy Campaign, overwater ferry flights of approximately 120 miles permitted air OP's to arrive on the beachhead direct from Southern England. Extra gasoline was carried in special ferry tanks to provide added range.

(2) Fourteen type L-5 aircraft of VI Corps were ferried into Southern France from bases at Naples, Italy.[11]

49. Airborne Operations.

a. Air OP's were not used for primary missions during the first phase of an airborne operation. After a perimeter defense had been established the air OP's flew in and landed on previously prepared airstrips. This generally occurred during the second day of an airborne operations.

b. Prior to the airborne operation across the Rhine by 17th Airborne Division the air OP's flew to forward landing fields of Ninth Army. The plan was to employ the air OP's as radio relay stations above friendly territory on the west bank of the Rhine. The relay stations were to provide radio communications between the 17th Airborne Division and XVIII Airborne Corps. Because of excellent communications the air OP relay stations were not required. On the second day of this operation the air OP's flew in to a division airstrip and were then employed on patrol flights.

50. Winter Operations.

a. Freezing temperature and snow resulted in many difficult problems which considerably restricted air OP operations. Take-off accidents were numerous during winter weather.

b. Snow covered airstrips had to be cleaned or packed before aircraft could operate. Skis were used by a few air OP's in First Army, but were not available in sufficient quantities for general use.

c. Frost and snow on wings of aircraft destroyed the efficiency of the wings, and aircraft would not develop satisfactory lift until it was removed. Frost was melted from the wings by connecting a hose to the exhaust of a vehicle and directing the hot gases through inspection plates to warm the inside of the wing. Preventing the formation of frost was accomplished by improvising wing covers.

d. Moisture collecting in fuel tanks froze and choked or restricted fuel flow to the carburetor. Removal required that the fuel system be drained and warm air applied to melt the ice. Hot exhaust gases from a vehicle's exhaust provided a field expedient method. Preventive measures were thorough straining of gasoline and prompt refilling of fuel tanks after each flight.

51. Night Flying.

a. Monthly air OP operations and status reports of First, Third, Ninth, and Fifteenth US Armies indicates that a total of only 38 night combat missions were flown.

b. Third Army did not favor night operation of air OP's. This policy was published in air OP Bulletin No 4, dated 22 November 1944.[5]

* * *

"b. Night flying: Night operations of air

OP's is not favored by this headquarters for the following reasons:

"(1) Involved coordination is necessary with both night fighters and anti-aircraft artillery units and identification procedure of these units would be disrupted by night flying L-4's.

"(2) Extensive preparations and special facilities are necessary.

"(3) Weather during the winter months will rarely approach the perfect conditions necessary.

"(4) Hazard to pilots and observers not trained for night flying is not justified by operational necessity."

c. Seventh Army reported that 241 night combat missions were flown during the month of April 1945.[1] These missions totaled 210 hours.

d. Night missions in VI Corps were cleared through the VI Corps Artillery Air Officer who then notified the 35th AAA Brigade and Forward Sector Operations No 1 of the 64th Fighter Wing.[31]

e. Experiments conducted by 13th Field Artillery Brigade in night combat operations of air OP's indicated that active enemy batteries could be located and fire adjusted rapidly and accurately. A report of the experiment was published as Operations Information Bulletin Number 1, dated 31 January 1944.[32]

52. Special Devices.

a. The Brodie Device, pontoons for L-4 and L-5 aircraft, and Army Air Force wire dispensers for L-5 aircraft were not available in the European Theater for use during combat.

b. Six rocket launchers of the "Bazooka" type were mounted, three on each wing, on an L-4 aircraft of the 4th Armored Division. Several enemy tanks were knocked out by this weapon.

53. Staging, Equipping, and Dispatching Air Sections.

a. Both organic and replacement field artillery aircraft were initially assembled in the United Kingdom by the Army Air Forces. Organic aircraft were then assigned to field artillery units as they became available. Replacement aircraft for combat units on the Continent were ferried across the channel by Air Force Personnel.

b. Field artillery units staged in the United Kingdom moved their air OP sections to the European Continent by ferry flights across the Channel. Additional gasoline tanks were installed on the aircraft to provide increased ferrying range. The flights across the Channel were supervised by the British Royal Air Force which

employed a Walrus type flying boat to guide the flights to a point on the Continent. Final destination was airfield B-61C at Rouen, France.

c. After the Port of LeHavre, France, became operational, replacement aircraft arrived on the Continent direct from the Zone of the Interior. These crated aircraft were transported to a designated Army Air Force Depot Group for assembly and assignment to Ground Force units.

d. Organic aircraft of field artillery units arriving on the Continent from the Zone of the Interior were to have been assembled by the same Air Depot Group that assembled the replacement aircraft. Actually this method was never placed in operation because of two factors:

(1) The 45th Air Depot Group which was given the mission of assembling liaison type aircraft was moved from the vicinity of Paris, France, to the vicinity of Charleroi, Belgium (vJ6712). Some forty crated aircraft accumulated at LeHavre, France, because of transportation difficulties.

(2) Assembly of liaison aircraft was a low priority mission compared with depot work on high performance aircraft.

e. Assembly of liaison aircraft was then established at Rouen, France, on airstrip B-61C by employing a detachment from 27th Mobile Reclamation and Repair Squadron operating under the supervision of the Air OP Section, Headquarters 61st Field Artillery Brigade.

(1) Assembled aircraft were assigned to field artillery units on a priority basis.

(2) Requisitions for Air Force equipment shortages were processed to the proper Air Depot Groups.

f. Responsibility for the assembly of liaison aircraft was later assumed by Aircraft Assembly Branch, Central Air Depot Area, Army Air Forces.

g. When field artillery units moved from the staging area, their air OP sections were dispatched from Rouen, France. Destinations were airfields in the vicinity of the army headquarters to which assigned. Prior to departure from Rouen, France, pilots were briefed on route to be flown, refueling stops enroute, how to contact the Army Artillery Air Officer, and were given necessary maps. The various Army Artillery Air Officers then issued further instructions that returned the air OP sections to their unit.

CHAPTER 2

TECHNICAL OPERATIONS

SECTION 1

REPLACEMENTS

54. Reinforcement Pilots.

a. The type of flying expected of a field artillery pilot required constant application of flight technique in order to maintain proficiency. Reinforcement field artillery pilots arriving in the European Theater had not flown for several months. These pilots required refresher flying before assignment to a combat unit.

b. Ground Force Reinforcement Depots were not equipped to provide pilot training.

c. Shipments of reinforcement pilots received in the European Theater were allocated to army groups on a basis of their requirements.

d. The reinforcement pilots were then assigned to each field army on a basis of their requirements.

e. A pilots' pool was maintained by each field army to provide a refresher type of flight training. Type missions flown consisted of training, courier, liaison, ferry, and supply. This system permitted new pilots to become familiar with terrain conditions in rear areas and better indoctrinated for combat.

f. Reinforcement pilots from the army pool were available for assignment to field artillery units or for attachment to corps artillery as an overstrength to be assigned as vacancies developed. Pilot vacancies were filled in a matter of hours.

g. Sufficient reinforcement pilots to provide a 10% overstrength in units were never available.

55. Pilot Losses.[33] Total pilot losses for the European Theater were not available at time of this report. Pilot losses in Third Army were tabulated and classified for the period 1 August 1944 - 8 May 1945. These figures are representative of losses occurring in a field army.

	Combat Casualties	Operational Accidents	Non-Flying Losses	TOTAL
Killed	18	7	1	26
Missing	12	0	0	12
Evacuated	26	10	30	66
TOTAL	56 53.8%	17 16.3%	31 29.9%	104 100%
Pilot losses per thousand hours of operation 1.11				

56. Mechanics. Reinforcement field artillery airplane and engine mechanics were utilized by the armies in essentially the same manner as were the pilots. The principle was to utilize reinforcement personnel wherever possible further to improve their technical qualifications. Mechanics were either attached to corps artillery as an overstrength for assignment when vacancies developed or held in an army pool where they maintained army reserve aircraft until assigned.

57. Replacement Aircraft.

a. Each field army maintained a replacement aircraft pool with its Army Air Force maintenance unit. Army Air Force ferry pilots delivered to army pools new aircraft from theater reserve as they were required.

b. Field artillery units obtained replacement aircraft from the army pool upon request to the Army Artillery Air Officer.

c. Assignment was accomplished by verbal orders and confirmed by Aircraft Assignment Orders which listed aircraft by serial number and organization.

58. Aircraft Losses.[33] Complete loss figures for the European Theater were not available at time of this report, but the tabulation of aircraft losses in Third Army for the period 1 August 1944 - 8 May 1945, listed below, is a fair indication of the losses sustained throughout the theater.

Disposition of Aircraft	Pilot error accidents	Other operational accidents	Combat losses	Total
Repaired for unit	52	21	31	104
Repaired for pool	65	23	20	108
Salvaged by MR&R Sq.	38	13	19	70
Destroyed	23	4	48	75
Total	178 49.89%	61 17.19%	118 33.1%	357 100%
Average loss per thousand hours of operation:				3.79
Salvaged or destroyed per thousand hours of operation:				1.54

SECTION 2

COMBAT FATIGUE

59. General.

a. Yearly examinations for flying (WDAGO Form No 64) were required of all field artillery pilots in

accordance with War Department Circular No 250, dated 19 June 1944. The flight physical examination could be obtained only from flight surgeons of certain Army Air Force installations which were not generally located convenient to ground force units. During early phases of combat the yearly physical examination for flying was generally overlooked.

b. A survey on the status of pilots' physical examinations was conducted by Third Army in November 1944.[1] Incomplete results of the survey (on 179 out of 224 pilots reporting) showed the following:

Last physical examination in 1942 --- 9
Last physical examination in 1943 --- 94
Last physical examination in 1944 --- 76

60. Study by Seventh Army.[34]

a. The Artillery Air Officer of Seventh Army arranged for pilots to secure flight physical examinations from the Surgeon, Headquarters, First Tactical Air Force (Prov).

b. Prior to 23 December 1944, 118 field artillery pilots had been given physical and psychological examinations.

(1) Sixty-four (64) pilots showed no fatigue.

(2) Thirty-two (32) pilots showed slight fatigue.

(3) Fourteen (14) pilots showed moderate fatigue.

(4) Eight (8) pilots showed severe fatigue.

61. Fatigue Classification.

a. "No Fatigue. This item is self-explanatory.

b. "Slight Fatigue. This term denotes that state of fatigue characterized by a slight diminution of enthusiasm, apathy, a slight increase in irritability and a minor degree of retardation of physical and mental acuteness. Cases coming within this category can be handled by periods of rest and recreation of relatively short duration (regular leave scheme, or regular and planned periods at a rest center).

c. "Moderate Fatigue. This describes those individuals who exhibit loss of enthusiasm, nervousness, insomnia, and the beginning functional symptoms of emotional illness. Such cases require more careful handling, but respond well to more prolonged periods of rest and rehabilitation and relief from combat flying until rehabilitated.

d. "Severe Fatigue. This term is used to describe the typical picture of advanced operational exhaustion and is an exaggeration of the previous category. The pilot shows loss of confidence and fear symptoms. There is a development of hypochondriacal, and asocial tendencies. The loss of efficiency is marked. These cases are usually not rehabilitable for combat flying, although removal from combat flying and a period of rest will usually restore the pilot to useful work in a non-operational capacity."

62. Rehabilitation policy for field artillery pilots.[35] Circular 40, Headquarters, European Theater of Operations, dated 12 April 1944, established the policy for rehabilitation of field artillery pilots. This circular provides for:

a. Hospitalization for pilots adjudged to have "severe fatigue."

b. Relief from combat flying of pilots adjudged to have "moderate fatigue" for appropriate periods of rest in army or theater rest centers.

c. Not to exceed 10% of T/O pilot strength on temporary duty at army rest camps for brief periods. This group includes those adjudged to have "slight fatigue."

63. Operation of Air OP Rest Centers.

a. To reduce combat fatigue among field artillery pilots Seventh Army established an Air OP Rest Camp at Grenoble, France, on 11 December 1944. Each corps and the 13th Field Artillery Brigade were authorized a quota not to exceed 10% of the total strength of field artillery pilots and air observers each week for one weeks rest and recreation. The operation of the Air OP Rest Camp contributed materially toward reducing operational accidents.

b. First Army operated an Air OP Rest Center at Liege, Belgium.

c. Third Army operated an Air OP Rest Center at Esch, Luxembourg.

d. Ninth Army operated an Air OP Rest Center at Maastricht, Holland.

SECTION 3

ADMINISTRATION

64. Air OP Technical Channels.[36]

a. The procedure for handling all air OP technical matters was prescribed by paragraph 32; Section VII, Administrative Standing Operation Procedure, dated 18 October 1944, Headquarters 12th Army Group, which

stated that technical air OP matters would be handled directly through artillery air OP channels.

b. Air OP technical channels were established between the artillery air officers of each successive field artillery echelon including:

(1) Headquarters European Theater of Operations.

(2) Army Groups.

(3) Armies.

(4) Corps Artillery.

(5) Division artillery, field artillery brigade, and field artillery groups.

c. Field artillery technical matters were considered as all subjects peculiar to or related to field artillery air OP operations.

d. The field artillery air officer of each headquarters involved supervised all air OP activities of the command. These activities combined the duties of a special staff section as applied to all air OP's operating under the headquarters of each field artillery echelon.

65. Forms, Records, and Reports. In addition to army air force forms and records prescribed in FM 6-150, records and reports were required of field artillery units to provide operational data.

a. Air OP Loss Report.[22] This report was submitted to army and was the basis for field artillery units to replace pilot and aircraft losses. Data contained in this report were used to compile statistics classifying aircraft accidents.

b. Monthly Air OP Operations and Status Report.[22] This report was submitted to army headquarters by all field artillery units assigned air OP sections. It included a summary of air OP operations by hours flown, number and type of missions and status of aircraft, personnel, maintenance, and supply. The report from subordinate units was consolidated by army headquarters and forwarded to Headquarters, European Theater of Operations.

c. Location of Airstrips. Each time a field artillery airstrip was moved, the coordinates of the new location were transmitted to corps artillery and army.

66. Squadron Code Markings.[37] Field artillery aircraft were assigned two digit numbers known as squadron code markings. The artillery section of each army group; army, corps artillery, field artillery brigade, infantry, armored and airborne division was assigned separate numbers as its squadron code marking. Each aircraft was then assigned an alphabetical letter as an individual aircraft marking. For example, the 1st Infantry Division Artillery

was assigned the number "34" as a squadron code marking which identified the division. Each of the 10 artillery aircraft was then given a letter (from A to include J), known as the individual aircraft marking letter, which identified each aircraft in the division. The code markings proved invaluable as a means for identifying the various aircraft operating in forward areas.

SECTION 4

MAINTENANCE AND SUPPLY

67. Source.

a. Higher echelon maintenance of aircraft and the supply of air force technical equipment for field artillery units was the responsibility of the Commanding General, United States Strategic and Tactical Air Force. This responsibility was delegated to Commanding General, Ninth Air Force, who further delegated the responsibility to Commanding General, IX Air Force Service Command.[38]

b. The IX Air Force Service Command provided each army headquarters with a Mobile Reclamation and Repair Squadron (T/O&E 1-8593-(8)) to service and supply all liaison type aircraft operating with a field army. The Air Force chain of command was from Headquarters IX Air Force Service Command to an Army Air Force Depot Group to the Mobile Reclamation and Repair Squadron. Active liaison by the Army Artillery Air Officer was necessary between the various Army Air Force agencies to coordinate ground force requirements.

c. Seventh Army arrived in the European Theater with the 4th Depot Unit, Army (T/O&E 1-407), as the agency for servicing and supplying liaison aircraft. This unit was attached to Headquarters Seventh Army for operations only.

68. Maintenance. All first and second echelon maintenance of aircraft was accomplished in the field by field artillery airplane and engine mechanics. All other maintenance that could not be accomplished expeditiously in the field was performed by the Mobile Reclamation and and Repair Squadrons. Aircraft requiring major repairs were transferred from field artillery units to the Mobile Reclamation and Repair Squadron. A replacement aircraft from the Army pool was then issued. Damaged aircraft were either salvaged or made serviceable and placed in the army pool for further assignment.

69. Supply. A thirty-day level of Army Air Force Technical Supplies was authorized to be maintained at the Mobile Reclamation and Repair Squadrons. Theater shortages and unbalanced stock distribution resulted in the following items becoming critical:

a. Propellers.

b. Landing gear assemblies.

c. Wing panels.

d. Maintenance equipment. This item became so critical that replacement of battle losses was difficult.

70. Thirty-Day Level.[39] Seventh Army based a thirty-day level of aircraft supplies on consumpiton figures developed by combat experience in Africa, Sicily, and Italy. The use of consumption figures as a basis for maintaining supply levels resulted in shortages being reduced to the very minimum for Seventh Army units.

71. Requisitions. All requisitions for Army Air Force Equipment were prepared on WD AAF Form No 102 by the Artillery Air Officer for air OP's operating with his headquarters. Field artillery battalions operating separately prepared their own requisitions. All requisitions were required to go directly to the Army Artillery Air Officer for approval prior to issue by the Mobile Reclamation and Repair Squadron. Expendable items were drawn direct from the Mobile Reclamation and Repair Squadron by executing a Stores Charge receipt (WD AAF Form 81).

72. Crash Pickup. A crash pickup service was provided by the Mobile Reclamation and Repair Squadrons to return damaged aircraft for repair or salvage.

73. Employment. Mobile Reclamation and Repair Squadrons were employed in the forward area of an army so as to be centrally located with respect to the various corps. Wide frontages necessitated that two echelons of the Mobile Reclamation and Repair Squadron be used in order to service the various corps over the army front.

74. Gasoline and Oil. The use of 80 octane general purpose fuel resulted in an increased number of forced landings due to engine failures caused by sticky valves and piston rings and shorting of spark plug electrodes by a build-up of lead deposits. Engine overhauls were reduced from 200-300 hours of operation to only 25 hours operation. This produced a maintenance burden on all mechanics. In March 1945 73 octane aviation grade gasoline became available. Considerable improvement was immediately noticed in operation of liaison aircraft. Disapproval of general purpose fuel by all pilots was universal throughout the European Theater. The supply of 1080 grade aviation engine oil was generally satisfactory.

75. Distribution of gasoline.

a. Aviation grade 73 octane gasoline was distributed through Quartermaster petroleum, oil, and lubricant dumps. Army artillery air officers prepared monthly estimates covering 90-day periods to be used for planning purposes by the Quartermaster.

b. Until adequate reserves were built up, Seventh Army rationed 73 octane gasoline on the basis of one barrel of gasoline per L-4 aircraft per week and two barrels of gasoline per L-5 aircraft per week.[40]

76. Plexiglas Inclosures. The transparent inclosures supplied on the type L-4 aircraft quickly became distorted and discolored because of effects of varying weather conditions. The reduction of visibility considerably

restricted observation. The IX Air Force Service Command constructed kits of moulded Plexiglas to replace the original transparent inclosures. The Plexiglas kits were installed on all field artillery aircraft by the various Mobile Reclamation and Repair Squadrons. These modifications, accomplished during combat, permitted clear and unrestricted observation from air OP's.

CHAPTER 3

CONCLUSIONS AND RECOMMENDATIONS

SECTION 1

CONCLUSIONS

77. Employment.

a. That the system of dawn-to-dusk air patrols provided the field artillery with continuous daylight air observation during flyable weather.

b. That the centralized control exercised over air OP sections was sufficiently flexible to provide liaison aircraft for missions required by battalions.

c. That centralized operation from base airfields resulted in improved aircraft maintenance, economy of operation for both personnel and equipment, continuous surveillance, and improved airfields.

78. Organization and Equipment.

a. That the assignment of several types and models of field artillery aircraft resulted in complicated supply and maintenance problems which did not increase the capabilities of air OP's.

b. That the SCR-610 type radio provided efficient communications, but was too heavy for use in the L-4 type aircraft.

c. That two liaison type aircraft provided adequate air observation for the headquarters of each field artillery organization.

d. That personnel and equipment authorized air OP sections by T/O&E was insufficient to permit independent operations at base airfields.

e. That photographic missions were limited by lack of equipment and trained personnel.

f. That air observers were provided by field artillery organizations on the basis of one observer for each liaison aircraft authorized by T/O&E.

SECTION 2

RECOMMENDATIONS

79. Employment. That tactical doctrine provide for

both centralized and decentralized employment of field artillery air OP's.

80. Organization and Equipment.

a. That air observers be assigned by T/O&E on the basis of one per liaison type aircraft.

b. That the artillery air OP organization be revised to include additional personnel and equipment to permit either centralized operation from a base airfield at division or group level or decentralized operations at battalion level.

c. That an improved, standard type aircraft be developed for field artillery.

d. That a lighter weight aircraft radio be developed capable of netting with standard field artillery radio equipment.

e. That aerial type cameras capable of producing sharp, clear obliques be included in appropriate Tables of Equipment.

f. That no change be made in assignment of liaison aircraft to field artillery units.

Bibliography

1. Monthly Air OP Operation and Status Reports, file 370/6, Artillery Section, Theater General Board.

2. Letter, Headquarters 100th Infantry Division Artillery, subject: "History of Air OP Operations", dated 24 October 1945, file 370/6, Artillery Section, Theater General Board.

3. Report, subject: "XII Corps Artillery in Combat", file 370.2, Artillery Section, Theater General Board.

4. Air OP Bulletin Number 3, Headquarters Third Army, dated 18 October 1944, file 370/6, Artillery Section, Theater General Board.

5. Air OP Bulletin Number 4, Headquarters Third Army, dated 22 November 1944, file 370/6, Artillery Section, Theater General Board.

6. Letter, Headquarters XIX Corps, subject: "Tactical Employment of Organic Field Artillery Air OP", dated 23 May 1944, file 370/6, Artillery Section, Theater General Board.

7. Memorandum, Office of the Artillery Officer, Headquarters Seventh Army, dated 31 October 1944, file 370/6, Artillery Section, Theater General Board.

8. Air OP Bulletin Number 6, Headquarters Third Army, file 370/6, Artillery Section, Theater General Board.

9. Artillery Information Letter Number 5, Headquarters Seventh Army, file 370/6, Artillery Section, Theater General Board.

10. Operations Memorandum Number 11, Headquarters V Corps Artillery, file 370/6, Artillery Section, Theater General Board.

11. Letter, Headquarters VI Corps Artillery, subject: "Summary of AOP Operations, 15 August 1944 - 9 May 1945", file 370/6, Artillery Section, Theater General Board.

12. Letter, Headquarters 12th Army Group, subject: "Photographic Equipment for Field Artillery Units", dated 8 December 1944, file 370/6, Artillery Section, Theater General Board.

13. Letter, Headquarters 12th Army Group, subject: "Photographic Equipment for Field Artillery Units", dated 4 April 1945, file 370/6, Artillery Section, Theater General Board.

14. Study by XV Corps Artillery for Gunnery Branch, file 337, Artillery Section, Theater General Board.

15. Army Ground Force Report Number 779, subject: "Field Artillery Matters", dated 31 March 1945, file 370/6, Artillery Section, Theater General Board.

16. Air OP Bulletin Number 5, Headquarters Third Army, file 370/6, Artillery Section, Theater General Board.

17. Artillery Air OP Bulletin Number 1, Headquarters V Corps Artillery, dated 1 July 1944, file 370/6, Artillery Section, Theater General Board.

18. Letter, War Department, subject: "Orders Requiring Participation in Aerial Flights, dated 5 August 1943, file 370/6, Artillery Section, Theater General Board.

19. Letter, Headquarters 12th Army Group, subject: "Orders Requiring Participation in Aerial Flights", dated 12 September 1944, file 370/6, Artillery Section, Theater General Board.

20. Air OP Bulletin Number 2, Headquarters Third Army, dated 20 May 1944, file 370/6, Artillery Section, Theater General Board.

21. First indorsement, Headquarters European Theater of Operations, United States Army, to letter, Headquarters 1st US Army Group, subject: "Equipment in Excess of T/O&E for Field Artillery and Tank Destroyer Units", dated 29 May 1944, file 370/6, Artillery Section, Theater General Board.

22. Field Artillery Air OP Memorandum Number 1 - General Information, Headquarters Fifteenth US Army, dated 3 February 1945, file 370/6, Artillery Section, Theater General Board.

23. Section II, Circular Number 5, Headquarters Third Army, dated 20 January 1945.

24. Letter, Headquarters European Theater of Operations, United States Army, file 400.34 OP Ord, dated 1 February 1945, subject: "Authorization of Holster, pistol Cal .45, M3 (shoulder, leather) for Field Artillery Liaison Pilots and Observers".

25. Letter, Headquarters 12th Army Group, subject: "Flying Clothing for Field Artillery Personnel", dated 21 November 1944, file 370/6, Artillery Section, Theater General Board.

26. Letter, Headquarters 12th Army Group, subject: "Notes on Air OP Conference", dated 1 February 1945, file 370/6, Artillery Section, Theater General Board.

27. AGF Report Number 1077 - Organization and Operation of XV Corps Artillery.

28. Operations Memorandum Number 27, Headquarters 35th AAA Brigade, dated 16 July 1944, file 370/6, Artillery Section, Theater General Board.

29. Letter of Instruction Number 26, Headquarters XIII Corps, dated 8 February 1945, file 370/6, Artillery Section, Theater General Board.

30. Photographs of LST Aircraft Carrier, file 370/6, Artillery Section, Theater General Board.

31. Letter, Headquarters VI Corps Artillery, subject: "AOP Night Flying", dated 5 March 1945, file 370/6, Artillery Section, Theater General Board.

32. Operation Information Bulletin Number 1, Headquarters 13th Field Artillery Brigade, dated 31 January 1944, file 370/6, Artillery Section, Theater General Board.

33. Report, Third Army Artillery Air OP Operations for period 1 August 1944 - 8 May 1945, file 370/6, Artillery Section, Theater General Board.

34. Letter, Headquarters Seventh Army, subject: "Rehabilitation Policy for Field Artillery Pilots", dated 31 December 1944, file 370/6, Artillery Section, Theater General Board.

35. Section I, Circular 40, Headquarters European Theater of Operations, dated 12 April 1945, file 370/6, Artillery Section, Theater General Board.

36. Paragraph 32, Section VII, C-17, dated 21 May 1945, to Administrative Standing Operation Procedure (short title: ADSOP), dated 18 October 1944, Headquarters 12th Army Group.

37. Letter, Headquarters European Theater of Operations, subject: "Squadron Code Markings for Field Artillery Aircraft", dated 5 February 1945, file 370/6, Artillery Section, Theater General Board.

38. Letter, Headquarters European Theater of Operations, subject: "Supply of Air Force Technical Equipment and Supplies to Field Forces, European Theater of Operations, United States Army", dated 24 March 1944, file 370/6, Artillery Section, Theater General Board.

39. Stock List, 30 Day Level for 300 L-4H and 100 L-5VW Aircraft, Office of Technical Supply, 4th Depot Unit, Army (AAF), dated 4 March 1945, file 370/6, Artillery Section, Theater General Board.

40. Letter, Headquarters Seventh Army, subject: "73 Octane Aviation Gasoline", dated 1 March 1945, file 370/6, Artillery Section, Theater General Board.