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ARMY CONCEPT TEAM IN VIETNAM
APO San Francisco 96243

AD 371854

EMPLOYMENT OF US ARMY AVIATION COMPANY (AERIAL SURVEILLANCE) IN COUNTER-INSURGENCY OPERATIONS (U)

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JOINT RESEARCH AND TEST ACTIVITY
Office of the Director
APO San Francisco 96309

REPORT EVALUATION BY DIRECTOR, JRATA

This evaluation report documents a valid study of the employment of an aerial surveillance company in counterinsurgency operations. The report should be of significant value in the future planning of aerial surveillance organizations.

During the evaluation, the 73rd Aviation Company (AS) proved effective in the collection and timely reporting of information on Viet Cong activity. Further evidence of the company's effectiveness was demonstrated during operations conducted subsequent to the period of evaluation.

New dimensions in tactical night operations have been opened as the direct result of OV-1 sensor capabilities. The capability to detect and provide near real-time reporting of targets has resulted in highly successful night air strikes against Viet Cong river and coastal traffic. Expanded use of surveillance systems is planned which should seriously interdict Viet Cong movement during the hours of darkness.

The findings, conclusions, and recommendations of the report are substantiated and I concur in them. The OV-1 force structure recommended by this report, with certain modifications in the mix of sensor aircraft, was requested in the 19 July 1965 Memorandum for the Secretary of Defense (Shopping List); to date this request has not been approved. The demonstrated tactical capability of the OV-1, during and subsequent to the ACTIV evaluation, and further definition of requirements for surveillance aircraft in RVN substantiate the request for an increased force of OV-1 aircraft.

Approved:

25 February 1966

JOHN K. BOLES, JR.
Brigadier General, USA
Director

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ARMY CONCEPT TEAM IN VIETNAM
APO San Francisco 96243

FINAL REPORT

EMPLOYMENT OF US ARMY AVIATION COMPANY (AERIAL SURVEILLANCE) IN COUNTER-INSURGENCY OPERATIONS(U)

JRATA Project No. 1C-200.2

9 February 1966

Approved:

HUGH E. QUIGLEY
Colonel, Armor
Chief

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DECLASSIFIED AFTER 12 YEARS
DOD DIR 5200.10

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AUTHORITY

Letter AGAM-P(M) (17 July 1964), ACSFOR, DA, 31 July 1964, subject: Army Troop Test Program in Vietnam (U), as amended.

Letter, FOR DS RTI, ACSFOR, subject: Evaluation Plan-US Army Aviation Company (Aerial Surveillance) in Counterinsurgency Operations (U), 18 February 1965.

CINCPAC Message DTG 12/2154Z Mar 65, subject: US Army Aviation Company (Aerial Surveillance) in Counter-insurgency Operations (U).

ACKNOWLEDGMENTS

The Army Concept Team in Vietnam is indebted to the following for their help in the evaluation:

Target Research and Analysis Center, MACV J-2
United States Army Support Command, Vietnam (now USARV)
United States advisors, II, III, and IV ARVN Corps
Aviation Group (Provisional) USASCV
765th Transportation Battalion
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FIGURES

(U) FIGURE 1. OV-1 (Mohawk) over the Mekong Delta.

I. (C) PREFACE

A. ABSTRACT

The purpose of this project was to evaluate the 73d Aviation Company (Aerial Surveillance) to determine the tactical employment of the company; the adequacy of the organization and equipment; the effectiveness of infrared (IR), side looking airborne radar (SLAR), and daylight and night photographic surveillance; and the logistical support required in counterinsurgency operations in the Republic of Vietnam.

The 73d Aviation Company (AS) was employed in accordance with US Army doctrine to support the II, III, and IV ARVN Corps, and the Target Research and Analysis Center (TRAC), J-2 Section, Military Assistance Command Vietnam (MACV). The 73d was equipped with six OV-1A (visual/photographic), two OV-1B (SLAR), and four OV-1C (IR) aircraft.

Army Concept Team in Vietnam (ACTIV) project officers and evaluators collected data from questionnaires, interviews, observation of operations, and official records from 1 April to 29 June 1965.

During the evaluation period, the 73rd Aviation Company flew 2,643 combat hours. No losses were attributed to enemy groundfire and aircraft were struck by small arms fire on only 12 occasions.

The imagery generated by daylight photographic, SLAR, and IR surveillance systems provided effective and timely information on Viet Cong activities. For example, acting on information gathered in part by the 73d Aviation Company, one division executed a 7-day operation that netted 200 Viet Cong KIA, 48 captured, 76 suspects, and 372 weapons.

Table of Organization and Equipment 1-128T (Modified) provided adequate personnel and equipment to process and interpret acquired imagery. However, the TOE was not adequate in other aspects, notably the number of mechanics provided, for sustained support of counterinsurgency operations. A TOE is recommended in annex H which, if implemented, should adequately support the surveillance mission in the counterinsurgency environment of Vietnam.

Although logistical support received was generally good, the supply of signal items was inadequate. The company was able to function effectively only because of the large amount of spare parts supplied in advance of its deployment.

B. OBJECTIVES AND METHODS

1. Objective 1 - Tactical Employment

Describe the tactical employment of the 73d Aviation Company, including the methods and procedures for furnishing the acquired data to intelligence staff agencies.

Methods for satisfying this objective were examination of company records and SOP's, completion of questionnaires, interviews with unit personnel, and observation by evaluators, on the ground and during flying missions.

2. Objective 2 - Airborne Surveillance

Determine the capability of the infrared, side looking airborne radar, and day and night photographic surveillance systems to provide information on Viet Cong activities.

Methods for satisfying this objective were:

a) Imagery produced from infrared, SLAR, and conventional film was evaluated and categorized for quality.

b) Information was recorded from mission debriefings to determine the number of targets developed by type of sensor. Percentage of the assigned targets covered per mission and any malfunctions or failures of the sensor equipment encountered during the mission were also recorded.

c) Missions were flown by evaluators and their observations were recorded.

d) Evaluators traced the flow of information from completion of a mission, through the processing procedures, until dispatch to the requesting agency.

e) Opinions of US staff and advisory personnel of units requesting intelligence from 73d Aviation Company (AS) were polled.

f) The night photographic system could not be evaluated because of insufficient data.

3. Objective 3 - Imagery Interpretation

Determine the adequacy of personnel and equipment in the imagery interpretation section to process and interpret acquired imagery rapidly.

Methods for satisfying this objective were continuous observation and documentation of section operation and opinion polling of key personnel and evaluators.

4. Objective 4 - Adequacy of TOE

Determine the adequacy of the Aviation Company TOE 1-128T (Modified) in counterinsurgency operations.

Methods for satisfying this objective were examination of company records, interviews with key personnel, and observation.

5. Objective 5 - Logistics

Document the logistical support requirements of the 73d Aviation Company.

Methods for satisfying this objective were, in addition to the use of questionnaires, the same as those for objective 4.

C. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

The 73d Aviation Company (AS) functioned effectively, accomplished the assigned surveillance mission, and had a positive effect on the conduct of tactical operations in RVN. Although the number and mix of OV-1 aircraft were inadequate to meet all requirements for reconnaissance and surveillance in RVN, day photo, IR, and SLAR imagery were effective in providing information on Viet Cong activities. Night photography was not evaluated, as only one mission was requested and flown.

Processing, interpretation, and dissemination of imagery and imagery information was timely and accurate, although delays were encountered because of communication difficulties. Personnel and equipment of the imagery interpretation (II) section were adequate in the performance of their function.

Table of Organization and Equipment 1-128T (Modified) was inadequate and the addition of one officer, one warrant officer and 29 enlisted men was required. Around-the-clock maintenance and increased inspection requirements necessitated a minimum of 2.4 mechanics per aircraft for organizational maintenance, instead of the 2.0 authorized, which accounts for some of the additional personnel recommended. In certain areas additional equipment was needed. On the other hand, some TOE items were in excess of company requirements.

Logistical support was generally good. Improvements in self-contained navigational aids for OV-1B and OV-1C aircraft were required, as was an adequate system for compass calibration.

A US Army aviation company (aerial surveillance) organized in accordance with the TOE presented in annex H should be employed in support of each ARVN corps. The recommended TOE provides for three OV-1B (SLAR) and nine OV-1C (IR) aircraft plus personnel and supporting equipment to sustain near all-weather, day or night, visual, photographic, and electronic sensor surveillance of a corps area of influence.

The Infrared Detecting Set AN/UAS-4 should be modified to increase its capability as an area search device, and clear-cut instructions are required on the use of filters provided for the infrared detectors. Improved ground auxiliary power equipment with sufficient power output is required to provide a preflight testing capability of electronic sensor equipment installed in the OV-1 aircraft.

II. (C) INTRODUCTION

A. PURPOSE

The purpose of this project was to evaluate the 73d Aviation Company (Aerial Surveillance) to determine tactical employment of the company; adequacy of the organization and equipment; the effectiveness of infrared (IR), side looking airborne radar (SLAR), daylight and night photographic surveillance; adequacy of the imagery interpretation section and their ability to interpret imagery rapidly; and the logistic support required in counterinsurgency operations in the Republic of Vietnam (RVN).

B. BACKGROUND

Early in the counterinsurgency effort in Vietnam, daylight aerial reconnaissance and surveillance by US and RVN military forces had been a significant deterrent to the Viet Cong in their preparation of ambushes, in their conduct of resupply, and in their other types of operations. As a result, the Viet Cong were forced to undertake military operations during the hours of darkness.

In early 1964, the Commanding General, United States Army Support Command, Vietnam (CGUSASCV), now US Army, Vietnam (USARV), submitted a request to Commander-in-Chief, United States Army Pacific (CINCUSARPAC) for two infrared-equipped OV-1C airplanes and augmentation of personnel for assignment to the 23d Special Warfare Aviation Detachment (SWAD) for the purpose of satisfying an urgent operational requirement for airborne surveillance equipment that would effectively detect insurgent activity during hours of darkness. The Commander, US Military Assistance Command, Vietnam (COMUSMACV) requested the Commander-in-Chief, Pacific (CINCPAC) to support the USASCV request.

The Army Concept Team in Vietnam (ACTIV) was given the mission to undertake an evaluation to determine the effectiveness of these infrared-equipped aircraft in obtaining reliable information and to determine the future requirements for aerial infrared equipment in the RVN.

Meanwhile, CGUSASCV received information that a proposal to organize a 120-man unit equipped with 3 OV-1B (SLAR) and 3 OV-1C (IR) aircraft, together with ground data link stations for deployment to RVN, was under consideration in Department of the Army.

On 13 August 1964, CINCUSARPAC received a message from DA which requested concurrence in the deployment of this unit and also inquired about the concept of employment and plan for absorbing the personnel into the current authorized personnel ceiling.

On 31 August 1964, COMUSMACV notified CINCPAC of the concept of employment and, at the same time, requested that the combination of three OV-1B's and three OV-1C's be changed to two OV-1B's (SLAR) and four OV-1C's (IR). Commander-in-Chief, Pacific forwarded COMUSMACV's request to DA where it was approved.

The 82d Aerial Surveillance and Target Acquisition (ASTA) Detachment was activated and designated as the unit to be deployed to the RVN. Before deployment, it was attached to the 82d Airborne Division, Fort Bragg, North Carolina, for organization, equipment, and training.

A conference was held at Headquarters, USARPAC from 6 to 10 October 1964 to recommend modifications to TOE 1-128T, Aviation Company (Aerial Surveillance) in order to permit merging of the 23d SWAD and the 82d ASTA Detachment.

These modifications of TOE 1-128T were subsequently approved and the TOE was designated TOE 1-128T (Modified).

The 82d ASTA Detachment was redesignated the 4th ASTA Detachment and was moved to the RVN during December 1964 where it joined the 23d SWAD. Both detachments were then organized into the 73d Aviation Company (Aerial Surveillance), TOE 1-128T (Modified), effective 26 December 1964. The 73d Aviation Company (AS) became operational 10 January 1965.

Subsequent to the decision to organize the 73d Aviation Company (AS), DA requested that the proposed ACTIV evaluation of aerial infrared equipment be expanded to include the entire company. A new evaluation plan was submitted on 24 November 1964 and was approved by CINCPAC on 12 March 1965.

The evaluation of the 73d Aviation Company (Aerial Surveillance) commenced 1 April 1965 and collection of data was completed on 29 June 1965.

C. SCOPE

1. Definition of the Project

The intent of this project was to provide an operational evaluation of the US Army Aviation Company (Aerial Surveillance), TOE 1-128T (Modified) in the counterinsurgency environment of Vietnam. Particular emphasis was placed on:

a) Describing the tactical employment of the company, including the methods and procedures of furnishing electronic sensor data to intelligence staff agencies.

b) Determining the capability of the IR, SLAR, and day and night photographic surveillance systems to provide information on Viet Cong activities.

c) Evaluating the adequacy of personnel and equipment to process and interpret acquired imagery.

d) Evaluating TOE 1-12ST (Modified) to determine what changes were required to make the company fully responsive in the counterinsurgency environment in Vietnam.

e) Documenting the logistical support requirements of the aviation company.

2. Summary of Statistics

	OV-1A (Visual Photo)	OV-1B (SLAR)	OV-1C (IR)
Average number of aircraft assigned	8	2	4
Average number of mission ready aircraft daily	5	1	2
Total flying hours	1631	371	616
Average monthly flight hours per aircraft	67	62	53
Total target areas assigned	2760	213	628
Total target areas surveyed	2466	187	460
Total mission hours	1477	306	483
Day	1468	6	75
Night	9	300	408
Instrument flight hours	1	55	57
Total mission hours over target area	1113	225	219
Day	1107	4	33
Night	6	221	186
Instrument flight hours	1	44	29
Number of targets of military significance	Unknown	2689	1789

3. Setting of the Project

a. Environment

The 73d Aviation Company (Aerial Surveillance) operated from Vung Tau Airfield located approximately 41 miles southeast of Saigon, Vietnam. Operational missions were flown in the mountain, highland, coastal, and delta regions of Vietnam under all but the most severe weather conditions. Where physical environment had a significant effect on surveillance operations, pertinent facts have been noted. Annex A contains a discussion of the enemy, weather, and terrain.

b. Military Elements

Documentation of operations of the 73d Aviation Company (AS) is the basis of this report. Data were also gathered from the following units:

1) Target Research and Analysis Center (TRAC), MACV J2

2) MACV J3

3) US Advisory Elements II Corps

4) US Advisory Elements III Corps

5) US Advisory Elements IV Corps

6) 765th Transportation Battalion

7) 611th Transportation Company

8) 330th Transportation Company

c. Equipment

The OV-1 aircraft, series A, B, and C, was the standard aircraft of the company. Other primary equipment was the AN/UAS-4 Aerial Infrared System, AN/APS-94 (A) Side Looking Airborne Radar System, KS-61 Camera System, KA-60 Panoramic Camera System, and the Marconi Doppler Flight Navigation System. (See annex C for detailed description of equipment.)

d. Mission

The mission of the 73d Aviation Company (Aerial Surveillance) was to perform visual, photographic, and electronic reconnaissance and surveillance in support of Republic of Vietnam counterinsurgency operations as directed by MACV J3.

4. Definition of Terms

See annex F.

D. EVALUATION DESIGN

1. Methodology

Findings were based on results obtained from compilation and analysis of quantitative data and collation of qualitative data.

a. Data Collection Methods

Data used in the preparation of this report were obtained through:

1) Questionnaires designed to record the significant events of a mission from the initial request to the final debriefing

2) Personal observation by ACTIV project officers and evaluators, including surveillance missions flown for the company by the evaluators

3) Data extracted from unit records, reports, and summaries that were transcribed on ACTIV forms specifically designed for the evaluation

4) Interviews with key personnel, debriefing of crews, and opinion samplings recorded in narrative form.

b. Analysis Methods

The analysis of the collected data was accomplished as follows:

1) Careful screening and comparison of all questionnaires and reports were made

2) An opinion poll of the supported units was made to determine whether or not information provided was useful to the military operations

3) Imagery interpreters' opinions regarding quality of acquired imagery were recorded on all imagery processed. Comparisons of imagery acquired in Vietnam to imagery published in II handbooks were made

4) Analysis was made of factors such as mission reaction times, tactics employed with various sensors and target areas, communication procedures, timeliness, and the validity of information acquired.

5) Quantitative data from damage reports were tabulated and the results summarized.

2. Limitations and Variables

United States advisors, joint staffs, US Army Support Command, and the 73d Aviation Company (AS) were directed to assist ACTIV evaluators to the maximum extent permitted by the local combat situation. Data were collected from surveillance missions in support of actual counterinsurgency operations and no missions were generated for the express purpose of producing evaluation data.

a. Limitations

(1) Operational control exercised by Headquarters, US Military Assistance Command, Vietnam.

(2) Operational support requested by supported units.

(3) Reliability of equipment.

b. Variables

(1) Weather.

(2) Condition of equipment.

(3) Enemy situation.

3. Support Requirements

Support requirements were provided as outlined in the evaluation plan with the exception that one officer evaluator (MOS 64823, Aircraft Maintenance) was provided by ACTIV and not from CONUS resources as planned. Permanently assigned ACTIV project officers and TDY personnel from USASCV and CONUS acted as evaluators. Funds to support TDY personnel were provided by the US Army Combat Developments Command.

4. Time Schedule

a. 10 Jan 65	73d Aviation Company (AS) became operational
b. 1 Feb to 13 Mar 65	Arrival of TDY personnel

c.	1 Apr 65 to 29 Jun 65	Data collection period
d.	1 Jul 65 to 15 Oct 65	Analysis of data and preparation of report

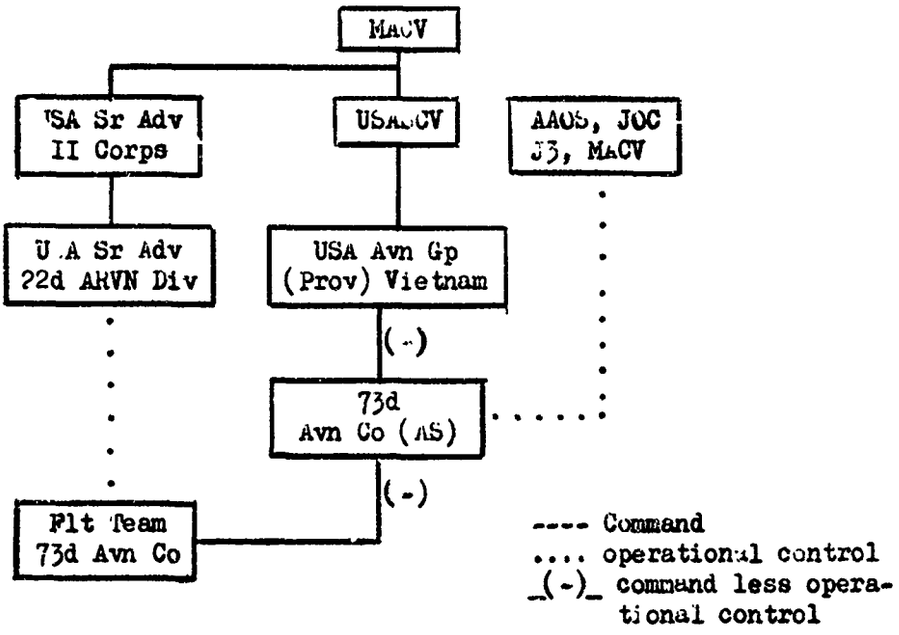
III. (C) DISCUSSION

A. OBJECTIVE 1 - TACTICAL EMPLOYMENT

1. Command and Control

When organized in December 1964, the 73d Aviation Company was assigned to the 765th Transportation Battalion (Aircraft Maintenance and Supply) located at Vung Tau, Republic of Vietnam. The battalion commander exercised command but operational control was vested in the Army Aviation Operations Sections (AAOS) of the Joint Operations Center (JOC), which directed the 73d Aviation Company (AS) on matters pertaining to allocation and employment of OV-1 aircraft.

On 15 April 1965 the 73d Aviation Company (AS) was released from assignment to the 765th Transportation Battalion and reassigned to the US Army Aviation Group (Provisional) Vietnam. Although the group commander acquired command, operational control remained with AAOS, and, though continued to receive administrative and logistic support from the 765th. Command and control organization is shown in figure 2.



(U) FIGURE 2. Command and control.

2. Deployment

The 73d Aviation Company was located at Vung Tau airfield, 41 miles southeast of Saigon. The airfield was operated and maintained by the 765th Transportation Battalion (AM&S). The location proved to be adequate in relation to the surveillance requirements which had to be supported. Facilities available included:

a) Direct support maintenance

b) General support maintenance

c) Hangar space and parking facilities

d) Ground control approach

e) Non-directional radio beacon

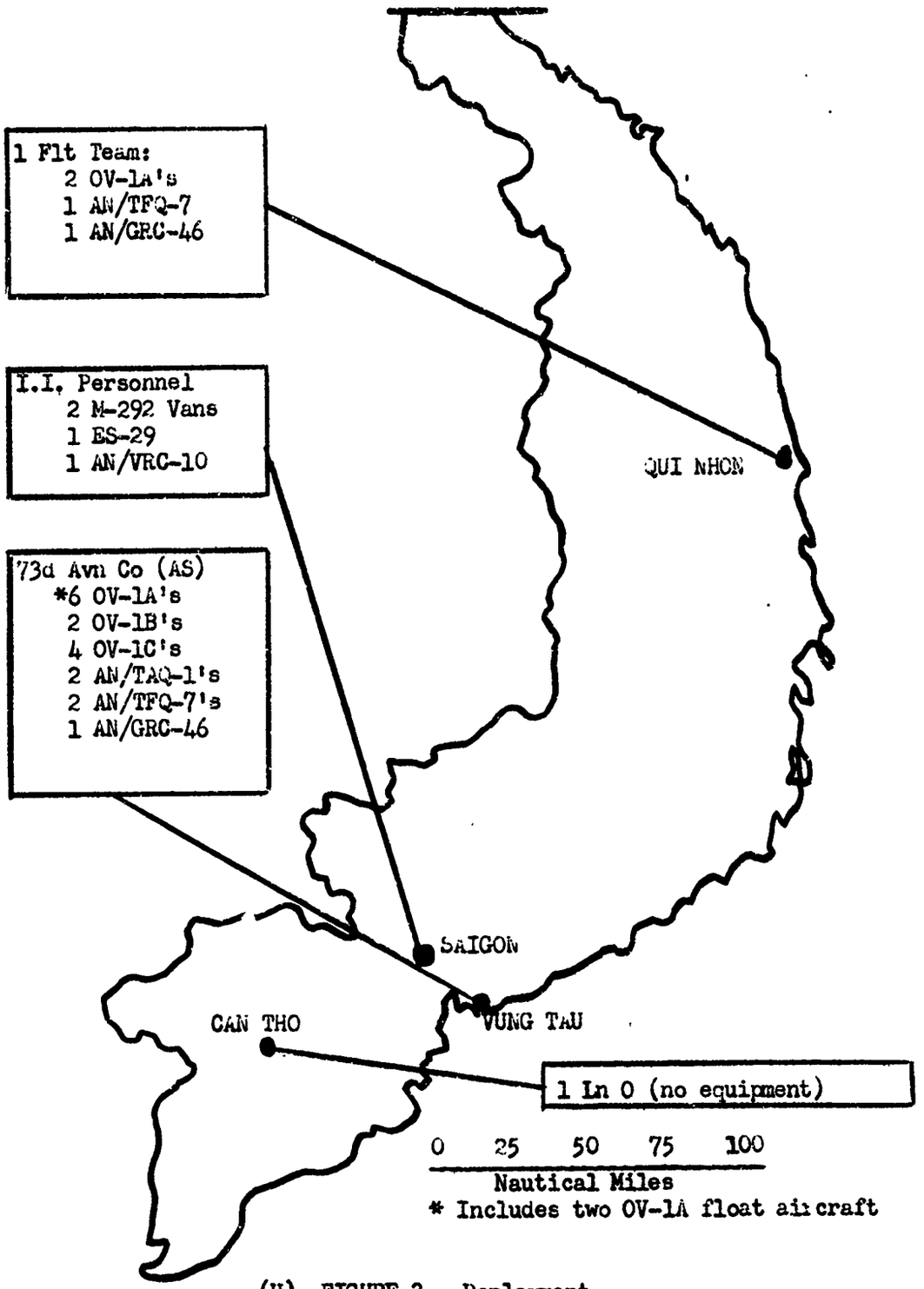
f) On-post housing (enlisted only)

g) Three pierced steel planking runways, the longest of which was 5,900 feet plus overruns.

Thirteen imagery interpreters, four photo processing personnel, and one generator operator assigned to the 73d Aviation Company were detailed for duty with the Target Research and Analysis Center (TRAC), MACV J2 with duty station at Tan Son Nhut Airfield, Saigon. One officer was also placed on duty with TRAC as 73d Aviation Company liaison officer to coordinate mission requests and assist imagery interpreters in mission planning. (See figure 3.) In addition, the 73d supported TRAC with two M-292 expansible vans and one ES-29 photo lab.

The AAOS directed the 73d Aviation Company to support the II Corps with two OV-1A aircraft daily as the first priority mission of visual surveillance. The senior advisor of II Corps re-allocated these two aircraft to operational control of the 22d ARVN Division at Qui Nhon, some 260 nautical miles north of Vung Tau. In order to be responsive to the needs of the 22d Division G2 advisor, the commanding officer, 73d Aviation Company, arranged to base two aircraft with necessary support at the Qui Nhon Airfield. As a consequence, 2 aircraft, 2 crews, 10 enlisted men, a photo dark room, and 1 AN/GRC-46 radio teletype were in a detached status throughout the evaluation. However, the aircraft and crews were rotated every 2 weeks.

One officer was stationed at Can Tho, IV Corps Headquarters to provide necessary liaison and assistance in mission requests for aerial surveillance.



(U) FIGURE 3. Deployment.

3. Mission Ready Aircraft

The 73d Aviation Company (AS) had the following aircraft assigned under TCE 1-128T (Modified):

a) 6 OV-1A's

b) 2 OV-1B's

c) 4 OV-1C's

The 611th Transportation Company (DS) issued two OV-1A float aircraft to the 73d Avn Co, making eight OV-1A aircraft available to support the visual and photographic surveillance mission. No float OV-1B or OV-1C aircraft were available in RVN.

The overall aircraft mission-ready rate was 72.8 percent. The number of aircraft available for aerial surveillance during April, May, and June are indicated in figure 4.

Aircraft Assigned	Average Number Aircraft Available			
	April	May	June	90-Day Avg
8 OV-1A's	5.4	6.2	5.9	5.8
2 OV-1B's	1.5	1.4	1.7	1.5
4 OV-1C's (3 OV-1C's after 9 June)	3.3	3.4	1.9	2.9

(C) FIGURE 4. Mission-ready aircraft.

Even though the average number of OV-1A aircraft mission-ready for visual and photographic surveillance was 5.8, only four aircraft were normally used. The standing operating procedure of the 73d Avn Co was to use two flight teams of two aircraft for all visual and photo missions. One flight team supported the II Corps (22d ARVN Division) daily while the remaining aircraft were used to support the requirements of the IV Corps (7th, 9th, and 21st ARVN Divisions). Series OV-1A aircraft supporting missions for the IV Corps would normally leave Vung Tau at first light and return around noon of the same day. An afternoon flight team was then dispatched and would remain in the IV Corps area until darkness.

Although an average of 1.5 OV-1B aircraft were mission-ready daily, one aircraft was used for SLAR missions during a 24-hour period. When available, the other aircraft was used for SLAR mission backup support.

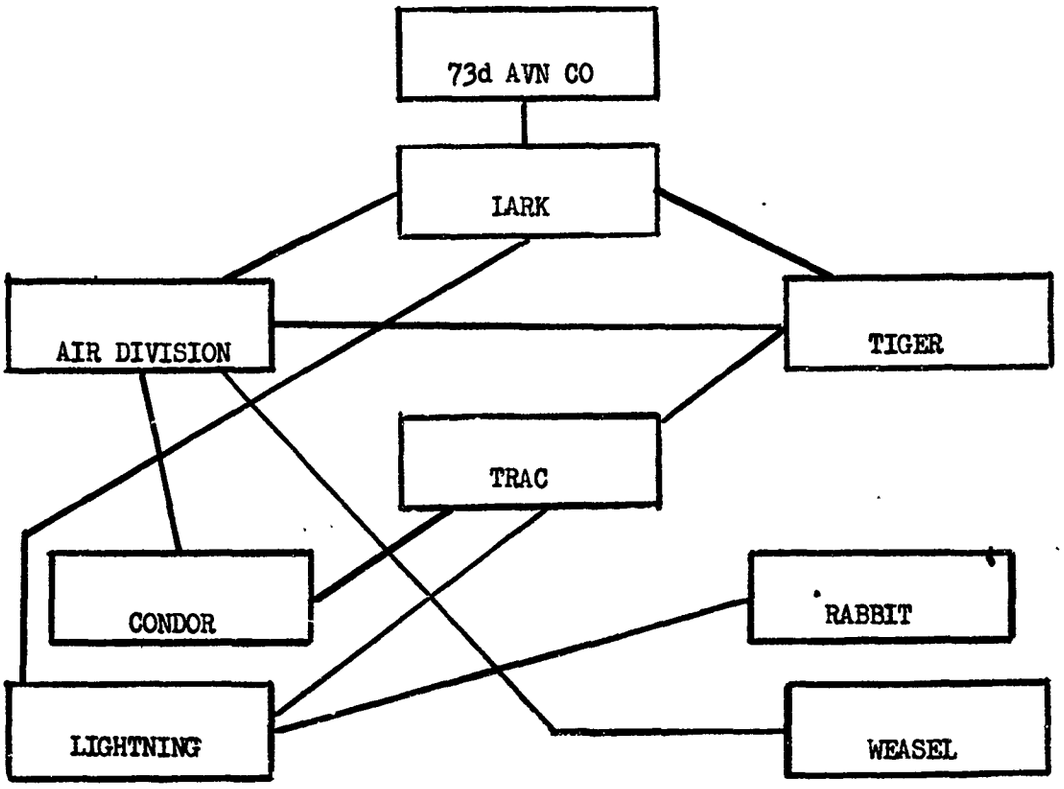
The daily average of 2.9 mission-ready OV-1C aircraft normally

provided two aircraft to accomplish preplanned infrared surveillance. When an immediate mission request was generated and approved, TRAC diverted aircraft from preplanned missions.

4. Communications

The telephone was the only means of electrical communication between the headquarters of the 73d Avn Co and supported units. Each telephone transmission was required to go through three military switchboards, with the exception of those to TRAC where only two were required. Circuits were often overloaded and prolonged delays were frequent.

The two AN/GRC-46 radio teletype sets provided for communications between the company and the supported units were inadequate during the evaluation. Distances between the 73d Avn Co and flight teams at Qui Nhon was 260 miles, well beyond the range of these radios. As a result, the telephone was used for communication even though much difficulty was experienced. A telephone traffic diagram is shown in figure 5.



(U) FIGURE 5. Telephone traffic diagram.

The 73d Avn Co did not operate in an intelligence or air request net. Aircraft, while airborne, operated in the supported unit's FM command net.

5. Mission Request Channels

Mission request channels and priorities were controlled by the AAOS, JOC Branch, J3 MACV. Using units employed two different channels for aerial surveillance requests depending on the type of surveillance mission desired.

a. Visual/Photo

Priorities for visual and photographic surveillance missions flown by the 73d Aviation Company (AS) were:

1) First Priority - II Corps (22d Div)

2) Second Priority - IV Corps

3) Third Priority - III Corps

4) Fourth Priority - TRAC

(1) First Priority - II Corps (22d ARVN Div)

Daily personal liaison maintained between the US Army G2 advisor, 22d ARVN Division, and the 73d flight team leader, both of whom were located at Qui Nhon, minimized communication and administrative problems. All preplanned and immediate mission requests from other II Corps units, including II Corps headquarters, were coordinated with the US Army G2 advisor, 22d ARVN Division.

(2) Second Priority - IV Corps

The divisions of IV Corps (7th, 9th, and 21st ARVN) requested surveillance missions through the corps COC. The 73d Avn Co liaison officer (at corps COC) received the mission requests and, after consolidation, passed them to the 73d Avn Co. When conflicts arose because of lack of aircraft or when the tactical situation demanded a concentrated surveillance effort in one particular area, the US Army G2 advisor, IV Corps established priorities for units within the corps.

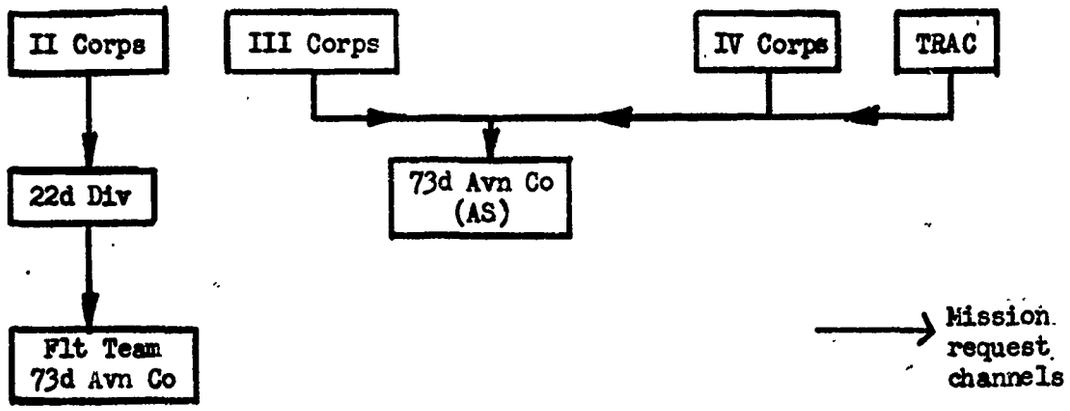
Preplanned and immediate mission requests flowed through the same channels. However, the IV Corps units had the authority to contact the 73d Avn Co directly for immediate visual and photo missions.

(3) Third Priority - III Corps

The US Army G2 advisor, III Corps, contacted the 73d Avn Co with all mission requests from III Corps units.

(4) Fourth Priority - TRAC

All mission requests originating in TRAC were given to the 73d Avn Co liaison officer on duty with the TRAC and he telephoned the requests to his company. (See figure 6.)



(U) FIGURE 6. Visual and photo mission request channels.

b. IR and SLAR

(1) First Priority - TRAC

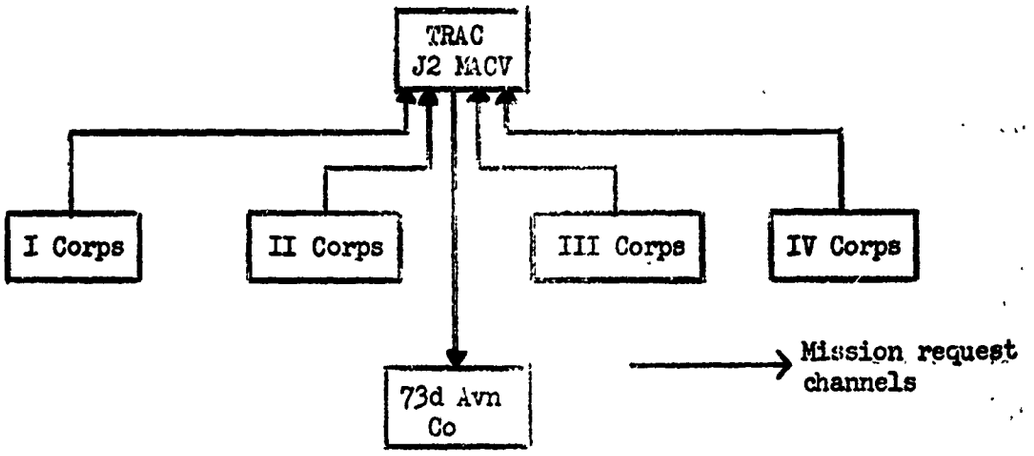
The TRAC operations officer decided which target areas were to be surveyed each day and then notified the 73d Avn Co liaison officer on duty at TRAC. The liaison officer assisted in planning and scheduling missions and forwarded the requirements to the 73d Avn Co.

(2) Second Priority - III Corps

All units in III Corps were required to submit mission requests to the US Army G2 advisor, III Corps, who forwarded them to TRAC for final approval.

(3) Third Priority - IV Corps

The IV Corps employed the same method as III Corps. (See figure 7.)



(U) FIGURE 7. Infrared and SLAR mission request channels.

6. Operational Procedures

The 73d Avn Co received mission requests primarily from two sources: visual/photo mission requests came from the company liaison officer with IV Corps and electronic sensor surveillance requests came from the company liaison officer with the TRAC.

a. Mission Scheduling

Preplanned mission requests received at the 73d Avn Co were held and consolidated with other requests. When all requests had been received they were assigned to surveillance platoon commanders, who designated the flight crews for the mission. The operations officer then assigned mission-ready aircraft to flight crews.

All mission requests for IR/SLAR target areas were plotted on maps. The imagery interpretation section prepared pilot traces of SLAR target areas on overlays from 1:250,000 and IR target areas on overlays of 1:50,000. The flight operations chief plotted all assigned visual/photo target areas on a large 1:500,000 general briefing map. Weather information was kept current and was posted in the operations office where it was readily available to all aviators.

Immediate mission requests were processed in the same manner as were preplanned missions. However, prompt action was taken to satisfy immediate missions when aircraft were available.

b. Briefings

(1) General Briefing

In a briefing held for aviators at 0700 hours each day, the intelligence officer discussed the current enemy situation as it existed in III and IV Corps and pointed out all known changes of Viet Cong unit locations. Also during this briefing, the company commander, operations officer, and maintenance officer discussed various subjects of interest that would affect accomplishment of overall tactical missions. No specific mission was discussed.

(2) Visual/Photo Briefing

Upon receipt of mission requirements the designated flight team leader studied the assigned target areas and briefed his wingman and the observers on the missions to be flown. The following was discussed:

a) Target area descriptions and locations

b) Scale of photographs requested

c) Sequence of target areas to be surveyed

d) Direction of flight over target areas

e) Altitudes to be flown over each target area

f) Units to receive inflight spot reports

g) Tactical FM radio frequencies to be used

h) Flight following FM and UHF radio frequencies

i) Weather forecast

j) Desired position of the wingman in relation to the flight leader during the missions

k) Refueling schedule and airfields to be used

l) Emergency procedures

Aviators were generally familiar with the area and enemy situation from repeatedly flying surveillance missions over the areas and, thus, detailed mission briefings on procedures, radio frequencies, terrain, and enemy indicators were not usually required.

(3) IR/SLAR Briefing

The intelligence officer or an imagery interpreter briefed IR and SLAR aviators on the mission requirements 3 to 6 hours prior to scheduled takeoff. Each aviator was given an overlay showing the target area to be surveyed.

The following mission information was provided:

a) Sensor to be employed

b) General period of flight (day or night)

c) Range and range delay settings (SLAR)

d) Channels to be used (IR)

e) Altitude over target areas (IR)

f) Coordinates of target area boundaries

g) Coordinates designating flight path (SLAR)

h) Nature of targets in areas

i) Time over target areas

j) Place where imagery was to be delivered for processing

k) Requestors' target numbers

l) Special instructions - requestors' call signs and frequencies and inflight spot report instructions.

c. Mission Flight Planning

Visual, photographic and SLAR surveillance mission flight planning was not difficult but IR mission flight planning was more detailed and about ½ hour was required to plan each flight.

(1) Visual/Photo

The flight team leader determined the sequence of targets to be surveyed, the time, direction, and altitudes to be flown over each, and the position of the wingman in relation to the flight team leader for each target area. The last target area to be surveyed was selected to be near an airfield where refueling facilities were available.

It was also determined which aviator would make in-flight spot reports to the supported units.

(2) SLAR

The II section plotted all target areas and desired flight paths on an overlay to a scale of 1:250,000 which was used by the aviator who transferred the information to an aeronautical chart showing the available ground navigational aids.

After obtaining weather information the aviator determined headings and ground speeds for each leg of the planned flight path. The altitudes flown were those recommended by the manufacturer of the AN/APS-94A SLAR, as follows:

Range	Altitude (Absolute)
25 km	7,000 ft
50 km	10,000 ft
90 km	14,000 ft

Mission planning for SLAR was the same as for other types of missions, except when target areas were in mountainous terrain. When radar masking by mountains was a factor, detailed flight planning was required.

(3) IR

The IR section aviators initially required approximately 2½ hours to plan an IR surveillance mission but, with experience, this was reduced to about 1 hour.

Not only was precise navigation required to position the IR sensor over the target area, but the limited area of coverage afforded by the 80 degree scan angle of the AN/AAS-14 and the low altitudes flown (below 2000 feet absolute) required detailed flight planning and a highly accurate navigation system.

Most navigation was accomplished using the self-contained doppler radar navigator. Boundaries of all target areas were plotted on a 1:250,000 chart and a 1:50,000 map. Man-made and natural terrain features that would appear near target areas on the terrain display scopes were selected as check points and plotted on the chart and map. Doppler coordinates were then computed for each target area and check point.

d. Navigation Procedures

Navigation procedures varied, depending on the type of surveillance mission flown. Visual and daylight photographic surveillance primarily used pilotage. Infrared and SLAR missions frequently conducted during periods of reduced visibility used a combination of all available means and methods of navigation.

(1) Visual and Daylight Photographic Surveillance

Most of the aviators in the visual/photo platoon were familiar with the operational areas. Rivers, islands, villages, and the varying coast line provided identifiable land marks easily correlated with maps and aeronautical charts, and determination of position was possible by map and chart inspection. When target areas were located in a section of the country where identifiable landmarks were limited, the nearest identifiable landmark was selected as an initial point and dead reckoning navigation procedures were used from that point to the target area.

When haze, smoke, or clouds limited visibility, nondirectional radio beacons and dead reckoning were used to position aircraft over the target area. Once over the target area the aviators adjusted their altitude to that required for the particular surveillance mission.

(2) SLAR

Aircraft equipped with SLAR were capable of performing surveillance in all but the most severe weather and frequently flew surveillance missions under conditions calling for use of instrument flight rules (IFR). The Saigon visual omni range (VOR) and various low frequency radio beacons were used in conjunction with dead reckoning and pilotage. Since SLAR missions were conducted at high altitudes (7,000 to 14,000 feet), radio line-of-sight between the aircraft and ground-based electronic navigation aids was usually maintained.

(3) IR

Aviators relied principally on the doppler radar navigator for navigation information. In addition, other methods such as ground-based radio navigation aids, pilotage, and dead reckoning were used.

e. Tactics

The inherent difference in SLAR, IR, and photographic surveillance equipment required that the surveillance platoons develop varied tactics and techniques to provide information in minimum time and with the least risk.

(1) Visual/Photo

Visual and photo missions were flown during daylight hours using flight teams of two aircraft each. The flight team leader and his wingman flew in a loose formation that allowed freedom for quick maneuvers and mutual support in surveying target areas. Each mission was accomplished by making the minimum number of passes over the target area and, when possible, it was made with one pass to achieve surprise.

(2) SLAR

The absence of enemy air power and large caliber anti-aircraft weapons permitted the SLAR equipped aircraft to accomplish surveillance missions without developing complex tactics and techniques. The ability to operate at night at high altitudes and in marginal weather were factors that contributed to the successful conduct of SLAR surveillance missions. Missions were conducted by single aircraft.

The size of target areas surveyed by SLAR-equipped aircraft were large (average size, 19,618 square kilometers). In order to provide usable imagery, the pilot was required to maintain altitude and heading control. The installed automatic pilot (ASW-12) was used extensively for this purpose and was considered essential to help obtain good quality imagery.

(3) IR

Night infrared surveillance missions were conducted over area targets by single aircraft. Altitudes could not be varied greatly because of airborne IR system limitations and the scale of imagery desired. Navigation lights were extinguished to reduce detection and vulnerability of the aircraft to small arms fire.

f. Techniques

The techniques of maneuver used over assigned target areas depended on individual aviator preference and variables of time of day, weather, enemy capabilities, size of target areas, terrain, and type of sensor employed.

(1) Visual and Photo

Visual surveillance missions permitted the aviators more latitude in selecting techniques and flight patterns than did other types of surveillance. The techniques used for photographic surveillance were similar to those employed for visual surveillance, as most photo target areas were taken under surveillance simultaneously by two aircraft. The lead aircraft employed the photographic sensor (KS-61A) and flew at the altitude required to provide the desired scale factor. Vertical photos

with the KS-61A required more passes over the target for adequate coverage. Normally, however, one or two target passes would provide complete coverage of the average 1.5 square kilometer photo target area. The second aircraft maintained a position above and behind and on occasion would employ the KA-60 camera to obtain oblique area coverage.

Over 75 percent of the surveillance accomplished with the KA-60 or KS-61A cameras was obtained while flying between 500 and 1500 feet absolute altitude. Percentage relationships pertaining to the type of patterns and the altitudes flown over photographic target areas, by sensor type, are shown in figures 8 and 9.

Type of Surveillance	Single Pass	Multiple Parallel Passes	Multiple Random Passes	Triangular Courses	Other
Visual	6.9	20.2	70.8	1.9	.2
KS-61A	51.9	30.1	15.5	2.5	-
KA-60	73.6	13.2	13.2	-	-
SLAR	55.6	33.6	7.2	2.5	1.1
IR	10.4	53.2	36.0	.2	.2

All values show percent of use in target areas within sensor category.

(C) FIGURE 8. Surveillance pattern usage compared with type of sensor employed.

	Altitude in Feet, Absolute									
Type of Surveillance	0 to 50	51 to 100	101 to 200	201 to 500	501 to 1000	1001 to 1500	1501 to 2000	2001 to 5000	5001 to 7000	Over 7000
Visual	12.0	-	.9	3.8	22.2	45.4	13.9	.9	.9	-
KS-61A	-	-	2.3	9.1	13.6	50.0	20.4	2.3	2.3	-
KA-60	-	-	-	7.6	38.5	38.5	15.4	-	-	-
SLAR	-	-	-	-	-	-	-	-	.1	99.9
IR	-	-	-	-	2.0	23.0	69.6	5.4	-	-

Climbs and decents disregarded. All values show percent of time over target areas within sensor category.

(C) FIGURE 9. Surveillance altitudes compared with type of sensor employed.

Typical flight patterns used for the various types of targets and target areas taken under visual and photographic surveillance are shown in annex B.

g. In-flight Spot Reports

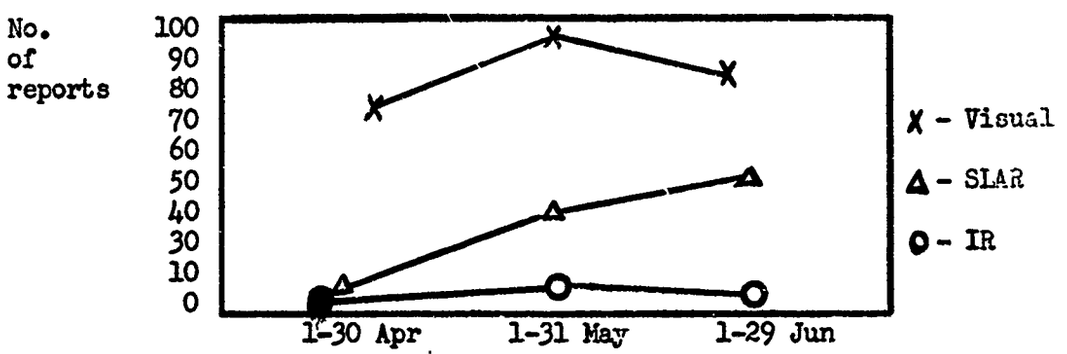
(1) Visual

Flight crews performing visual surveillance made 251 spot reports to supported units during the evaluation, most of which were made over the FM tactical radio to division G2 advisors. Whenever FM radio contact over the units' command net could not be established, aircraft landed at the nearest airfield and a spot report was made by telephone. Negative information was included with the in-flight spot reports.

(2) SLAR

The frequency of SLAR reports increased as techniques and procedures were developed for coordinating immediate actions against Viet Cong night activity (figure 10). Armed helicopters, fighter-bombers, and flare illumination aircraft were placed on standby status to react promptly to targets of opportunity identified by the electronic sensors.

The inflight techniques required to provide accurate target data from SLAR surveillance were less demanding than from IR because of the relatively large field of view and the manner in which imagery was presented. It was possible to compute and report target position in 6-digit UTM coordinates by use of the RO-166 Recorder-Processer-Viewer. The RO-166 allowed direct, long-term viewing of the processed imagery by the aircrew and permitted target locations to be plotted directly on a map and rechecked for accuracy without reference to a navigational aid.



(C) FIGURE 10. Spot report summary.

(3) IR

Inflight spot reports associated with IR surveillance

were made on seven occasions. Techniques for providing coordinates of significant IR emissions on a real-time basis were not developed by the company. (See objective 2.)

h. Debriefings and Reports

Crew members were debriefed at the end of each flight. The information obtained was recorded and used to provide requesting units with pertinent information.

7. Information Dissemination - Methods and Procedures

Several procedures were required to disseminate information obtained from aerial surveillance missions. These were governed by the mission request priority system previously discussed and the communications system used.

Immediate Photo Intelligence Reports (IPIR) on IR and SLAR imagery were either written directly at the TRAC or were written at Vung Tau and then given to the TRAC for dissemination. Normal distribution of IPIR's by the TRAC was made to the following:

a) J2 High Command (ARVN)

b) J2 MACV

c) G2, appropriate corps

d) G2, requestor other than corps

e) N2, Naval Advisor Group (water results only)

f) Division intelligence officer, 2d Air Division (USAF)

g) CO, 73d Aviation Company

h) TRAC Research Branch

i) File

a. Visual Surveillance

In-flight spot reports were made to the supported division G2 advisor over the division FM command net. Even though an in-flight or telephonic spot report had been made, the flight crews were required, at the termination of each flight, to complete a standard 73d Avn Co debriefing form. This form was completed in duplicate, one copy dispatched to the supported unit, and the other filed.

b. Photographic Surveillance

On missions flown for IV Corps, photographic prints, a completed debriefing report, and an overlay plot were delivered to the IV Corps air traffic coordinating officer (ATCO) the day after the mission was flown. The ATCO then delivered the mission results to the requesting unit by helicopter.

Results of missions flown for the 22d ARVN Division were hand-carried by the flight team leader to the division G2 advisor immediately after processing. The division G2 advisor debriefed the flight team aviators at the time the photos were received. All photos processed at Qui Nhon were interpreted by the photo interpretation section with the 22d Division.

During the evaluation there were no immediate photo missions requested for divisions of IV Corps. However, the procedure used by the 73d Avn Co prior to the evaluation was to process the photos, make an overlay plot, and air-deliver the plot, debriefing report, and photos the same day the mission was flown. Since none of the divisions in IV Corps had adequate airfields close to division headquarters a photo drop was made using the message drop port of the CV-1A.

c. SLAR Surveillance

There were two recorder heads available for the AN/APS-94A SLAR. When using the RC-225 recorder the exposed film had to be developed and dried in a photo darkroom. When the RO-166 was used the exposed film was developed and viewed while airborne and, after landing, the film was washed, dried, and interpreted.

Initially, the RO-225 recorder was used with the SLAR. Since most SLAR flights terminated at Vung Tau, film processing and interpretation was conducted there and IFIR's were telephoned to the TRAC, which in turn relayed the information to the unit intelligence staff agencies concerned. These reports were flown to TRAC for further analysis later that same day.

Shortly after the 73d Avn Co was organized, the SLAR operators were given additional training on the installation and use of the RO-166 Recorder-Processor-Viewer. With the use of the RO-166, film was processed and viewed, and moving targets were plotted and reported to appropriate unit staff intelligence agencies while the aircraft was airborne. At the termination of the flight the processed film was interpreted and an immediate report made to the TRAC. The average time from landing to the time this information was telephoned to the appropriate headquarters by TRAC was 2 hours and 27 minutes.

d. IR Surveillance

Normally, IR flights terminated at Tan Son Nhut Airfield. Exposed film was delivered to the TRAC where it was processed and interpreted. The flight crews were debriefed while the film was being developed, washed, and dried. After completing the interpretation, an immediate photo interpretation report was made to the appropriate unit staff intelligence agencies. The average elapsed time from landing to the completion of the telephonic report was 2 hours and 48 minutes.

e. Responsiveness

Intelligence information which resulted from all aerial surveillance missions was provided on a timely basis to responsible agencies (TRAC) and commands but there were times when many units (below corps level) did not receive information acquired by IR and SLAR until several hours after intelligence was developed. (See objective 3.)

8. Training

The personnel of the 73d Avn Co were generally capable of performing their assigned tasks without additional training. However, a few inadequacies in training and experience of aviators and electronic sensor and doppler radar maintenance personnel were found.

a. Aviators

(1) Low-Level Navigation

Accurate low-level navigation during periods of restricted visibility was a definite requirement for providing 100 percent coverage of assigned IR target areas. During the initial period of operations it was found that aviators had difficulty in achieving the required coverage of infrared target areas. These areas were usually located in flat terrain covered with heavy jungle vegetation. Prominent land marks were not visible at night and ground electronic navigation aids could not be relied on because of their distant location and the low altitudes at which the missions were flown. Detailed flight planning was necessary before each flight in order to plot check points that could be identified on the IR terrain display scopes and to determine the type of patterns to be flown within the target areas. The consensus of opinion among evaluators and 73d Avn Co aviators was that training in this area should receive more emphasis in CONUS.

During most of the evaluation period, only six qualified aviators were assigned to undertake IR surveillance missions. However, during the last half of the evaluation, three additional US Army Combat Surveillance School trained aviators were available. These newly assigned aviators required 15 hours training in night low-level navigation and

15 hours of ground school on doppler navigation and the IR system before they were considered ready to undertake missions. Four aviators received operational qualification in the use of the doppler navigation system.

(2) Cross-Training Requirements

Cross-training from one series of OV-1 aircraft to another as they were configured for the evaluation required the following number of hours of training:

Aircraft Type	Cross-Training Required	
	Flight hours	Ground hours
OV-1A	1 to 15 (gunnery)	8 (armament)
OV-1B	3 (SLAR)	5 (SLAR theory and opn)
OV-1C	10 to 15 (Doppler and IR opn)	15 (Doppler and IR opn)

(3) Experience Level

The experience level, as of 1 April 1965, of the OV-1 aviators was as follows:

Total Fixed-Wing Time		OV-1 Time		OV-1 Combat Flight Time	
Hours	No. of Aviators	Hours	No. of Aviators	Hours	No. of Aviators
0 to 500	2	101 to 200	3	0 to 50	1
501 to 1000	5	201 to 300	9	51 to 100	5
1001 to 1500	10	301 to 400	9	101 to 150	7
1501 to 2000	1	401 to 500	1	151 to 200	3
Over 2000	4			201 to 250	5
				251 to 300	1

The company SOP required newly assigned aviators to fly two operational missions with an experienced aviator before being assigned sole responsibility for surveillance missions. In the case of visual and photo missions, the team leader was the experienced aviator and the newly assigned aviator flew as wingman. Infrared and SLAR missions were

conducted with an experienced aviator as copilot and operator during visual flights, while the newly assigned aviator piloted the aircraft.

During the evaluation, the average flight hours per aviator were 43.7 hours for April, 38.9 hours for May, and 38.8 hours for June.

b. Electronic Sensor Operators

All sensor operators had to be capable in reading maps rapidly and accurately. Additionally, they had to be capable of plotting IR emissions and radar returns as they appeared in the IR terrain display scopes and on the processed film as it appeared in the viewer of the RO-166 Recorder-Processor-Viewer. Problems associated with in-flight plotting of emissions and radar target returns were:

1) Small work area in cockpit and lack of free movement caused by various parachute and seat harnesses.

2) Converting doppler coordinates to map grid coordinates.

3) Infrared emissions were visible for only a few seconds and the operator was required to shift his vision from the display scopes to the doppler computer to determine coordinates and then back to plot the emissions on a map. During this time other important emissions might well go unseen.

4) To prevent light from shining in the aviator's eyes at night, the terrain display scopes were shielded and inconveniently placed for the already occupied pilot to see them, and he could not readily assist the operator.

Side looking airborne radar operators required additional training in maintenance and use of the RO-166 Recorder-Processor-Viewer. Installation and operator maintenance training was supervised by the factory representative.

c. Imagery Interpreters

See objective 3 for details on imagery interpreters.

d. On-The-Job Training

On-the-job training was used effectively by the 73d Avn Co. The early ETS of sensor operators necessitated on-the-job training of other personnel to provide operators. Two IR sensor operators were trained successfully in this manner during the evaluation. One additional IR operator had been similarly trained before the evaluation.

9. Vulnerability

Viet Cong small arms fire had no significant effect on OV-1 aircraft operations. A total of 2,643 hours were flown in OV-1 aircraft from 1 April to 29 June 1965. There were no known losses of OV-1 aircraft due to enemy action. Twelve aircraft were hit with eighteen rounds. See annex B for hit data.

Estimated .30 caliber small arms fire damage resulted in aircraft being grounded for sheetmetal work for a total of 31 out of 1260 aircraft days. One OV-1C was hit with two estimated .50 caliber rounds while on a night mission and considerable damage was sustained. Although the aircraft landed without incident, it was out of service for 30 days.

All aircraft hits were received at 2000 feet absolute altitude or lower, as shown in figure 11.

	0-500 feet	500-1000 feet	1000-1500 feet	1500-2000 feet
OV-1A	0	7	2	1
OV-1B	0	0	0	0
OV-1C	0	0	0	2

(U) FIGURE 11. Aircraft hit data.

One OV-1C aircraft failed to return from a night infrared mission and, despite an intensive search, was never found. Both US crew members are listed as missing. Although the cause of disappearance of the aircraft could not be determined, it is not listed as a ground-fire loss. One known casualty occurred when an aviator was slightly wounded in the check by a piece of flying plexiglass. He was given medical treatment and returned to duty the same day.

10. Supplemental Information

a. Visual Surveillance

The visual surveillance capability provided by OV-1A aircraft had been evaluated in Vietnam by ACTIV on two previous occasions and findings presented in the reports "Mohawk Aircraft in the Target Acquisition Role" (U), 1 February 1964, and "Employment of OV-1 (Mohawk) Aircraft in Support of Counterinsurgency Operations" (U), 25 May 1963.

During the present evaluation, nearly all of the visual surveillance missions were flown in support of the 7th, 9th, and 21st Divisions in the ARVN IV Corps and the 22d Division in the ARVN II Corps. A few missions were flown in support of the 5th Special Forces Group in the

III Corps area and TRAC. Visual target areas were surveyed as shown in figure 12.

Mission	II Corps	IV Corps	Other
Preplanned	360	1419	12
Immediate	107	152	2
Targets of Opportunity	4	65	-

(C) FIGURE 12. Visual target area summary.

(1) Mission Aborts

Of a total of 2052 visual target area missions assigned, 249 or 12.1 percent were aborted. Adverse weather conditions over the target area and aircraft malfunction accounted for 69.1 percent of all aborts.

(2) Target Indicators

When possible the intelligence value of target indicators for each visual target area was determined and a composite assessment of the indicators made. Personnel, sampans, fortifications, and structures, in that order, were most frequently reported. Normal activity (36.8 percent) and unusual activity (35.2 percent) occurred about equally. In 4.2 percent of the target areas no indication of activity was observed and the nature of activity in 23.8 percent of the target areas could not be determined. It should be noted that in each target area, group sightings of any one category were recorded as one sighting. (See figure 13.)

b. Aircraft Armament

The six authorized and two float OV-1A aircraft were equipped with 2.75-inch rockets and caliber .50 machineguns to provide a suppressive fire capability. Armed aircraft were normally employed in pairs and, when suppressive fires were requested, both aircraft participated.

Each aircraft normally carried one of the following armament loads:

1) Load A - Two XM-14 systems (750 rounds of caliber .50 each) and 2 LAU-32 systems (7 rounds of WP rockets each, normally used for target marking)

2) Load B - Two LAU-3 systems (18 rounds of HE rockets each) and 2 LAU-32 systems.

Category	Sightings by Area
Personnel	1184 (32.9%)
Animals	76 (02.1%)
Unidentifiable Objects	2 (00.1%)
Construction	40 (01.1%)
Vehicles	41 (01.1%)
Supplies	24 (00.7%)
Junks or Ships	39 (01.1%)
Sampans	919 (25.5%)
Structures	299 (08.3%)
Fortifications	465 (12.9%)
Camouflage	97 (02.7%)
Other	421 (11.5%)

(U) FIGURE 13. Categories of visual surveillance missions.

When defensive firepower was required during visual photo missions, mutually supporting fire was delivered. Existing rules of engagement prohibited firing upon suspected VC unless they fired first and then only after the ARVN observer on board verified that the incoming fire was enemy. This was strictly enforced by the company commander.

Armed OV-1A aircraft were used to escort OV-1C aircraft on daylight IR missions in II Corps area. The airspeed differential between the two aircraft required the OV-1C to decrease its speed by about 20 knots. This decrease in speed of the sensor aircraft was considered to be insignificant compared to the protection provided by the escort.

Aviators unanimously agreed that an aggressive use of defensive firepower insured that missions were successfully accomplished. The retalitory capability of the armed aircraft allowed the aircraft to fly longer and remain longer in prime target areas with greater safety. As a result, positive and more detailed information was obtained from areas in which suppressive fire was used.

c. Alert Aircraft

The Vung Tau Airfield commander required two armed OV-1A aircraft with flight crews, in addition to other aircraft, to standby during the hours of darkness to defend the airfield against attack. The concept included a standby CV-2B Caribou, loaded with illumination flares, to illuminate the attacking force, thereby allowing armed OV-1A's to attack.

d. ARVN Observers

The rules of engagement, as stated in MACV Directive 95-2, required ARVN observers in all armed OV-1 aircraft. The observers were officers who had completed the ARVN aerial observer's school and they were familiar with the area and assisted the aviators with navigation (pilotage) and identification of Viet Cong activity. The ARVN observers frequently made spot reports to ARVN units over the FM radio.

e. Ground Based Navigation Aids

Radio navigation aids were located in the vicinity of major population centers (figure 14). Coverage was considered adequate for aircraft operating at altitudes where radio line-of-sight with the very high frequency aids could be maintained. It was also adequate for general navigation at lower altitudes, below line-of-sight, when close enough to the low powered, low frequency aids to receive a reliable signal. Precision low altitude radio navigation in remote areas of the delta or in many of the target areas located in mountainous terrain was not possible using standard navigation equipment. Therefore, the accuracy of low-level night surveillance was to a great extent dependent upon proper operation of the doppler radar navigators installed in the OV-1C aircraft. The effect of navigation on surveillance is discussed in objective 2.

11. Findings

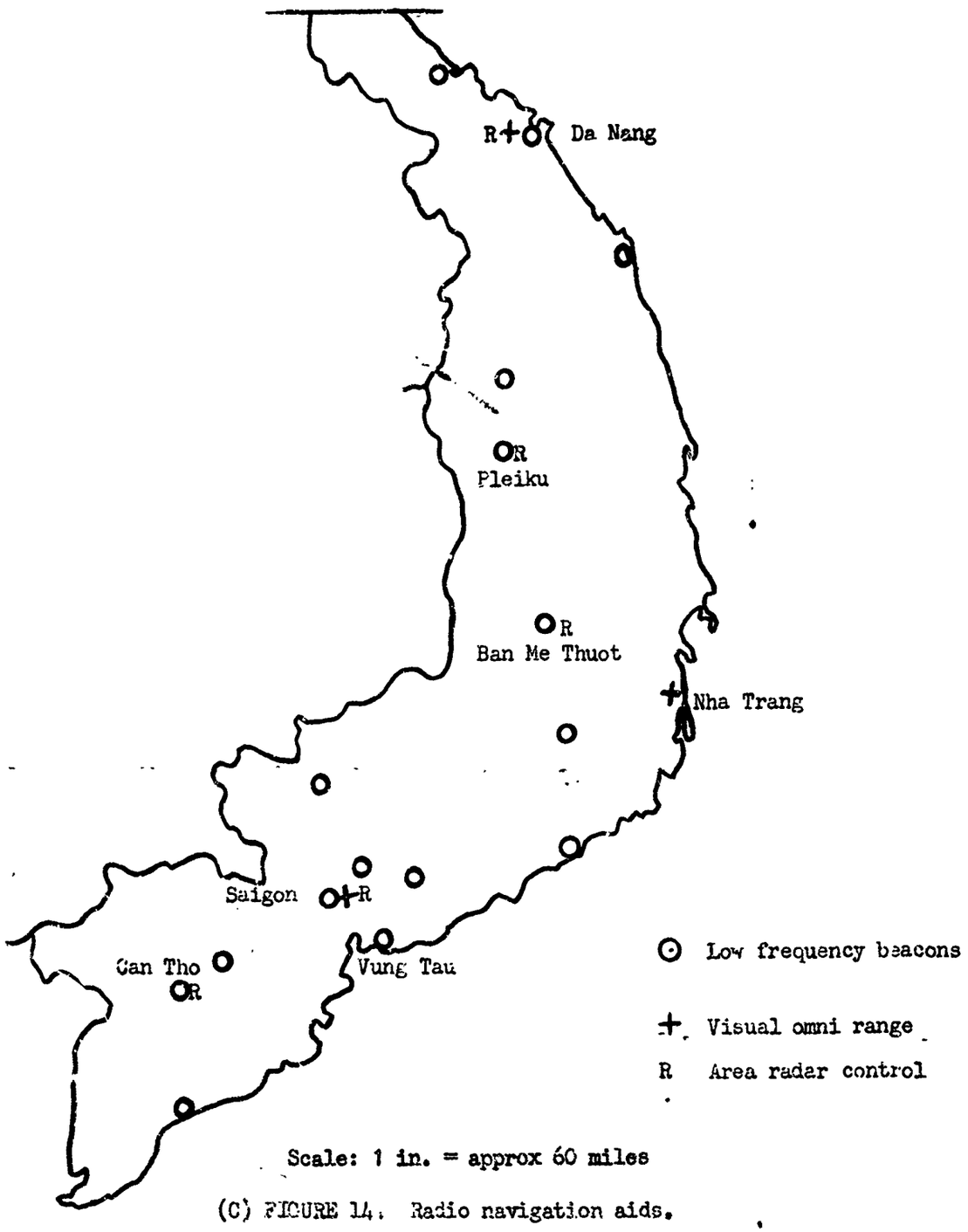
a. The AAOS, JOC, MACV maintained operational control of the 73d Avn Co.

b. The TRAC was delegated responsibility for dissemination of all information acquired from imagery produced by electronic sensor equipment assigned to the 73d Avn Co.

c. The 73d Avn Co provided liaison officers to the TRAC, II Corps, and IV Corps.

d. Eighteen personnel of the 73d Avn Co imagery interpretation section were assigned to the TRAC with duty station at Tan Son Nhut.

e. One visual/photo flight team with supporting elements was placed at Qui Nhon in support of the 22d ARVN Division.



Scale: 1 in. = approx 60 miles

(C) FIGURE 14. Radio navigation aids.

f. Two OV-1A float aircraft were issued to the 73d Avn Co to support the visual/photo mission requirement.

g. The overall mission-ready rate for OV-1 aircraft was 72.8 percent.

h. The telephone was the primary means of communication between the 73d Avn Co and the supported units.

i. The GRC-46 radio set was not effectively employed.

j. Visual/photo mission priorities were controlled by the AAOS, JOC, MACV.

k. The established procedure for SLAR/IR mission requests by the corps required that they be submitted to the TRAC for action.

l. Visual/photo missions were flown only during daylight hours. Infrared and SLAR missions were flown predominately at night.

m. The doppler radar navigator was used extensively during IR surveillance missions.

n. All visual/photo missions were flown by a team of two OV-1A aircraft.

o. Visual/photo reconnaissance missions were flown at absolute altitudes ranging from 500 to 2000 feet.

p. Infrared reconnaissance was flown by a single aircraft generally between 1000 and 2000 feet absolute altitude.

q. Side looking airborne radar equipped aircraft operated singly and flew at absolute altitudes of 7000 feet or higher.

r. Photographic surveillance was accomplished using the single pass technique.

s. Side looking airborne radar surveillance was accomplished using the single pass and multiple parallel pass technique.

t. Infrared surveillance was accomplished using the multiple parallel and multiple random pass technique.

u. Visual surveillance was accomplished using the multiple random pass technique.

v. Inflight spot reports were frequently made during visual/photo missions.

w. The number of inflight spot reports during SLAR missions increased as means were developed to determine targets by UTM grid coordinates.

x. The SLAR operators were given additional training on the installation and use of the RO-166 recorder-processor-viewer.

y. The average time after mission return for spot reporting by TRAC to the appropriate headquarters was 2 hours and 27 minutes for a SLAR mission, and 2 hours and 48 minutes for an IR mission.

z. The 73d Avn Co provided electronic (SLAR/IR) intelligence information directly to the TRAC for further distribution.

aa. The IV Corps requested and received the preponderance of visual/photo reconnaissance missions flown by the 73d Avn Co.

bb. All OV-1A aircraft were armed.

cc. Newly assigned OV-1 qualified aviators lacked adequate doppler radar navigator training and experience.

dd. Newly assigned aviators required additional flight and ground school training prior to participating in operational missions.

ee. Eighty-two percent of the assigned aviators had more than 200 hours of OV-1 flying experience and 98 percent had over 50 hours of OV-1 combat experience at the beginning of the evaluation.

ff. Assigned aviators flew an average of 40 hours first pilot time each month in the OV-1.

gg. It was necessary to train two IR sensor operators on the job.

hh. A total of 2,643 hours were flown by OV-1 aircraft with a total of 18 hits received, for an average of one hit per 146.8 flying hours. Small arms fire had little effect on OV-1 operations.

ii. Defensive firepower provided a vital deterent to hostile groundfire.

jj. More positive and detailed information was often obtained from target areas in which suppressive fire was used.

B. OBJECTIVE 2 - AIRBORNE SURVEILLANCE

1. Surveillance Equipment

Information on insurgent activity was obtained by the 73d Avn Co

through one or more of the following surveillance systems:

a) Photographic Surveillance System, Airborne, KS-61A (KA-30 Camera).

b) Aerial Camera System, Still Picture, KA-60.

c) Side Looking Airborne Radar Set, AN/APS-94 (A)

d) Infrared Surveillance System, AN/UAS-4.

A detailed description of equipment is provided in annex C.

2. Surveillance Configuration

The configuration of OV-1 Mohawk aircraft employed by the 73d Avn Co is shown in figure 15. All major items of surveillance equipment were used with the exception of the Transponder Set, AN/DPN-62 A(V). This transponder set is designed to operate only with the AN/MPQ-29 Tracking Radar which was not available in the RVN.

Installation of the KA-60 Aerial Camera System in six OV-1A aircraft was completed on 25 February 1965. The two assigned OV-1A float aircraft were similarly equipped on 5 May and 8 June 1965.

The AN/ARA-54 glide slope antenna was relocated upon installation of the KA-60 camera, but subsequently removed from its modified location to permit increased airflow through the chin airscoop. Inadequate cockpit airflow was a factor adversely affecting crew comfort and efficiency.

3. Surveillance Flying Hours

During the 90-day evaluation, 2267 mission-hours were flown in the following categories:

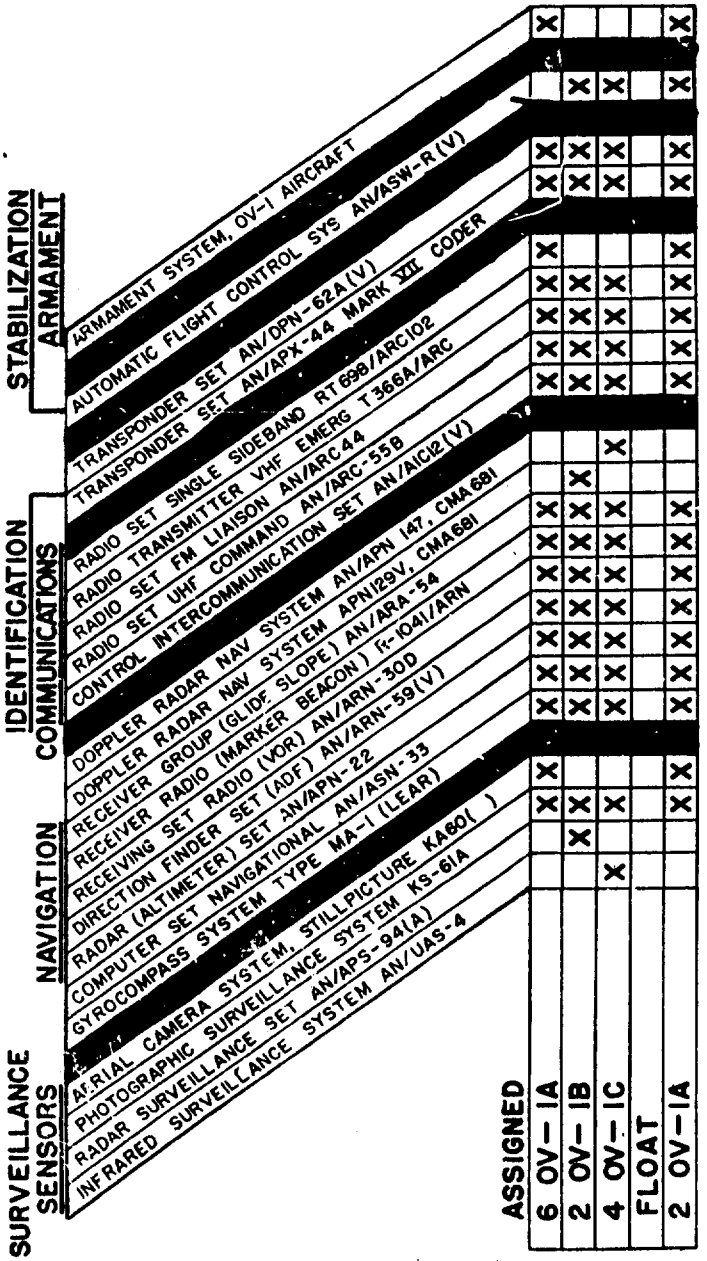
a) 1558 hours (68.7 percent) over target areas

b) 709 hours (31.3 percent) travel time to and from assigned target areas

c) 1549 hours (68.3 percent) flown during daylight hours

d) 113 hours (5.0 percent) flown under instrument flight conditions (primarily at night to accomplish SLAR and IR surveillance)

Because of numerous thunderstorms and extreme turbulence which occurred during the latter part of the evaluation period, less instrument flight time was recorded than during the earlier portion of the



(C) FIGURE 15. Configuration of OV-1 aircraft, 73d Aviation Company (AS)

evaluation. Although the severity of weather conditions progressively increased and adversely influenced the operational and technical aspects of surveillance, bad weather was not particularly significant since 86.0 percent of scheduled surveillance was successfully accomplished.

A detailed summary of the surveillance flying hour requirement for three successive 30-day periods is shown in figure 16. A comparison of total flying hours over target areas for each type of surveillance reveals that approximately 74.0 percent of both visual/photo and SLAR surveillance time was productive as compared with only 45.2 percent for IR. This difference can be attributed to the manner of employing the IR sensor, which is discussed in paragraph 5 of this objective. Successful surveillance was accomplished of:

a) 10,201 square kilometers by photographic and visual means

b) 41,315 square kilometers by IR mode

c) 3,531,289 square kilometers by SLAR sensor

4. Photographic Surveillance

Photographic surveillance was one of the primary means of daylight reconnaissance performed for ARVN tactical elements at the division level. Mohawk OV-1A aircraft were allocated on a daily basis in direct support of divisions in the ARVN II and IV Corps areas. Photographic reconnaissance was used to determine the validity of specific information on suspected VC activity and to confirm information obtained from other intelligence sources.

Surveillance of targets by photographic means covered the entire spectrum of Viet Cong activities. The more significant applications involved photography of installations or structures, fortifications, obstacles, boats, (sampans), terrain features, pre-strike analysis, and post-strike damage.

There were 459 photographic target areas averaging 1.5 square kilometers in size scheduled for surveillance. Surveillance was accomplished in 414 (90.2 percent) of the assigned target areas (figure 17). Most of the photographic requirements were generated by the 7th, 9th, and 21st Divisions of the ARVN IV Corps. The remainder was generated by the 22d Division of the ARVN II Corps, TRAC, and the 5th Special Forces Group.

Of the photographic surveillance missions, 83.3 percent were preplanned, 11.2 percent were of an immediate nature, and 5.5 percent were targets of opportunity.

The KS-61(A) was employed 385 times to obtain photographic

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FLYING HOUR TOTALS 1 APR THRU 29 JUL 65

		1 - 30 APR TOT	1 - 30 APR TMT	1 - 30 MAY TOT	1 - 30 MAY TMT	31 MAY - 29 JUN TOT	31 MAY - 29 JUN TMT	1 APR - 29 JUN TOT	1 APR - 29 JUN TMT
VISUAL PHOTO	DAY	402:03	561:31	392:31	528:10	312:24	378:00	1106:58	1467:41
	NIGHT	06:57	07:47	—	01:50	—	—	06:57	09:37
	INSTRU-MENTS	00:40	00:40	—	—	—	—	00:40	00:40
IR	DAY	10:02	18:35	22:53	54:27	—	02:40	32:55	75:42
	NIGHT	65:26	161:30	68:06	132:05	52:30	114:15	186:02	407:50
	INSTRU-MENTS	13:23	27:15	09:44	18:35	06:15	11:20	29:22	57:10
SLAR	DAY	01:30	02:00	02:15	03:05	00:15	00:30	04:00	05:35
	NIGHT	47:56	73:25	77:22	107:50	95:34	119:18	220:52	300:33
	INSTRU-MENTS	16:15	21:06	15:35	20:35	11:45	13:25	43:35	55:06

NOTE: TOT indicates total time over target areas (travel time excluded).
TMT indicates total surveillance mission time (travel time included).
Instrument flight hours are included in day/night values.

(C) FIGURE 16. Aerial surveillance flying hour summary.

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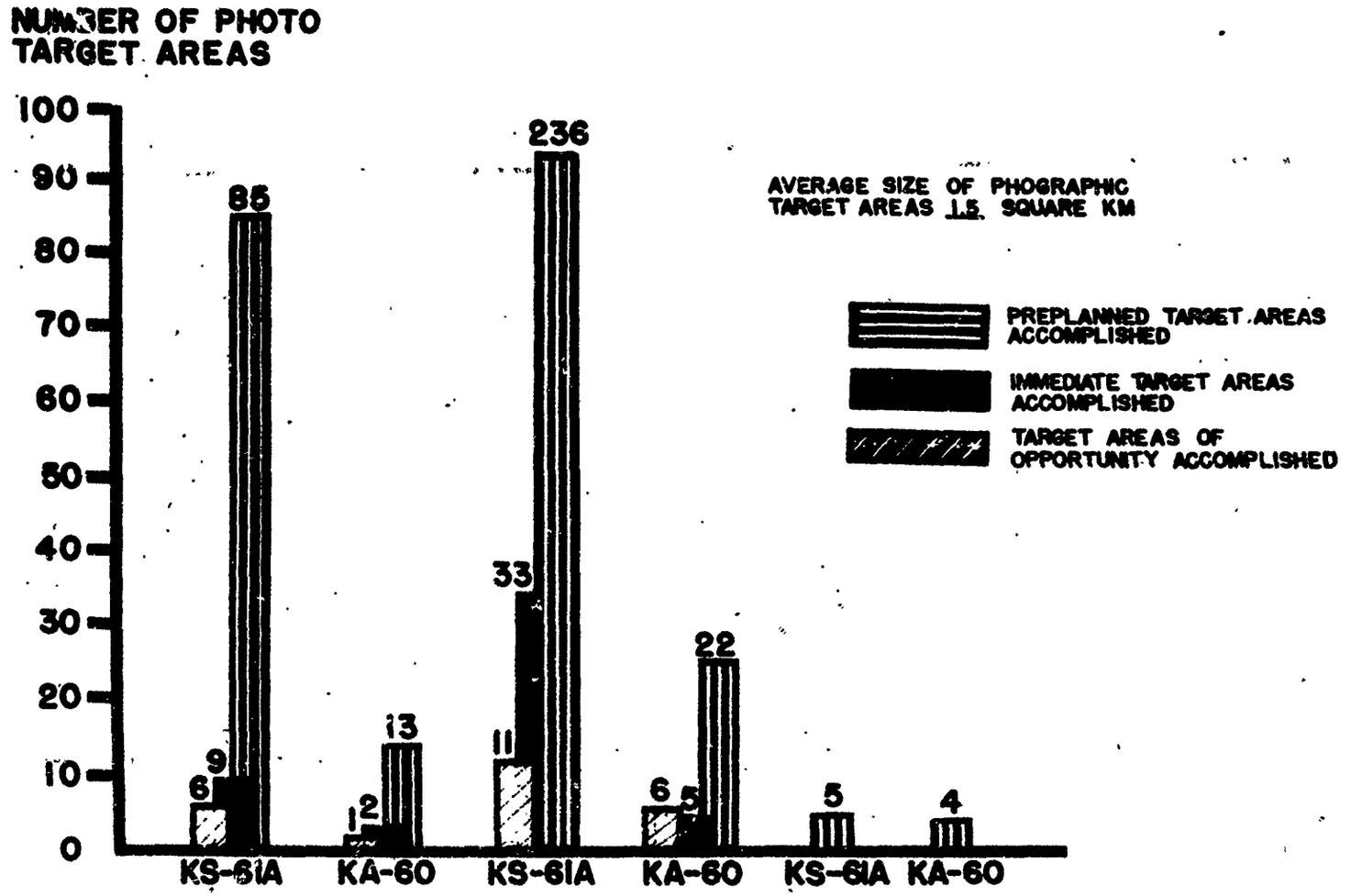

(C) FIGURE 17. Photographic surveillance target area summary.

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coverage of target areas. By comparison, the KA-60 was employed on 53 occasions. This system was normally employed in the vertical mode to provide the positive scale factors necessary for accurate and detailed interpretation of imagery. When oblique photography was required, the KA-60 was normally employed.

Only one night photographic surveillance mission was requested during the evaluation. This mission was successfully completed and the imagery was of good quality. Although supported units had previously expressed a need for night aerial photography, this type of surveillance was neither requested nor flown except in the one case, and an adequate basis could not be established for determining the company's capability for night photographic surveillance.

Successfully covered were 85.2 percent of the assigned KA-60 photo target areas and 90.9 percent of the KS-61 (A) photo target areas. These computations include all photo missions, whether they were cancelled, were totally or partially aborted, envolved navigation errors, or resulted from equipment failures, (less than 100 percent coverage). Also included are cases of faulty film processing techniques.

One roll of color film was exposed in each photographic sensor as an operational test. The film used in the KA-60 was processed by the USARPAC Signal/Photo Laboratory at Fort Shafter, Hawaii and the quality of imagery was excellent. Results of interpretation of the KA-60 color imagery revealed that photographic interpretation was less difficult but it did not improve on or add to intelligence information. In fact the value of information so obtained was degraded because of the 10-day transportation and processing time to Hawaii.

The color film used in the KS-61(A) was employed on a classified mission. Consequently, it was delivered to TRAC prior to processing and the results were never made available to the evaluation team.

5. Electronic Surveillance

Side looking airborne radar and infrared surveillance were the primary means of night reconnaissance employed by the 73d Avn Co. The TRAC programmed missions for SLAR and IR surveillance on a daily basis and was the recipient of all electronic surveillance data obtained. These data were normally used by TRAC in conjunction with information from other sources to develop Viet Cong trends and then analyzed and forwarded to operational elements for appropriate action.

The SLAR and IR sensors were used primarily as area search devices to detect suspicious activity at night in prohibited areas and to provide indicators useful in locating concentrations of the Viet Cong. During a typical 24-hour period, surveillance coverage by the IR sensor was over 450 square kilometers and, by the SLAR, over 39,235 square kilometers.

The SLAR and IR surveillance systems provided positive real-time information on Viet Cong activity when it was predetermined that all activity in the assigned target area was hostile. It is interesting to note that both the SLAR and the IR sensors detected insurgent vehicles used in support of the major military engagement at Song Be in July 1965.

a. Side Looking Airborne Radar

Side looking airborne radar was tactically employed to detect the location of fixed and moving targets on land and along coastal and inland waterways. It was also used to determine the direction and speed of moving targets, to determine the long-range pattern of land and waterborne traffic movement in critical areas, and to maintain surveillance along international boundaries. The SLAR regularly detected numerous boats and sampans moving along the coast and on rivers and canals.

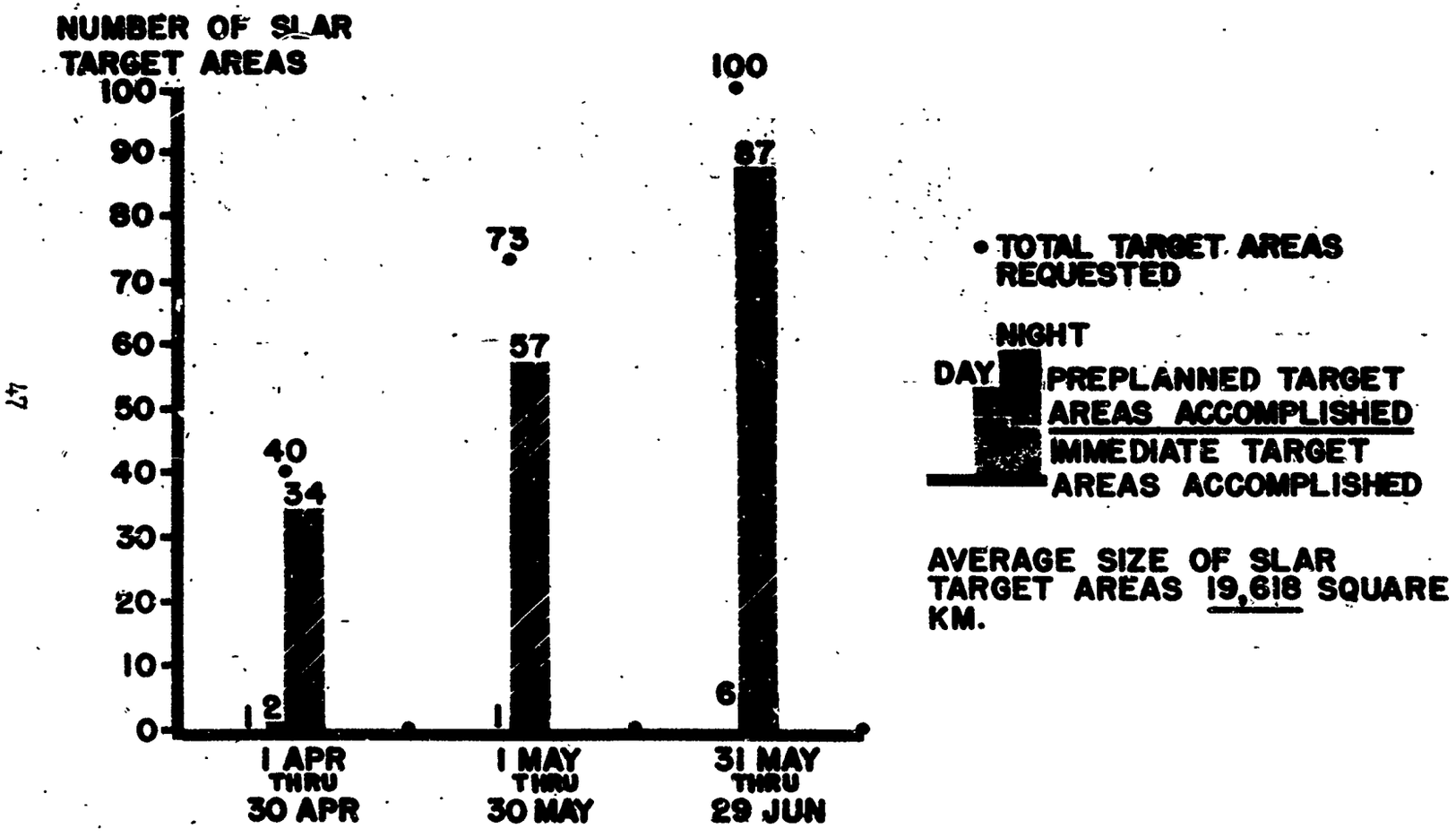
As shown in figure 18, SLAR surveillance was successfully accomplished in 188 (88.3 percent) of the 213 target areas scheduled, and covered an average size of 19,618 square kilometers. For SLAR, 95.2 percent of the target areas were preplanned and 4.8 percent were of operational-immediate interest.

The limited use of daylight SLAR surveillance (one mission) and the lack of continuous night SLAR surveillance in areas of critical interest was attributed to the fact that only two SLAR aircraft were available to support all MACV requirements. Because of maintenance and other requirements only one SLAR aircraft normally was available during any 24-hour period.

Range and range delay settings used in each target area normally were specified by the requestor. To obtain greater area coverage while retaining moving target indications, 50-kilometer range and 0-kilometer range delay settings were most often requested for coastal area surveillance capabilities. Twenty-five kilometer range and ten-kilometer range delay settings were used most often to survey inland waterways and the land mass since these settings provided the best scale factor for precise plotting of target location.

When determination of the direction and speed of targets was essential, more than one pass was required. The multiple pass technique was employed to survey 40.8 percent of the SLAR target areas, while 55.6 percent of the target areas were surveyed using a single pass. Specific relationships pertaining to the types of patterns and altitudes flown over SLAR target areas are shown in figures 8 and 9.

The SLAR sensor detected a total of 2,689 targets of military significance as determined by imagery interpretation, including land



(C) FIGURE 18. SLAR surveillance target area summary

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and waterborne targets that were both fixed and moving. Only those individual SLAR returns detected in restricted (curfew) areas or under circumstances that could not be otherwise accounted for were recorded.

The normal anticipated traffic flow was disregarded. Figure 19 compares the number of SLAR targets of military significance with the number of SLAR target areas taken under surveillance in the three successive months during the evaluation.

Targets were detected with the SLAR sensor in spite of unfavorable weather, and 44 of 225 surveillance hours were accomplished under weather conditions requiring IFR.

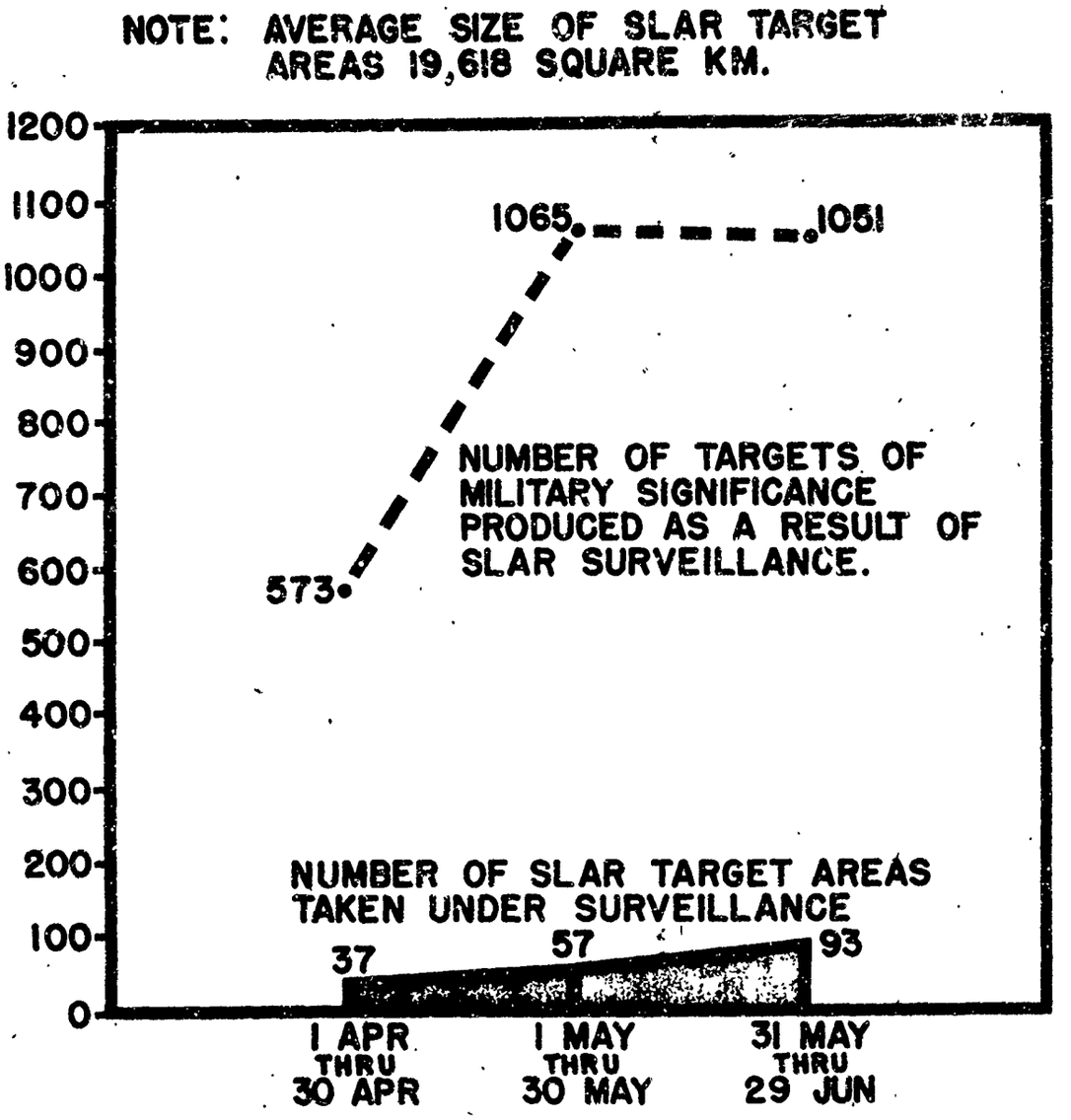
A comparison of the total area assigned for SLAR surveillance with the total area actually surveyed reveals that 76.8 percent of the SLAR surveillance missions were successfully accomplished. This figure includes all mission cancellations, target areas that were partially or not at all covered, and all other factors resulting in less than 100 percent usable imagery.

The RO-225/APS 94(A) Radar Mapping Recorder and the RO-166/UP Radar Mapping Recorder-Processor-Viewer were both used. The RO-225/APS 94(A) was employed during the initial 23 days of evaluation and functioned properly. Prior to and during the initial period of the evaluation, the RO-166/UP was used with limited success. Repeated malfunctions were experienced that were mainly attributed to the chemical composition of the local water which caused the film processing fluid to change characteristics. Water, condensed as a by-product of air conditioner operation in the electronic maintenance vans, was collected and substituted for local water. This change in water source resulted in reliable operation of the RO-166/UP equipment.

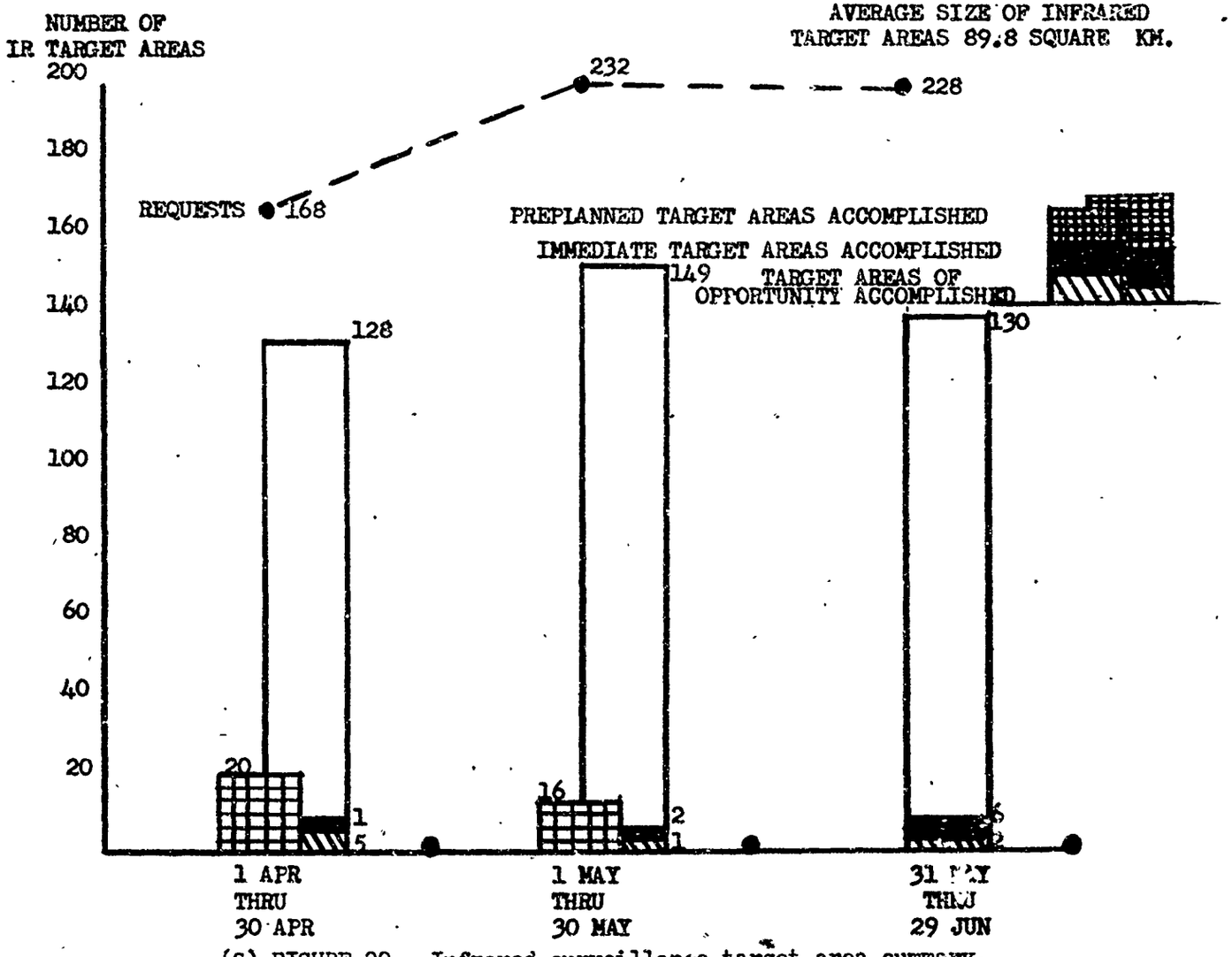
The RO-166/UP was successfully employed on 86.7 percent of the SLAR surveillance missions. By comparing imagery with maps, operators were able, while airborne, to determine to 6 digits the coordinates of targets. Procedures were established during the second half of the evaluation for transmitting target data by airborne spot reports directly to G2 elements at division level. The division assessed the information and recommended the priority of targets to reaction forces.

b. Infrared Surveillance

Infrared surveillance was used to detect heat emissions in areas suspected of being occupied by insurgent forces. The major source of IR emissions of Viet Cong origin were cooking fires and campfires. The number and pattern of infrared emissions in a target area were used to assist in determining the strength, precise location, and the disposition of enemy forces. As shown in figure 20, infrared surveillance was accomplished in 452 (71.7 percent) of the 628 assigned target areas,



(C) FIGURE 19. Operational results of SLAR surveillance



(C) FIGURE 20. Infrared surveillance target area summary.

which averaged 89.9 square kilometers in size. Most infrared surveillance was scheduled during the early evening and early morning hours and 96.3 percent of infrared target areas were preplanned, 1.9 percent were operational-immediate, and 1.8 percent were targets of opportunity.

Area search procedures were required in 96.5 percent of the scheduled target areas and very few point targets or route reconnaissance missions were flown. (See figure 21.) An average of 450 square kilometers of selected area was searched in a 24-hour period. In comparison, the average ARVN corps area varied from 17,600 to 42,910 square kilometers in size. The IR aircraft were used to conduct surveillance in both the ARVN III and IV Corps areas and, for a 13-day period in May, in the ARVN II Corps area of interest.

Infrared surveillance was conducted between 1000 and 2000 feet absolute altitude in 92.6 percent of the missions. Although this altitude is higher than that normally used in CONUS, the IR detector was still capable of detecting high background contrast emissions through dense jungle growth. Surveillance at lower altitudes increased the problem of plotting imagery on a standard map reference because of the sensor's relatively narrow field of view.

During the evaluation the IR sensor detected a total of 1,789 targets of military significance. Single or multiple IR emissions at a specific location were recorded as a single target of military significance and anticipated heat emissions from recognized sources were disregarded.

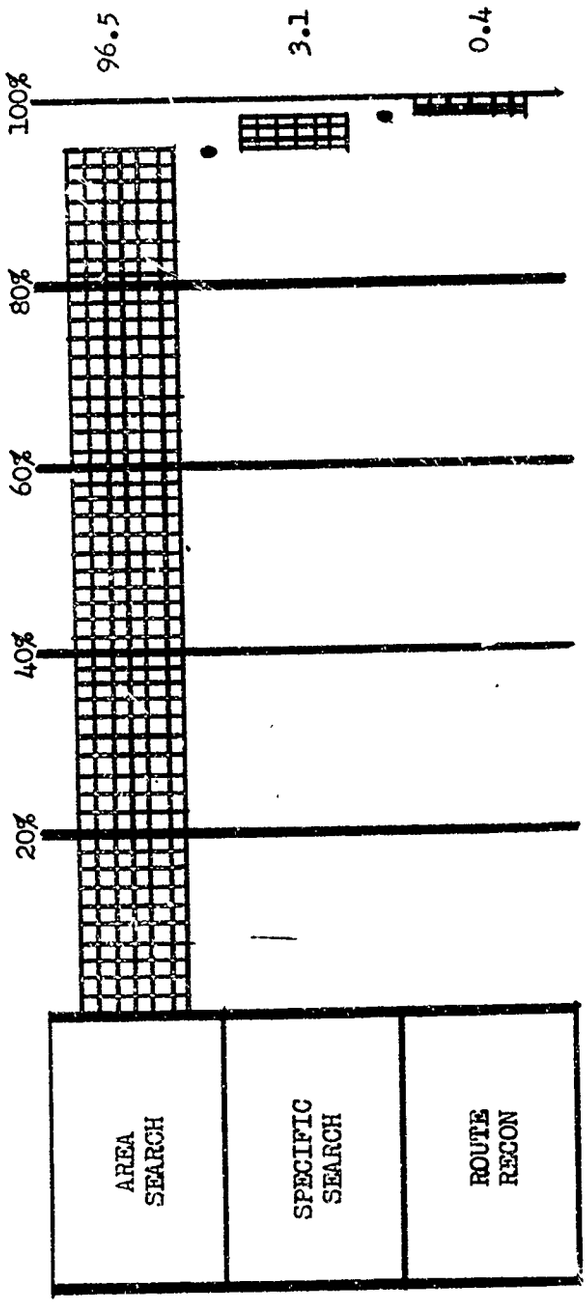
Data plotted in figure 22 compare the number of IR targets of military significance with the number of IR target areas taken under surveillance in three successive 30-day increments. Considering the number of target areas surveyed and the amount of flying time over the target areas, there was a large decrease in detection of targets of military significance during the last 30 days of the evaluation. It was not possible to determine precisely the cause for the decrease, as many variables influenced IR surveillance. Some of the reasons were:

1) A number of target areas were repeatedly taken under surveillance during the initial 60 days.

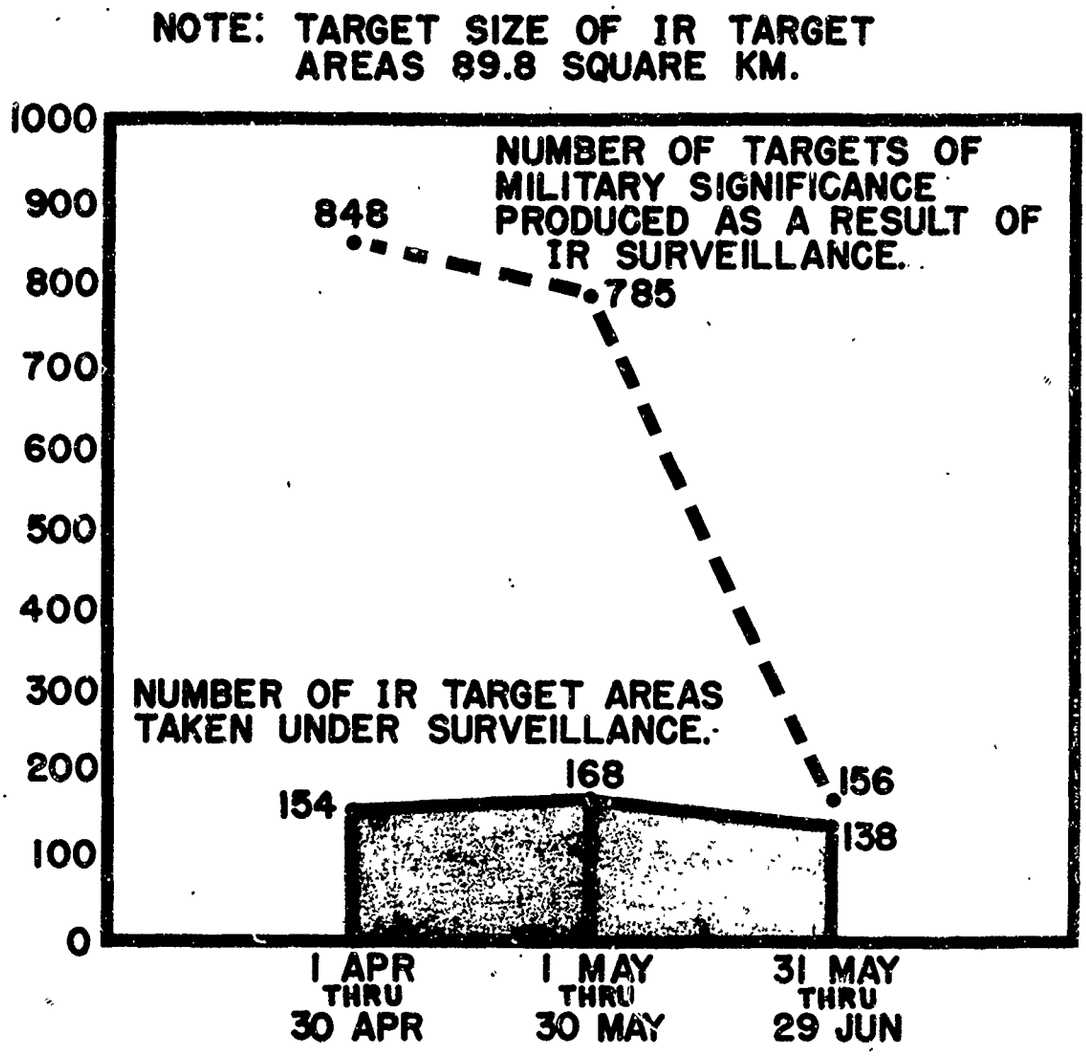
2) A larger number of new target areas were taken under surveillance during the final 30 days and many provided negative results.

3) Fewer aircraft were available to support IR surveillance during the final 30 days and fewer IR missions were flown.

A comparison of the total area assigned for IR surveillance



(C) FIGURE 21. Type of IR reconnaissance required.



(C) FIGURE. Operational results of IR surveillance.

with the total area actually surveyed reveals that 46.5 percent of the IR surveillance missions were successfully accomplished. This figure includes cancellations, target areas that were partially covered or not covered, navigation errors, or equipment failures resulting in less than 100 percent usable imagery of the assigned target areas. The three most significant operational aspects adversely affecting mission accomplishment were bad weather, navigation inaccuracy, and poor quality or unplottable imagery.

Maintaining a relatively low absolute altitude over mountainous terrain during conditions of reduced visibility or at night imposed an operational limitation on the employment of the IR sensor. Therefore, mission requirements in mountainous areas were performed during daylight hours in visual flight conditions.

The photo multiplier tube (visible light detector) was used in one of the two channels of the IR system on 19.4 percent of the daylight missions. Surveillance with the photo multiplier was not considered to be advantageous as it offered no improvement over the IR detectors. A more efficient use of the system was to employ IR detectors in both channels. One channel was operated at the best contrast setting to provide map-like presentation of the terrain to aid in plotting the imagery and the second channel was set to wash out terrain and thereby display significant infrared emissions with more prominence, thus aiding interpretation.

The AN/TAQ-1 Infrared Surveillance Information Center was not evaluated as it was used only for test, demonstration, and flight following in the III Corps and IV Corps areas during the last 15 days of the evaluation.

6. Quality of Imagery

The quality of the surveillance imagery obtained from the photographic and electronic sensors fell into one of three catagories:

a) Good - Imagery sharp and clear; definition, resolution, and contrast good to excellent.

b) Fair - Imagery satisfactory for all requirements; resolution, definition, or contrast somewhat degraded.

c) Poor - Imagery partially or totally unsatisfactory; definition, resolution, or contrast did not permit comprehensive interpretation.

To establish controls governing the classification of imagery during the evaluation, two well-qualified imagery interpreters independently assessed the quality of each film strip. When a difference

of opinion was encountered, a third imagery interpreter passed judgement on the classification. When human error was considered to be a factor influencing the quality of imagery, that sample was eliminated.

The quality of surveillance imagery obtained from the photographic and electronic sensors is shown in figure 23, together with the percent of imagery that could not be plotted because of weather factors or the absence of identifiable terrain features. The ability of the imagery interpreter to plot the imagery at a specific map location was to some degree dependent upon the quality of the imagery, but to a greater extent upon the terrain and terrain cover in the target area. Because of their narrow fields of view, the KS-61(A) and the UAS-4 systems produced imagery that was especially affected by these factors. A further discussion of this problem is contained in objective 3.

a. Photographic

Both cameras normally produced good quality imagery. However, the KA-60, used for oblique photography over longer ranges, was more subject to the effects of atmospheric haze. A yellow-blue filter was used on the KA-60 as required to provide better haze penetration and improve the quality of imagery.

All KA-60 imagery was plottable because of its panoramic format. A small amount (1.1 percent) of KS-61(A) imagery could not be plotted because of the absence of distinctive terrain features.

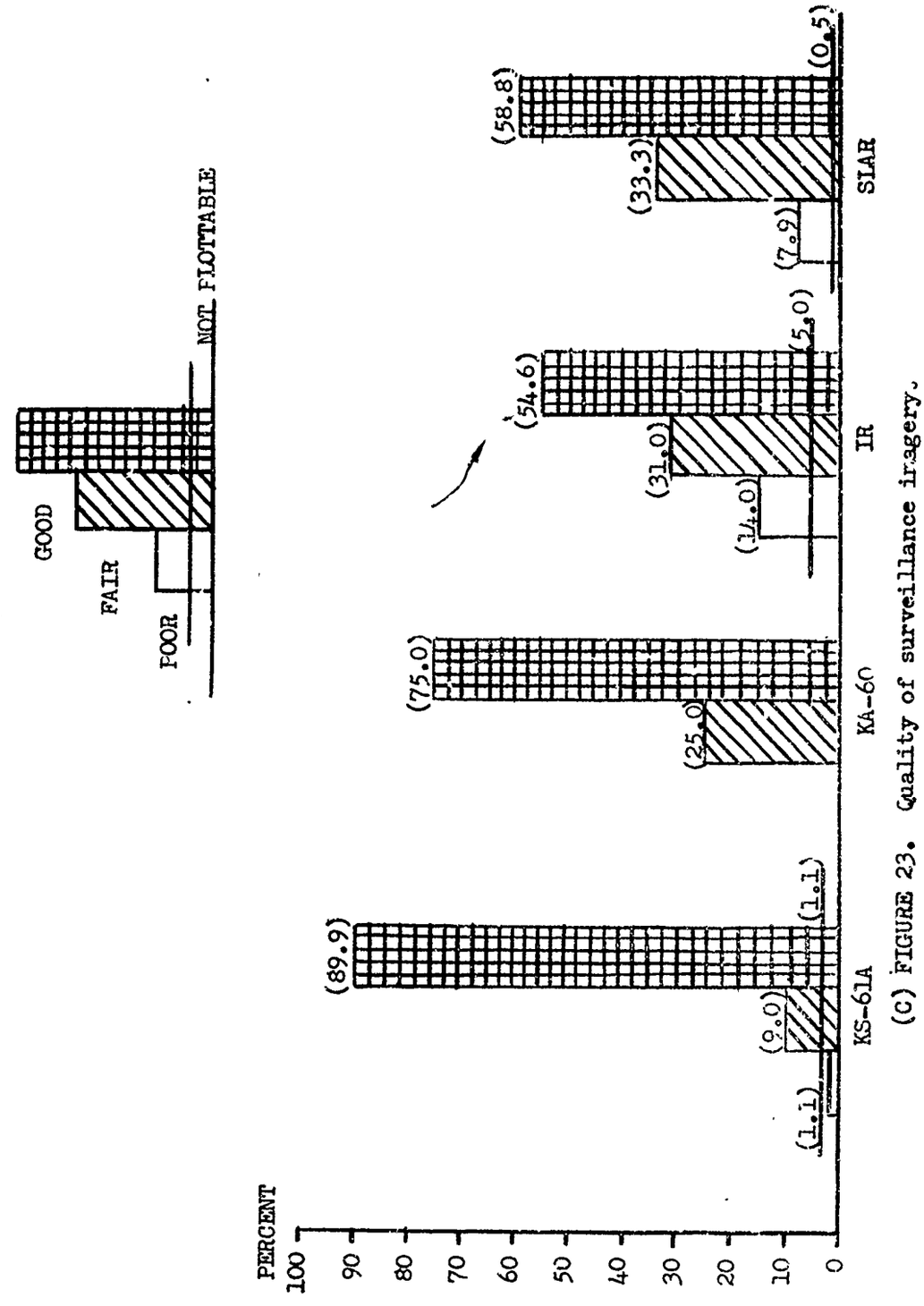
b. SLAR

The quality of SLAR imagery was generally good. A small portion (7.9 percent) was classified poor owing primarily to the effects of weather. During the southwest monsoon season large storm areas developed during the day and persisted throughout the night. Imbedded in these storm areas were numerous thunderstorms producing smaller areas of intense precipitation which the SLAR sensor could not successfully penetrate. Heavy cloud cover and areas of light to moderate precipitation had little or no effect and the quality of imagery obtained under these conditions was fair to good.

Side looking airborne radar imagery obscured by intense precipitation could not be plotted to a standard reference. For this reason, 0.5 percent of the SLAR imagery was not plottable.

c. IR

The overall quality of IR imagery was good. However 14.4 percent of the imagery was classified as poor, primarily because of weather or difficulty in adjusting control settings.



(C) FIGURE 23. Quality of surveillance imagery.

Infrared surveillance was flown during instrument flight conditions 13.3 percent of the time. Intense IR emissions were detected through light clouds, moderate precipitation, and banks of ground fog. It was not possible to evaluate the effectiveness of filters with IR since there was only one instance when a 4.5 to 5.5 micron band pass filter was used and it produced inconclusive results. The quality of IR imagery was primarily affected by the reduction in contrast caused by bad weather. Cloud obscuration and lack of distinctive terrain features in the target area caused 5.0 percent of the IR imagery to be unplottable to standard map reference.

Mohawk OV-1C aircraft operated in the ARVN II Corps area for a 13-day period and conducted IR surveillance over rugged mountainous terrain. During surveillance in this area aviators manually maintained contour flight control (pitch axis) over steep terrain gradients. The sensor operators had considerable difficulty in compensating for the large and rapid displacements of absolute flight altitudes. This condition downgraded the overall quality of IR imagery.

7. Mission Aborts and Mission Delays

Photo, IR, and SLAR target missions were aborted in 180 of the 1300 assigned. (See figure 24.) Adverse weather in the target area accounted for 50.5 percent of mission aborts. One factor not specified in figure 24, and one which caused target aborts, was the difficulty in establishing the required positive radar control prior to commencing low-level reconnaissance of target areas adjacent to the Cambodian border, as was required by COMUSMACV to prevent inadvertent border crossings. The data shown in figure 24 do not include those missions that were cancelled on the ground before takeoff.

The 45 surveillance missions that were delayed had a negligible effect on mission accomplishment in that the delay was usually short. The average mission delay time for all causes was 49 minutes. No single significant factor can be cited as the reason for delays. Total downtime by cause was as follows:

1 TO 30 APRIL

Reason for Delay	Length of Delay (Hours)
Visual/Photo	
KA-60	00:10
KA-60	00:30

NUMBER OF ASSIGNED TARGETS ABORTED

REASON FOR ABORT	1 - 30 APRIL			1 - 30 MAY			31 MAY - 29 JUN			TOTAL		
	PHOTO	IR	SLAR	PHOTO	IR	SLAR	PHOTO	IR	SLAR	PHOTO	IR	SLAR
SENSOR FAILURE		4		6	1	2	6	2	4	12	7	6
PERSONNEL FACTORS						1						1
GROUNDFIRE		1			3		1	2		1	6	
AIRCRAFT MALFUNCTION					10	3	10		2	10	10	5
NAVIGATION EQUIPMENT FAILURE		1	3		8	1		2	1		11	5
WEATHER	2	8	2	9	39	9	3	17	2	14	64	13
OTHER	6	1			3		2	2	1	8	6	1

TOTAL ASSIGNED TARGET AREAS 1 APRIL THROUGH 29 JUNE:

PHOTO 459 IR 628 SLAR 213

(C) FIGURE 24. Target abort summary.

IR/Photo		
	KS-61A	00:30
	Refueling	00:45
IR		
	AN/AAS-14	00:20
	Communications	01:30
	Communications	00:50
	AN/AAS-14	01:00
	AN/AAS-14	01:00
	Unknown	00:30
SLAR		
	Unknown	01:00
	AN/APS-94A	01:30
	Aircraft Maintenance	01:00

1 TO 30 MAY

Visual/Photo		
	Aircraft Maintenance	01:00
	Refueling and Personnel	01:00
	Aircraft Maintenance	00:40
	Ejection Seat Maintenance	00:50
	Communications	00:30
	Aircraft Maintenance	01:00
	Aircraft Maintenance	00:45
	Armament	00:10
	Aircraft Maintenance	02:15

IR

AN/AAS-14	00:15
AN/AAS-14	01:30
AN/AAS-14	00:15
AN/AAS-14	01:00
AN/AAS-14	00:30
Communications	00:45

SLAR

AN/APS-94A	01:45
Aircraft Maintenance	01:30
Unknown	01:00
AN/APS-94A	01:00

31 MAY TO 29 JUNE

Visual/Photo

Aircraft Maintenance	00:15
Aircraft Maintenance	00:25
Aircraft Maintenance	00:25
Communications	01:00
Armament	01:00

IR

AN/AAS-14	00:45
AN/AAS-14	00:20

SIAR

Aircraft Maintenance	00:30
Aircraft Maintenance	00:35
AN/APS-94A	01:00
Aircraft Maintenance	01:30
Aircraft Maintenance	00:30
Aircraft Maintenance	01:00

8. Multi-Sensor Surveillance

Few simultaneous multi-sensor surveillance missions were flown. On occasion productive target areas were scheduled for more than one means of surveillance but these missions were conducted at different times and thus were not considered as true multi-sensor surveillance. Therefore, the effects of multi-sensor surveillance were not determined.

9. Effect of Navigation on Surveillance

The navigation means employed by aviators during surveillance missions were: a) doppler radar navigation, b) low frequency automatic direction finder (ADF), c) visual omni range (VOR), d) ground radar vector, e) pilotage, and f) dead reckoning. The doppler radar navigation equipment was installed in the OV-1B (SIAR) and OV-1C (IR) model aircraft. The other means of navigation were common to all OV-1 aircraft and their use was dependent upon the mission, the location of the target area with respect to the navigation aid, existing weather, time over target (day or night), and the navigation accuracy required.

Variations existed among the means of navigation used to proceed to and from target areas and fly over the target areas. These variations are illustrated in figure 25.

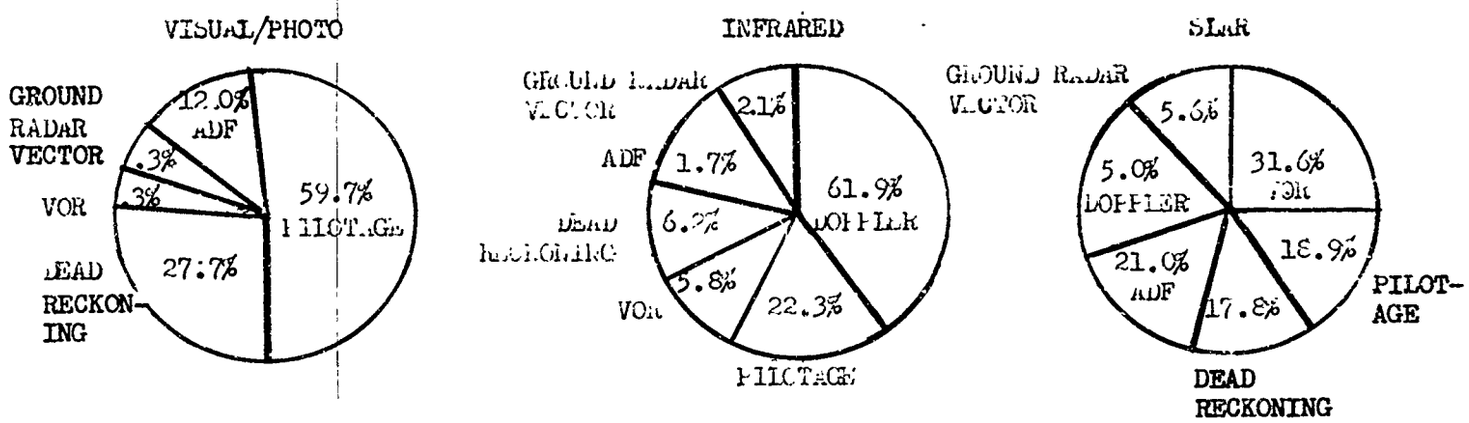
a. Navigation For Photographic Reconnaissance

Pilotage and dead reckoning navigation were the primary methods employed. Other methods were used to position aircraft when the target areas were devoid of distinctive landmarks. Navigation during daylight photographic surveillance missions was successfully accomplished with the available techniques and equipment.

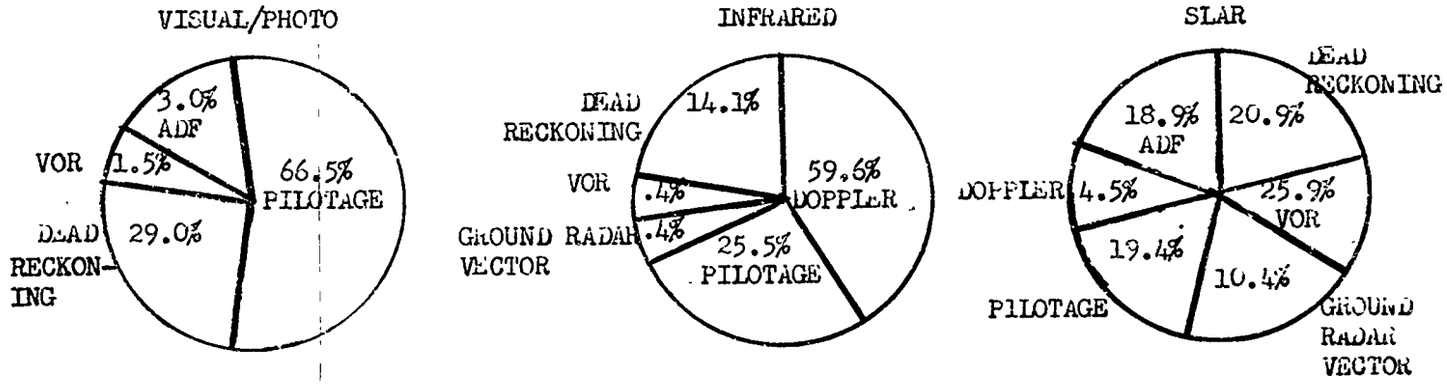
b. Navigation for Electronic Reconnaissance

The navigation means employed with SLAR and IR equipment in

PRIMARY MEANS OF NAVIGATION TO AND FROM TARGET AREAS



PRIMARY MEANS OF NAVIGATION OVER TARGET AREAS



(C) FIGURE 25. Navigation summary.

the conduct of reconnaissance varied widely, based on the differences in characteristics and employment of these sensors.

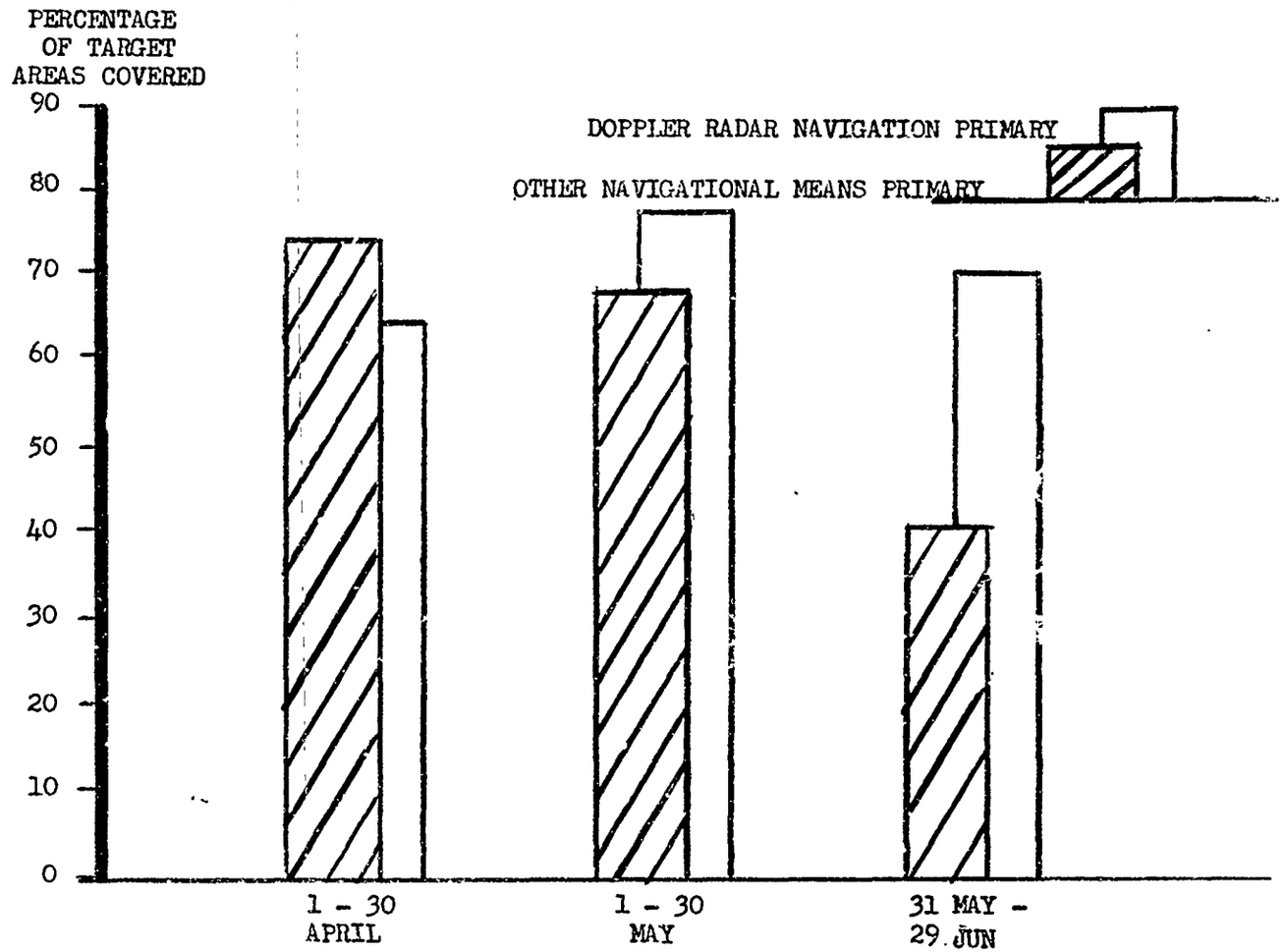
The SLAR sensor was normally employed above 7000 feet and provided surveillance coverage of large areas along a series of straight line courses. A greater variety of navigation aids were thus available. The IR sensor, generally employed at 2000 feet or below, provided surveillance coverage of relatively small areas and required a series of short parallel or random passes. These areas were usually remotely located from ground based navigational aids and a very high degree of navigation precision was required.

Several factors influenced the use of doppler navigation equipment for SLAR and IR reconnaissance. Substantial heading errors were introduced into the doppler radar navigation system from the MA-1 gyro-compass. These error signals varied among aircraft and were the results of MA-1 compass alignment deficiencies. Because a suitable compass rose for calibration was not available to the 73d Aviation Company, personnel were unable to eliminate this deficiency by application of normal compass swinging procedures. With the assistance of the Joint Research and Test Activity, MACV, a field expedient was devised to permit ground swinging of the MA-1 compass using the MK II Astro Compass assembly, which eliminated the compass alignment problem. Improvement in the accuracy of doppler radar navigation was noted.

Most of the maps used to plot doppler navigation coordinates were of second or third order survey accuracy. This factor introduced additional errors in positioning the aircraft for precision surveillance of small target areas. Frequent updating of the doppler computer over distinctive landmarks easily recognized at night was required to minimize this effect over long distances.

The composite Ryan-Marconi doppler radar navigation system installed in the OV-1B model aircraft was considered by the aviators of the 73d to be operationally unreliable and therefore was infrequently used during SLAR surveillance operations. (See annex D.) A discussion of the reasons for unreliable operation of this system appears in objective 5. Because of the manner of employing the SLAR and the ready availability of other navigation aids, this problem did not seriously interfere with the unit's capability to accomplish the SLAR surveillance mission. Visual omni range, in conjunction with other navigation methods, was used periodically to fix the position of the aircraft along SLAR surveillance courses.

The percent coverage of assigned IR target areas obtained by employing doppler navigation equipment was compared with the results obtained using other navigation means (figure 26). Infrared target areas totally or partially aborted were excluded from computations presented in figure 26. During the first 30-day period of the evaluation, the MA-1 gyro-compass alignment problem had a significant effect on the accuracy



(C) FIGURE 26. Effects of navigation on infrared target area coverage.

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with which the infrared sensor was positioned over the target area. A steady improvement in the results obtained using the doppler navigator system was noted as the gyro-compass alignment problem and the best techniques for employing the system were resolved.

The value of the doppler navigation system or other self-contained navigation equipment in support of IR surveillance cannot be overemphasized. Considering the preponderance of night IR surveillance, and the progressive deterioration of weather which increasingly restricted the use of pilotage methods, it would have been virtually impossible to perform infrared surveillance without the doppler navigation equipment.

10. Value and Use of Surveillance Information

The consensus of opinion among users of intelligence derived from airborne surveillance was that the information was accurate, timely, and provided positive location of VC activity. Limitations included too few aircraft available to support requests and assignment of mission request priorities. See annex C for a crossection of comments from G2 advisors and J2 staff agencies.

11. Findings

a. General

(1) There were 2267 aerial surveillance mission hours flown.

(2) The 73d Aviation Company accomplished 86.1 percent of its assigned surveillance missions.

(3) During 45 missions there was an average delay of 49 minutes.

(4) There was 60.4 percent of the photographic and electronic imagery classified as good, 28.5 percent of the photographic and electronic imagery classified as fair, and 11.1 percent of the photographic and electronic imagery classified as poor.

(5) Weather was the most important factor which adversely affected the operational and technical aspects of surveillance.

(6) All requests for infrared and SLAR surveillance could not be fulfilled because of the limited availability of sensor equipped aircraft.

(7) The 73d Aviation Company (AS) supported the equivalent of one ARVN Corps on a daily basis.

(8) The TRAC easily consumed the available infrared and SLAR assets of the 73d Aviation Company (AS) on a daily basis.

(9) Few multi-sensor surveillance missions were flown by the 73d Aviation Company (AS).

b. Visual/Photographic

(1) Aircraft spent 75.4 percent of visual/photographic surveillance time flying over target areas.

(2) Aircraft spent 99.4 percent of visual/photographic surveillance time flying during daylight hours and only one mission was flown at night. It was therefore not possible to evaluate the capabilities of night photography to provide information on VC activities.

(3) Photographic surveillance was routinely employed to confirm information obtained from other sources.

(4) The KS-61A photographic system was normally employed to obtain vertical photographic coverage.

(5) The KA-60 photographic system was used to satisfy requirements for oblique photography.

(6) A filter was used on the KA-60 when required to relieve the adverse effects of atmospheric haze.

(7) Photographic surveillance was one of the primary airborne means of daylight reconnaissance performed in direct support of ARVN tactical elements at division level.

(8) Photographic target area missions were preplanned 83.3 percent of the time, 11.2 percent were operational-immediate, and 5.5 percent were targets of opportunity.

(9) Of the imagery obtained from photographic target areas scheduled for surveillance, 88.1 percent was usable.

(10) Most supported units reported that photographic surveillance was timely, of value, and conformed to their requirements.

c. Side Looking Airborne Radar

(1) Aircraft spent 73.5 percent of SLAR surveillance mission time flying over target areas.

(2) Side looking airborne radar surveillance missions were flown 98.3 percent of the time at night.

(3) Side looking airborne radar surveillance aircraft spent 18.3 percent of the time over target areas while flying under instrument conditions.

(4) The SLAR was used primarily to detect suspicious or prohibited activity at night and to provide indicators useful in locating concentrations of Viet Cong personnel.

(5) The SLAR detected numerous boats or sampans moving along the coast or on rivers and canals.

(6) Only one daylight SLAR surveillance mission was flown.

(7) The SLAR target missions were preplanned 95.2 percent of the time and 4.8 percent were operational-immediate.

(8) Usable imagery was obtained from SLAR target areas scheduled for surveillance 76.8 percent of the time.

(9) The SLAR sensor detected a total of 2689 targets of military significance.

(10) The RO-166/UP was used for computing target locations to 6-digit UTM coordinates.

(11) Twenty-five kilometer range and 10-kilometer range delay settings were most often used to survey inland waterways and the land mass with SLAR and 50-kilometer range and 0 delay settings were most often used for SLAR coastal area surveillance.

(12) Units receiving information from SLAR surveillance reported it provided useful, accurate, and timely information on Viet Cong activities.

(13) Preplanned SLAR surveillance missions provided timely and useful information to ready reaction forces. Effective countermeasures were taken against Viet Cong targets as a result of information provided by SLAR surveillance.

d. Infrared

(1) Aircraft spent 45.2 percent of IR surveillance mission time flying over target areas.

(2) Aircraft spent 84.3 percent of IR surveillance mission time flying at night.

(3) Instrument conditions prevailed during 13.4 percent of the IR surveillance flown over target areas.

(4) Infrared was used primarily to detect suspicious or prohibited activity during the early morning and early evening hours and to provide indicators useful in locating concentrations of Viet Cong personnel.

(5) The major sources of IR emissions of Viet Cong origin were cooking and campfires.

(6) Infrared surveillance was limited to target areas of critical interest.

(7) The number and pattern of significant infrared emissions was used to assist in determining the strength, precise location, and disposition of enemy forces.

(8) Significant IR emissions were often found in areas covered with dense jungle growth and were readily detected at the surveillance altitudes flown.

(9) Usable imagery was obtained from IR target areas scheduled for surveillance 46.5 percent of the time.

(10) The IR target areas were preplanned 96.3 percent of the time, 1.9 percent were operational-immediate, and 1.8 percent were target areas of opportunity.

(11) The infrared sensor detected a total of 1789 targets of military significance.

(12) Area search procedures were required in 96.5 percent of the IR target areas.

(13) Two OV-1C aircraft covered an average of 450 square kilometers in a typical 24-hour period.

(14) It was possible to detect targets with IR through light clouds or thin banks of ground fog but it was not possible to obtain normal background contrast emissions from terrain and foliage.

(15) One recorded use of the 4.5 to 5.5 micron band pass filter to improve IR detection through ground fog produced insignificant results.

(16) In view of limited use, no clear-cut guidelines on the recommended use of IR filters can be made.

(17) The photo multiplier tube was used on 7 of the 36 daylight IR missions but it was not used at night.

(18) In mountainous terrain, flight hazards restricted the use of sensors to daylight hours and visual flight conditions.

(19) The AN/TAQ-1 Infrared Surveillance Center was not used to provide data to tactical ground elements.

(20) Units receiving information from IR surveillance reported it provided useful and accurate information on Viet Cong activities.

(21) Because of the sensor operators' inability to compensate manually for large, rapid displacements of aircraft velocity and absolute altitude, 56.0 percent of IR imagery over mountainous terrain was only fair to poor.

(22) There was 95.0 percent of IR imagery that was plottable.

e. Navigation

(1) All available navigation means were used during surveillance operations.

(2) Pilotage and dead reckoning navigational methods were used extensively in daylight visual/photo reconnaissance.

(3) The composite doppler radar navigator in the OV-1B aircraft was used on only 17 of the 147 SLAR surveillance missions.

(4) The composite doppler radar navigator in the OV-1B aircraft was considered operationally unreliable by the SLAR aviators but SLAR surveillance was successfully accomplished using navigation aids other than the doppler radar navigator.

(5) The average IR target area coverage was 69.7 percent when the doppler radar was used as the primary means of navigation.

(6) The average IR target area coverage obtained using other than the doppler was 60.7 percent.

(7) Aviators reported that the doppler radar navigator in the OV-1C aircraft often provided the capability to locate and survey target areas undefinable by other navigation means.

(8) Maintaining precision alignment of the MA-1 Gyrocompass System was a recurring problem.

(9) Map inaccuracies and MA-1 gyrocompass misalignment affected IR target area coverage.

C. OBJECTIVE 3 - IMAGERY INTERPRETATION

The 73d Aviation Company (AS) had 18 imagery interpreters assigned when the company became operational in January 1965. At that time, MACV J2 had a need for additional imagery interpreters at the Target Research and Analysis Center (TRAC). Since the only imagery interpretation personnel available in Vietnam were those of the 73d, the company was directed to assign 13 of the 18 imagery interpreters to duty with the TRAC. The TRAC then assumed the responsibility for the interpretation of all IR imagery acquired by the 73d's C-47 aircraft and for the dissemination of all information obtained by interpretation of electronic sensor imagery. The TRAC also took the responsibility for preliminary mission planning for all SLAR and IR missions.

Although the 73d Avn Co was the subject of this evaluation, it was necessary to study the Imagery Interpretation (II) Section at TRAC to obtain data on the duties they performed for the 73d.

1. Mission

The mission of the imagery interpretation section was:

a) To process and interpret acquired imagery

b) To perform other duties related to imagery interpretation as required

c) To transmit information obtained through imagery interpretation to requesting units.

2. Organization

a. 73d Aviation Company (AS), Vung Tau

The II section of the 73d Avn Co consisted of only 1 officer and 4 imagery interpreters after the assignment of 13 interpreters to TRAC. The four interpreters were divided into two teams for 24-hour operation in 12-hour shifts.

The II section had the responsibility for processing and interpreting the majority of the photographic and SLAR imagery as well as some of the IR film acquired by the assigned C-47 aircraft. The section was also responsible for completing the planning for the IR and SLAR missions after preliminary planning had been done by TRAC.

The number of missions processed and interpreted during the evaluation were:

1) Photo: 69

2) SLAR: 114

3) IR: 3

b. The TRAC, Tan Son Nhut

The TRAC had a total of 54 imagery interpreters assigned: 23 to accomplish the immediate interpretation of imagery and 31 for followup detailed interpretation. The immediate interpretation section had one officer in charge and three teams of eight, seven, and seven men each. They rotated in 12-hour shifts at 0800 and 2000 hours, allowing 24 hours for each team between shifts.

In addition to responsibility for Air Force and other organizations' imagery, the TRAC processed and interpreted the majority of the IR imagery and some of the SLAR and photographic imagery acquired by the 73d Avn Co. The number of 73d missions processed and interpreted at TRAC during the evaluation were:

1) Photo: 23

2) SLAR: 12

3) IR: 430

c. Effect

The division of responsibility for imagery interpretation between TRAC and the 73d Avn Co at Vung Tau had no effect on the interpretation effort. However, TRAC required that all information obtained by SLAR and IR imagery interpretation at Vung Tau be transmitted to TRAC for dissemination to tactical units. This information was transmitted by telephone since no radio nets were established. Depending on the amount of information to be reported, it required from 30 minutes to over 1 hour to transmit the report by telephone. An imagery interpreter at TRAC recorded the information, determined which units were to be notified, and notified the units.

If several headquarters had to be notified, the information could be several hours old before it reached the last unit. For example, imagery from SLAR missions flown in the IV Corps area was processed and interpreted by the 73d but the information obtained by the interpreter had to be transmitted to TRAC, which, in turn, normally had to notify corps headquarters, 7th, 9th, and 21st Divisions, Rung Sat Special Zone,

and the Naval Advisory Group. With an average of 45 minutes to establish communications and to read the report to each unit, it was 5¼ hours after completion of interpretation before the last unit was notified.

In general, II personnel were found to be adequately trained and qualified to interpret and process the imagery produced by the 73d Avn Co. The II section operated on a 24-hour basis and approximately 21 man-hours were required daily for typing, transmision of reports, and maintenance of files. Because the II section had no assigned clerical personnel, a problem existed in typing, filing, and forwarding of II reports to requesting units. During the evaluation these essential tasks were performed by highly trained II personnel. The assignment of two clerk-typists to the imagery interpretation section would alleviate this situation and allow the imagery interpreters to work exclusively in their own MOS.

3. Training and Experience

a. Training

Personnel assigned to the II section were school-trained imagery interpreters. One warrant officer received his training at the US Army Military Police and Intelligence School, Oberammergau, Germany. One enlisted man received his training in classes conducted by the 1st Military Intelligence Battalion (Aerial Reconnaissance and Surveillance) at Fort Bragg, North Carolina. The remainder of the personnel attended the imagery interpretation course at the US Army Intelligence School, Fort Holabird, Maryland. The officer course varied in length from 19 to 23 weeks. The material covered was the same as in the enlisted courses but additional time was spent on intelligence training to qualify officer students as G2 air officers.

b. Experience

Individual experience of personnel assigned to the II section is listed in annex D.

The average total experience of personnel assigned to the imagery interpretation section was, as of 1 April 1965, as follows:

Officers	45.7 months
Warrant officers	80.0 months
Enlisted men	15.5 months

It must be noted, however, that 10 enlisted personnel had 10 months or less actual experience in II work. This was somewhat offset by the fact that all of the 10 men had a background of 15 weeks of formal

schooling at Fort Holabird, Maryland.

It was determined that personnel were well-trained and had a good background in interpretation of photographic, infrared, and SLAR imagery.

c. Adequacy of Training

The infrared and SLAR imagery used in the II courses were mainly test imagery recorded over populated areas such as Fort Bragg, North Carolina and Fort Meade, Maryland. No electronic imagery of South East Asia or any tropical jungle terrain was used in the formal II classes.

A lack of familiarity with the area of RVN resulted in some imagery initially being misinterpreted, such as:

1) Wells were interpreted as foxholes or anti-aircraft weapon emplacements.

2) Stacks of cord wood or charcoal were interpreted as stacks of camouflaged supplies.

3) Stacks of thatching material were interpreted as stacks of camouflaged supplies.

As the imagery interpreters became familiar with the area, errors were greatly reduced.

The imagery interpreters were not adequately trained in capabilities of the OV-1 aircraft. It was found that they were not aware of the cruising speeds and operating range of the aircraft or film consumption factors for the IR and SLAR equipment. As a result, the senior imagery interpreter at TRAC often planned and approved missions that were beyond the capabilities of the aircraft or sensor. To alleviate this problem the company commander assigned an aviator as liaison officer with the TRAC to advise them on the capabilities and employment of the aircraft.

4. Imagery Interpretation Support Requirements

The number of man-hours of II support required, as discussed in this objective, were based on the average amount of sensor imagery produced during 1 hour of OV-1 flight time over the target. These support requirements show average times to prepare, process, debrief, interpret, and write reports for each mission hour.

a. Photo

The KA-30 camera had an average film capacity of 240 frames of useful photography after adjustment and testing. Depending on the size of the target area and scale of photography, this film supply could be depleted in less than 1 hour.

(1) Preparation Time

The imagery interpreters assigned to a specific mission checked the mission request to determine the TOT, area covered, type of information desired, and units to which reports were to be sent. The target areas were drawn on appropriate maps and checked to determine the location and types of activities which might be detected. Average time for preparation for a photographic mission was 15 minutes.

(2) Processing Time

The ES-29 required 14½ hours to process 2,759 frames of photographic imagery, for an average of 190.2 frames per hour. Thus, 1 hour and 16 minutes were required for processing 1 hour of photo flight time.

(3) Debriefing

Since a photo mission was also essentially a visual mission, visual sightings were usually more extensive than on IR or SLAR missions. As a result, debriefing for photo missions required approximately 30 minutes. Debriefing procedures are described in annex D.

(4) Interpretation Time

The II section required 264.17 hours to interpret 10,349 frames, for an average of 39 frames per hour. Thus, they required 6 hours and 9 minutes to interpret 1 hour of photo imagery.

(5) Report Writing

Reports for IR, SLAR, and photo missions were similar. Depending on the amount of information detected on the imagery, it required 5 to 30 minutes to write a report for one mission, with an average of 15 minutes per mission flying hour.

b. SLAR

The two OV-1B (SLAR) aircraft flew a total of 224.5 hours over target areas and acquired 9,491 inches of imagery during the evaluation, for an average of 42.2 inches of imagery per hour.

(1) Preparation Time

Preparations made by the imagery interpreter assigned a SLAR mission were essentially the same as the preparations described for photo missions. The maps used for SLAR were 1:250,000. Approximately 15 minutes preparation time were required for a SLAR mission.

(2) Processing Time

The ES-29 required 3½ hours to process 518 inches of SLAR imagery or an average of 148 inches per hour. Thus, it required 17 minutes to process 1 hour (42.2 inches) of SLAR imagery. However, following the development of a technique for making in-flight spot reports from SLAR imagery, all SLAR imagery was processed in flight on the RO-166 in-flight recorder/processor.

(3) Debriefing

The pilot and sensor operator were debriefed when the imagery was delivered for processing. Debriefing of a SLAR mission took an average of 10 minutes. (See annex D,)

(4) Interpretation Time

The imagery interpretation section required 168.3 hours to interpret 9,491 inches of SLAR imagery, for an average of 56.3 inches of imagery per hour. Thus, the II section required 44.5 minutes to interpret 1 hour of SLAR imagery.

(5) Report Writing

An average of 15 minutes was required to write the report for the imagery acquired in 1 hour.

c. IR

The four OV-1C aircraft flew a total of 218¼ hours over target areas and acquired 9,079 feet of imagery, for an average of 41.5 feet of imagery per hour.

(1) Preparation Time

Preparation for an IR mission was more time consuming than for photo and SLAR missions. It included checking the mission request, obtaining maps and photographic coverage of the area, and checking the maps and photos to determine the type of activity that could be detected on the imagery. This preparation required approximately 30 minutes per mission.

(2) Processing Time

The ES-29 required 110:28 hours to process 9,079 feet of imagery, for an average of 82.2 feet per hour. It required 30 minutes to process 1 hour of IR imagery.

(3) Debriefing Time

Debriefing of an IR mission was the same as for a SLAR mission and took an average of 10 minutes.

(4) Interpretation Time

The imagery interpretation section required 783 hours to interpret 9,079 feet of IR imagery, for an average of 11.3 feet of imagery per hour. Thus, the II section required 3 hours and 42 minutes to interpret one hour of IR imagery.

(5) Report Writing

An average of 15 minutes was required to write the report for the imagery acquired in 1 hour.

d. Summary

Figure 27 summarizes the man-hours required to support 1 hour of exposed imagery.

Activity	Photo	SLAR	IR
Preparation	:15	:15	:30
Processing	1:16	:17	:30
Debriefing	:30	:10	:10
Interpreting	6:09	:44	3:42
Report Writing	:15	:15	:15
Total	8:25	1:41	5:07

(C) FIGURE 27. Man-hours required to support 1 hour of OV-1 imagery.

Total time elapsed to handle one mission is not indicated. In some cases, the activities took place simultaneously; in others, two or more imagery interpreters were participating.

Annex D describes the major duties of the imagery interpretation

section and shows man-hour utilization by the 73d imagery interpretation section and by the TRAC imagery interpretation section.

5. Equipment

The major items of equipment which the II section was authorized are listed in annex D.

a. Light Tables

The Richards light table and related optical equipment were not available to the Vung Tau section until 15 June 1965. Prior to the arrival of this equipment, the section used two AR-18 light tables and four small light tables which were components of the AN/TAQ-1 infrared ground surveillance center.

(1) AR-18 Light Table

The AR-18 light table has a viewing surface of 18 x 10 inches. Without film brackets the overall dimensions are 29 x 16 x 6 inches. Light is supplied by four neon tubes and cannot be regulated because of the lack of a rheostat. Film brackets are easy to attach and adjust. Film size up to 9 inches can be used on this table. The AR-18 light table was adequate for the needs of the imagery interpreter. It was easily packed in a combination carrying case/table and provided the section with a portable light table when required.

The table was adequate for all requirements but it is heavy and awkward to handle when trying to keep film oriented to a map. Since the table cannot be tilted the interpreter had to bend over to read film imagery, which became very fatiguing after only a short period.

(2) Light Table (Component of AN/TAQ-1)

This light table has a viewing surface of 12 x 9 inches. The overall size is 18 x 12 x 8 inches with the film brackets attached. The film brackets are not mounted securely and are difficult to adjust. After the film has been mounted, the brackets have a tendency to open up, allowing the film spool to drop off. Light is supplied by neon tubes of constant intensity.

The viewing surface of the table is small and allows only a small portion of the film to be viewed at one time. This increases the difficulty of plotting, which in turn increases the amount of time required to plot and interpret imagery.

The table is small and light, is easy to move, and film can easily be kept oriented with the map. However, the small viewing surface and inadequate film brackets reduced its effectiveness.

(3) Richards Model GFL 918

The model 918 light table has a viewing surface of 18 x 10 inches. The overall size is 20 x 10 x 6 inches without the film brackets mounted. The brackets are easy to attach and adjust. They will accomodate film sizes up to 9 inches. Light is supplied by a xenon tube and the intensity can be regulated by a rheostat.

The viewing surface is mounted to the base by means of a short pedestal with a ball and socket joint. This allows the table to be rotated or tilted to any position desired. The table was found to be satisfactory in every respect. The tilt capability was a welcome improvement as was the rheostat controlled lighting which enabled imagery to be viewed with less eye strain and greater accuracy.

(4) Richards Model GFL 940MC

The model 940 light table has a viewing surface of approximately 40 x 10 inches. The overall size is 44 x 10 x 16 inches without film brackets or optics kit attached. The table has a bracket designed to mount the optics kit, Richards MC-2. The use of the optics kit allows the imagery to be studied under high magnification while the imagery is on the light table. Light is supplied by a xenon tube and the intensity can be varied.

As many as nine frames of imagery can be viewed at one time. The variable intensity light features reduces eye fatigue problems and accounts for quicker interpretation of imagery. More than one imagery interpreter was able to work on this table at the same time.

The Richards light tables, with their variable light intensity, adjustable tilt, and large viewing areas, were ideal for interpreting all forms of imagery. The large size of the viewing areas afforded the imagery interpreters an improved means of relating all identifiable terrain features on a map run and simplified the plotting requirement.

b. Optics

(1) Optics Kit, Richards MC-2

The optics kit is a variable power, zoom microscope/stereoscope. It is equipped with three lenses, 0.5x, 1.0x, and 2.0x, a stereoscope attachment, and two sets of eyepieces, 10x and 20x. By using various combinations of lenses and eye pieces, the kit is capable of providing magnification from 3.5x to 120.0x. When used as a stereoscope it is capable of providing magnification from 7x to 70x. The use of the Richards optics kit allowed imagery interpreters to detect and identify small objects that were undetected or not identifiable with

tube magnifiers and the 2x and 4x stereoscopes.

No provisions were made to allow the optics kit to be used with the model 918 light table. This feature could be provided through the use of a base and arm assembly to hold the optics over the table. The kit could be mounted on many different brackets. It was used by the II section by mounting it on the Richards model 940 light table and was found to operate quite well.

(2) Power Stereoscope, Richards CPMB

The power stereoscope consists of the optics kit MC-2 and a base with a viewing surface approximately 5 x 8 inches in size. Illumination intensity of the viewing surface can be varied with a rheostat.

The base is designed to accomodate large format photography, (9 x 9 inches or larger). The KA-30 film was easily mounted on the stereo template and the spools were laid on either side of the base on the table. This required the imagery interpreter to roll film from spool to spool by hand. It was not uncommon for the spools to roll off the table and unravel.

(3) Enlargers

The enlarger, which is a component of the ES-29 photo lab, was not adequate for the needs of the imagery interpreters. It would enlarge a $4\frac{1}{2}$ x $4\frac{1}{2}$ inch KA-30 print to a 9 x 9 print but would enlarge small portions of a negative to a usable size with only the greatest difficulty. This was especially true if the desired area were located near a corner of the negative.

The Omega enlarger in the AN/TFQ-7 photo lab was an ideal enlarger for aerial photography. The movable easel allowed enlargement of any desired portion of a negative, and because it could receive several sizes of paper, it could enlarge negatives to any size desired.

(4) Water Supply

The AN/TFQ-7 photo lab at Vung Tau experienced difficulties with the water supply. The mineral content of the water caused a chemical reaction with the processing chemicals. At times this affected the film to the extent that the quality of the imagery was degraded to fair or poor; at times it was unusable. To alleviate this problem, water was collected from air conditioners and used for film processing.

(5) SLAR Imagery

Some difficulty was experienced in processing SLAR imagery. The ES-29 photo lab required a minimum of 35 feet of film to operate properly. To alleviate this problem, a piece of blank film was used as a leader when required.

(6) Maps

Maps of certain areas, especially the area along the Cambodian border north of Tay Ninh, had many inaccuracies. Many roads and streams were not depicted or were shown in the wrong location or with the wrong alignment and new villages had been built that were not on the maps used. These deficiencies caused difficulty in plotting infrared missions.

Flight planning calculations presupposed that the target area was in the exact location shown by map coordinates. If the map location of the desired target area were in error, the pilot flew his mission exactly as planned but covered only a small portion or none of the target. Map inaccuracies negated the accuracy of the doppler navigation system. As a result of these difficulties the amount of time required to plot infrared missions flown over these areas was greatly increased. This problem was partially solved by using photo mosaics when photo coverage was available but because of the scale of the photography some of these mosaics were large and difficult to handle.

6. IR Interpretation Techniques

The techniques used to interpret photographic and SLAR imagery were generally as taught in the formal training presented in CONUS schools. Infrared interpretation, however, was somewhat different from that taught in the school system in that upon completion of interpretation of infrared imagery, the imagery interpreter plotted the detected missions on conventional photo coverage of the area. The black and white photography was then interpreted to determine the cause of the emissions instead of comparing emissions to maps as in the school system.

On many occasions, the process of correlating the photography with the infrared imagery led to the discovery of potential target areas. Subsequent surveillance of these areas frequently resulted in the area being developed into a target against which action was recommended.

7. IR Flight Altitudes

Army doctrine taught at the US Army Combat Surveillance School, Fort Holabird, Maryland and the US Army Combat Surveillance School, Fort Huachuca, Arizona, states that the infrared sensor is normally employed to verify or check target areas developed by SLAR, visual, or

photographic surveillance. Based on this concept the infrared sensor would be used primarily for route reconnaissance and point target missions. For this type of employment the best imagery is obtained at 500 to 1000 feet altitude. In the counterinsurgency environment in Vietnam, however, the infrared sensor was used in area search to locate Viet Cong units in bivouac areas. Bivouac areas were usually located in the jungle away from roads and built-up areas. As a result, there was a lack of identifiable terrain features from which to plot. (See figure 28.) If a larger area were covered, the probability of recording identifiable terrain features on the imagery increased, but quality of the imagery was sacrificed.

Based upon operational experience in RVN the 73d Aviation Company selected an altitude of 1500 to 2000 as the best compromise between quality of imagery and the probability of securing identifiable terrain features from which to plot imagery of the area covered. Of the 460 IR missions flown by the 73d Avn Co, 54.4 percent of the infrared imagey was classified as good, 31.1 percent was classified fair, and 14.5 percent was classified as poor. Even though 40 missions were totally or partially unplottable, the quality of imagery for the missions was : 3 good, 15 fair, and 22 poor.

8. Findings

a. Of the 18 imagery interpreters in the 73d Avn Co, 13 were assigned to duty with the TRAC.

b. The II section was not authorized clerk/typists to perform required administrative functions.

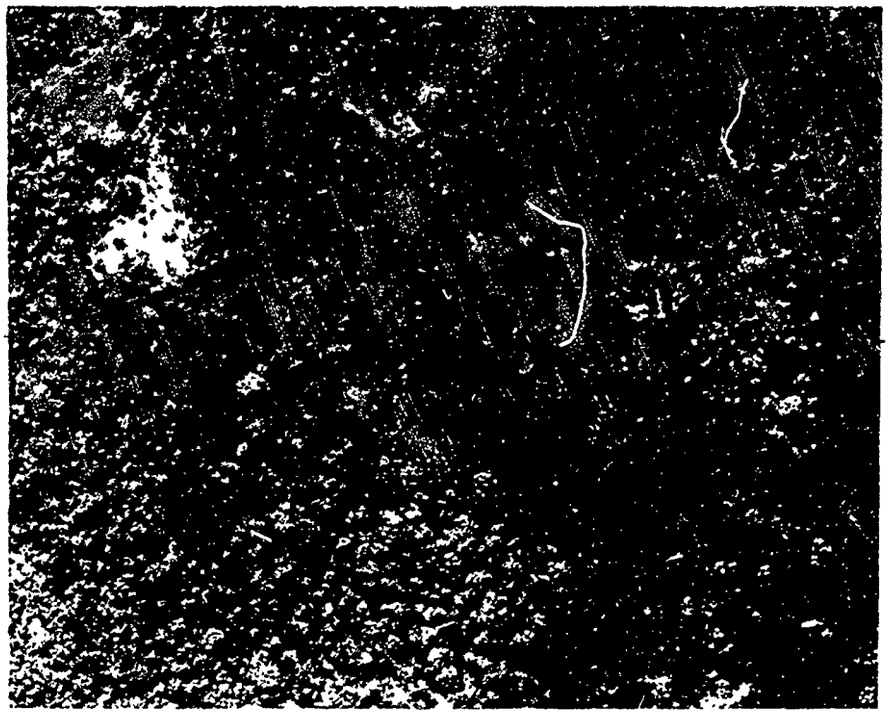
c. The TRAC had the responsibility for disseminating intelligence information to intelligence staff agencies on all data acquired by electronic sensor means assigned to the 73d Avn Co.

d. The telephone was the only electrical means used for disseminating intelligence information from the TRAC to interested staff agencies.

e. The dissemination of intelligence information to interested staff agencies from the TRAC required an average of 45 minutes for each telephonic transmission, or a total of 5 hours and 15 minutes to send information from the TRAC to all interested units of IV Corps.

f. All imagery interpreters assigned to the 73d Avn Co were school-trained.

g. Officer personnel assigned as imagery interpreters were school-trained in G2 air functions.



(U) FIGURE 28. Aerial photograph of tropical jungle growth.

h. A break-in period was used to familiarize newly assigned imagery interpreters with the peculiarities of the area of operations.

i. Prior to placing a 73d Avn Co liaison officer with TRAC, the II section of the TRAC transmitted mission requests to the 73d Avn Co which were beyond the performance capabilities of OV-1 aircraft.

j. The map coverage of many areas of Vietnam was inaccurate and out of date for II functions of the 73d Avn Co.

k. The average amounts of imagery produced per mission flight hour were: photography, 240 frames; SLAR, 42.2 inches; and infrared, 41.5 feet.

l. An average of 8.4 man-hours was required of the II section to support each hour of photography, 1.7 man-hours to support each hour of SLAR, and 5.1 man-hours to support each hour of infrared imagery.

m. The AR-18 light table was adequate.

n. The Richards light table, models GFL 918 and GFL 940 MC provided an excellent capability for interpreting all forms of imagery.

o. The optics kit, Richard MC-2, although satisfactory in itself, was not compatible with the model 918 light table.

p. Lack of film brackets on the base of the power stereoscope (Richards CPMB) created difficulty in the handling of imagery.

q. The enlarger installed in the ES-29 photo lab was inadequate for the needs of the imagery interpreters.

r. The mineral content of the local water used in the AN/TFQ-7 adversely affected film processing.

s. Film leader was required to process SLAR imagery in the ES-29.

t. Imagery interpreters had difficulty in plotting infrared film flown between 500 to 1000 feet absolute altitude, particularly in mountainous and jungle areas, because of the lack of reference points and the small area of coverage.

u. A decrease in the quality of IR imagery was a result of flying higher altitudes to cover larger areas.

v. Imagery produced by the 73d Avn Co was processed and interpreted rapidly.

D. OBJECTIVE 4 - ADEQUACY OF TOE 1-128T (MODIFIED)

The mission stated for an Aviation Company (Aerial Surveillance) in TOE 1-128T is to extend surveillance and target acquisition capabilities of Army and corps units through the use of organic aircraft, sensory equipment, and aerial observers. The TOE gives the company the capability of providing sustained, near all-weather, day and night surveillance of the area of influence for which the Army and corps has primary aerial surveillance responsibility.

Modified for a counterinsurgency environment, TOE 1-128T had certain sections deleted because of the lack of a requirement in the environment of RVN, and to comply with US Army troop strength ceiling. Other sections were added to provide personnel and equipment for tasks that would normally be accomplished by a military intelligence battalion.

The following platoon, sections, and teamswere deleted for the reasons indicated:

Unit	Reason
One surveillance platoon	Troop ceiling and lack of equipment.

Unit	Reason
One aircraft maintenance section	Deletion of one surveillance platoon negated the requirement for this section.
One airfield control section	This section was not required. Airfields where the company could be based for prolonged periods of time had this capability provided from other sources.
Three tracking and control teams	Limited range of tracking and ploting radar and security problems that would be encountered when displacing radar sets to forward sites.

The following sections were added for the reasons indicated:

Unit	Reason
One imagery interpretation section	No imagery interpretation section organic to the US Army existed in RVN.
One third echelon maintenance section	This section already existed as part of the 23d SWAD which was to be part of TOE 1-128T (Modified) -- the only OV-1 equipped unit in RVN.
One photo lab section	This section was required to process imagery rapidly.
One electronic maintenance section	No direct or general support electronic maintenance was available in RVN to support the electronic sensors.
One aircraft armament section	The resources in RVN that were to be organized into the company included the six OV-1A Mohawk aircraft organic to the 23d SWAD.

Table of Organization and Equipment 1-128T (Modified) was accepted and approved by USARPAC and DA, and the 73d Aviation Company (Aerial Surveillance) was organized in RVN on 26 December 1964. The DA-approved

TOE 1-128T (Modified) is shown in annex E.

The Company Commander, 73d Aviation Company (AS), realizing a potential span of control problem with the service platoon, restructured the company to centralize all signal elements in a newly created signal platoon. The 73d Avn Co as structured by the company commander, and that evaluated by ACTIV, is shown in figure 29.

1. Company Headquarters

Company headquarters of the 73d Avn Co had the normal responsibilities of a company headquarters element, including command and control, general administration, mess, and automotive maintenance support. Figure 30 shows the company headquarters organization.

a. Headquarters

(1) Personnel

Company headquarters consisted of the company commander, executive officer, first sergeant, company clerk, and light truck driver. In addition to the normal duties associated with command, the commander was required to maintain close liaison with G2 and G3 personnel of supported units to familiarize them with the equipment and capabilities of the 73d Avn Co. The executive officer assisted the commander and in his absence commanded the company. The first sergeant was responsible for administration and supervision of the enlisted men in the company. There were no unusual problems found in company headquarters and authorized personnel were adequate for command, control, and administration.

(2) Equipment

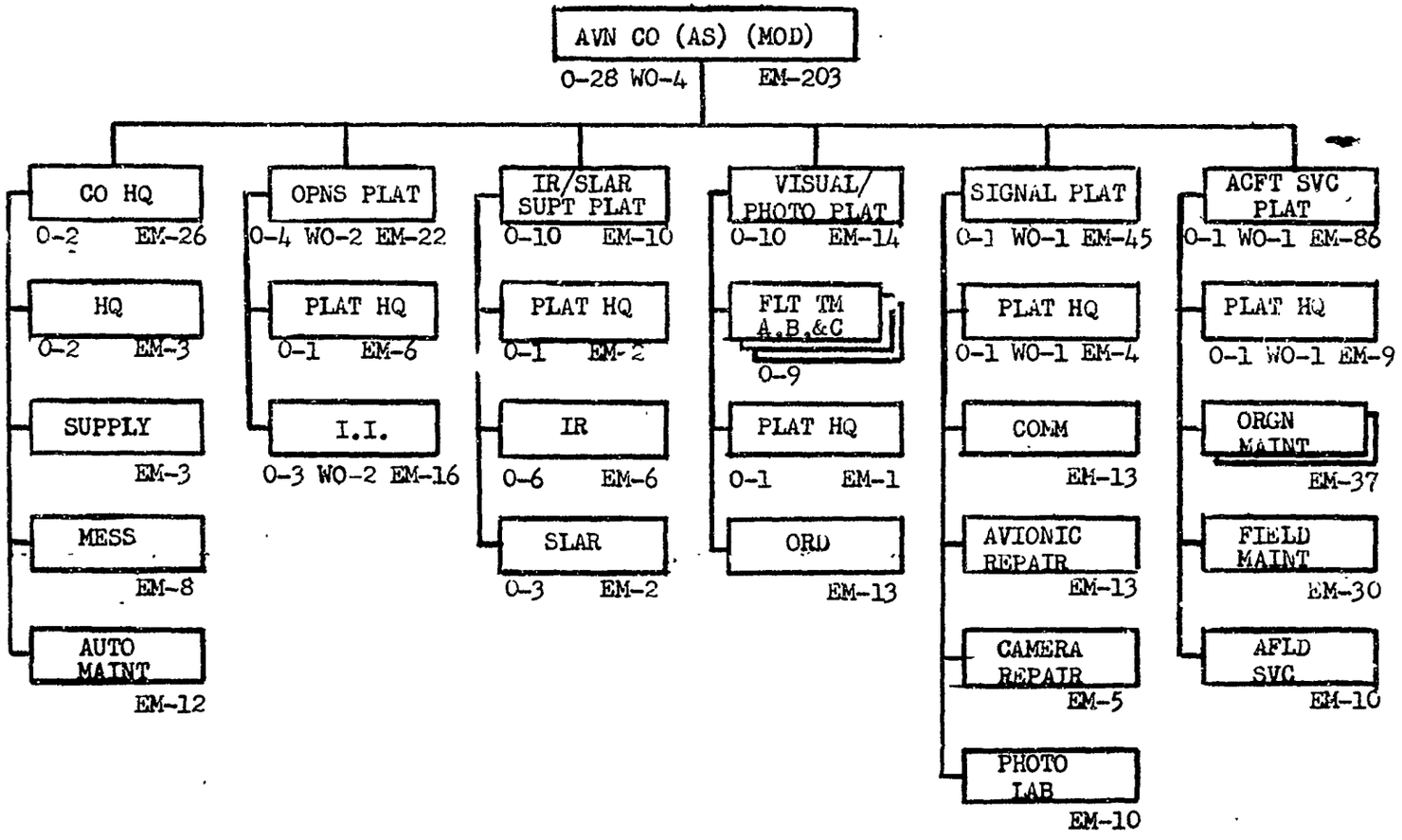
Equipment of the company headquarters was similar to that found in the headquarters of any aviation company and was adequate.

b. Company Supply

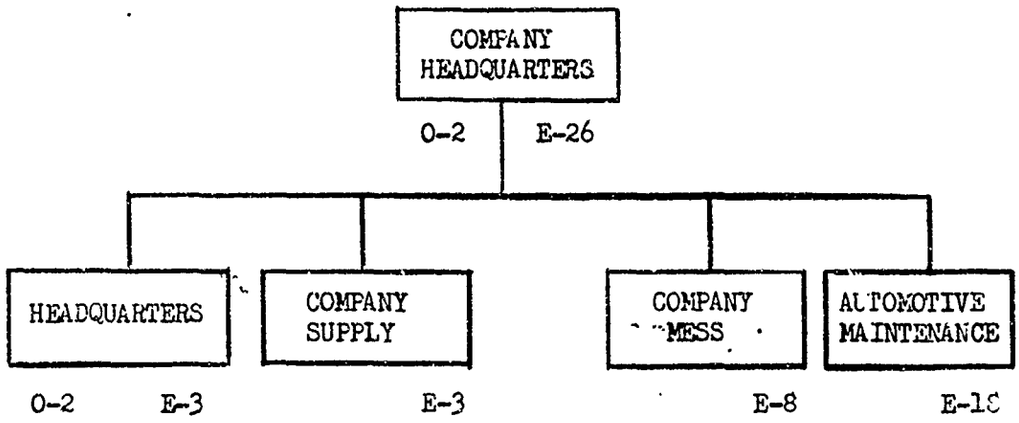
(1) Personnel

The company supply of the 73d Avn Co was authorized a supply sergeant, supply clerk, and armorer. Since the company operated as a separate unit, it was necessary to maintain a property book. Two aviators were assigned additional duties of supply officer and assistant supply officer, and together these officers averaged 48 hours of work per week in the company supply. The company supply officer was responsible for the following functions:

a) Company property book



(U) FIGURE 29, TOE 1-128T (Modified) as restructured by the company commander.



(U) FIGURE 30. Organization chart, company headquarters.

b) Supply of TOE and expendable general supply items of the company

c) Unit movement plans

d) Post, camp, and station property accountability

e) Arms room

f) Basic load of ammunition and rations

The U-6A airplane which was issued to the 73d by the 765th Transportation Battalion was used in part by the company supply for continual pickup and turn-in of supplies at Saigon. Personnel assigned to the section were adequate to accomplish company supply activities.

(2) Equipment

The company supply was sufficiently equipped to accomplish its mission.

c. Company Mess

(1) Personnel

The company mess personnel worked for the 765th Transportation Battalion consolidated mess and were not evaluated. Basic guideline figures for cooks per authorized strength indicated that the eight authorized personnel were adequate to support the company.

(2) Equipment

Equipment of the company mess was stored and maintained in the company supply room. The equipment would have been adequate if the 73d had been required to operate its own mess.

d. Automotive Maintenance

(1) Personnel

Automotive maintenance was authorized a motor sergeant, four generator specialists, six wheeled-vehicle mechanics, and an ordnance parts specialist. These personnel were responsible for organizational maintenance of vehicles and power equipment. Organizational maintenance was performed by the user sections of the company under the supervision of automotive maintenance personnel. No unusual difficulties were encountered and there were sufficient personnel to meet all requirements.

(2) Equipment

Evaluation of the equipment indicated that sufficient tool kits and supporting equipment were authorized and available for organizational maintenance.

2. Operations Platoon

The operations platoon of the 73d Avn Co was responsible for:

a) Planning surveillance operations

b) Operation of a flight dispatch facility

c) Processing of mission requests

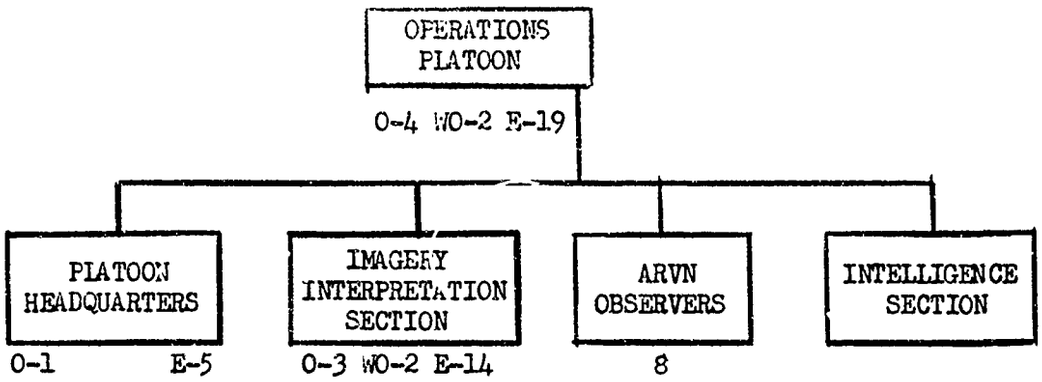
d) Delivery of information obtained by surveillance platoons

e) Timely interpretation of imagery

f) Processing of awards and decorations

g) Intelligence functions of the company

The operations platoon was organized as shown in figure 31. The platoon headquarters and the II section were authorized by TOE 1-128T (Modified). The ARVN observer section was an augmentation from ARVN sources. The intelligence section was organized by the commanding officer to perform daily intelligence briefings and other intelligence duties.



(U) FIGURE 31. Organization chart, operations platoon.

a. Headquarters

(1) Personnel

The operations platoon headquarters was authorized an operations officer, a flight operations chief, and four flight operations specialists. The operations officer commanded the platoon, piloted aircraft on surveillance missions, and made frequent liaison visits to supported units. The flight operations chief was primarily responsible for 24-hour operation of the flight dispatch facility. The flight operations personnel received and processed missions requests, assisted aviators on flight planning, provided weather data, and monitored a radio used for flight following service. In addition, they maintained extensive records which included debriefing reports, flight records, and information necessary for awards and decorations. One aviator worked in the platoon headquarters with the additional duty of assistant operations officer, which was necessary to insure continued officer supervision of the platoon during the absence of the operations officer.

The platoon headquarters functioned satisfactory. However, it was the opinion of the evaluators and 73d Avn Co personnel that the organization would have been more effective with the addition of an operations sergeant E-7 (MOS 907.7). The operations sergeant would assist the operations officer in planning surveillance operations of the company and the flight operations chief would then be able to give closer supervision to flight operation functions. With the addition of an operations sergeant, the flight operations chief should be an E-6 (MOS 907.60)

(2) Equipment

The AN/GRC-46 radio set authorized the operations platoon was transferred to the signal platoon. Personnel in the signal

platoon had the responsibility of providing communications for the operations platoon. This was considered by the evaluation team to be a more effective method of operating.

A utility fixed-wing aircraft, U-6A, was issued to the company by the 765th Transportation Battalion (AM&S). This aircraft was used by the operations platoon to deliver imagery, imagery interpreter reports, effect command liaison with supported units, and for general administrative requirements, and was flown an average of 50 hours per month.

The remainder of the equipment authorized the platoon headquarters was adequate to support the mission.

b. Imagery Interpretation Section

(1) Personnel

The 73d Avn Co was authorized an imagery interpretation section consisting of 3 officers, 2 warrant officers, and 14 enlisted personnel.

Thirteen imagery interpreters were loaned to the Target Research and Analysis Center (TRAC) in Saigon where most of the infrared and approximately 10 percent of the SLAR imagery was interpreted. The remainder of the II section was located in Vung Tau where most of the KA-30, KA-60, and the bulk of the SLAR imagery was interpreted.

The tasks assigned to the imagery interpretation section were:

a) Interpret and plot all imagery.

b) Transmit imagery interpretation (spot) reports by telephone to requesting and interested units.

c) Type imagery interpretation reports for distribution.

d) Maintain files on imagery interpretation reports, mission requests, mission debriefing data, and information pertaining to the final disposition of imagery.

The only problem area found was that one highly trained imagery interpreter had to devote full time to performing the required clerk/typist duties as indicated above. The II section operated on a 24-hour basis and approximately 21 working hours were required daily for typing, transmission of II reports, and maintenance of files. The lack of clerical assistance often resulted in delayed forwarding of typed copies of II reports to the requesting units. In general,

personnel were found to be adequate to interpret and process the imagery produced by the company.

(2) Equipment

The equipment authorized was adequate to support the II section with one exception. The authorized Richards light table and related optical equipment were not avaialable until 15 June 1965. The substitute light tables were considered too small but imagery was interpreted satisfactory using the substitute equipment.

c. ARVN Observers

Military Assistance Command, Vietnam Directive 95-2 directed that an ARVN observer accompany each OV-1 aircraft that carried armament. There were eight ARVN observers attached to the company and their knowledge of the terrain and the enemy situation assisted in the identification of Viet Cong activity. They also assisted in low-level aerial navigation of areas that were unfamiliar to the aviators.

Considerable difficulty was experienced by the company in obtaining and retaining observers from the supported ARVN divisions but, when available, eight observers were considered adequate. No special equipment was required.

d. Intelligence Section

The intelligence section was created from company resources. One aviator and one flight operations specialist were assigned to the section and given the following responsibilities as additional duties:

1) Maintaining a daily situation map

2) Preparing and presenting a daily intelligence briefing which included the following:

   a) Current enemy situation

   b) Known hazards to flight

   c) Current weather and weather forecast

   d) Flight techniques to assist in obtaining better imagery

3) Monitoring mission debriefings

4) Maintaining aerial navigation charts

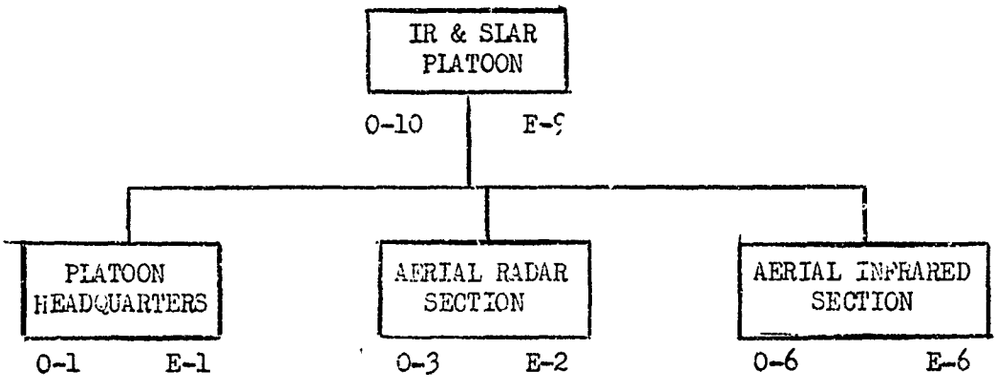
5) Maintaining security of classified equipment and documents

6) Maintaining security clearances for assigned personnel

The aviator and flight operation specialists were required to spend approximately seven working hours daily performing intelligence duties. It was determined that personnel in the II section were school-trained in these duties and could have accomplished them satisfactorily without additional personnel.

3. IR/SLAR Platoon

The IR/SLAR Platoon had the mission of providing day and night aerial surveillance during all but the most severe weather conditions. The platoon was capable of providing visual observation and day or night photography. As shown in figure 32, the platoon was divided into three sections: platoon headquarters, the aerial radar section, and the aerial infrared section.



(U) FIGURE 32. Organization chart, IR/SLAR Platoon.

a. Headquarters

(1) Personnel

The personnel assigned to the platoon headquarters were the platoon commander and a light truck driver (MOS 670.00). The platoon commander supervised the sections and participated in operational missions. The light truck driver had the responsibility of driving the 3/4-ton truck which transported one of the two AN/TAQ-1 surveillance information centers assigned to the aerial infrared section of the platoon. He also served as radio operator for the installed radio of the AN/TAQ-1. The platoon commander designated the senior sensor operator as the acting platoon sergeant with the tasks of supervising all the

enlisted personnel, maintaining and caring for equipment, and supervising the administrative functions of the platoon. These duties greatly reduced his time available for supervision of the sensor operators and participation in operational missions.

(2) Equipment

The equipment assigned to the platoon headquarters was adequate.

b. Aerial Radar Section

(1) Personnel

The aerial radar section was authorized three aviators (MOS 1980) and two SLAR operators E-5 (MOS 207.10). The senior aviator served as section leader. All three aviators participated in operational flights. The authorization of operator personnel was, except in one instance, adequate for assigned equipment. The AN/TAQ-2 ground data station, an authorized component of the AN/UPD-2 SLAR system that was not available during the evaluation, would require an additional E-5, MOS 207.10, operator.

(2) Equipment

No problem existed since very little equipment was authorized the aerial radar section.

c. Aerial Infrared Section

(1) Personnel

The section was authorized six aviators (MOS 1980) and six IR sensor operators (MOS 207.10). The senior aviator served as section leader. All six aviators participated in operational flights. The sensor operators' duties consisted of operating the four aerial infrared sets and the two ground based AN/TAQ-1 surveillance information centers. The section was short two operators, so an on-the-job training program was initiated within the company. This program provided two operators, which alleviated the shortage and contributed to the effectiveness of the section. Authorized personnel were adequate for operation of the section.

(2) Equipment

Equipment of the aerial infrared section was adequate.

4. Visual/Photo Platoon

The visual/photo platoon was organized into three flight teams of two aircraft each.

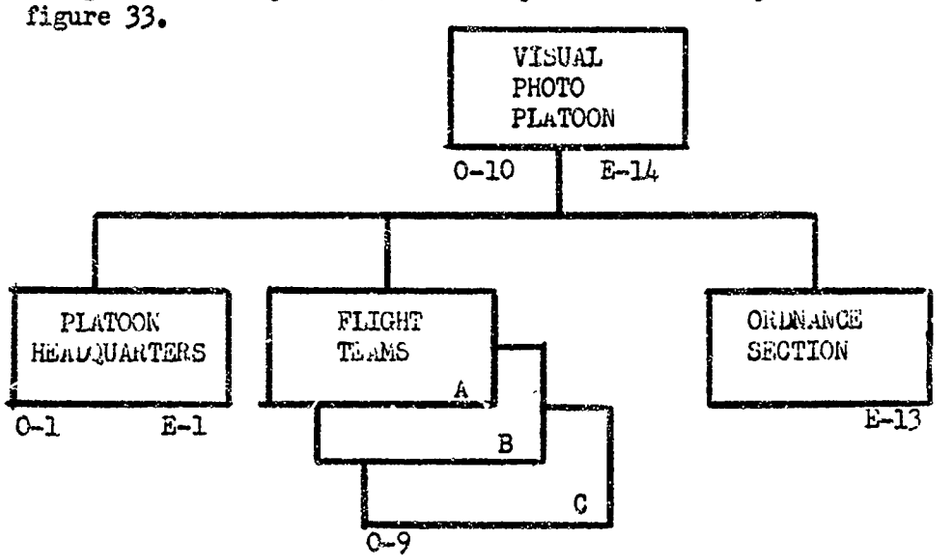
The platoon was organized to provide:

a) Continual day and night reconnaissance and surveillance under visual flight conditions

b) Visual observation of routes, zones, and areas

c) Rapid spot photography using vertical, oblique, and forward looking panoramic cameras during daylight hours and vertical photographic coverage during the hours of darkness.

Six OV-1A's equipped for visual and photographic missions were assigned to this platoon. The composition of the platoon is shown in figure 33.



(U) FIGURE 33. Organization chart, Visual/Photo Platoon.

a. Headquarters

(1) Personnel

Platoon headquarters was authorized a platoon commander and a light truck driver. The platoon commander supervised three flight teams and an ordnance section. The light truck driver, although assigned

to the visual/photo platoon, had the additional responsibility of driving one of the two 3/4-ton trucks assigned to the IR/SIAR platoon. He also was required to operate the radio installed in the AN/TAQ-1.

(2) Equipment

The equipment authorized the platoon headquarters was adequate for the performance of the assigned mission.

b. Flight Teams

(1) Personnel

Each of the three flight teams consisted of three Army aviators and two OV-1A camera-equipped airplanes. Each team employed the buddy system, with the second airplane providing suppressive fire when necessary for successful accomplishment of the assigned mission. The third aviator in the team provided liaison with the supported unit and a backup flying capability. This method of operation (mutual support) within the organizational concept functioned satisfactorily. Personnel assigned were adequate to perform the visual and photographic mission.

(2) Equipment

The authorized equipment of the three flight teams was sufficient for performing visual observation and photo surveillance.

c. Ordnance Section

The ordnance section had the responsibility for maintaining the aerial armament systems, special ordnance equipment, and ammunition storage. The personnel of this section prepared armament systems and flares for flight, armed the ordnance at preflight, de-armed ordnance at post flight, and removed the armament systems and flares as required upon completion of a mission.

(1) Personnel

There were 13 enlisted personnel authorized: 1 aircraft armament supervisor, 2 senior aircraft armorers, 6 aircraft armorers, 1 ammunition storage supervisor, and 3 ammunition storage specialists. Members of this section were available for 24-hour duty.

The aircraft armament supervisor was the section leader and was responsible to the platoon leader for the operation of the ordnance section. The aircraft armament specialists performed the actual arming and de-arming of the ordnance. The ammunition storage personnel were responsible for care, maintenance, and storage of the various types of ammunition used by the unit. The section encountered no difficulties

and was adequately staffed to support the visual/photo platoon.

(2) Equipment

The ordnance section was authorized 11 line items of equipment. These were sufficient except that a 3/4-ton truck and trailer were needed for transporting personnel and ordnance to and from the ammunition storage area and arming areas. A 2½-ton truck and trailer were used for this purpose.

5. Signal Platoon

Because of the size and complex nature of the signal and electronics effort, the 73d Avn Co organized a signal platoon even though there was none authorized by TOE. This was accomplished by merging the communications section and photo lab section of the TOE operations platoon with the electronics maintenance section of the TOE service platoon. The responsibilities assigned the signal platoon included:

a) Maintenance of all communication and navigation equipment of 14 OV-1 aircraft, including 6 doppler systems

b) Maintenance of 14 KS-61A camera systems, 5 float KA-30 cameras, and 8 KA-60 cameras

c) Maintenance of two AN/UAS-4 infrared systems, two AN/AAS-14 infrared detecting sets, and four AN/APS-94 radar systems

d) Operation and maintenance of three AN/TFQ-7's and one ES-29 photographic darkroom

e) Maintenance of 19 vehicular-mounted radio sets

f) Administration of the signal supply section which had to store and control approximately 6,000 line items

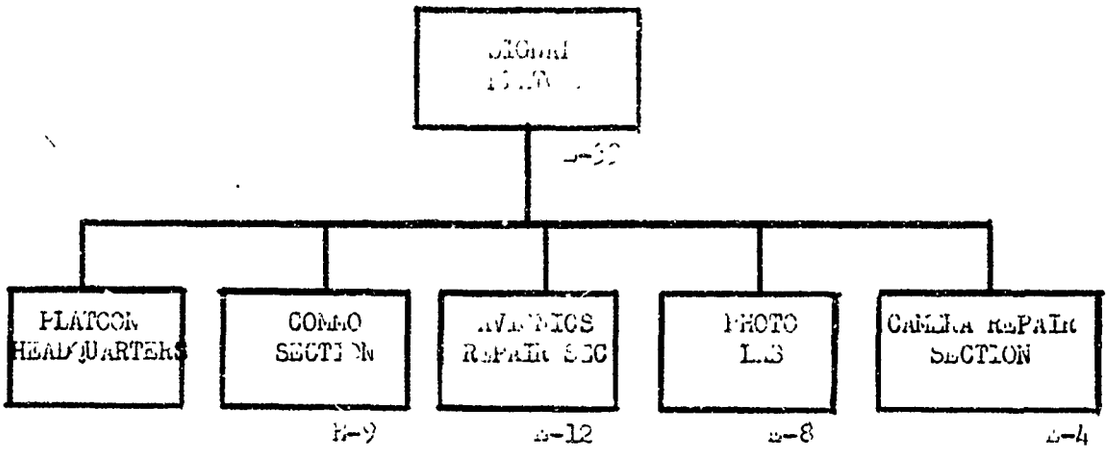
g) Processing of IR, SLAR, and photo imagery resulting from aerial surveillance missions performed by the company.

The structural organization of the signal platoon shown in figure 34 is similar to the communications platoon authorized an aerial surveillance company under the TOE 128P series and it provided the most effective organization for signal and electrorics maintenance support.

a. Headquarters

(1) Personnel

The signal platoon headquarters consisted of a platoon



(U) FIGURE 34. Organization chart, Signal Platoon.

commander (an additional duty for one aviator), a platoon sergeant (the senior enlisted person from the communications section), and one signal supply specialist (assigned to aircraft service platoon headquarters).

The platoon commander was responsible for command and control of the platoon in addition to advising the company commander on communications and maintenance of the signal and electronics equipment in the company. This responsibility required the full-time attention of a signal officer.

The performance of the company's mission depended to a great extent on the operation of its electronic equipment. Maintenance of this equipment required specialized technical knowledge and background not possessed by assigned officer personnel. A communication electronics repair technician (warrant officer, MOS 286A) was needed in the signal platoon for supervision of technical maintenance and supply.

There was a need for a platoon sergeant to assist the platoon commander in control and supervision of the enlisted personnel and equipment of the platoon, and to provide technical assistance in the maintenance effort of the platoon. A platoon sergeant, E-7, MOS 284.70 would provide this capability for the platoon.

The authorized signal supply specialist was responsible for maintenance of a signal supply system involving approximately 6,000 different signal line items. This included maintenance of a prescribed load list (PLL), an authorized stockage list (ASL), daily requisitions, and a large number of supply publications. (For further discussion of the signal supply system, see objective 5.) The platoon used two personnel in signal supply but they were not able to fulfill the workload without assistance. Two personnel, one E-5, MOS 765.60 and one E-4,

MOS 765.10 were required in addition to the authorized signal supply specialist to maintain the signal supply system.

(2) Equipment

The signal platoon headquarters was authorized eight line items of equipment. An electronics shop semi-trailer mounting an AN/ASM-190 was the only piece of equipment that was significally different from that in other platoon headquarters. Its purpose was to provide a relatively dirt-free storage area for sensitive electronic and signal repair parts. The equipment was considered sufficient to support the platoon headquarters.

c. Communications Section

The communications section consisted of the communication chief, radio teletypewriter (RTT) team chief, two RTT operators, three wiremen, one switchboard operator, and a radio repairman. These personnel were responsible for operation of 2 AN/GRC-46's, the company's wire communications, and maintenance and repair of 19 vehicle-mounted FM radios.

(1) Personnel

The communications chief was responsible to the signal platoon commander for the operation of the section.

The RTT team (one team chief and two operators) was responsible for the operation and maintenance of the two AN/GRC-46's. Both sets were seldom employed since the RTT team could operate only one of the AN/GRC-46's during sustained round-the-clock operations. The team chief supervised the operators and performed operator duties when a 24-hour capability was required. An additional RTT team chief, E-5, MOS 053.60, and two RTT operators, E-4, MOS 053.10 were required.

A section wireman and a switchboard operator from the section were on special duty with the 765th Transportation Battalion during the evaluation. The two remaining wireman installed and maintained the company's telephones, switchboard, and associated equipment.

The radio repairman was responsible for maintaining and repairing 19 vehicle-mounted FM radio sets. During his absence the company was without a radio repair capability. One additional radio repairman, E-4, MOS 296.10 was needed for sustained combat operations.

In accordance with the provisions of AR 611-201, and with the addition of personnel discussed above, the communication chief's grade would be raised from E-5 to E-6.

(2) Equipment

The communications section was authorized sufficient repair kits and parts to support the company. The AN/GRC-46 (formerly in the operations platoon) was transferred to the communications section, less the 3/4-ton truck and trailer.

c. Avionics Repair Section

(1) Personnel

The avionics repair section consisted of one senior aerial sensor repairman, four aerial sensor repairmen, and seven aviation electronic repairmen. These personnel were responsible for the organizational, field, and limited depot maintenance of all aircraft avionics equipment.

The senior aerial sensor repairman acting as the section chief was responsible for the avionics repair and maintenance of six electronic sensors (two SLAR and four IR) and six doppler navigation systems. Commensurate with his responsibilities, it was considered appropriate that the section chief's grade be raised from E-5 to E-6.

The authorized aerial sensor repairmen were adequate for maintenance of the electronic sensor systems. In addition, they assisted the IR/SLAR platoon by serving as in-flight sensor operators for scheduled surveillance missions. In view of the skill and proficiency required to accomplish sensor maintenance, and to create a career field for MOS 207.10 qualified personnel, it was considered appropriate that the sensor repairman's grade be raised from E-4 to E-5. This is not outlined in AR 611-201 since the MOS is relatively new and has not been assigned in a company-size unit prior to this time.

The section was authorized seven aviation electronic repairmen (two E-5's and five E-4's, MOS 284.10), to maintain the avionics equipment installed in OV-1 aircraft. It was determined that one additional electronic repairman was needed for sustained 24-hour operation.

The manufacturers' representatives from companies supplying the various avionics and electronic equipment rendered invaluable assistance in trouble shooting and in routine maintenance of the avionics equipment. No attempt was made to evaluate the effect of this assistance on the work load of the section since it was primarily advisory in nature. When the experience level of military personnel increases, the value of technical assistance should decrease accordingly.

(2) Equipment

The avionics repair section had an adequate number of

test sets, tool kits, and semitrailer-mounted AN/ASM-1[illegible] and 190 electronic shops. (One M-109 substitute shop van was used in lieu of an AN/ASM-189.) The section also had a developmental liquid nitrogen generator to give the company means of manufacturing liquid nitrogen for the IR sensors. For detailed discussion of the nitrogen plant, see objective 5.

d. Photographic Laboratory Section

The photographic laboratory section had the responsibility for processing all imagery acquired by the 73d Aviation Company.

(1) Personnel

The photo lab section consisted of one photo lab supervisor, two senior photo lab specialists, four photo lab specialists, and one photo equipment repairman. The photo lab supervisor, as section chief, was responsible for operation of the three photo labs employed by the company. One senior photo lab specialist and three photo lab specialists supported the TRAC in Saigon. One senior photo lab specialist and one photo lab specialist supported the 73d Avn Co's flight team at Qui Nhon. The photo lab supervisor, with the part-time assistance of camera repairmen and other company personnel, supported the company at Vung Tau. The photo equipment repairman assigned to this section also performed duty with the camera repair section.

One additional senior photo lab specialist, E-5 MOS 843.10 and two photo lab specialists, E-4, MOS 843.10 were needed to operate the photo lab at Vung Tau.

(2) Equipment

Three photo labs were employed by the company during the evaluation. One ES-29 supported the TRAC in Saigon and two AN/TFQ-7's were stationed, one each, at Qui Nhon and Vung Tau.

The company was authorized three AN/TFQ-7 and three ES-29 photo labs. One AN/TFQ-7 was not used because no replacement parts were available and two ES-29's were not received by the company until 27 June, three days prior to termination of the data collection period.

Three ES-29 photo labs alone would have been adequate for processing all the imagery acquired by the 73d Aviation Company.

e. Camera Repair Section

(1) Personnel

The camera repair section consisted of four surveillance

photo repairmen. One photo equipment repairman, although assigned to the photo lab, worked with the camera repair section. These personnel were responsible for organizational, field, and limited depot maintenance of 14 KS-61A camera systems, 6 KA-60 panoramic cameras, and 5 KA-30 cameras (float).

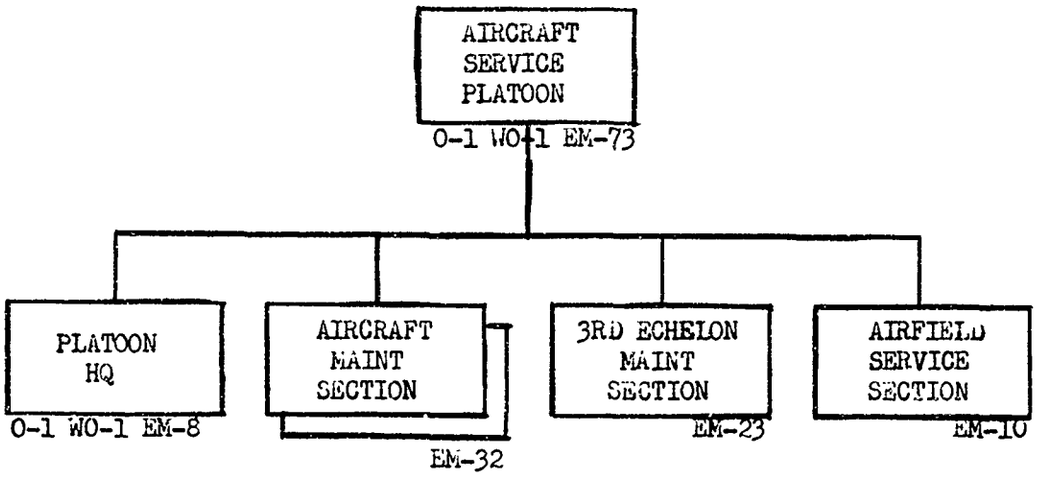
Manufacturers' representatives provided invaluable assistance in the maintenance and operation of the aerial cameras and related equipment. The evaluation indicated an adequacy of numbers of personnel to maintain all camera systems. However, assistance from technical representatives of the manufacturers precluded accurate determination of maintenance capability.

(2) Equipment

The camera repair section was authorized sufficient test sets and tool kits for accomplishing its mission.

6. Aircraft Service Platoon

The aircraft service platoon was responsible for organizational and field maintenance, including limited fourth echelon maintenance, of all aircraft assigned to the company. In order to accomplish these tasks, the platoon was organized as shown in figure 35.



(U) FIGURE 35. Organization chart, Aircraft Service Platoon.

The company TOE authorized a service platoon which included an automotive maintenance and an electronics maintenance section. As previously discussed, these sections were placed under control of other platoons in the company, which resulted in a residual organization with the mission of aircraft service support.

a. Headquarters

(1) Personnel

The aircraft service platoon headquarters was authorized a platoon commander, an airplane maintenance technician, a platoon sergeant, two airplane technical inspectors, two aircraft parts specialists, a shop clerk, a signal parts specialist, and an aircraft supply clerk. The platoon commander and platoon sergeant were responsible for command and control of the platoon. The aircraft maintenance technician provided technical supervision of all maintenance performed. He was assisted primarily by two technical inspectors whose job was to insure that the correct maintenance was being performed. This was done through frequent inspections of the quality of maintenance as outlined in applicable TM's. The aircraft parts specialists were responsible for the aircraft supply system of the company. One aircraft parts specialist assigned to the third maintenance section was reassigned to the aircraft service platoon headquarters to assist in a consolidated aircraft supply activity. The other aircraft parts specialist was designated as NCOIC of the aircraft supply section. This position should be authorized in the grade of E-5 because field maintenance responsibility was added to normal company aircraft supply. The signal parts specialist was assigned to duty in the signal platoon headquarters. The shop clerk provided the normal administrative support for the service platoon. These personnel were adequate for the accomplishment of the mission. However, a clerk/typist to work with the technical inspectors would improve the effectiveness of the organization. The technical inspectors were frequently involved in filing inspection forms, checking maintenance forms, maintaining publications, and several other clerical duties which detracted from their job of quality control. The use of a clerk/typist, E-4, MOS 711.20 would have enabled the technical inspectors to devote full time to their primary job.

(2) Equipment

The platoon headquarters was authorized sufficient vehicles and equipment to perform its mission.

b. Aircraft Maintenance Sections

The 2 aircraft maintenance sections contained 32 personnel who were responsible for the organizational maintenance of the aircraft. The aircraft maintenance sections were organized so that they could separately support the two surveillance platoons if the method of operation required employment from two separate locations. A more thorough discussion of the aircraft maintenance procedures used by the 73d Avn. Co is contained in objective 5, which indicates that for maximum use of the aircraft, four additional aircraft mechanics were required. This was

substantiated on a maintenance hour per flying hour ratio. Two of the mechanics should be authorized grade E-5, MOS 672.30 and two should be E-4, MOS 672.20.

(2) Equipment

Equipment of the sections was sufficient except that one additional 3/4-ton truck and trailer was needed for transportation of personnel and equipment on the flight line.

c. Third Echelon Maintenance Section

(1) Personnel

The third echelon maintenance section performed third and limited fourth echelon maintenance on all aircraft assigned or attached to the company. Several different types of MOS-qualified personnel were included in the section and performed jobs as indicated by their titles. A more detailed discussion of the section and its personnel requirements is discussed in objective 5. One repair foreman was used as a line chief and supervised the two aircraft maintenance sections. The second repair foreman was in charge of the third echelon maintenance section and adequately supervised the section on a 24-hour basis. Because of extensive sheet metal repair required for the aircraft as a result of ground fire, two additional airframe repairmen, E-5, MOS 686.10 were needed. Aircraft were grounded for extended periods of time because the three authorized airframe repairmen were insufficient to accomplish the required work.

Scheduled inspections and maintenance work were delayed on occasion because the four authorized airplane repairmen, MOS 672.40 were not able to complete the accumulated work load. Indications were that the required work could have been accomplished in an efficient and timely manner with an additional two airplane repairmen, MOS 672.40, and two airplane mechanic helpers, MOS 670.00

Only one machinist, MOS 443.10 and one hydraulic system repairman, MOS 687.10 were authorized. In the absence of either of these individuals the unit was without that particular maintenance capability. Also, when maintenance involving these specialties was required on a 24-hour basis, the unit was unable to meet the requirement. These conditions were of sufficient importance to justify an additional machinist, E-4, MOS 443.10, and a hydraulic system repairman, E-5, MOS 687.10. In addition, the tool crib shop van required a full-time E-3 supply clerk, MOS 760.10. Other personnel in the section, which included aircraft engine repairmen, propeller repairmen, and electrical repairmen, were considered adequate.

Three parachute packers, MOS 646.27, were authorized

by TOE 1-128T (Modified). These personnel were integrated into the third echelon maintenance section and performed all maintenance and repair on the Martin Baker ejection seat.

(2) Equipment

The section was authorized equipment in the form of shop vans, shop sets, and test sets, all of which were adequate.

d. Airfield Service Section

(1) Personnel

The airfield service section operated under control of the 765th Transportation Battalion airfield service facility and could not be evaluated as a separate unit. However, it was the opinion of the evaluation team and key personnel of the company that the 10 assigned enlisted men were sufficient for servicing the company's aircraft and performing crash rescue duties.

(2) Equipment

The section was authorized five 2½-ton trucks and 1½-ton trailers in addition to four fuel tankers. A requirement could not be established for four of the 2½-ton trucks. It was determined by key personnel of the unit and by the evaluators that one 2½-ton truck and one 3/4-ton truck and trailer would be sufficient for the transportation requirements of the section.

7. Findings

a. Personnel and equipment of the company headquarters were adequate.

b. A utility aircraft (U-6A) averaged 50 flying hours monthly performing administrative and logistical support missions for the company.

c. Automotive maintenance was accomplished in a satisfactory manner.

d. One aviator was required in the operations platoon headquarters as an assistant operations officer.

e. Approximately 21 working hours were required daily for typing, transmission of imagery interpretation reports, and maintenance of files.

f. One aviator and a flight operations specialist were used to perform intelligence duties.

g. The personnel of the II section were school-trained in intelligence duties and adequately accomplished the company's intelligence requirements.

h. The TOE did not provide a platoon sergeant for the IR/SLAR platoon.

i. A 3/4-ton truck and trailer were needed for transporting personnel and ordnance among the ammunition storage and arming areas.

j. Duties within the signal platoon were such that a full-time platoon leader was required.

k. Maintenance of the company's electronic equipment required specialized technical knowledge and educational background not possessed by assigned officer personnel.

l. The TOE made no provision for a platoon sergeant for the signal platoon.

m. The two personnel in signal supply MOS's were not able to carry the workload without outside assistance.

n. Although the company was issued two AN/GRC-46 radios and both are required, only one RTT team was authorized by TOE.

o. The one authorized company radio repairman was not capable of rendering full-time (24-hour) repair support.

p. The addition of six doppler navigation systems required personnel with specialized training and increased the work requirements of the avionics repair section beyond its authorized support capability.

q. The three photo lab specialists authorized were adequate to support the one ES-29 lab at the TRAC on a 24-hour basis.

r. One ES-29 and two AN/TFQ-7 photo labs provided adequate processing capability for all imagery acquired by the company. One ES-29 lab was adequate to support the TRAC.

s. The one authorized M-109 shop van was inadequate to meet the requirements of the avionics repair section.

t. The two technical inspectors in the aircraft service platoon headquarters were frequently involved in filing inspection forms, checking maintenance forms, maintaining publications, and other clerical duties which detracted from their primary job of quality control.

u. The senior aircraft parts specialist was required to perform the additional duties as NCOIC of the aircraft supply section. This section had the responsibility for field maintenance supply in addition to the normal aircraft company supply.

v. A 3/4-ton truck and trailer were required by the organizational maintenance section for transportation of personnel and equipment on the flight line.

w. Maintenance hour per flying hour ratio indicated there was an insufficient number of airplane mechanics in the aircraft maintenance section.

x. The number of airframe repairmen in the TOE was inadequate in view of the extended periods of time damaged aircraft had to await airframe repair.

y. In the absence of either the machinist or the hydraulic systems repairman, the company was completely without a capability in those particular maintenance areas.

z. Work order analysis and man-hour availability in each shop of the field maintenance section indicated that there was an insufficient number of airplane repairmen and mechanics helpers.

aa. A full-time supply clerk was required in the tool crib shop van.

bb. Four 2½-ton trucks with 1½-ton trailers authorized in the airfield service section were excess to company needs.

cc. The airfield service section had a requirement for a 3/4-ton truck with 3/4-ton trailer for transporting personnel and crash equipment to points within the airfield complex.

E. OBJECTIVE 5 - LOGISTICAL SUPPORT

1. Maintenance

Records of the 73d Avn Co indicated that during the evaluation 14 OV-1 aircraft were programmed to fly 868 hours per month but actually flew an average of 889 hours per month.

a. Organizational Maintenance

The organizational maintenance section was responsible for first and second echelon organizational maintenance on six OV-1A airplanes of the visual photo platoon, two OV-1B's and four OV-1C's of the IR and SLAR platoon, two OV-1A float aircraft, and one U-6A attached for administrative support. The maintenance performed was as outlined in TM 55-1510-204-20, Organizational Maintenance Manual, OV-1 Airplane. Salt air corrosion and dusty conditions required additional maintenance to be added to the daily inspections as follows:

1) Wash propellers and coat with light oil.

2) Wash engine nacelles and coat with light oil.

3) Wash struts and actuators and lubricate with hydraulic fluid.

4) Wash foreign matter off of induction air intakes.

5) Inspect entire aircraft for corrosion and battle damage.

The maintenance man-hours of direct labor averaged 12,746 hours per month, as shown below, for a ratio of 14 hours of maintenance labor per hour of flying:

	April	May	June	Averages
Organizational maintenance	7452	6000	6114	6522
Field maintenance	6627	6639	5405	6223
Total man-hours direct labor	14079	12639	11519	12746
U-6A man-hours direct labor	84	88	86	84
OV-1 man-hours direct labor	13995	12551	11433	12659
U-6A flying hours	42	47	62	50
OV-1 flying hours	860	934	874	889
Average hours per OV-1 aircraft	61	66	62	63
U-6A maint hours for each flying hour	2	2	2	2
OV-1 organizational maint hours for each flying hour	9	6	7	7
OV-1 field maint hours for each flying hour	7	7	7	7
OV-1 total maint hours for each flying hour	16	13	14	14

Data were obtained from 73d Avn Co man-hour records and verified by evaluator spot checks. Supervisors' time was eliminated.

Maintenance man-hour records indicated that 7 of the 14 hours maintenance per flying hour were required for organizational maintenance. With 868 programmed monthly flying hours, a 30-day month, and 14 OV-1 aircraft assigned and attached, each aircraft averaged 2 flying hours per day which required, at 7 maintenance hours per flying hour, 14 hours of organizational maintenance each day, or 420 hours per month. This required 2.4 mechanics per aircraft.

b. Field Maintenance

All field maintenance requirements were placed on Maintenance Request Work Orders, DA Form 2407, and scheduled through the various shops by the quality control section. A record of all 2407 forms completed was compiled on DA 2405 Maintenance Request Register. In addition to those inspections required of field maintenance in TM 55-1510-204-34, the intermediate inspection of the OV-1 was increased approximately 5 man-hours as follows:

1) Remove main landing gear wheels and retorque brake assembly mounting bolts.

2) Inspect brake linings and replace as required.

3) Repack wheel bearings.

4) Lubricate main landing gear.

5) Clean oil cooler.

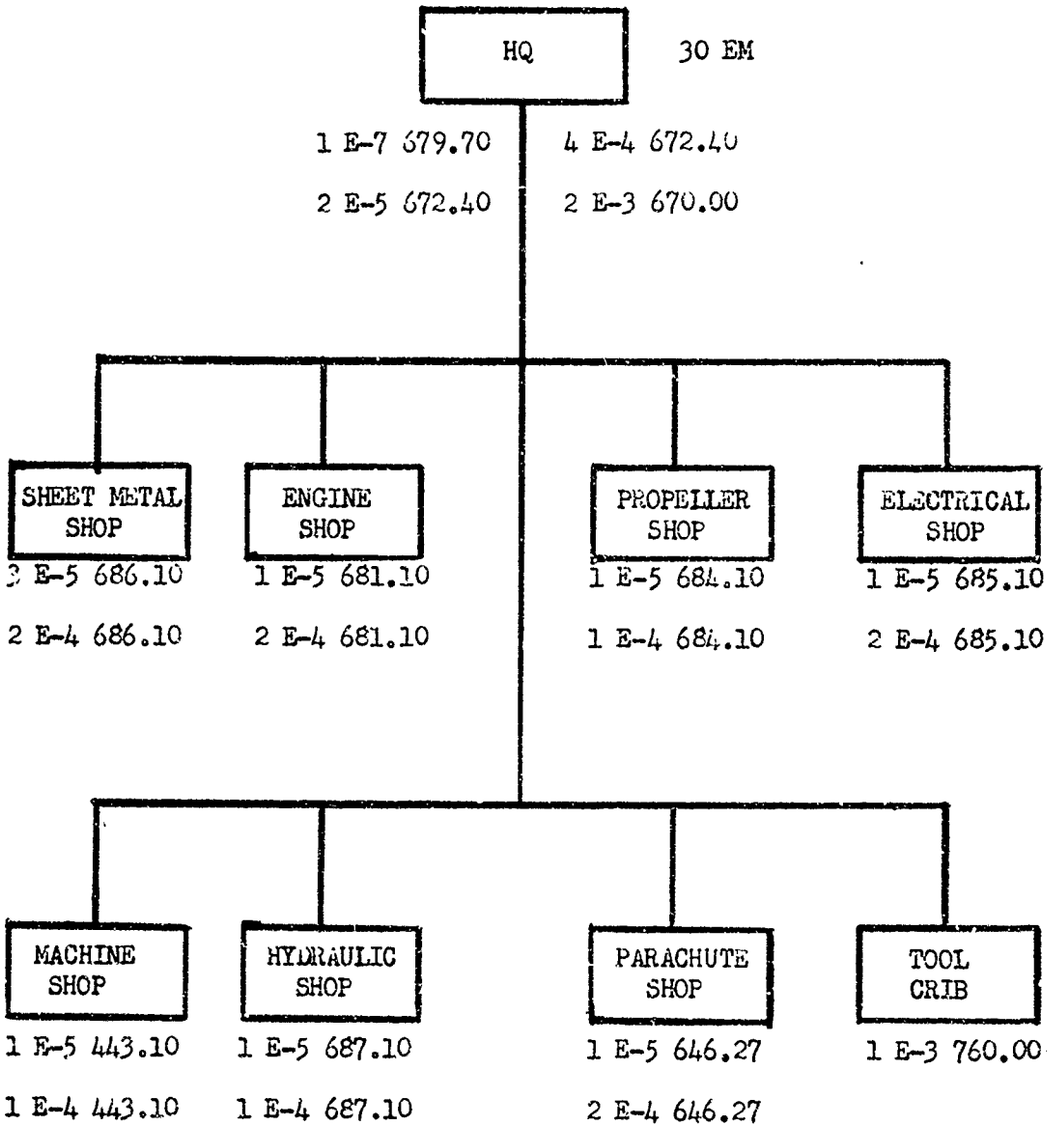
6) Remove, clean, and lubricate windshield wipers.

7) Apply corrosion preventative compound to outboard wings.

8) Change oil every other intermediate inspection.

Field maintenance man-hour records of the company indicated that an average of 6223 man-hours of field maintenance direct labor was required to maintain 14 OV-1 aircraft flying 889 hours per month. This gave a ratio of 7 hours of field maintenance direct labor per flying hour. The USASCV flying hour program was 62 hours per month. Considering the 14 aircraft assigned and attached, it was determined that 6076 hours of direct labor were required for the field maintenance program*. Including supervisory personnel, clerical personnel, and 24-hour operations, the TOE of the field maintenance section should be as shown in figure 36, which is an increase of seven EM.

*62 hours x 14 aircraft x 7 hours equals 6076 hours



(U) FIGURE 36. Proposed field maintenance section, 73d Aviation Company.

Field maintenance tools and equipment were adequate except for the following:

1) One additional set of jacks, tripod, 10-ton was required. Normally one set was in use under an aircraft in maintenance and a second set required for operations such as replacing blowout tires.

2) A portable hydraulic mule is required for ground maintenance testing of the aircraft hydraulic system to enable the system to be energized without operation of the engine driven pumps.

3) A parachute rigging table and drying tower were required.

Excess equipment included Herman Nelson heaters, piston engine special tools, preoilers, and a Sweeney engine stand.

c. Avionics

Sufficient float stock of avionics equipment was available to insure a minimum of downtime attributable to avionics problems. Spare parts were available primarily from the basic load brought in-country with the 4th ASTA platoon.

The average work day for personnel was 12 hours, which was necessary to insure 24-hour operation. Using a 6-day work week and 12 hours per day as standard, each man was available 312 hours per month. Man-hours lost to guard, details, and necessary administrative duties averaged 20 hours per month for E-5's and 60 hours for E-4's and below.

(1) Doppler Radar

The IR aircraft had a Marconi doppler radar navigator system that worked well and had few failures. The SLAR aircraft combined an AN/APN-129 doppler and a Marconi computer into a system and this composite system was so unsatisfactory that aviators stopped using it. Although equipment failures caused problems, unreliability which resulted in inaccuracies was the primary reason for its disuse. Generally, upon checking the equipment after a mission, no malfunction could be discovered. A trained enlisted doppler repairman was not assigned to the company and a SLAR repairman was substituted, which probably accounted for some of the repair problems. Moreover, the Marconi representative had not been trained on the AN/APN-129 doppler. Both the Marconi representative and the enlisted repairman were radar repairmen and had no difficulty keeping the Marconi system operating properly. In view

of their general technical knowledge and ability it was felt that failures of the composite doppler system were not caused entirely by a lack of repair capability, but from basic equipment ineffectiveness.

(2) Compass

Swinging of the MA-1 compass system was a problem because an adequate compass rose for calibration was not available to the 73d Avn Co. Accurate compass information is required by the doppler system, as the doppler is only as accurate as the compass input. Without a compass rose, swinging of the MA-1 is time consuming and inaccurate. A temporary solution was devised by the Joint Research and Test Activity in the form of an MK II astrocompass adapter which allowed the astrocompass to be used for swinging the MA-1. This system was satisfactory but is considered an interim method to be used only until a compass rose is available.

(3) Maintenance of Equipment

Excellent maintenance support from manufacturers' representatives was provided for the following items of equipment:

Equipment	Company
KA-60 Camera KS-61 System	Fairchild Camera and Instrument Company
Doppler Navigation System	Canadian Marconi Company
Infrared	HRB Singer Company
SLAR	Kearfott Electronics
ES-29	PAX Electronics
OV-1 Aircraft	Grumann Aircraft Engineer Corp
Engines	Lycoming Div, Avco Corp

d. Electronic Sensor Maintenance

Electronic sensor maintenance was excellent. As an example, only 13 target areas out of 841 missions were aborted because of sensor failure. Ground delays, prior to flight, attributable to sensor or avionics problems were four in April, seven in May, and three in June. Average ground delay time was 52 minutes.

(1) Liquid Nitrogen Generator

The aircraft IR systems required cooling by liquid nitrogen. When the aircraft arrived in RVN they were equipped with internal nitrogen generating systems. After 2 weeks of operation, and prior to the evaluation, it was thought that vibration had loosened connecting joints in the cooling lines. The manufacturer's representative suggested a modification and the aircraft project manager was informed. The aircraft generating system was removed and the ground nitrogen generator was used to fill nitrogen bottles to be carried aboard the aircraft. It was then found more convenient to have the bottles filled by the USAF than to make full use of the ground generator available in the unit. The unit's generator was a large non-standard piece of equipment which did not perform properly using the local electrical power. (See figure 37.) Since this equipment was not relied upon as a source of nitrogen, no evaluation was made of its performance, logistics required, or nitrogen generated.

(2) Ground Power Units

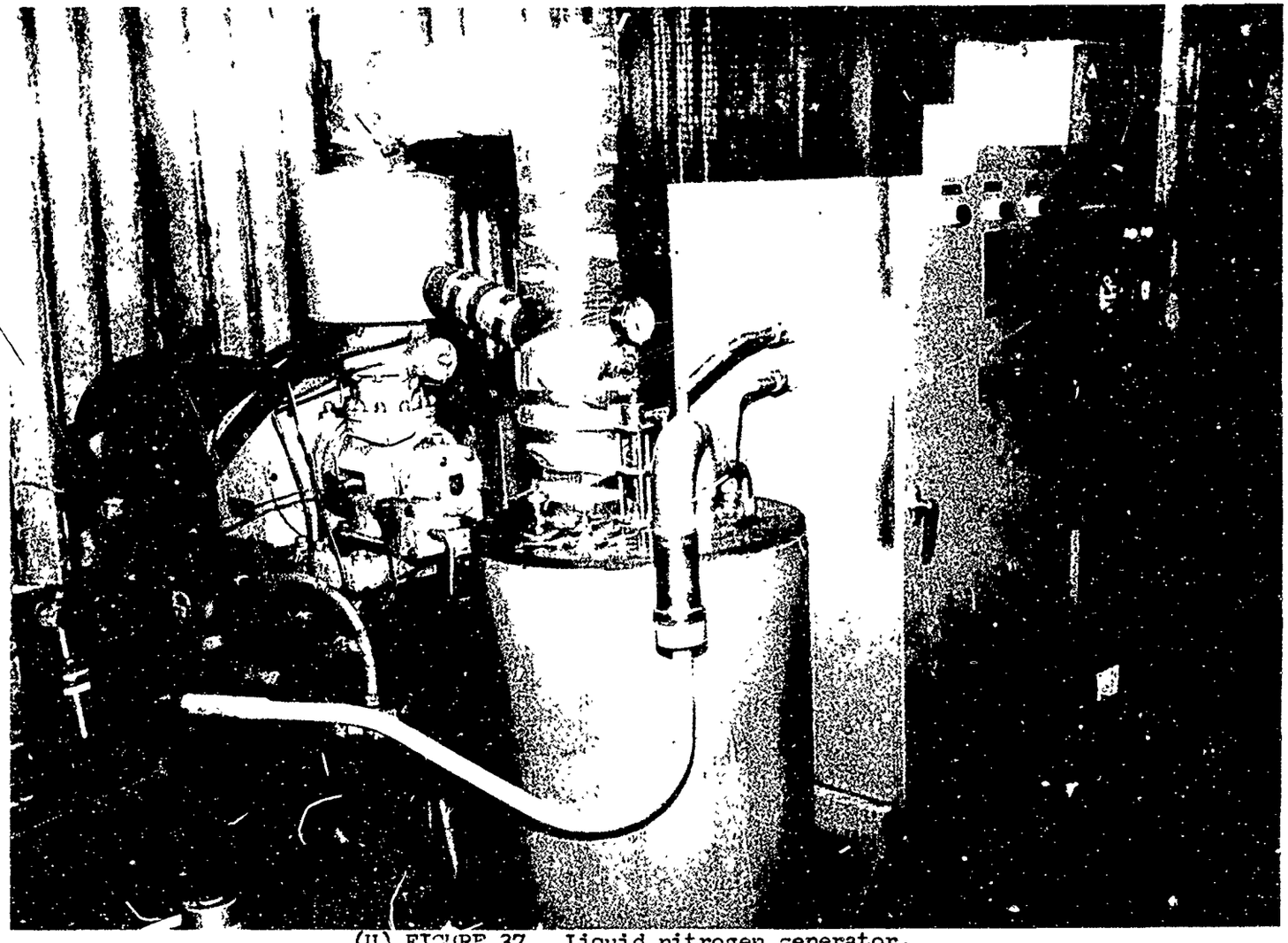
Ground power units capable of providing 200 amperes at 28 volts dc over extended periods were required for sensor preflight and trouble shooting but were not available. As a substitute, one MA-1 multiple service unit and tug was assigned to the aircraft maintenance platoon. Because it was used also as a tug it was frequently not available for preflight checks. The average preflight testing required 45 minutes of continuous power, and trouble shooting on occasion took longer. The MA-1 overheated when used for an extended period. As an interim measure the sensor sections obtained an auxiliary power plant from an H-37 helicopter unit.

e. Other Maintenance

(1) Automotive

Automotive maintenance was conducted by the 73d Avn Co on the assigned vehicles shown below and was organized into first, second, and third echelon:

Type of Vehicle	Model	Number Assigned	Number Used
3/4 T	M-37, M-37B-1	10	10
2 1/2 T	M-35	15	5
	M-109	3	2
	M-49C	4	4
	M-35A1	1	0
	M-135	9	0



(U) FIGURE 37. Liquid nitrogen generator.

Type of Vehicle	Model	Number Assigned	Number Used
5 T	Wrecker	1	1
5 T	Tractor	7	1
1/4 T	M-151	5	5
1/4 TR	M-100	3	3
3/4 TR	M-101	10	10
1 1/2 TR	M-105, M-107	16	5
6 TR	M-119	4	4
AC Shop Van	M-447	4	4
Elect Shop Van	M-348A-2 AN/ASM-189	2	2
	Total	94	56

Even though 27 vehicles and 11 trailers were not used, they required some daily maintenance and a periodic runup.

The company was hampered by lack of a grease pit in the company area and maintenance was further complicated by blowing sand.

(2) Aircraft Ordnance

The aircraft ordnance section was responsible for the receipt, storage, maintenance, and disposition of the following:

a) Caliber .50 machinegun ammunition

b) 2.75-inch rockets

c) Photo flash flares

d) Illumination flares

The section performed maintenance on:

a) XM-14 caliber .50 machinegun pods

b) 2.75-inch rocket pod (19 tubes)

c) 2.75-inch rocket pod (7 tubes)

Arming of aircraft and maintenance of the aircraft armament systems also were the responsibility of the section. Machinegun pods were installed or removed from the OV-1 with the Mark 7 bomb lift trailer towed by a 3/4-ton truck. The Mark 7 bomb lift was operated by a manual hydraulic pump. It was slow and is considered obsolete.

2. Supply

a. Aircraft Supply

Upon activation of the 73d Avn Co the prescribed load list (PLL) of the 23d SWAD and the PLL of the 14th ASTA detachment were combined. Duplications were eliminated and a PLL of 1182 line items was submitted through the 611th Transportation Company (DS) to the Aviation Supply Point, Saigon, and approved. Some 649 third echelon line items were based upon a 24-month demand experience obtained for 6 OV-1A aircraft of the 23d SWAD. The remaining line items were developed by the US Army Aviation Command, AMC to support OV-1B and C aircraft through fourth echelon repair.

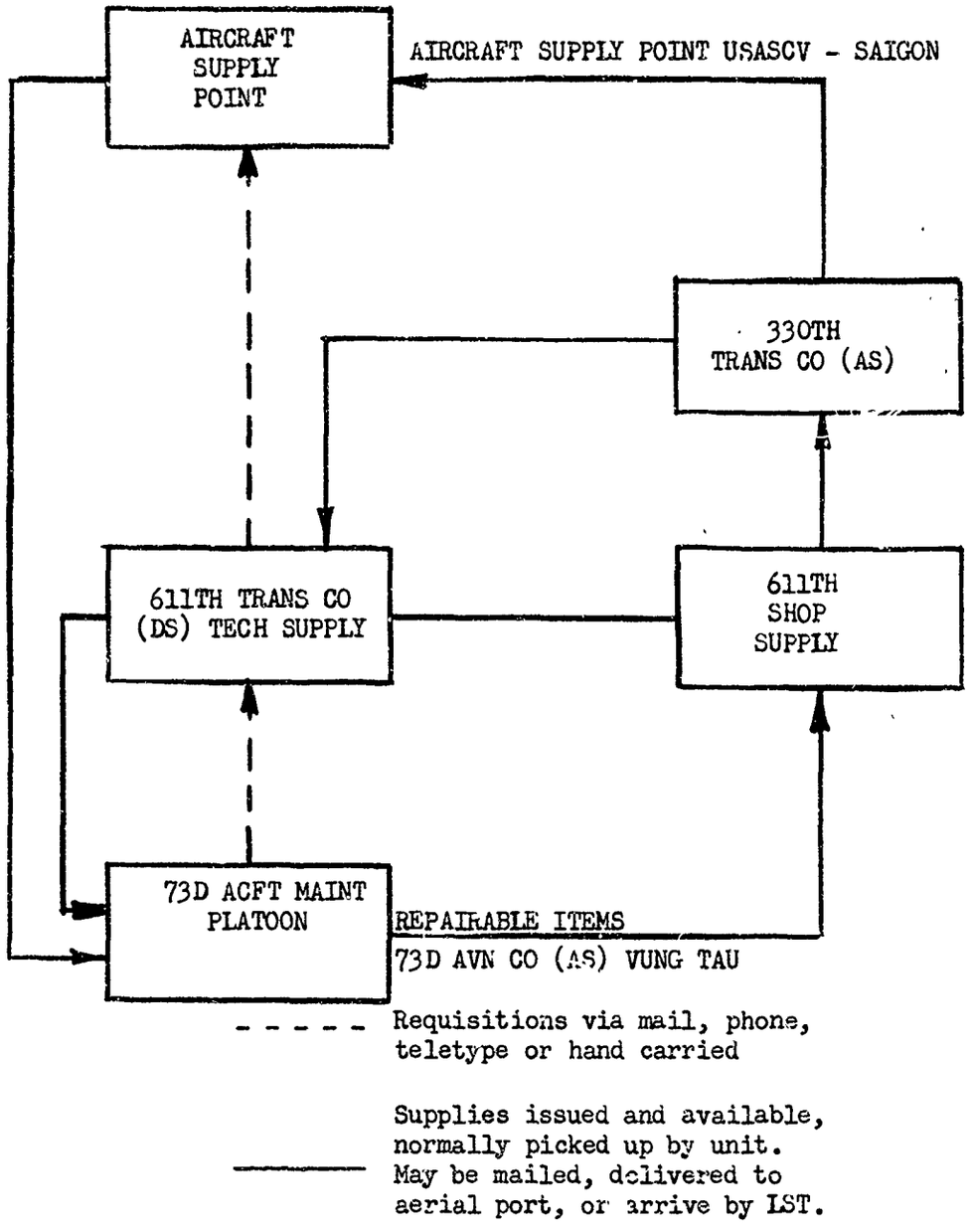
Upon completion of 6 months' demand experience or upon changes in major items of equipment, the PLL was to be reviewed by the company. Those items showing three demands in 180 days were to be retained in the company PLL. In addition, a limited number of insurance or mission essential items not having three demands were to be authorized by the 611th Transportation Company (DS) for retention on the PLL. Fringe items (new items required without previous demand experience) were to be requisitioned and stocked in limited quantity until demand experience of 180 days had been obtained. The 73d Aviation Company had a technical supply flow as shown in figure 38.

The number of aircraft supplt personnel was considered adequate but doubt existed as to the proper enlisted rank spread. The chief of the supply section, an E-4, supervised two other E-4's and one E-3 and had the responsibility for 3 supply vans, 1 tool crib, and nearly 1200 line items of supply.

b. Signal Supply (Avionics and Sensor)

Because of a shortage of personnel and the lack of a packing list, some of the parts brought by the 4th ASTA Detachment and stored in CONEX containers had not been unpacked and properly recorded. Upon completion of unpacking and recording actions, it was intended to consolidate the 4th ASTA Detachment and 23d SWAD supply groups into one supply system.

Signal supply response was inadequate. No deadline requisitions were filled during the evaluation, No immediate effect was felt because float items were available and used. Of the 322 requisitions



(U) FIGURE 38. Aircraft technical supply channels.

for expendables, only 22 were filled. The unit was able to maintain its avionic and electronic equipment only because of the excellent supply of spare parts brought in-country by the 4th ASTA Detachment. Without immediate action taken by Consolidated Supply Activity to fill outstanding requisitions, the unit may well not be able to continue to perform its mission.

Standard items were requisitioned by mail from Consolidated Supply Activity (CSA) in Saigon. Replacement parts were generally mailed to the unit although occasionally they were picked up at the CSA in Saigon.

Only one signal supply clerk was authorized by TOE. He was responsible for approximately 6000 line items plus the maintenance of supply catalogues and cross reference manuals.

Figure 39 lists film and photographic chemical consumption. During the month of April all SLAR film was processed on the ground after completion of the flight. During May and June, however, in-flight processing of film was done, hence the different type of SLAR film.

A list of equipment supported is shown in figure 40.

c. Automotive Supply

Automotive supply for the 73d Avn Co was the responsibility of the motor maintenance section. The current TOE was adequate to support the assigned vehicles. A partial PLL for 187 line items was submitted to the CSA for approval but did not cover all assigned special purpose vehicles such as fire trucks and wreakers. The lack of a qualified ordnance repair parts clerk caused automotive supply to suffer. Approximately 25 percent of the authorized parts stockage list was out of supply. Stock record cards did not reflect an inventory or a balance on hand. A considerable quantity of repair parts authorized for use at third and fourth echelon was, however, on hand.

d. Aircraft Ordnance Supply

A consolidated ammunition requirement was submitted to CSA in Saigon once each week by the company supply officer. Ammunition was delivered each week to the aerial port in Vung Tau. A 3-man ammunition detail used two rough terrain forklifts assigned to the armament section to move the ammunition to the base storage area where ammunition was uncrated and rockets assembled. A similar detail was required approximately four times a week to move ammunition from the base storage area to the airfield armament area, to return reusable rocket containers to the aerial port, and to move unserviceable rocket pods to the salvage yard. Flares were delivered to the crew chiefs on the flight line.

SLAR SECTION

	Type of Film	FSN	No. of Rolls	Size
Apr	Panatomic X Emulsion 5240	6750-754-0792	15 ea	5 in. x 100 ft
May	Radar Recording	6750-772-9199	14 ea	9½ in. x 50 ft
Jun	Radar Recording	6750-772-9199	15 ea	9½ in. x 5[illegible] ft

IR SECTION

	Type of Film	FSN	No. of Rolls	Size
Apr	Plus X Aerecon	6750-825-0270	41 ea	5 in. x 250 ft
May	Plus X Aerecon	6750-825-0270	39 ea	5 in. x 250 ft
Jun	Plus X Aerecon	6750-825-0270	44 ea	5 in. x 250 ft

VISUAL AND PHOTO SECTION

Chemicals	FSN	Size of Container	Quantity
Developer NR 25	6750-153-8915	1 gal	65
Developer M 4	6750-514-1865	3½ gal	6
Developer D 76	6750-291-2638	1 gal	5
Acetic Acid	6750-151-6558	2 qt	4
Rapid Fix	6750-201-1199	5 gal	10
Hypo Fixer	6750-577-4903	1 gal	4

Paper	FSN	No. Sheets per Container	Quantity
Contact	6750-803-9436	150	12
Enlarging	6750-248-4224	250	12
Roll	6750-597-2636	250	15

Film	FSN	Size	Quantity
Plus X	6750-717-6845	5 in. x 100 ft	60
Plus X	6750-577-4636	70 mm x 100 ft	30

(U) FIGURE 39, Film and photographic chemical consumption.

AVIONICS

Detecting Set, Infrared	AN/AAS-14( )	4 ea
Fuel Quantity Measuring System	AN/AJQ-7( )	14 ea
Radar Data Transmitting Set	AN/AKT-16( )	2 ea
Radar Set	AN/APN-22	14 ea
Navigation Set, Radar	AN/APN-129(V)	2 ea
Radar Surveillance Set	AN/APS-94A	2 ea
Transponder Set	AN/APX-44( )	14 ea
Receiver Group	AN/ARA-54( )	6 ea
Radio Set	AN/ARC-44( )	14 ea
Radio Set	AN/ARC-73( )	14 ea
Radio Set	AN/ARC-73( )	1 ea
Receiving Set, Radio	AN/ARN-30D	15 ea
Radio Set	AN/ARC-102( )	8 ea
Direction Finder Set	AN/ARN-59(V)	29 ea
Computer Set, Navigational	AN/ASN-33	14 ea
Fire Detecting System, Acft Engine	AN/ASQ-65	14 ea
Automatic Flight Control System	AN/ASW-12	14 ea
Control Set, Intercommunication	C-1611/ARC	28 ea
Battery, Storage	BB-433	14 ea
Photographic Surveillance System, Airborne	KS-61	14 ea
Magnetic Slaved Directional Gyro Stabilized Compass System	MA-1 (Lear)	14 ea
Radio Receiver	R-844/ARN-58	8 ea
Radio Receiver	R-1041/ARN-68	6 ea
Radar Mapping, Recorder-Processor-Viewer	RO-166/UP	2 ea
Radio Trasmitter ,	T-366/ARC	6 ea
Transmitting Set, Radio	AN/ART-41( )	4 ea

GROUND COMMUNICATION EQUIPMENT

Radio Teletypewriter Set	AN/GRC-46	2 ea
Radio Set	AN/VRC-24	2 ea
Radio Set	AN/VRC-18	8 ea
Radio Set	AN/VRC-10	7 ea
Radio Set	AN/PRC-10	6 ea
Radio Set	AN/PRC-6	8 ea
Telephone Set	TA-312/PT	12 ea
Control Group	AN/GRA-6	8 ea
Switchboard, Manual	SB-22/PT	2 ea
Receiver, Radio	R-520/URR	11 ea
Receiver	AN/GRR-5	2 ea
Vibrator Pack	PP-68/U	1 ea
Wire	WD-1/TT	10 mile
Photographic Darkroom, Portable	AN/TFQ-7	3 ea
Photographic Darkroom, Portable	ES-29( )	2 ea
Infra-Red Surveillance Info Center	AN/TAQ-1	2 ea

(C) FIGURE 40. Signal equipment supported.

Aircraft ordnance expenditure during the evaluation was as follows:

Type of Ordnance	April	May	June
Cal .50 ammunition	2000	8850	3250
2.75-inch rockets			
Motors	343	938	1100
HE warheads	(307)	(812)	(704)
WP warheads	(36)	(126)	(396)
Photo flash flares	156	0	0
Illumination flares, Mk III	0	0	0
Smoke illumination flares	12	12	12

e. POL Supply

Requirements for POL were submitted through two channels: package POL products were requisitioned on form 1049 from the 21st QM Detachment, Saigon and bulk POL was ordered by telephone each day from the POL office of the Consolidated Supply Activity, Saigon.

Aviation company POL was supplied by a consolidated POL section under operational control of the 765th Transportation Battalion, airfield service officer. All personnel for handling POL supply were attached to Hq and Hq Detachment of the 765th Trans Bn. A sergeant (E-6) and 7 enlisted men were attached from the 23d QM POL Det, 3 POL specialists were attached from the 73d Avn Co, and 1 POL specialist each was attached from the 611th Transportation Company and the 765th Transportation Battalion for a total of 13 personnel.

Vung Tau received POL under commercial contract in 55-gallon drums or bulk tankers. It was stored in twelve 10,000-gallon rubber tanks, 6 of which contained 115/145 avn gas, 5 contained JP-4, and 1 contained automotive gas. The POL section had two 350-gallon-per-minute fuel pumps and two 50-gallon-per-minute fuel pumps. Six 600-gallon skid tanks, eleven M-49 1200-gallon tankers, and three 5000-gallon tankers were also available and were used when needed. Automotive gas was delivered daily to all areas on the airfield for stationary engines and was issued in bulk to the motor maintenance section. Lubricants were issued on demand. Daily records were maintained on all issues and receipts.

Fuel samples were taken and inspected daily and POL in drums was filtered at least twice before being put into aircraft. The Saigon POL laboratory personnel were available on call and visited Vung Tau once each month to render assistance as required.

Single point pressure refueling on the OV-1 was preferred by POL personnel as it could be accomplished without climbing on the wings of the aircraft. Thus, wings were not subject to damage by nozzles and tanks were not opened to blowing sand. One of the M-49 tankers was equipped with pressure refueling nozzles.

Supply of POL was adequate and was accomplished in an efficient manner with only three 73d Avn Co POL specialists. The company would appear to have sufficient personnel and equipment for POL supply if operated independently, but this was not evaluated as they did not move or operate independently.

Consumption of POL during the evaluation follows:

Type of POL	April	May	June
JP-4 115/145 aviation gas Aviation grease Aviation oil	Issued on a battalion basis; no records of company use		
Diesel fuel (gal)	1729	1029	1429
MOGAS (gal)	936	835	1037
Generator oil (only) (gal)	33	17	18

f. General Supply

The company supply officer was responsible for all TOE and installation supply, ammunition and rations, items authorized by the table of allowance (TA 50-901), and expendable administrative supplies.

Supplies requested directly from the source of supply by the various supply sections of the company consisted of POL, aircraft repair parts, avionics repair parts, automotive repair parts, ammunition, and daily ration requests.

The company supply officer had four sources of supply: the Navy Supply Office, Headquarters Support Activity, Saigon, for administrative supplies contained in the "Shopping Guide of Common Use Items"; the Consolidated Supply Activity, Saigon for TOE, TA, and general supply support; the 611th Transportation Company (AM&S DS), Vung Tau for new or replacement aircraft; and the Engineer R&E Office, Vung Tau for construction and post camp and station supplies.

Requisitions were submitted on standard forms 2765, 2765-1, or 1348 and were mailed to Saigon. With the exception of bulk POL, which was ordered by telephone and delivered, approximately 90 percent of the supplies were picked up by company personnel in Saigon and the

remaining 10 percent were received through the mail. The company supply officer normally sent one or two men, depending on the supply quantity, to Saigon twice weekly to pick up supplies. Because of the requirement to pick up supplies in Saigon, two additional personnel were detailed to the supply section to assist the section to form essential duties.

3. Facilities

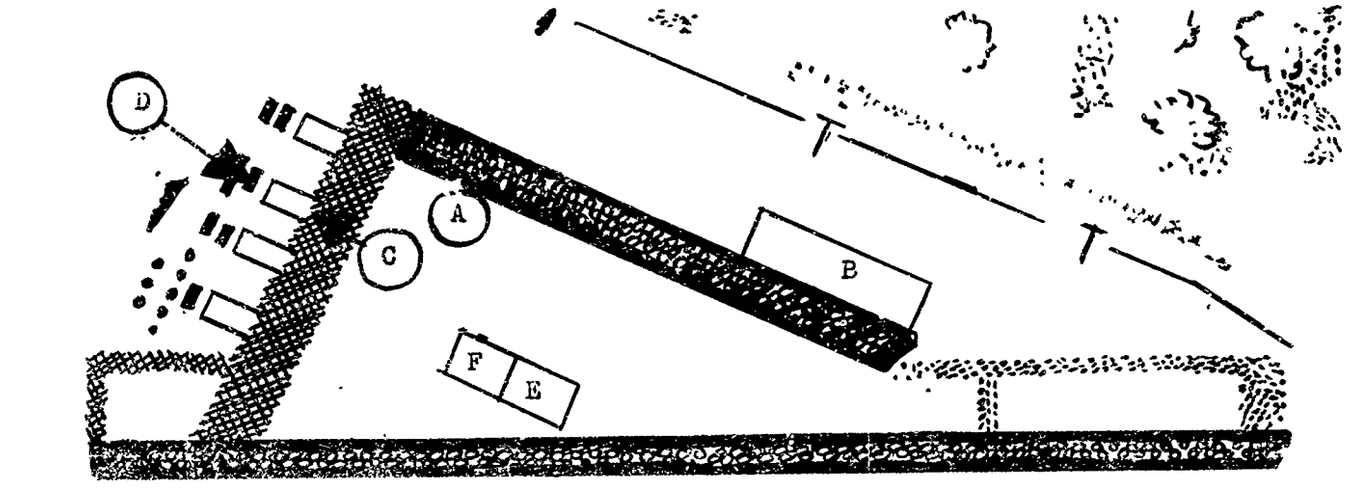
The 73d Avn Co occupied the areas of Vung Tau Airfield designated in figure 41. The company headquarters facility was adequate except for company supply. A supply room addition had been requested and was approved for construction in FY 66. Troop billets were crowded but permanent troop housing and bachelor officers quarters were also scheduled for construction in FY 66.

a. Aircraft and Avionics Maintenance

Aircraft field maintenance was conducted in a corrugated steel hanger and maintenance space was adequate. Only occasionally was hanger space available for organizational maintenance. Portable engine maintenance stands and maintenance shelters were required but not available to the unit for flight line maintenance. Provisions for lights and 28-volt dc current required on the flight line for testing the avionics equipment in the OV-1 aircraft were marginal.

The signal platoon had the following facilities:

Use	Number	Type of Facility
Signal office and supply	2	Semi-trailer, van electric, 6-ton, 2 wheel, M348A2, AN/ASM-190
Side looking airborne radar repair	1	AN/ASM-189, electronic repair van
IR repair	1	AN/ASM-189, electronic repair van
Photo section	3	Photographic darkroom, AN/TFQ-7
	3	ES-29 photographic darkroom
Avionics repair	1	AN/ASM-189, electronic repair van
	1	Van, special (no nomenclature but almost the same as AN/ASM-189)



A. FLIGHT LINE (SURVEILLANCE)
B. FLIGHT LINE (OBSERVATION)
C. FIELD MAINTENANCE AREA
D. COMPANY HEADQUARTERS
E. MOTOR PARK
F. ARMAMENT SECTION

(U) FIGURE 41. 73d Aviation Company area.

Use	Number	Type of Facility
Camera and doppler	1	AN/ASM-189 electronic repair van
	1	M-109 shop van
CONEX containers		
a. Storage of basic load of film	1	
b. Storage of photographic chemical supplies	2	
c. Storage of ground radios	1	
d. Storage of lighting kits, field wire, and reels	1	

These were adequate with the exception that a rigging table and a drying tower were required by the field maintenance parachute packing and rigging section and photographic film storage facilities were not adequate. Film was stored in CONEX containers and no provisions were provided for the desirable temperature control necessary to prolong film shelf life. The M-109 shop truck should be replaced with an electronic repair van AN/ASM-189 for use by the camera repair section.

b. Aircraft Ordnance Maintenance

The location of the facility available to the armament section shown in figure 41 was marginally adequate. A locally constructed wooden shack was used as an office with the roof extended to form a covered maintenance area. Bomb lifts with loaded pods were stored in the open and covered with tarpaulins. Rockets were stored and handled by the armament section adjacent to the motor park.

c. Motor Maintenance

The motor park was located in the center of the airfield as shown in figure 41. The area was low and flooded during the rainy season. Only one fourth of the park was paved and the remainder was soft beach sand.

4. Findings

a. The lack of a clerk/typist in the platoon headquarters of the aircraft service platoon hampered adequate record keeping.

b. A minimum of 2.4 mechanics per aircraft were necessary for proper organizational maintenance.

c. The workload and extra inspection requirements indicated that seven additional field maintenance personnel were required.

d. With the organization of a signal platoon, a platoon leader, maintenance officer, and a platoon sergeant were necessary but not authorized within the platoon structure.

e. The line item volume in the supply section of the signal platoon was too great to be handled by one supply specialist.

f. Additional field maintenance tools were necessary for the proper conduct of maintenance.

g. Some items of field maintenance equipment were excess to the needs of the company.

h. The AN/APN-129 doppler navigation system coupled with the Marconi Computer system did not perform satisfactorily, though each of the units taken alone was satisfactory.

i. A compass rose was necessary for compass calibration.

j. Adequate ground power equipment was not available for preflight inspection of sensor equipment.

k. There were 27 motor vehicles not used by the company.

l. The Mark 7 bomb lift used by the aircraft ordnance section was unsatisfactory.

m. The personnel grade structure of the aircraft supply section did not provide sufficient rank for the section chief.

n. The supply response received by the signal section was inadequate.

o. The lack of an assigned repair parts clerk in the automotive supply section of motor maintenance affected stock levels of required repair parts.

p. Engine maintenance stands and maintenance shelters were required but not authorized.

q. Facilities for the storage of photographic film were unsatisfactory. A refrigerated storage van was requisitioned.

r. The area used for motor park was unsatisfactory.

s. The ordnance maintenance facility was unsatisfactory.

t. Vibration loosened connecting joints in the cooling lines in the closed cycle nitrogen cooling system component of the AN/UAS-4.

IV. (C) CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

It is concluded that:

1. Table of Organization and Equipment 1-128T (Modified) was inadequate. The addition of one officer, one warrant officer, and 29 enlisted men was required.

2. The IR and SLAR electronic surveillance systems used were effective in providing information on Viet Cong activities.

3. The number and mix of OV-1 electronic sensor equipment was inadequate to meet all the requirements for reconnaissance and surveillance in support of MACV.

4. The visual surveillance capability of the company was effective.

5. Photographic sensors are effective during daylight hours but their use was not fully exploited.

6. Additional data were required to evaluate the company's night photographic capability.

7. Temperature controlled facilities were required for the storage of photographic film.

8. Although the availability of SIAR sensor equipment was limited, tactical units were provided timely and responsive information of enemy targets.

9. Side looking airborne radar sensors had a 24-hour near all-weather capability and were effective under instrument flight conditions.

10. A need existed for an accurate, self-contained navigation system to facilitate both IR and SLAR surveillance.

11. Explicit instructions on the use of IR filters were required.

12. The existing navigation equipment was inadequate for IR surveillance in mountainous terrain at night and during periods of reduced visibility.

13. The lack of an automatic compensator for changes in aircraft speed and absolute altitude resulted in a degradation of the quality

of IR imagery obtained over mountainous terrain.

14. A precise heading reference and improved map accuracy were required to minimize navigation error during IR surveillance.

15. The most effective operating altitude for the IR sensor was 1500 to 2000 feet.

16. Modification of the Infrared Detecting Set AN/AAS-14 (Airborne Sensor Component) of the AN/UAS-4 Infrared Surveillance System was required to improve its capability for area search. Modification of the closed cycle nitrogen cooling system component of the AN/UAS-4 was required to insure its reliability.

17. Comprehensive training in the use of the doppler radar navigator was required for OV-1 qualified aviators arriving in RVN.

18. The AN/APN-129/Marconi Computer composite was not usable but an effort to improve the composite is not necessary since newer equipment (AN/ASN-64) has already been type-classified.

19. The TOE of the imagery interpretation section was adequate for rapidly processing and interpreting acquired imagery.

20. Imagery interpreters were not adequately trained in CONUS in imagery peculiar to Vietnam.

21. The 73d Aviation Company (AS), although limited in resources, functioned effectively and accomplished the assigned surveillance missions.

22. The use of the telephone for dissemination of intelligence information was time consuming and unreliable.

23. The company's intelligence requirements could have been adequately performed by personnel in the imagery interpretation section rather than having this function assigned as part-time duty to one aviator and an operations specialist.

24. Ground navigation aids available in the RVN were adequate for SLAR and daylight visual/photo reconnaissance.

25. The armament capability of the OV-1 assisted in the successful accomplishment of visual, photographic, and certain daylight IR surveillance missions.

26. The signal platoon did not receive adequate supply support during the evaluation but it still functioned effectively because it had been supplied in advance with a large amount of spare parts.

27. The company required three additional 3/4-ton truck and three 3/4-ton trailers. Four 2½-ton trucks with 1½-ton trailers were excess to their requirements.

28. A minimum of 2.4 mechanics per aircraft (rather than than the 2.0 authorized) were required for organizational maintenance based on around-the-clock operations and increased inspection requirements.

29. The following additional field maintenance equipment was needed:

a) One set of jacks, tripod, 10 ton.

b) One portable hydraulic mule.

c) A parachute rigging table.

d) A parachute drying tower.

30. The following field maintenance equipment was not required:

a) Herman Nelson heaters.

b) Piston engine special tools.

c) Pre-oiler.

31. An adequate compass calibration system was required to properly align the MA-1 gyrocompass.

32. The auxillary ground power unit which provided for preflight check of the sensor equipment was inadequate.

33. Engine maintenance stands and maintenance shelters were required.

B. RECOMMENDATIONS

It is recommended that:

1. The TOE for an Aviation Company (Aerial Surveillance) presented in annex H be approved for counterinsurgency warfare in Vietnam and that one company be placed in support of each of the ARVN corps and MACV. (Immediate action should be taken to implement the recommended additions and deletions to the TOE of the 73d Avn Co, annex E.)

2. An adequate and dependable communication system organic to the company be provided for the dissemination of intelligence information.

3. The capabilities of the photographic, SIAR, and IR sensors be fully exploited, including multi-sensor surveillance to provide timely targeting data to tactical elements.

4. Explicit instruction for the use of infrared filters be developed and disseminated.

5. The Infrared Detecting Set AN/AAS-14 (airborne sensor component) of the AN/UAS-4 Infrared Surveillance System be modified to improve its capability for area search without degrading the sensitivity of the system.

6. The AN/UAS-4 IR system be modified to incorporate automatic compensation for changes in aircraft speed and absolute altitude.

7. Development of a suitable terrain following device be expedited to permit safe IR surveillance in mountainous terrain at night and during periods of restricted visibility.

8. The composite Ryan-Marconi AN/APN-129(V)1, CMA681 Doppler Radar Navigation System be replaced by a more effective, self-contained system.

9. The MA-1 gyrocompass system be replaced by a stable, accurate, and reliable system.

10. A suitable ground auxillary power unit be provided to permit preflight inspection and maintenance of avionics equipment.

11. Engine maintenance stands be added to the ground handling tool set on the basis of one stand per two aircraft.

(C) ANNEX A

ENEMY, WEATHER, AND TERRAIN

1. (U) ENVIRONMENT

The Republic of Vietnam (RVN) occupies a crescent-shaped area of about 67,000 square miles on the southeastern edge of the Indochina Peninsula. Although only 45 miles wide at the 17th parallel, its demilitarized northern border with North Vietnam, it has a seacoast of 1,500 miles on the South China Sea and Gulf of Siam, and western borders with Laos and Cambodia of about 900 miles. The land borders are poorly defined and drawn through difficult and inaccessible terrain.

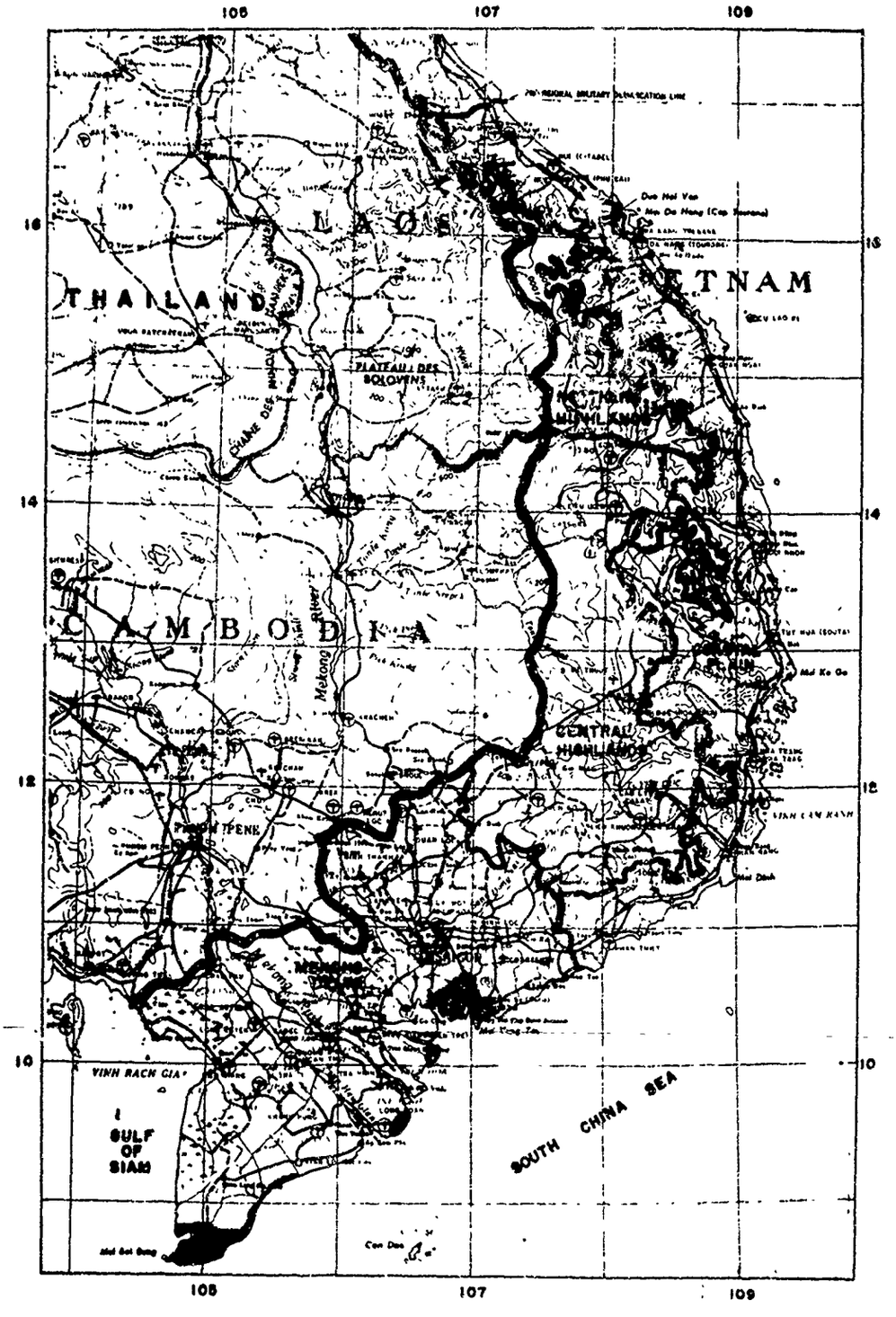
a. Terrain

There are four distinct geographical regions: The highlands located in the north and central portion, the plateaus of the central highlands, the coastal plain, and the Mekong Delta in the south. See figure A-1.

The northern two-thirds of the RVN is dominated by a chain of broken mountains and rugged hills extending in a northwest-southeast direction and terminating on the northern edge of the delta plain about 40 miles north of Saigon, the capital. The area is characterized by steep slopes, sharp crests, narrow valleys, and dense vegetation. It is sparsely populated, mainly by primitive and nomadic tribes, and it contains few roads or trails.

The central highlands adjacent to the Laos-Cambodia border contain extensive plateau areas. Here, the mountains give way to more gently rolling terrain. The northern plateau is covered by almost impenetrable tropical forests and jungles, which often have two dense overhead layers of foliage at heights of about 40 and 125 feet. The southern portion is typical savannah country, with large open expanses covered by tropical grasses and open forests. This region is more heavily populated than the northern highlands and has more roads and trails.

The coastal plain, varying from 10 to 25 miles in width, extends from the 17th parallel to the Mekong Delta. At several places mountain spurs jut out to the sea, cutting the plain into a series of compartments roughly at Mui Dinh, Mui Ke Ga, Quang Ngai, Da Nang, and Hue, north of which the spurs become more frequent. The area is characterized by sandy beaches and dunes, backed up by rice fields, fertile areas, and marshes extending to the mountains. It contains many small cities.



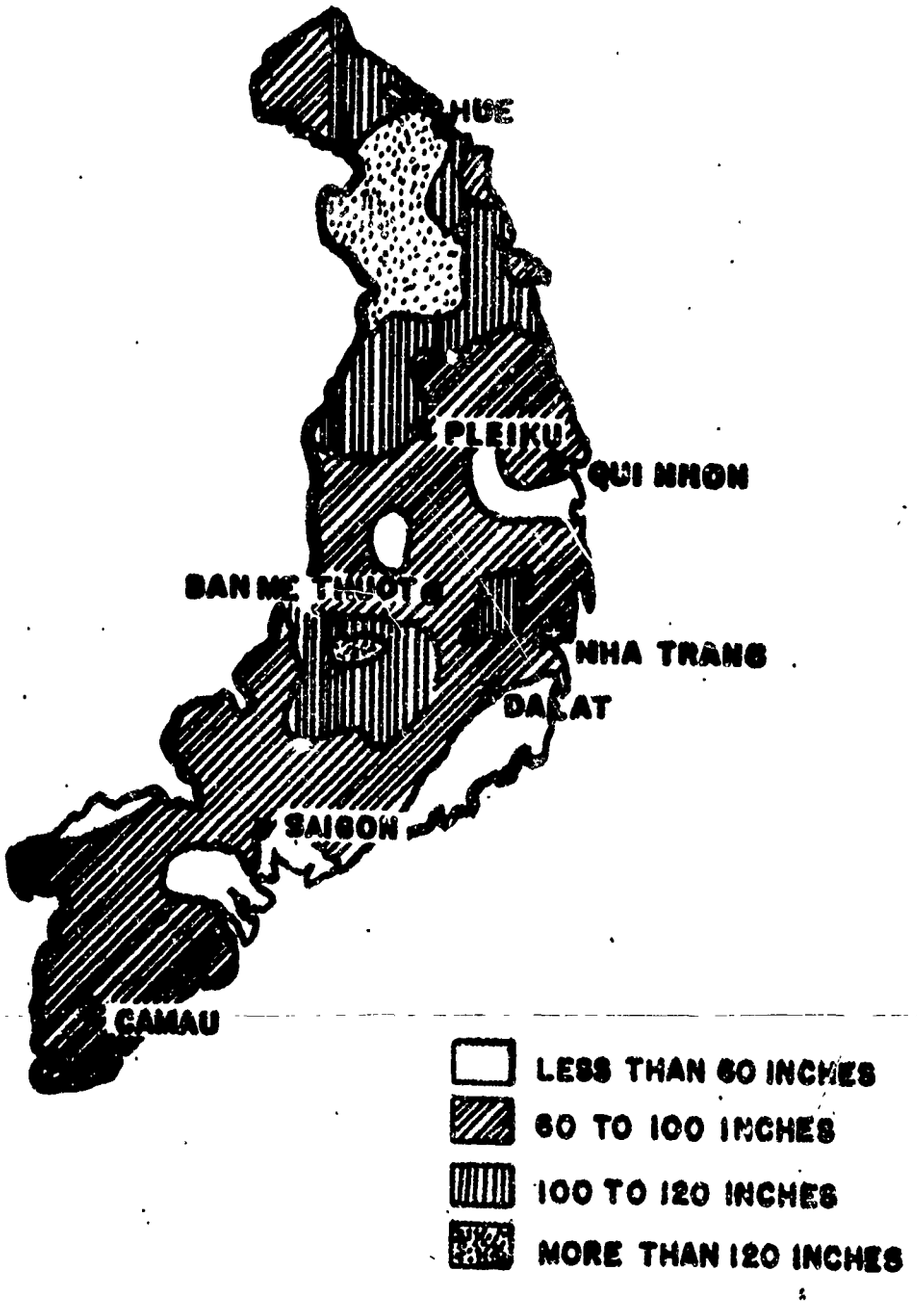
(U) FIGURE A-1. Geographical regions, RVN

The southern third of the country is part of the large delta plain formed by the rivers Hau Giang, Mekong, Vam Co, Saigon, and Dong Nai. The Hau Giang flows directly to the South China Sea. The huge Mekong splits into four branches, and the Vam Co and Dong Nai enter the Saigon before reaching the sea. In addition to these major tributaries, the area is cut by a number of smaller streams and a dense network of canals. The plain is relatively flat with few points exceeding an elevation of 20 feet above sea level. It is a very fertile area with more than 9,000 square miles under rice cultivation. Drainage is effected chiefly by tidal action, with the difference between ebb and flood as much as ten feet in some areas. The southernmost tip of the delta, known as the Ca Mau Peninsula, is covered with dense jungles, and mangrove swamps stand at the shoreline and on river estuaries. The eastern portion of the delta plain is heavily forested. The Plain of Reeds, a large marshy area covered with tall reeds and scrub trees, is located in the center of the delta region adjacent to the Cambodian border. During the rainy season, a major portion of the entire area is completely inundated.

b. Climate and Weather

The climate is hot and humid, subtropical in the north and tropical in the south where the monthly mean temperature is about 80 degrees Fahrenheit. The annual rainfall is heavy in most regions and torrential in many. It is heaviest at Hue which has an annual average of 128 inches. The low of 28 inches at Mui Dinh, a small cape on the eastern coast some 62 miles south of Nha Trang, results from the presence of hills in the area. At Saigon, rainfall averages 80 inches annually. See figure A-2.

Seasonal alternation of monsoon winds profoundly influences the weather throughout the year, although geographical features alter patterns locally. The winter monsoon blows generally from the northeast from early November to mid-March and often brings floods to the northern portion of the RVN. This is the period of the dry season in the delta, which usually lasts from December through March. The winds begin to shift in March, and with the exception of the coastal plain, high temperature and humidity prevails in all of the RVN from April to mid-June. The summer monsoon blows generally from the southwest from mid-June to late August or early September, bringing to the delta region heavy and frequent rains, high humidity, tropical temperatures, and maximum cloudiness. Mountains cause clouds to pile up and deposit moisture before the clouds reach the coastal plain or the northern highlands, which areas are dry during this period. In September the winds begin to shift again, and the coastal plain receives its maximum amount of rain and cloud cover, including severe tropical storms and typhoons.



(U) FIGURE A-2. Annual precipation, RVN

c. Communications

Roads throughout the RVN are few in number, poorly cared for, and narrow. Road travel to major areas in the north is often stopped completely when bridges and narrow places are destroyed, either by natural causes or the Viet Cong (VC). In the delta region, 2,500 miles of navigable inland waterways ease somewhat the communication burden placed on the 1,200 miles of primary and secondary roads in the region.

A single-track, narrow gauge railroad connects Saigon with the northern provinces by way of the coastal plain. The system and equipment is old and frequently damaged by the VC.

There is no wire telephone communication among the major centers of population. What radio telephone service is available is at the mercy of the often unstable atmospheric conditions over the RVN. Telephone equipment used in major cities is antiquated or makeshift.

In effect, rural areas are virtually isolated. It is not unusual for a VC act of terrorism or sabotage to take place in an outlying delta area and be reported in Saigon a week or more later. Most incidents accounted for take at least two or three days to get into the situation reports to Saigon.

d. Population

The RVN has a population of approximately 15.7 million, with an average density of 234 per square mile. The highland region is generally the least settled of the geographic areas of the RVN, and the coastal plain contains the most people. About 90 percent of the people live on the 13 percent of the land best suited for rice cultivation: the delta and the small river basins of the coastal plain.

Racially, the population is composed of 85 percent ethnic Vietnamese, 6 percent Chinese (who have established a great influence on the economy of the RVN), 5 percent Montagnard (the nomadic aboriginal tribe people living in the highlands), 3 percent Khmer-Cham (of Cambodian descent), and 1 percent European, Indian, and other small groups.

Religiously, about 80 percent profess Buddhism, about 10 percent profess Catholicism, and the rest profess Muhammedanism, Hinduism, Protestantism, Cao Daism, or Hoa Haoism (two local sects).

Socially, there is an upper class composed of old mandarin families, landed gentry, government officials, professional men, intellectuals, clergy, and wealthy businessmen; an urban middle class of civil servants, teachers, and small businessmen; and a lower class, mainly composed of farmers, but with a growing group of urban workers. Mobility upward within the structure is possible but difficult, especially up from the lowest.

Vietnamese culture is based on traditional Chinese customs and has been profoundly influenced, especially among the upper class living in the cities, by the French. Most rural Vietnamese continue to follow the traditional way of life. The great divergence in racial, religious, social, and cultural structures has produced continued strife and tensions among the people who belong to the various groups. There seems to be no evidence of a permanent stabilizing force available within the Vietnamese society to control conflicting elements.

The Vietnamese have a deep and traditional belief in destiny and man's inability to change the natural order of events. This concept, reinforced by religious beliefs, results in a high valuation of the virtues of stoicism, patience, and endurance. The Vietnamese are proud of their ethnic traditions and hold themselves superior to ethnic minorities in the RVN and to the peoples of neighboring countries.

Most of the people living in the countryside, who make up 90 percent of the population and who provide the main targets for the VC, care neither for the government in Saigon nor for the VC. They want to be left alone to grow their crops, raise their families, have a tranquil old age, and die traditionally.

2. (C) MILITARY ELEMENTS

a. (C) Friendly

The friendly units involved were those units that requested aerial surveillance from the 73d Aviation Company (AS).

(1) Units

(a) TRAC

The TRAC had first priority on electronic surveillance capability, coordinated all requests for electronic aerial surveillance in Vietnam, and was also responsible for processing and interpreting the majority of the infrared imagery obtained by the 73d Aviation Company and dissemination of all intelligence information obtained by electronic sensor means.

(b) II Corps

The II Corps had first priority on the photo/visual capability of the company. One flight team of two OV-1A Mohawks were stationed at Qui Nhon to fulfill the photo/visual requirements of II Corps. The corps also received information gained by IR and SLAR surveillance mission flown in the corps area of responsibility.

(c) III Corps

The III Corps had second priority on the electronic surveillance capability of the 73d Aviation Company. The TRAC scheduled the majority of their missions in the III Corps area. The corps received copies of all information gained from aerial surveillance missions flown in the corps area of responsibility.

(d) IV Corps

The IV Corps had second priority on the photo/visual capability and third priority on the electronic surveillance capability. The corps received copies of all information obtained from surveillance missions flown in the corps area of responsibility.

(e) Naval Advisory Group and Special Forces

These units requested surveillance missions through TRAC. All information obtained by aerial surveillance which was of interest to these units was forwarded to them.

(2) Missions

The mission of TRAC was to provide timely target intelligence to combat echelons for immediate as well as pre-planned attack by integrating intelligence from all sources in the most expeditious manner possible and to provide priority guidance to reconnaissance assets supporting the war against the Viet Cong.

The mission of the 73d Aviation Company (Aerial Surveillance) was to perform visual, photographic, and electronic reconnaissance and surveillance in support of Republic of Vietnam counterinsurgency operations as directed by MACV J3.

b. (U) Enemy

It is a well-documented fact that the Communist apparatus in the RVN is an extension of the Communist party of North Vietnam, and that direction and materiel and personnel support is received from the North. Supreme authority in the VC political and military organization in the RVN is the Central Office South Vietnam located in Tay Ninh Province near the Cambodian border. Subordinate thereto are four military regions and one special zone (corresponding roughly to the capital area), each of which has a subordinate series of provincial, district, and village-commune party committees.

(1) Units

The VC military forces can be divided into 3 operational

categories: main force, local force (together about 35,000 troops), and militia units (60,000 to 80,000 soldiers). The main force consists of full-time units controlled by the military region. Local force units are controlled by province and district committees. They are well-organized, and the personnel are well-trained and well-equipped. Militia units are full- and part-time local armed groups responsible to district, village, and hamlet authorities. Personnel of these units are used frequently as intelligence gatherers, porters, or as reinforcements for main and local force units. They may replace losses in the local force.

A VC battalion is planned for 400 to 500 men, but in reality may consist of as few as 250. A company averages 100 men, and a platoon about 30. Personnel may be acquired voluntarily, by kidnapping, or by impressment using blackmail or threats of violence. There is evidence that large numbers (a total of about 45,000 in four years since 1960) of native-born North Vietnamese have infiltrated from North Vietnam through Laos into the RVN.

Viet Cong forces are in general lightly equipped and have a commensurate degree of cross-country mobility. In addition to individual weapons, they have a large number of automatic weapons, and light crew-served weapons. The larger units are equipped with mortars and recoilless rifles. Supplies are obtained through capture, local procurement, taxation, and infiltration. Food staples such as fish, rice, and manioc are readily available.

(2) Capabilities

Because of support rendered by the country people, familiarity with the area, lack of responsibility for life and property, and the nature of guerrilla organization, equipment, and tactics, the VC are able to move virtually at will throughout much of the RVN. They are able to exploit as necessary the differences in race, religion, class, economic condition, and cultural background of their targets. They have a well-developed intelligence system, good discipline, and a usually effective security system.

Viet Cong military operations have the advantages of speed, surprise, deception, and infiltration. Training, accomplished in small, local areas by well-indoctrinated cadre, probably emphasizes selection of the most vulnerable targets, night operations, movement as small units until concentration is required, terrorism and propaganda, use of weapons, employment of terrain and weather, and infiltration. The VC objective is not, at the present stage of their insurgency to hold terrain, but rather to inflict losses on government forces, to capture weapons and materiel, and to convince the people that the government in Saigon cannot protect them and will eventually be defeated.

(3) Limitations

Viet Cong limitations stem from their need for strong security and the largely clandestine nature of their activities. Although the people among whom they live afford them a high degree of protection, active and passive, force must often be used, and support based on threats and fear endures only as long as pressure is brought to bear. Primitive living conditions add to the strain of avoiding government troops until the right moment. The VC are vulnerable to air and artillery attack, and less so to armor attack. Limited logistical capability, lack of communications, and insufficient medicine are other weaknesses.

(C) ANNEX B

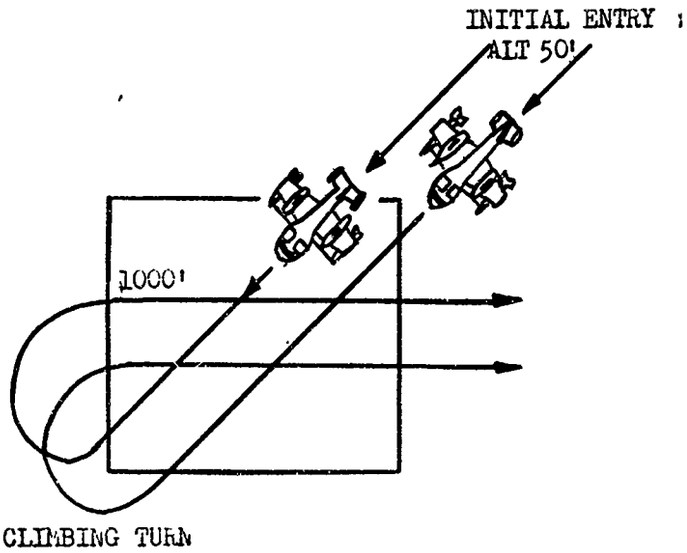
TACTICAL EMPLOYMENT

Annex B illustrates some of the tactics employed in flying visual/photo, SLAR, and IR surveillance missions and presents hit data for the 12 OV-1 aircraft that were damaged by enemy ground fire.

1. VISUAL/PHOTO

Flight teams consisting of two aircraft conducted visual/photo surveillance. Various patterns were employed depending on the nature of the target anticipated, VC reaction, and the altitude required.

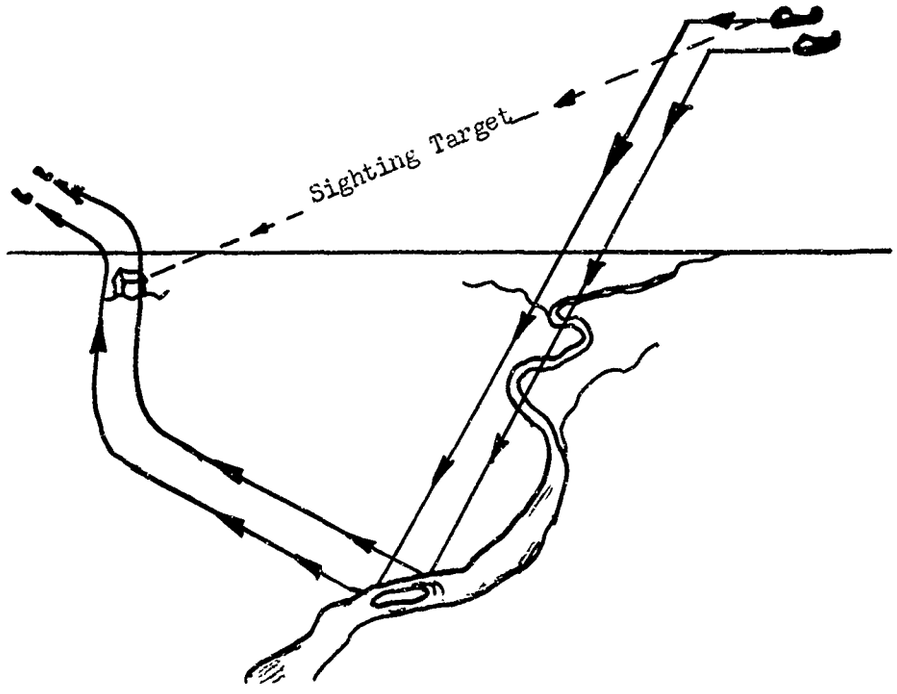
Figure B-1 illustrates a flight maneuver frequently employed by the Visual/Photo Platoon in surveying point targets. The initial



(U) FIGURE B-1. Visual technique 1.

entry was conducted at high cruise speed at an altitude of 50 feet. After passing the target area, a climbing turn to the right was executed and the aircraft leveled off at 1000 feet. At level-off the speed of the aircraft was much slower for the high-altitude flyby. Turns were generally made to the right to allow the observer continuous sighting of the target area.

A technique frequently used, shown in figure B-2, was for a flight of two airplanes to approach a target area at 1000 to 1500 feet and, after the target was sighted in the distance, the aircraft would turn away from the target and dive toward the ground. After reaching a low altitude (50 feet) the aircraft would proceed to an initial point (IP) that had been selected while at the higher altitude. Upon reaching the IP the aircraft would turn toward the target and rake their surveillance pass.

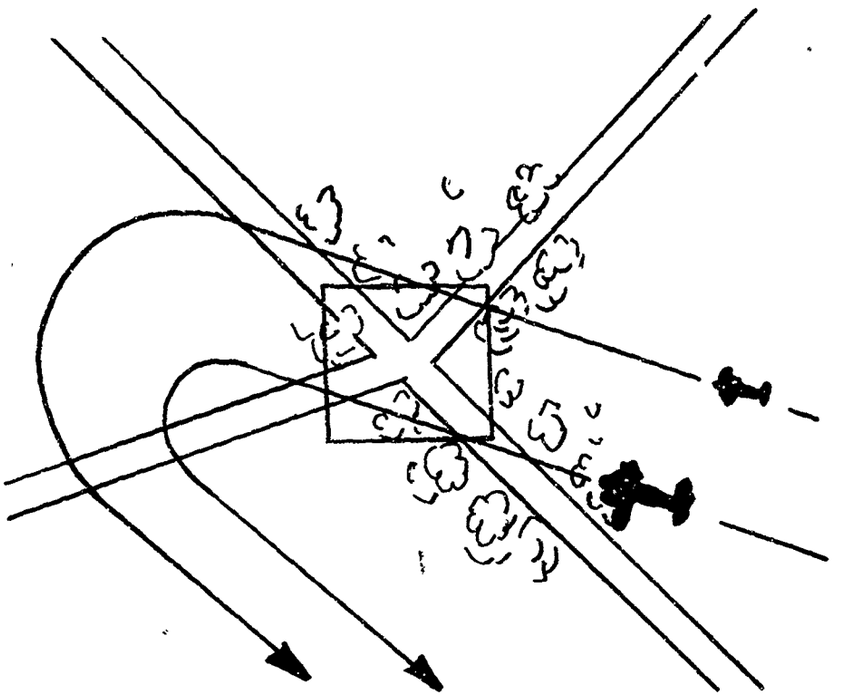


(U) FIGURE B-2. Visual technique 2.

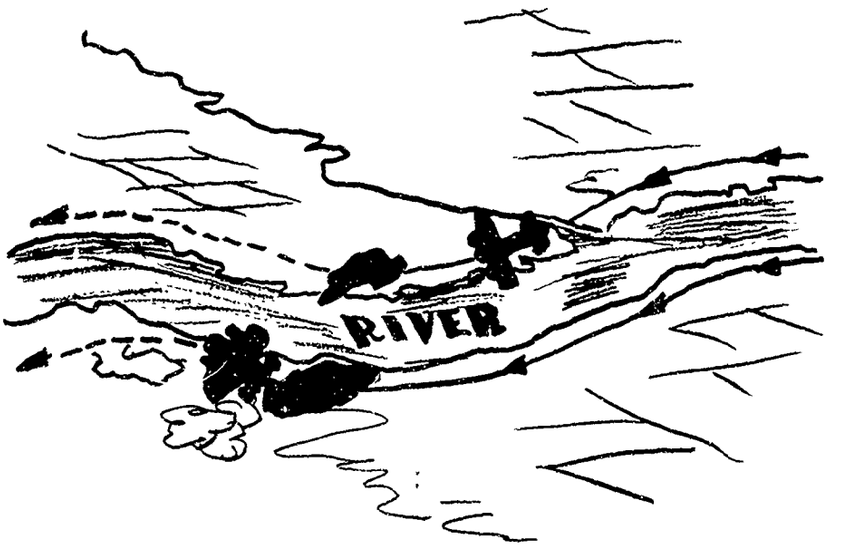
Figure B-3 illustrates photo surveillance of a point target. A single pass was used when the Viet Cong had a good air defense capability or when it was desired not to draw the attention of the Viet Cong to the area of interest. The altitude flown depended upon the requested scale factor, lens cone used, and the weather. One aircraft photographed the target while the observers in the other one visually searched for targets.

Figure B-4 shows a type of route reconnaissance flown by a flight team of two OV-1A aircraft. The wingman flew at the 5 o'clock position in relation to the flight leader. Each aircraft was flown at an altitude that allowed it to clear the highest obstacle and each flight crew was responsible for searching under the tree line on the opposite side of the route.

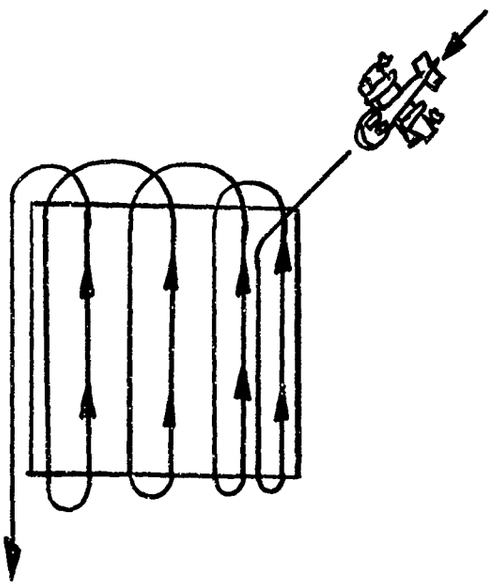
Figure B-5 shows a pattern that was used to acquire a photo mosaic of a target area. Initial points were selected for the beginning of each



(U) FIGURE B-3. Visual/photo point target surveillance.



(U) FIGURE B-4. Visual route reconnaissance.



(U) FIGURE B-5. Photo mosaic.

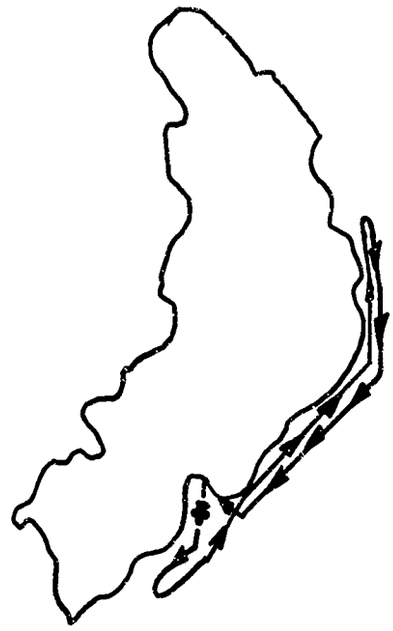
parallel pass and photographic runs were made with the aircraft on autopilot and heading in the same direction to insure a straight and level flight path. The heading used on the first run was used on succeeding runs even though the wind caused drifting of the aircraft. This insured that all flight paths were parallel and the proper overlap was provided. The aviator usually made his turns to the left so that he could keep the target area in view and align properly on his next IP.

The basic patterns used when laying suppressive fires were the circle and the figure eight. The size of the patterns and the direction of the firing passes were constantly varied. The two aircraft were spaced within the pattern so that each was protected by the other as it broke from its firing pass. When possible, firing passes were begun at an altitude of 2500 feet with a 20 degree dive angle. Weather, however, often required the use of lower altitudes and shallower dive angles.

2. SLAR

Aircraft were required to fly straight and level during SLAR surveillance in order to produce undistorted imagery. The range delay capability of the SLAR enabled the aircraft to be a considerable distance from the target area throughout the entire mission.

Large area search patterns were flown by SLAR equipped aircraft along the coast of the RVN as shown in figure B-6. Various ranges were used for this type of search, depending upon the requestor's needs.



(U) FIGURE B-6. SLAR coastal surveillance.

However, if ranges were changed in flight, altitudes flown had to be changed to provide optimum results. Flight legs were planned so that a minimum number would be required because the RO-166 recorder had to be placed on stand-by whenever a turn was made.

Figure B-7 shows a small area search pattern flown in a triangle. This pattern was flown with either one or both antennas in use. The primary area of interest was in the center of the triangle.

Figure B-8 shows a small target area taken under SLAR surveillance with 0 range delay and 25 kilometer range settings. The aircraft reversed course and continued to keep the area under surveillance until released or until forced to return for fuel. Inflight spot reports were made to the requesting unit from information obtained from the processed film in the RO-166 Recorder-Processor-Viewer. Using the 25 kilometer range, the optimum altitude was 7000 feet absolute. Flying over the Saigon area allowed the aviator to use ground radar, the Saigon visual omni range station, the low frequency radio beacon located in Saigon, and the doppler navigator to assist in navigation.

3. IR

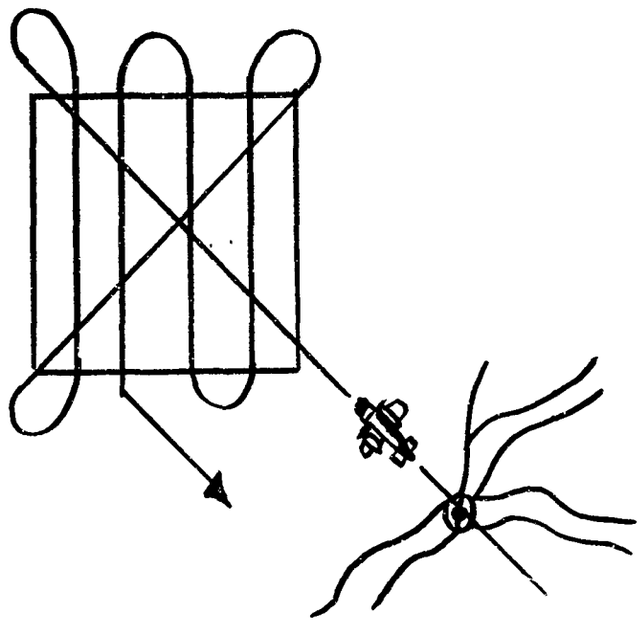
Most IR surveillance missions were area search. Multiple parallel pass search patterns were most frequently employed because complete

(U) FIGURE B-7. SLAR area search, technique 1.

(U) FIGURE B-8. SLAR area search, technique 2.

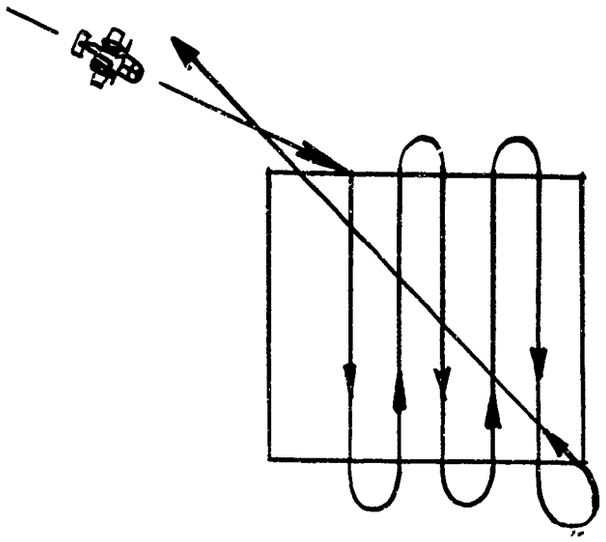
IR surveillance coverage of the target area was most readily obtained using this technique. The random pass method was used over areas where small arms fire was anticipated.

Figure B-9 illustrates a small area search pattern using IR surveillance. This pattern was flown at about 1500 feet absolute altitude and an attempt was made to eliminate multiple parallel passes as much as possible to preclude enemy anticipation of future positions. In this sketch the tip of the island in the river is used as an identifiable checkpoint that would be seen in the terrain display scopes as the aircraft passes overhead. Knowing the doppler coordinates of this checkpoint allowed the aviator to up-date his computer, thus eliminating any errors. This mission was flown with the aircraft blacked out and the aviator relying solely on his doppler navigator for navigation.



(U) FIGURE B-9. IR area search, technique 1.

Figure B-10 shows the small area search pattern most frequently used to insure a high percentage of coverage while flying IR surveillance missions. Multiple parallel passes were made over the area at an altitude of about 1500 feet absolute.



(U) FIGURE B-10. IR area search, technique 2.

4. HIT DATA

DATE TIME GROUP 091100 April . OV-1 SERIES A .

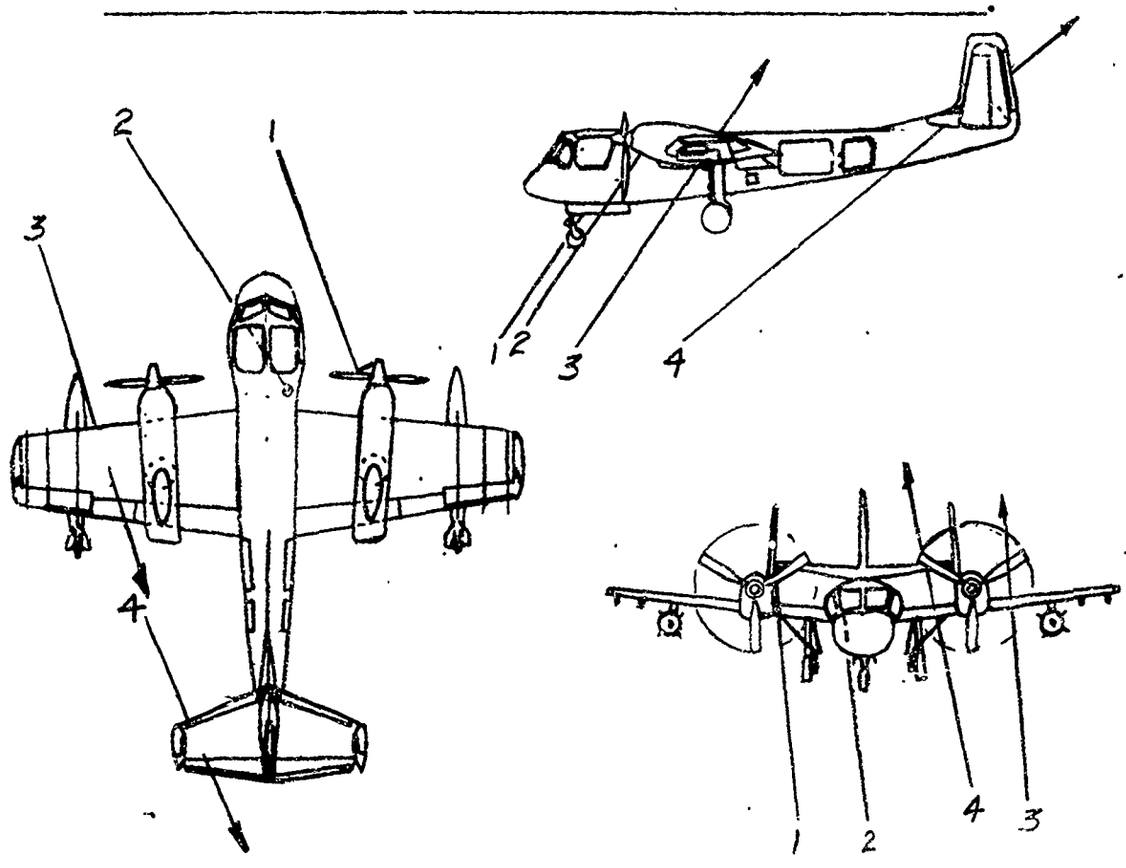
MISSIONS Visual . ALTITUDE 1200 feet

NUMBER OF HITS 4 . CALIBER OF PROJECTILE(S) .30 (Est) .

INJURIES None .

WEATHER 2000 feet broken - Visibility 15 miles .

DESCRIPTION OF HIT(S) 1. One projectile struck one blade of the right propeller. The projectile broke into several pieces which damaged the spinner. 2. A projectile punctured the nose wheel well door and continued up and aft, striking the right elevator bell crank and support bracket. 3. A projectile punctured the left wing outer panel. One rib and two stringers were damaged. An aileron push rod was slightly damaged. 4. A projectile penetrated the left elevator damaging the aircraft skin and one rib.



B-7

DATE TIME GROUP 271545 April . OV-1 SERIES A

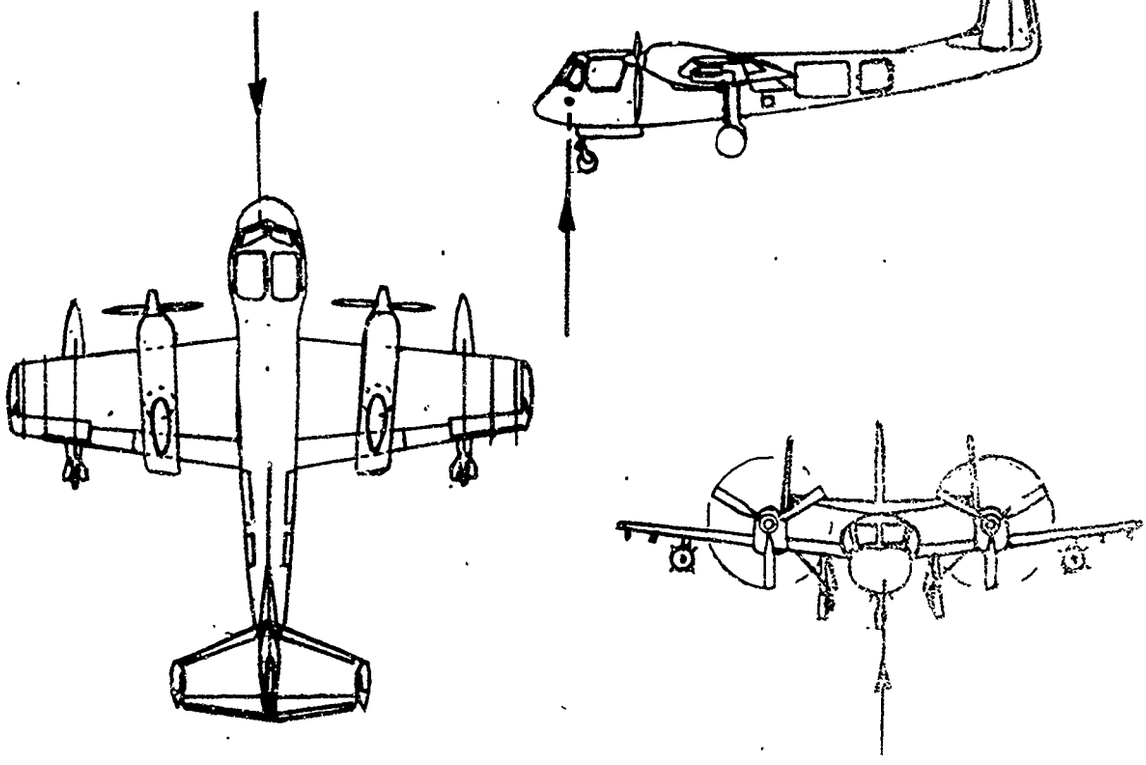
MISSIONS Visual . ALTITUDE 1000 feet

NUMBER OF HITS 1 . CALIBER OF PROJECTILE(S) .30 (Est) .

INJURIES None .

WEATHER 3000 feet scattered - Visibility 15 miles .

DESCRIPTION OF HIT(S) Estimated .30 caliber projectile entered aircraft through forward inboard cover of right nose wheel well door, damaged the forward frame of the nose wheel well, dented a line, cut a wire, cut through 60 percent of the aileron tube (co-pilot's). Floor was dented slightly. .



DATE TIME GROUP 131115 May 65. OV-1 SERIES 1

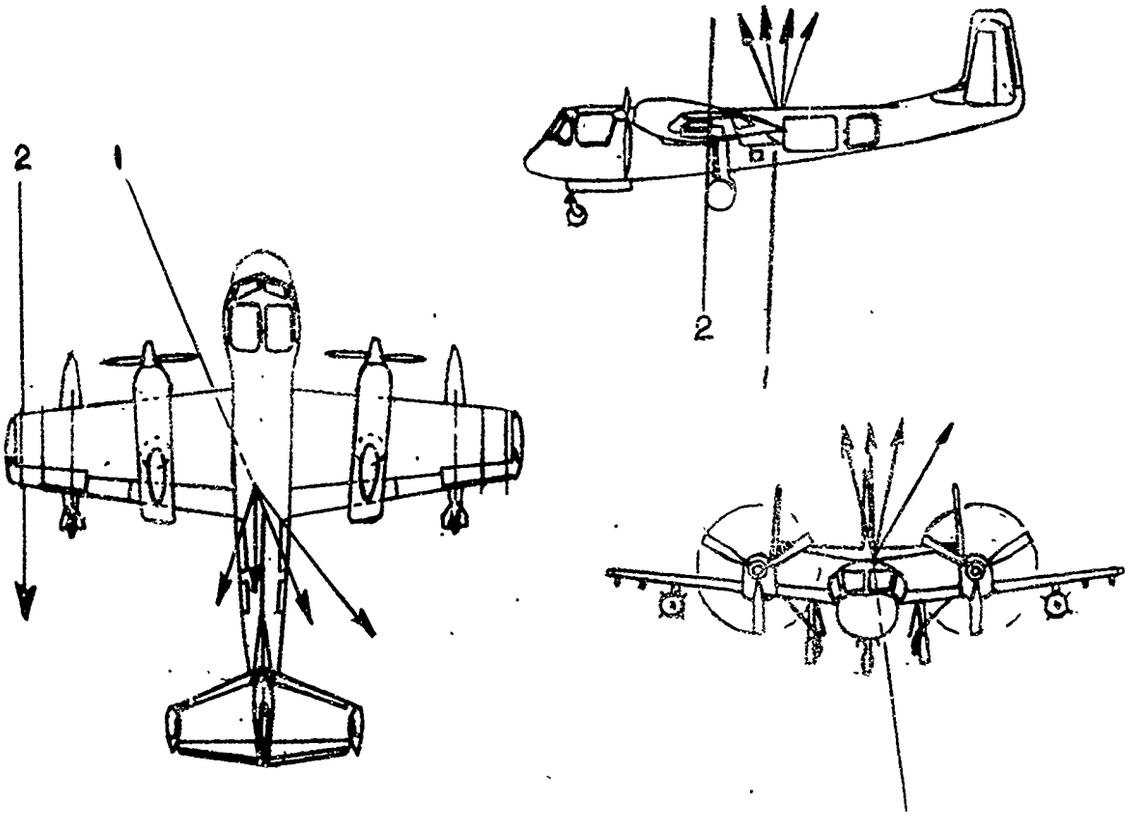
MISSIONS Visual. ALTITUDE 800 feet

NUMBER OF HITS 2. CALIBER OF PROJECTILE(S) .30.

INJURIES None.

WEATHER 5000 feet scattered - Visibility 20 miles.

DESCRIPTION OF HIT(S) 1. First round went up and aft, penetrating aft radio junction panel fiber glass cover. Terminals 1 and 2 of terminal strip 125 and terminals 1 through 7 of terminal strip 126 (all unused) were shot away. The round then struck the left control bellcrank bracket, inflicting no damage to the bellcrank. Four holes were in the top of the fuselage. The elevator trim tab cable was partially severed. 2. Estimated .30 caliber round entered left aft of aircraft through landing light. One stringer was damaged.



DATE TIME GROUP 171800 May 65. OV-1 SERIES A.

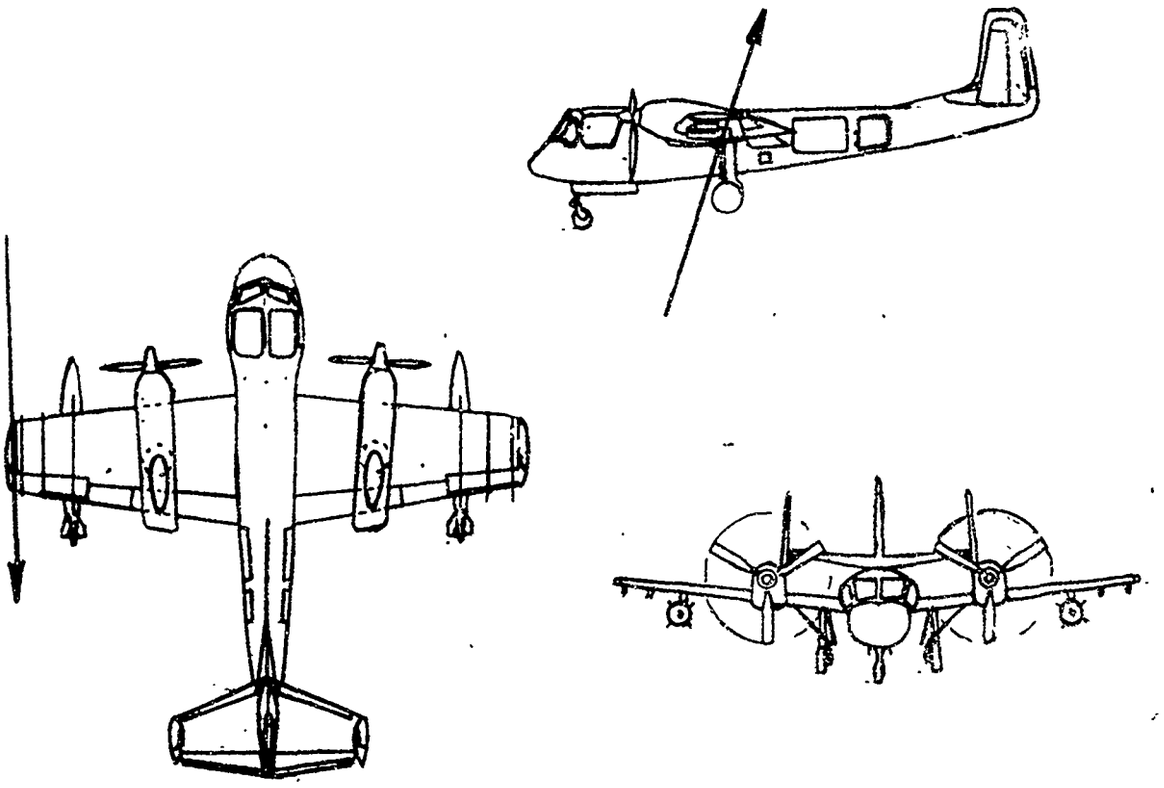
MISSIONS Photo. ALTITUDE 1000 feet.

NUMBER OF HITS 1. CALIBER OF PROJECTILE(S) .30.

INJURIES None.

WEATHER 2000 feet variable - Visibility 15 miles.

DESCRIPTION OF HIT(S) 1 bullet hit the rocket pod and tumbled through the wing tip. Minor damage to stringer.



DATE TIME GROUP 19 May 1965. OV-1 SERIES A.

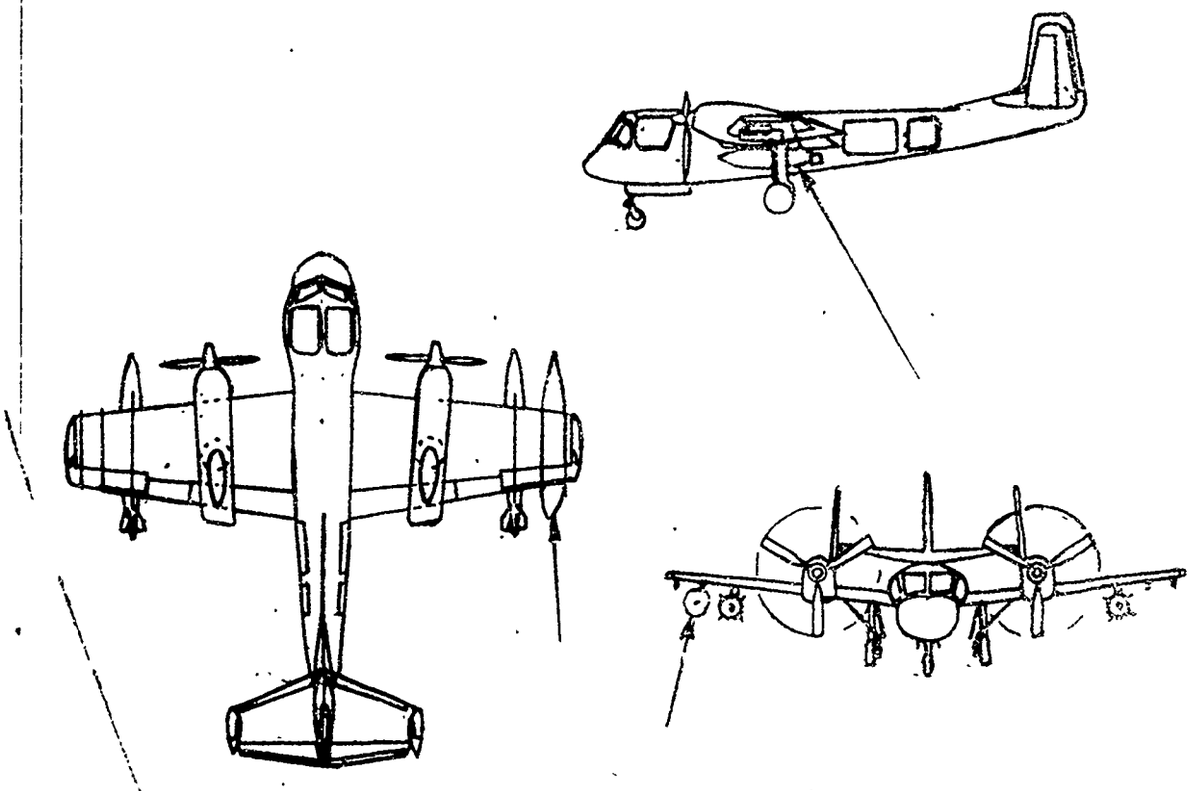
MISSIONS Visual Photo. ALTITUDE 1200 feet.

NUMBER OF HITS 2. CALIBER OF PROJECTILE(S) .30.

INJURIES None.

WEATHER Clear.

DESCRIPTION OF HIT(S) Two projectiles found in right CE 750-round .50 caliber pod. Both rounds entered same hole, cutting .50 caliber cartridge cases. Powder was ignited but there was no secondary explosion.



DATE TIME GROUP 21 May 65 (time unknown). OV-1 SERIES A

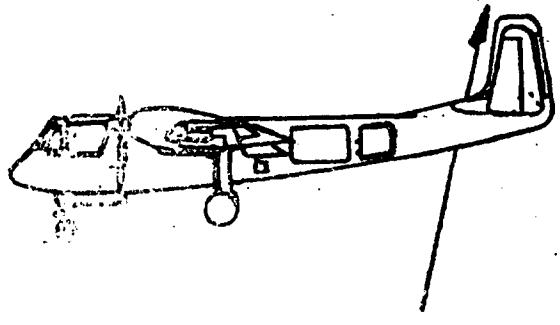
MISSIONS Visual. ALTITUDE Unknown

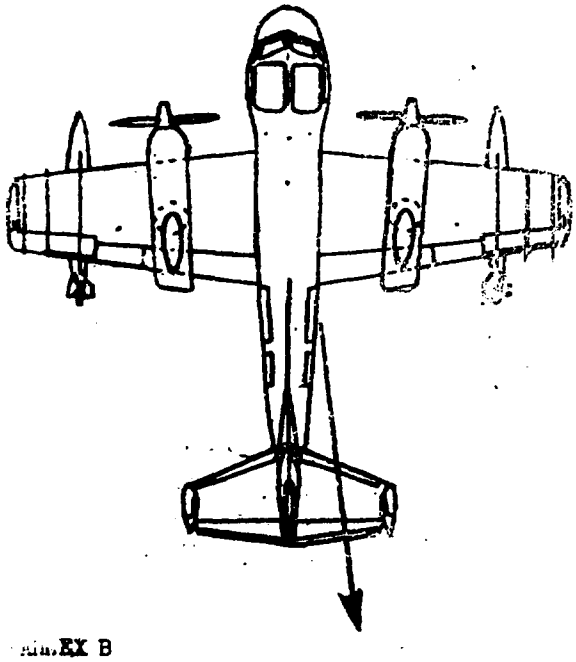
NUMBER OF HITS 1. CALIBER OF PROJECTILE(S) .30.

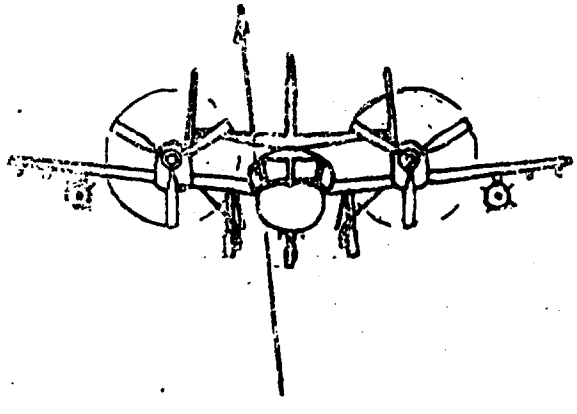
INJURIES None.

WEATHER Clear.

DESCRIPTION OF HIT(S) Leading edge of right horizontal stabilizer, minor damage to de-icer boot and metal skin.







ANNEX B

B-14

f

DATE TIME GROUP 212030 May 65. OV-1 SERIES A.

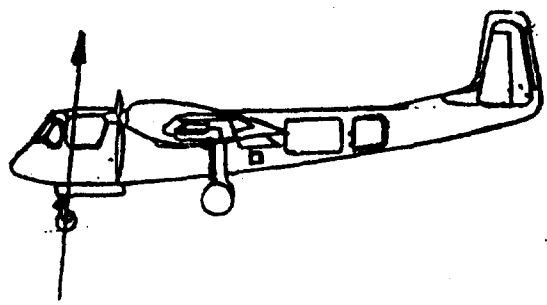
MISSIONS Photo. ALTITUDE 2000 feet.

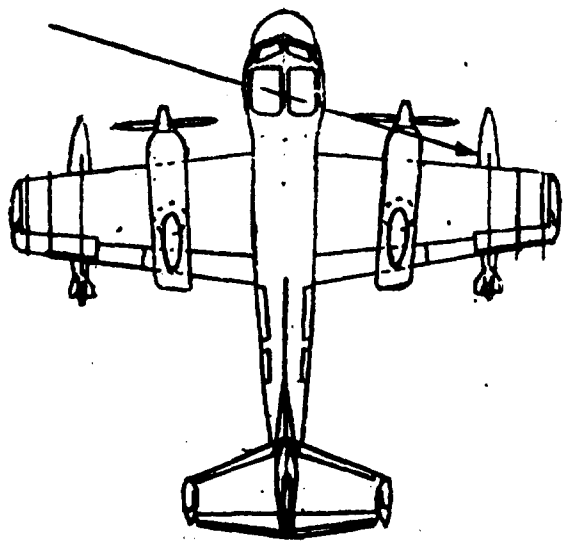
NUMBER OF HITS 1. CALIBER OF PROJECTILE(S) .30 (Cal).

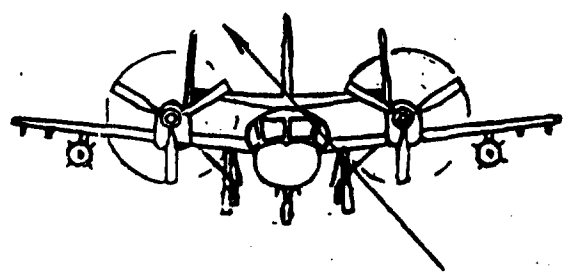
INJURIES Small cut on aviator's cheek from plexiglass.

WEATHER Clear.

DESCRIPTION OF HIT(S) Left side latch and through left side of top canopy. Plexiglass damaged.







DATE TIME GROUP 210930 May 65. OV-1 SERIES A.

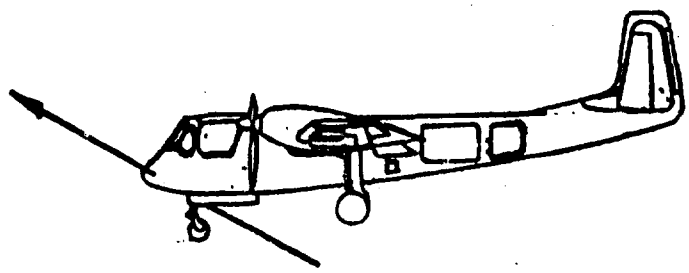
MISSIONS Visual. ALTITUDE 1000 feet

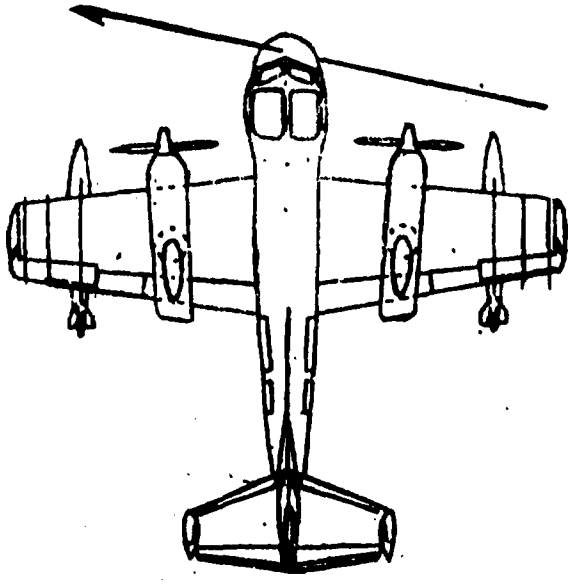
NUMBER OF HITS 1. CALIBER OF PROJECTILE(S) .30 (Est).

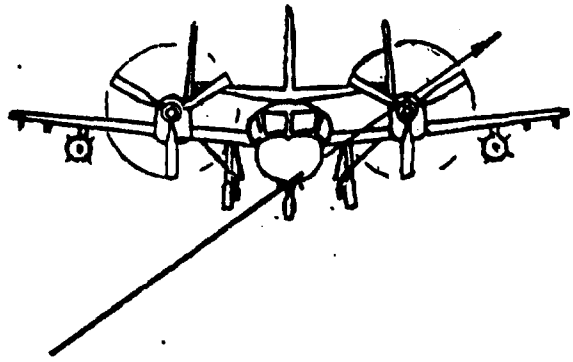
INJURIES None.

WEATHER Clear.

DESCRIPTION OF HIT(S) Estimated .30 caliber bullet entered the aircraft through the bottom of the nose section. It passed through the IFF reflector and the airframe and skin. Damage to a stiffener brake mechanism, push rod assembly, and crank tube.







HIT DATA CHART

DATE TIME GROUP 22[illegible]0 May 65. OV-1 SERIES C

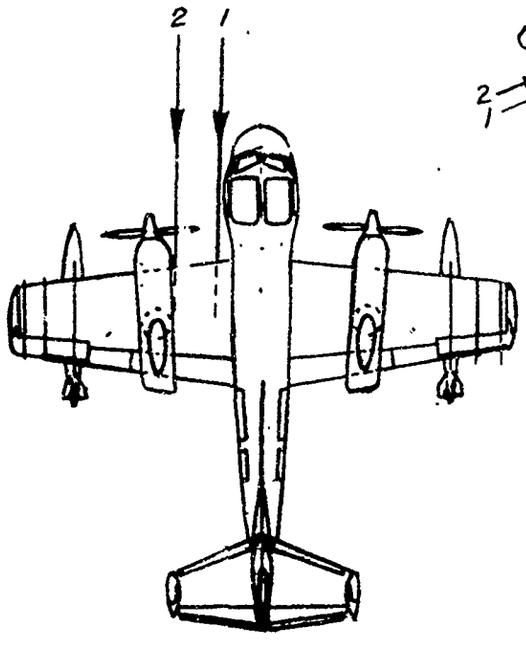
MISSIONS IR. ALTITUDE 2000 feet

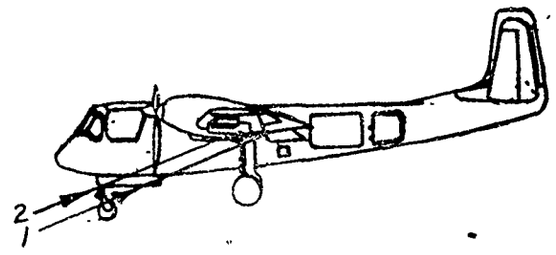
NUMBER OF HITS 2. CALIBER OF PROJECTILE(S) .50.

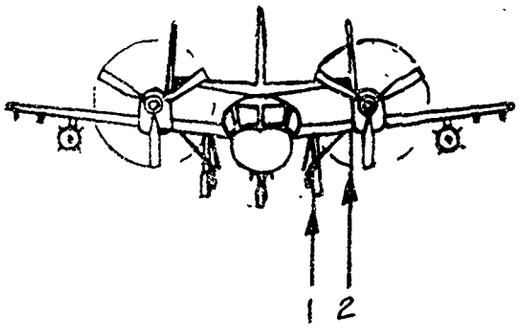
INJURIES None.

WEATHER 3000 feet scattered.

DESCRIPTION OF HIT(S) Two rounds damaged landing gear door fairing, forward trunion support member, bottom landing gear scissor, tire, top wing skin, brackets, and stringers.







DATE TIME GROUP 291915 May 65. OV-1 SERIES C.

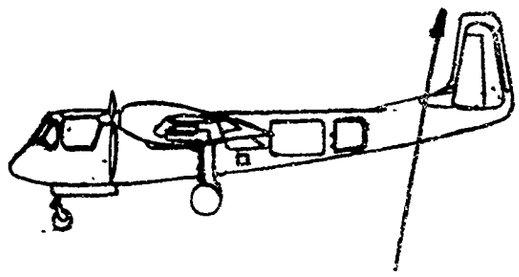
MISSIONS IR. ALTITUDE 2000 feet

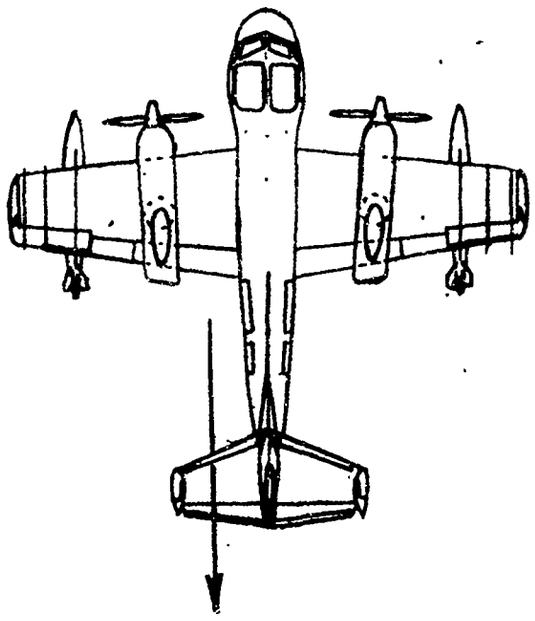
NUMBER OF HITS 1. CALIBER OF PROJECTILE(S) Unknown.

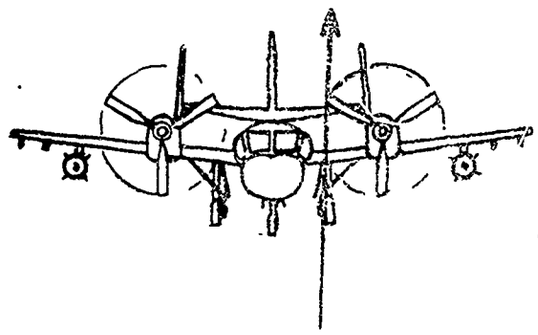
INJURIES None.

WEATHER 5000 feet overcast - Visibility 15 miles.

DESCRIPTION OF HIT(S) Left horizontal stabilizer de-icer boot. Skin grazed.







HIT DATA CHART

DATE TIME GROUP 190715 Jun 66. OV-1 SERIES A.

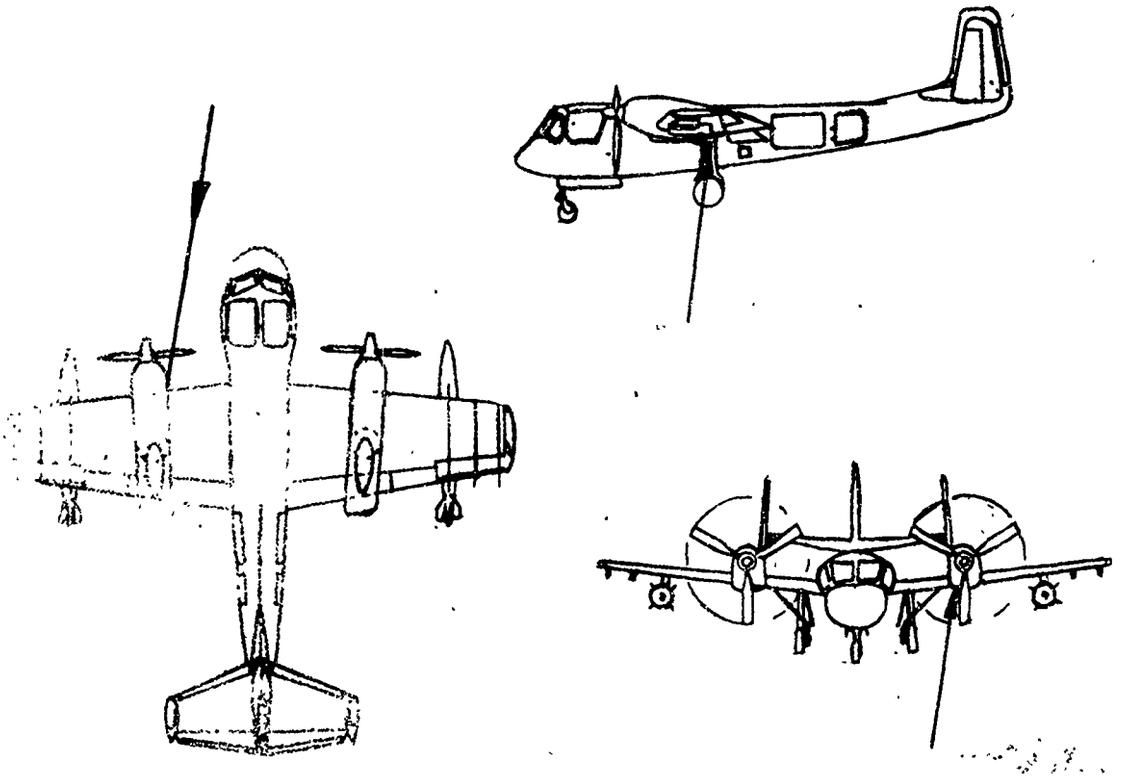
MISSIONS Visual. ALTITUDE 1000 feet

NUMBER OF HITS 1. CALIBER OF PROJECTILE(S) .30.

INJURIES None.

WEATHER Clear.

DESCRIPTION OF HIT(S) Round entered aircraft through the left main landing gear nacelle fairing assembly, continued up into the wheel well and severed the hydraulic line to the brake assembly. The round then entered the engine exhaust tube where it terminated.



HIT DATA CHART

DATE TIME GROUP 271545 Jun 65. OV-1 SERIES A.

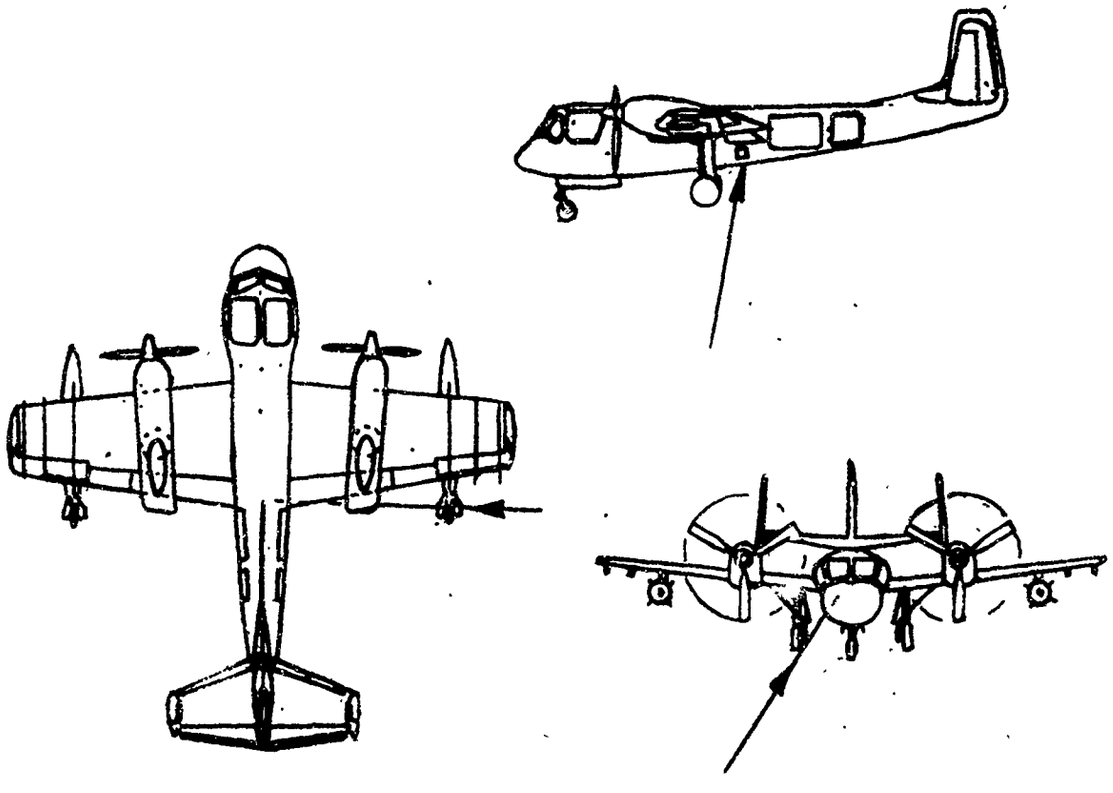
MISSIONS Visual. ALTITUDE 1200 feet.

NUMBER OF HITS 1. CALIBER OF PROJECTILE(S) .30.

INJURIES None.

WEATHER 1000 feet scattered - Visibility 15 miles.

DESCRIPTION OF HIT(S) Round entered aircraft through the channel supporting the right camera door hinge (forward), splitting the channel between three of the jo-bolt holes. Prior to terminating, the round also inflicted negligible damage to the camera door actuating arm.



HIT DATA CHART

DATE TIME GROUP 271545 Jun 65. OV-1 SERIES A

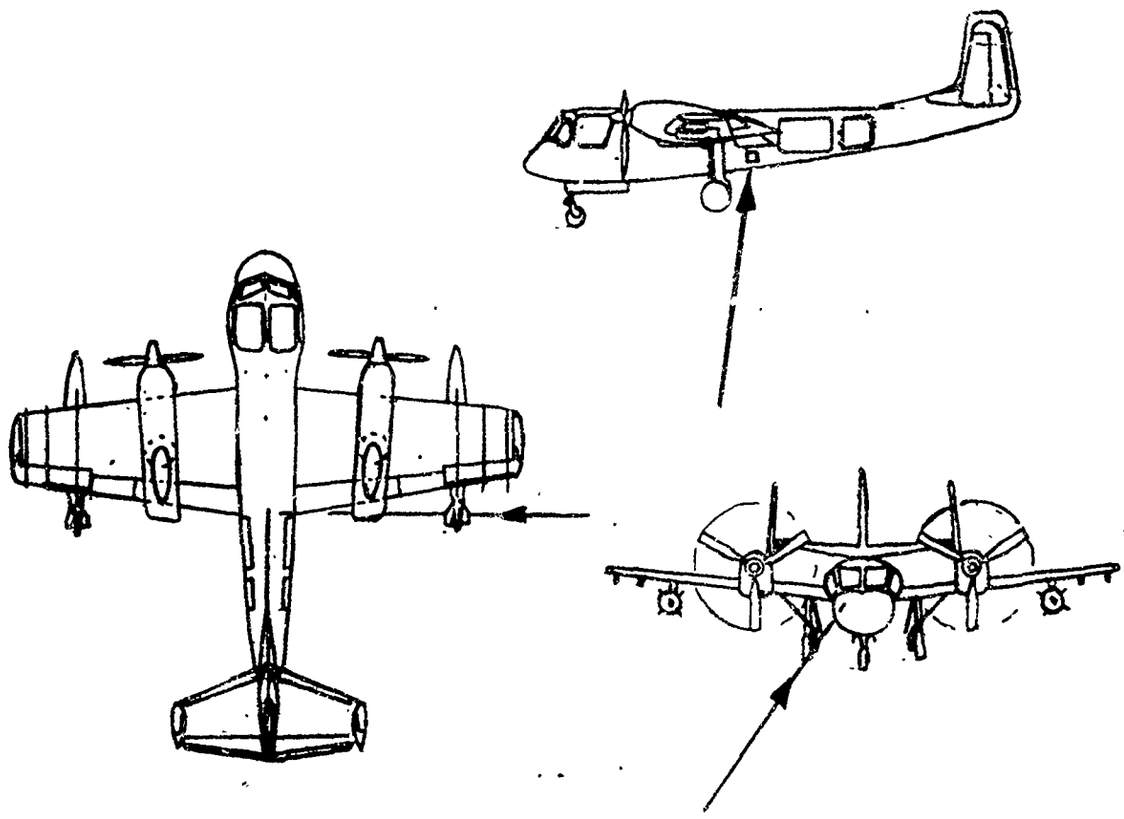
MISSIONS Visual. ALTITUDE 1200 feet

NUMBER OF HITS 1. CALIBER OF PROJECTILE(S) .30.

INJURIES None.

WEATHER 1000 feet scattered - Visibility 15 miles.

DESCRIPTION OF HIT(S) Round entered aircraft through the channel supporting the right camera door hinge (forward), splitting the channel between three of the jo-bolt holes. Prior to terminating, the round also inflicted negligible damage to the camera door actuating arm.



(C) ANNEX C

DESCRIPTION OF EQUIPMENT

1. PHOTOGRAPHIC SURVEILLANCE SYSTEM, AIRBORNE, KS-61A

Photographic Surveillance System, Airborne, KS-61A is common to all OV-1A, OV-1B, and OV-1C aircraft. The system consists of: Camera, Still Picture, KA-30A; Lens Cone Group, LA-136A; and Control System, Photographic Surveillance, Airborne LS-38A. (See figure C-1.) The photo system is designed to take vertical and 15- or 30-degree left or right oblique aerial photographs in the several day modes (modes a through c below) using natural illumination, or vertical aerial photographs in the night mode with artificial illumination. The KS-61A system is designed to function over a wide range of altitudes and ground speeds. It provides for manual, semi-automatic, or automatic compensation of the camera for variation in altitude, speed, and focal length. Lens cone groups are available in 3-, 6-, 12-, and 18-inch focal lengths. Results from the system are shown in figure C-2.

The photo control unit positions the camera to the desired camera depression angle, changes the camera iris opening and shutter speed by measuring light reflected from the target area, and generates signals which control the camera in the basic modes of operation.

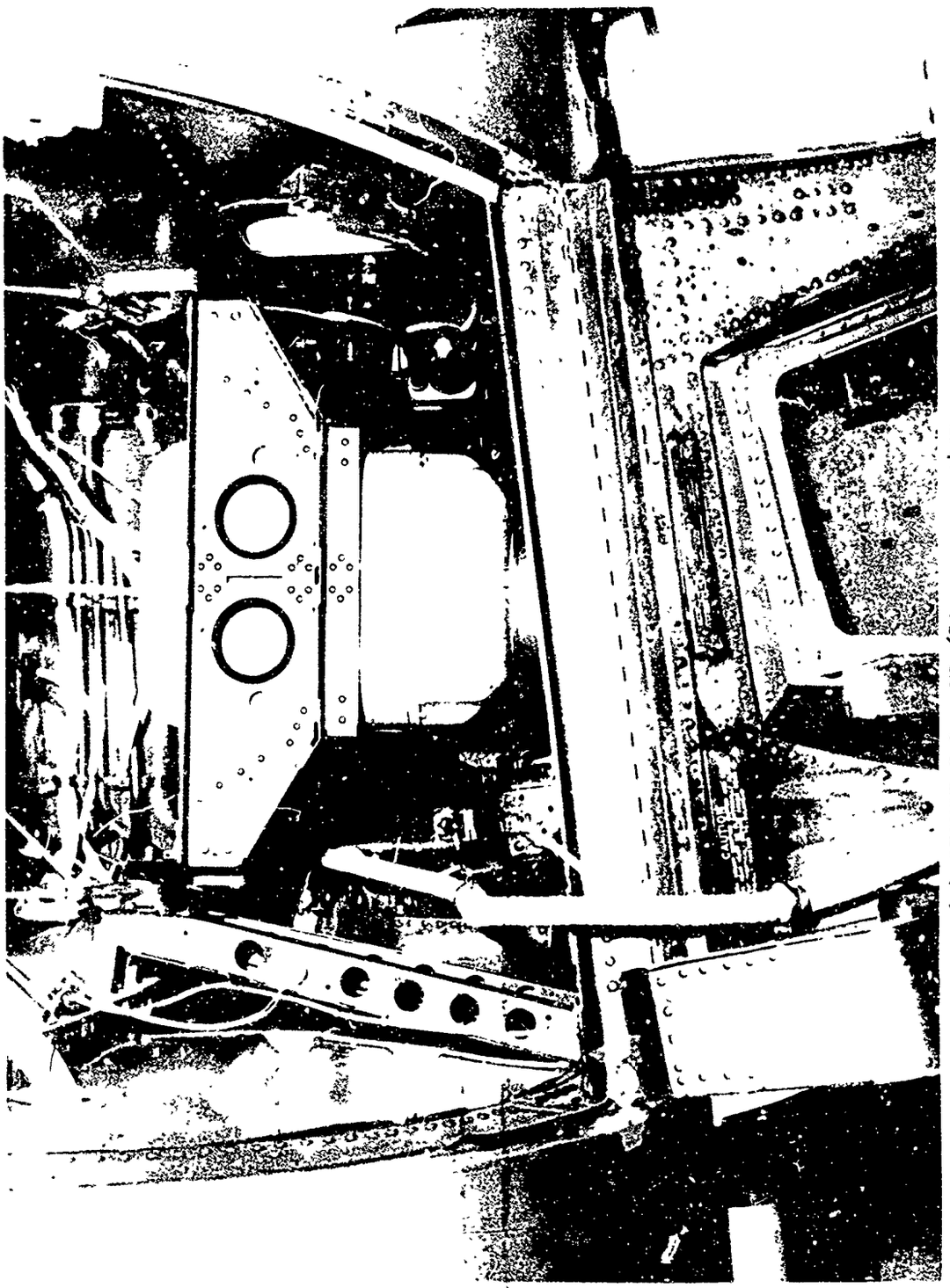
The KA-61A system is designed to function in the following operating modes:

a) Autocycle. In the autocycle mode, the control equipment scans the terrain for brightness and image motion and automatically sets the camera for correct exposure, image motion compensation (IMC), and exposure interval to produce 60 percent forward overlap.

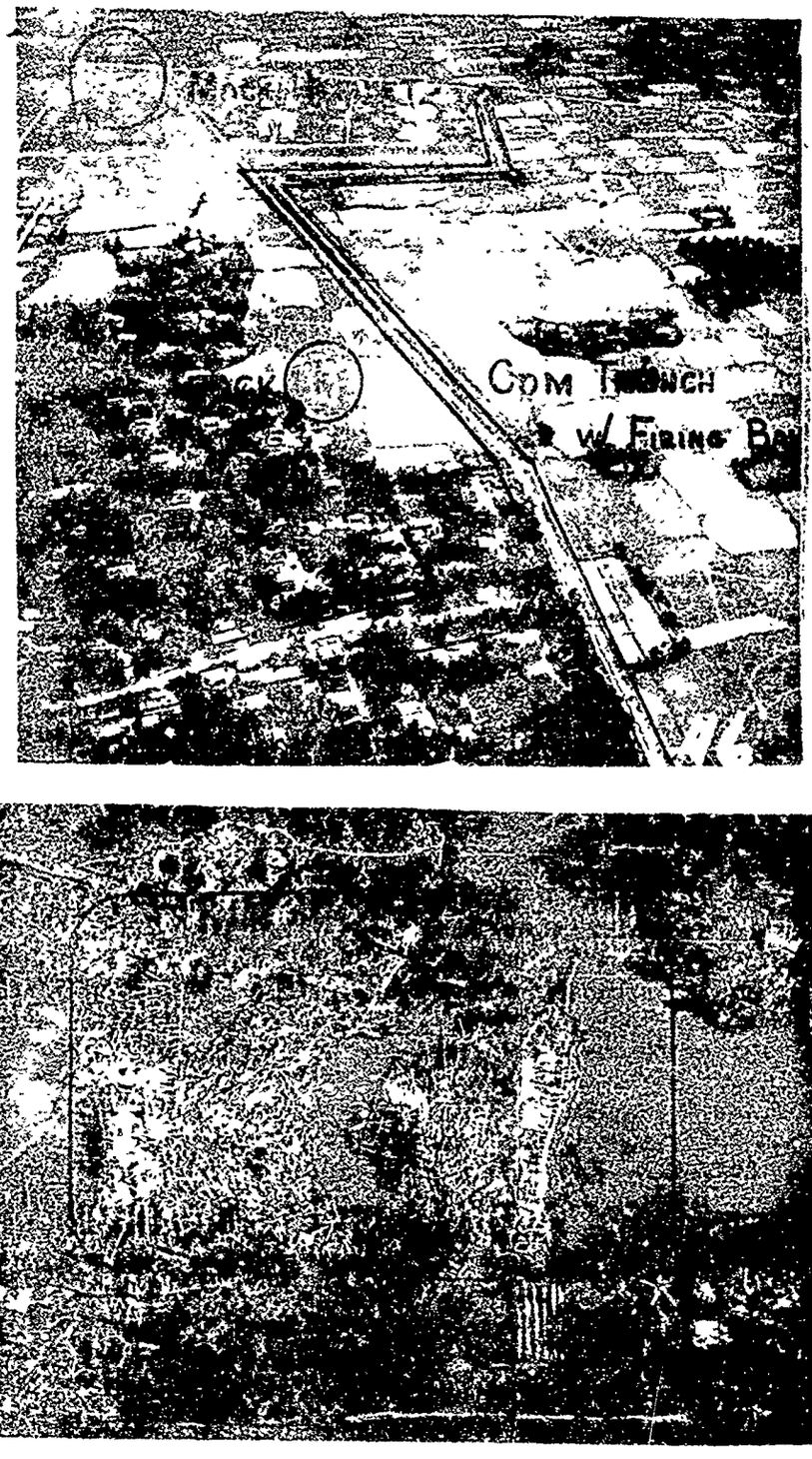
b) Pulse. In the pulse mode, the operator must set the camera for correct exposure and set the exposure interval to produce any desired forward overlap. Image motion compensation is not used in this mode.

c) Pulse-IMC. In the pulse-IMC mode the operator adjusts the camera for correct exposure, IMC rate, and exposure interval to produce any desired forward overlap up to 80 percent.

d) Night. In the night mode the operator must set the camera for correct exposure and IMC rate. The control equipment is adjusted to cycle the artificial illumination device at the correct interval to produce any desired forward overlap up to 80 percent.



(U) FIGURE C-1. KS-61A camera system.



(U) FIGURE C-2. KS-61A imagery.

In all modes of operation, the capability to obtain at least a 60 percent forward overlap of vertical exposures is provided to insure accurate scale, complete coverage, and stereoscopic viewing of the photographs.

2. AERIAL CAMERA SYSTEM, STILL PICTURE, KA-60

Aerial Camera System, Still Picture, KA-60 was installed in the 73d Aviation Company's OV-1A Model aircraft. The system consists of a camera body and film magazine, camera controls, and an operator's control panel. (See figure C-3.) The KA-60 Camera System is designed for daylight operations and provides high resolution, 180-degree panoramic coverage on 70mm perforated, Aerecon, Plus X film. The camera is mounted to look forward through a window in the nose cap of the OV-1A aircraft and is aligned to a 20-degree depression angle below the horizon in level flight. This forward oblique position will produce a sequence of photographs providing a complete presentation, along the flight path, of the ground area directly beneath the aircraft to the forward horizon and through both lateral horizons. Results from the system are shown in figure C-4.

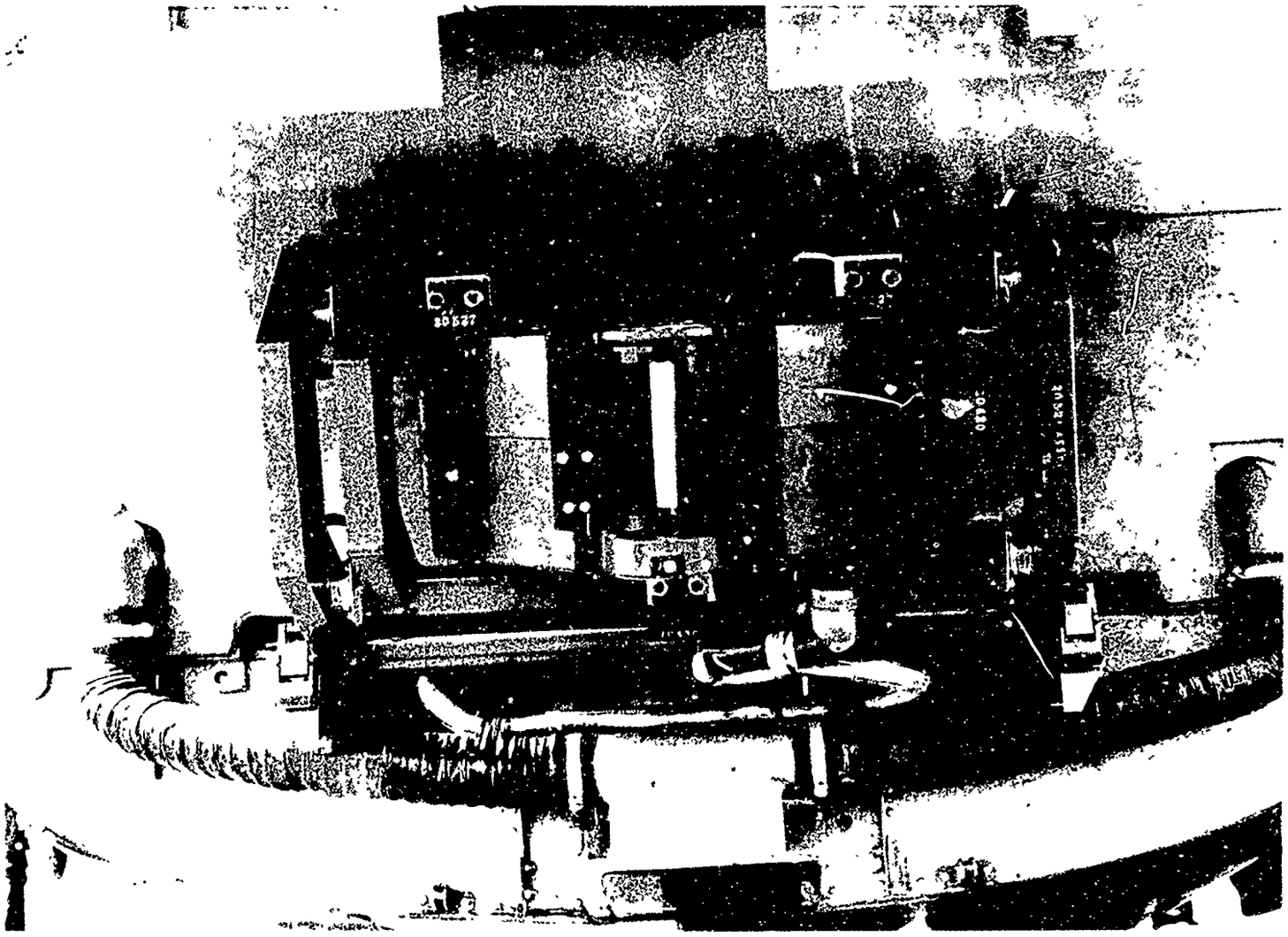
The KA-60 camera incorporates a 3-inch F2.8 lens, a rotating double dove prism, and automatic exposure control which provide a panoramic format over 9.4 inches of film image area corresponding to 180-degree scan angles and space for data recording. Approximately 250 frames of photography may be obtained from a 250-foot film supply. Only 100-foot rolls of film were used by the 73d during the evaluation.

The camera control unit, in conjunction with a photocell located on the camera body, generates signals which automatically adjust the slit width and aperture control mechanisms for proper film exposure.

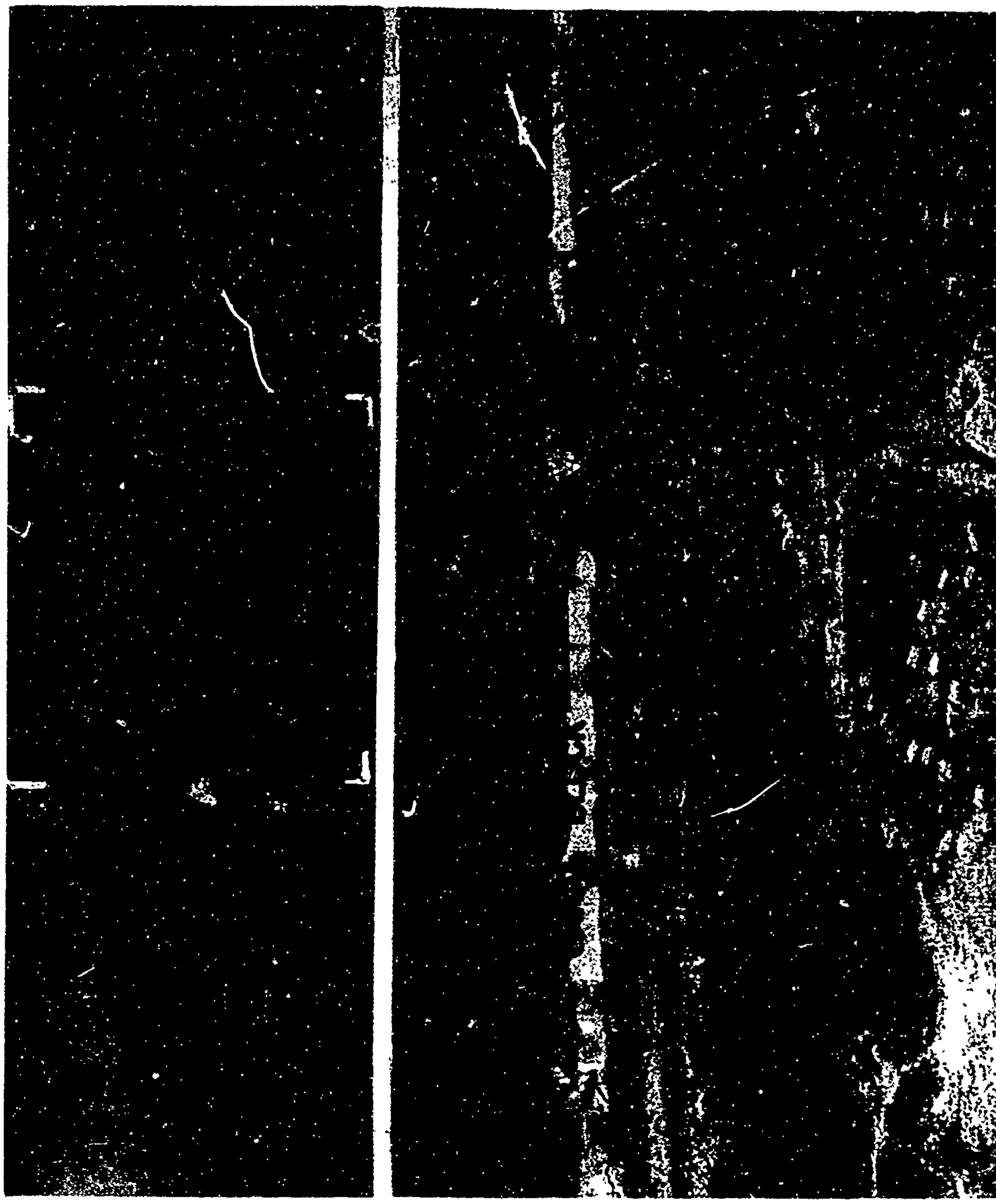
The operator's control panel contains the controls and indicators of the camera system and permits the operator to establish the desired cycling rate by selection of the following modes of operation:

a) Pulse Mode. In the pulse mode the operator manually adjusts an intervalometer to sequence the camera at the desired cycling rate. The cycling rate may be programmed to account for aircraft altitudes and velocity, thus providing a 60 percent forward overlap of exposures for stereo viewing. The range varies from one exposure per second to one exposure every 60 seconds. Also incorporated in this mode is a manual extra picture switch which activates the camera between cycles.

b) Autocycle Mode. In the autocycle mode two cycling rate options are available. The autocycle mode selector switch may be positioned at two or four cycles per second and the camera



(U) FIGURE C-3. KA-60 camera system.



(U) FIGURE C-4. KA-60 imagery.

will be automatically programmed to expose film at the selected rate when the operate switch is energized.

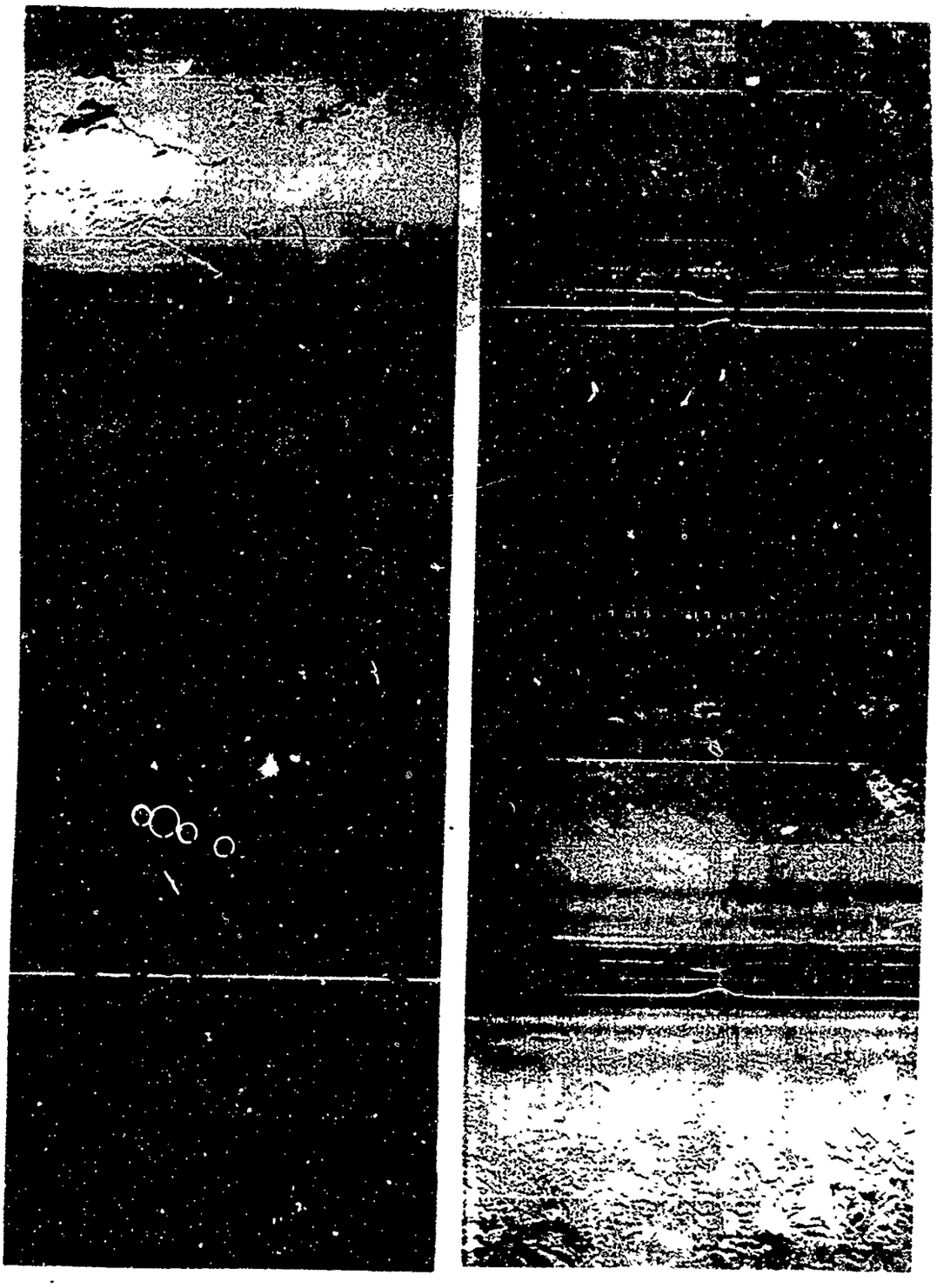
3. SIDE LOOKING AIRBORNE RADAR SET AN/APS-94(A)

The Side Looking Radar Set AN/APS-94(A) is the airborne sensor component of the AN/UPD-2 surveillance system and is installed in the OV-1B series aircraft. The complete AN/UPD-2 system includes an air/ground data link and a ground-based data receiving set, which were not available in the RVN. The AN/APS-94(A) is a non-coherent pulse radar providing good penetration of clouds and precipitation. The equipment has the capability to detect and record on film in the form of a radar strip map, both fixed and moving targets on one or both sides of the aircraft flight path to a maximum range of 90 kilometers. By selecting the optimum of a number of combinations of range and range delay settings, an image covering a total of 180 kilometers in width may be recorded on a single film strip in one target pass. To a distance of 70 kilometers on either side of the aircraft, all moving objects of a size equal to or larger than a $\frac{1}{4}$-ton truck moving in excess of 3 miles per hour should be recorded as moving targets on the imagery. Under ideal conditions larger moving targets may be sensed out to the maximum 90-kilometer range of the equipment. Results of SLAR are shown in figure C-5.

The Radar Recorder-Processor-Viewer, Radar Mapping, RO-166/UP or Recorder, Radar Mapping, RO-225/APS-94(A) are optional components of the set and are installed at the airborne observer's position, along with operating controls, an oscilloscope to monitor system operation, and an indicator consisting of two cathode ray tubes (CRT), integrated with the recorder-viewer. The operating controls are integrated into a semi-automatic system for ease of operation. The airborne operator need not be a skilled radar technician as the system is simple to operate, which makes it possible to use an imagery interpreter operator for near real-time inflight interpretation of the processed imagery. From 30 to 180 seconds, depending on range selection, are required to process the film with the RO-166/UP equipment. Alternate recording units provide the option of using either 12.7mm (5-inch) roll film or 24mm ($9\frac{1}{2}$-inch) roll film with the inflight processor. When either of the radar mapping components are used, a present position display capability is achieved and aircraft position in kilometers north or south and east or west of a pre-selected datum will appear as numeric data on the completed radar map in the AN/APS-94(A).

4. INFRARED SURVEILLANCE SYSTEM AN/UAS-4

The AN/UAS-4 Infrared Surveillance System consists of Infrared Detecting Set, AN/AAS-14; Radio Transmitting Set, AN/ART-41; and the AN/TAQ-1 Infrared Surveillance Information Center.



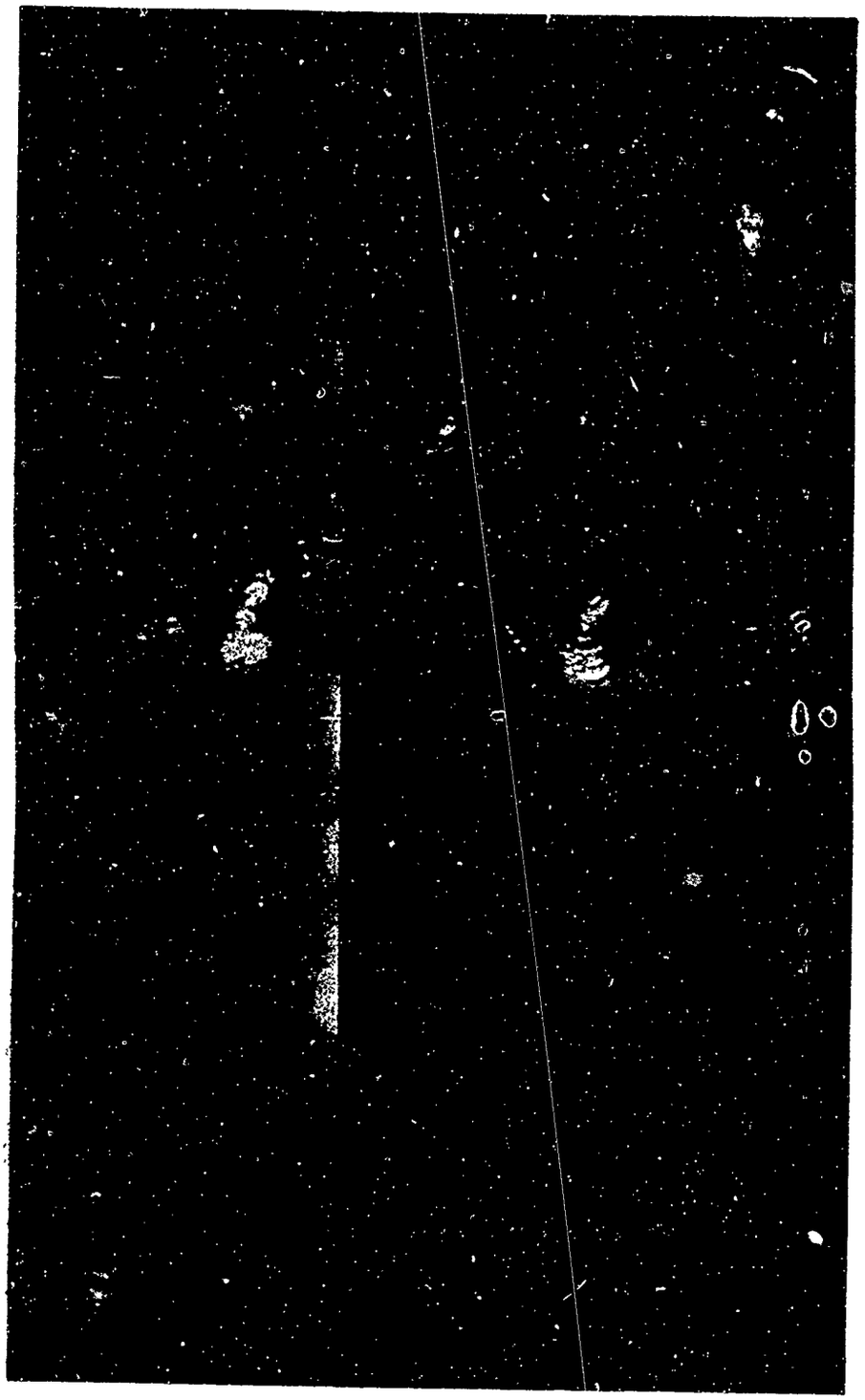
(C) FIGURE C-5. SLAR imagery.

The Infrared Detecting Set, AN/AAS-14 is the airborne sensor component of the Infrared Surveillance System, AN/UAS-4 and is installed in the OV-1C series aircraft. The set is a passive, gyro-stabilized, 2-channel (A and B) receiving system that detects infrared and visible light radiations from the earth's surface by means of an optical scanning process focusing these radiations on supercooled detector elements. The detector cells convert received radiation into electrical signals that are used to modulate two terrain display indicator CRT, one calibrator indicator CRT, and one glow modulator tube. The terrain display indicator CRT's permit the operator to observe a real-time, television-type presentation of the earth's surface along the aircraft flight path. The calibrator indicator CRT enables the operator to monitor video signals and control the recording process. Recording for permanent record is made by the glow modulator tube on 5-inch Aerecon Plus X film that is provided in 250-foot rolls. The operator may choose any one of four possible recording formats when simultaneously receiving on both channels. The recording options are single (channel A or channel B), dual, or superimposed. Because of the simplicity of operation the operator need not be a skilled infrared technician. This makes it possible to use an imagery interpreter operator to make on-the-spot airborne interpretation of imagery on the terrain display indicators. Results of the IR surveillance system are shown in figure C-6.

Detector cell elements available for the AN/AAS-14 are lead selenide, P-type golddoped germanium, indium antimonide, and a visible light photo multiplier tube. Only indium antimonide and the photo multiplier tube were available in the RVN during the evaluation. Any two of the several infrared radiation detectors or the photo multiplier are used at one time, each used in a separate detection channel. Infrared and light radiation can be detected by this equipment both day and night. The detectors are cooled and stabilized at operating temperature (approximately minus 196 degrees centigrade) by means of a closed cycle liquid nitrogen cooler or by manual filling of a liquid nitrogen Dewar within the detectors. Continuous scanning is accomplished over an 80-degree strip of terrain, 40 degrees on either side of the aircraft line of flight. This system is designed for optimum reception and recording of emissions from 250 to 5000 feet absolute altitude.

Radio Transmitting Set, AN/ART-41 facilitates the transmission of real-time information from Infrared Detecting Set, AN/AAS-14 to the Infared Surveillance Information Center, AN/TAQ-1. Amplified signals from the detectors, together with appropriate synchronization, rate, and aircraft position data, are fed into the frequency modulated AN/ART-41 where they are mixed and relayed to the AN/TAQ-1 ground station. Use of this telemetering link allows ground personnel to obtain instantaneous results from the aerial surveillance while it is in progress.

The AN/TAQ-1 Infrared Surveillance Information Center is the ground receiving and display portion of the AN/UAS-4 Surveillance System



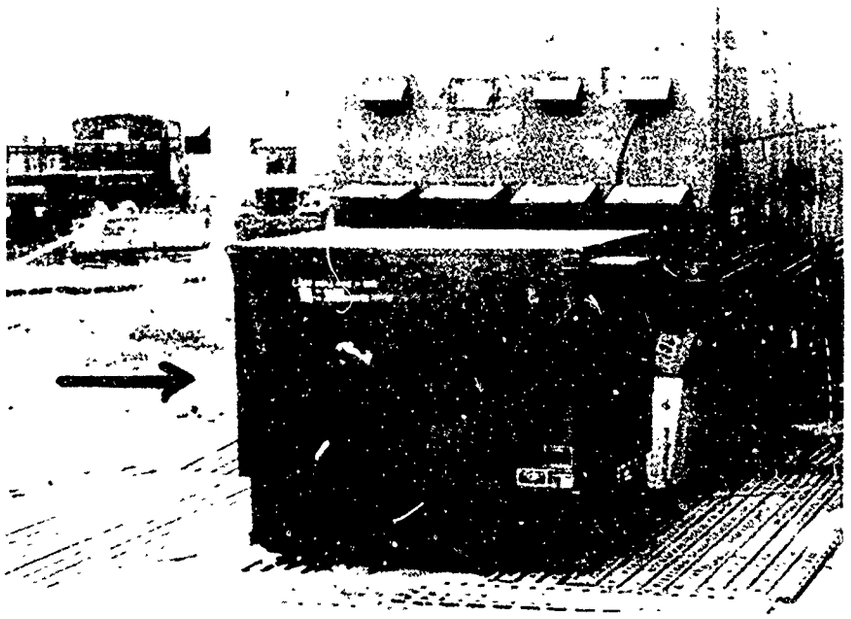
(C) FIGURE C-6. IR imagery.

(figures C-7 and C-8). It is equipped with the receiver components of the AN/ART-41 Data Link, necessary facilities for direct communication with the aircraft, and a console similar to the control console of the AN/AAS-14 in the aircraft. Two 5-inch CRT's in the contol console of the AN/TAQ-1 display the same real-time, television-type data viewed by the airborne operator. As these data are received they are exposed on film. Subsequently, this film is processed in a photo darkroom, thus providing a second permanent record. Aircraft present-position information relative to a preselected base reference point is continuously displayed on counter-type console readouts of the TAQ-1 ground equipment.

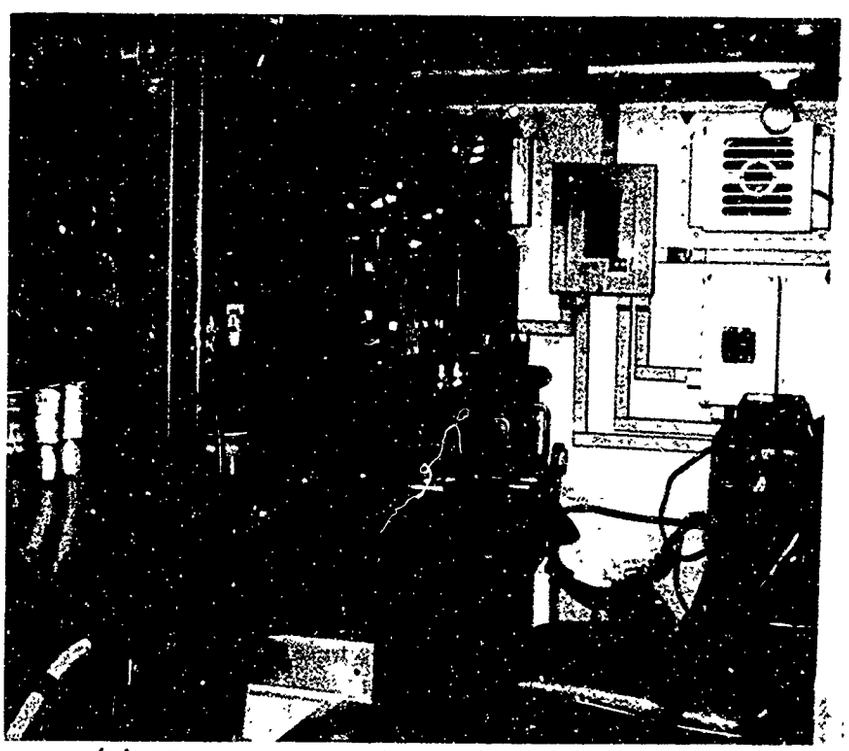
5. DOPPLER RADAR NAVIGATION SYSTEMS

The Doppler Radar Navigation Systems AN/APN-129(V) 1, CMA 681 and AN/APN-147(V) KE, CMA 681 are self-contained, lightweight, transistorized, integrated airborne radar navigation systems. They provide continuous present-position information with reference to a preselected datum and one or more selected destinations. The composite AN/APN-129 (V) 1, CMA 681 Navigation System is installed in the OV-1B model aircraft and the AN/APN-147(V) KE, CMA 681 Navigation System is installed in the OV-1C aircraft of the 73d Avn Co. (See figure C-9.) In addition to their own doppler-derived track formation, the doppler systems require heading information from a heading reference system and true airspeed from a measured airspeed unit. Present position is displayed by means of a pictoral analog of distance and track-to-destination. Windspeed and wind direction, with the resultant drift angle, are displayed in the same format. The systems also provide digital readouts of ground speed in knots and rectangular coordinates of destination and present-position in kilometers. Electrical position outputs are provided to supply marginal film record data on the AN/APS-94(A) (SLAR) and the UAS-4 (IR) installed in the OV-1B and OV-1C aircraft, respectively. In the OV-1B aircraft the complete installation consists of Doppler Sensor, AN/APN-129(V) 1; Doppler Computer, CMA 681; and Measured Airspeed Unit, C 12405-00-014. In the OV-1C aircraft the installation is identical, except that the Doppler Sensor, AN/APN-147(V) KE is used in place of the AN/APN-129(V) 1 and the Velocity Converter (part of CMA 681) is not required.

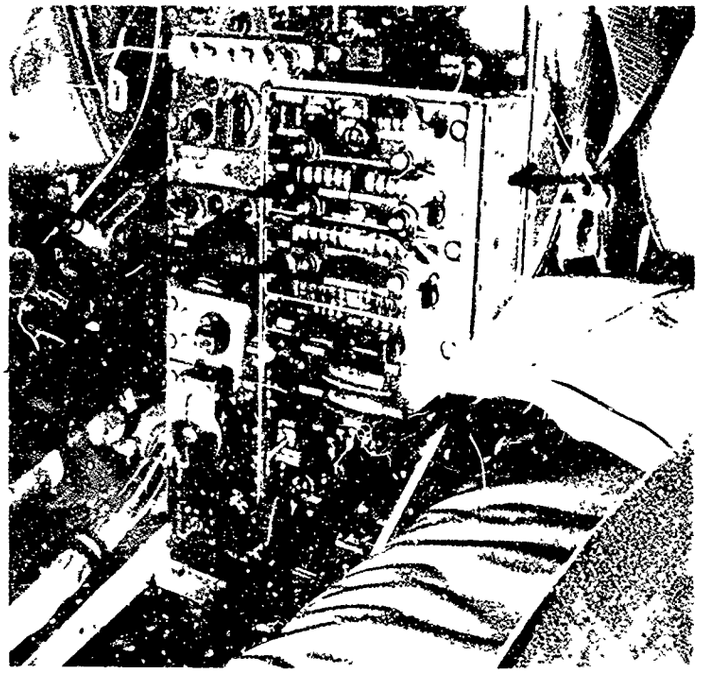
The doppler systems have three basic modes of operation: NORMAL, MEMORY, and AIR DATA. NORMAL operation requires inputs of valid track and groundspeed information. Wind velocity is continuously calculated and stored in memory circuits. In NORMAL operation the capability to compensate for differences in the radar reflectivity characteristics of land and water is provided. Should the doppler sensor indicate warning that the doppler-derived groundspeed is unreliable, the doppler computer will automatically switch to a MEMORY mode of operation. In MEMORY, the doppler computer will use heading and true airspeed imputs in conjunction with the last reliable wind velocity from the memory circuits to compute



(U) FIGURE C-7. AN/TAQ-1, outside view.



(C) FIGURE C-8. AN/TAQ-1, inside view.



(U) FIGURE C-9. Doppler radar navigation control console.

track and groundspeed. Present position will, therefore, continue to be updated during periods of MEMORY. The computer will automatically revert to NORMAL operation on receipt of valid signals from the doppler sensor.

The computer is also capable of an AIR DATA mode of operation and is usually selected when radio silence is required. The purpose of this mode is to ensure that the computer will carry out all calculations using dead reckoning and manually updated wind information when the doppler radar transmitter cannot be used because of tactical requirements. In all modes, magnetic variation is manually inserted into the computer as required for computations of true heading.

6. VALUE AND USE OF SURVEILLANCE INFORMATION

The following comments are verbatim statements of G2 advisors at division or J2 staff agencies receiving aerial surveillance support from the 73d Avn Co. Significant statements were extracted from questionnaires and from other documents. The listed comments are not all of the comments received but are representative of, and specific to, the type of surveillance support provided.

a. Photographic Surveillance

(1) Captain, Advisor, Division Level, II Corps Area.

"Photo requirements have been timely and certainly of value. Because of the basic characteristics of the Mohawk, we have a rapid positive means of reacting to "spot" intelligence. Likewise, we have a quick, effective means of photographic coverage that cannot be accomplished by any other aircraft within the time frame required. Visual surveillance and photographic coverage have been used extensively in this area. In almost all cases, information obtained by aerial surveillance means was classified B/2."

(2) Staff Sergeant, Intelligence Analyst, Division Level, III Corps Area

"Photos have proven to be valuable for so many targets, too numerous to mention.

"An operation was launched on Ben Cau Concentrating Market (VC). Air photos were used to plan and brief. This enabled the pilots (fighter and helicopter) to see their targets before the operation and for the ground troops to know exactly where to go and what they were to do. This operation went off as smooth as clock work. We feel that without the use of air photos it would not have gone as smooth. Results: 15 VC killed in action, 6 VC captured including two females that were attending a VC school on Combat Courses, 1500 kilos of paper, a few weapons, 1500 kilos of rice, many documents, 500 kilos of tobacco, much (not able to count) medicine, and many other items that were taken by the individual soldiers (ARVN).

"A headquarters where a cadre and team of the VC lived and planned for acts of sabotage in the SAIGON-GIA DINH area. Fourteen were suspected to be staying there. Air photos were used to brief the pilots (fighters and helicopter) and also the raiding party. This operation again was a great success we feel due to the use of air photos. Results: 7 killed in action, 3 captured VC, 6 weapons and numerous demolitions, many documents to include the plans and a schematic to destroy a large POL storage area in SAIGON.

"The above listed are only two of the successful operations that we feel air photos played an important part in the final results."

(3) Captain, Advisor, Division Level, IV Corps Area

"Visual and photo surveillance missions have been very effective. Information resulting from visual and photo missions has been accurate and timely. In many cases visual and photo surveillance

missions have been used to verify intelligence reports (agents, captives, ralliers). In some cases agents have been used to verify information received from visual surveillance and from photo interpretation resulting from aerial surveillance missions conducted by 73d Aviation Company.

"One of the most significant operations that has been conducted by 7th Division was based partially on information obtained from visual and photo mission conducted by 73d Aviation Company. Specifically, visual and photo missions were used to verify agent reports, detect and locate enemy arms factories, training centers, storage houses, anti-aircraft positions, water holes and other enemy facilities in Thanh Phu District, Kien Hoa Province, where an operation was launched beginning 28 April 65 and terminated 5 May 65. The operation resulted in the following VC losses: 200 killed in action (178 body count), 48 captured, 76 suspects. Weapons: one 81mm mortar, one 60mm mortar, two 7.62 automatic rifles, one hundred six .45 and 7.62 SMG's, three .30 caliber carbines, two .45 pistols, six flamethrowers, two hundred fifty-four .30 caliber rifles and three assorted rifles.

"The G2 of the 7th Division feels that the 73d Aviation Company has very effectively provided information (visual and photo) that has aided in determining VC locations, installations, movement and intentions. The G2 also commented that the airborne spot reports provided by the 73d Aviation Company are the most timely intelligence reports that he receives."

(4) Major, Advisor, Division Level, IV Corps Area

"Enlargements of panoramic and oblique photography have become very effective for counterinsurgency intelligence operations in the delta areas."

b. Electronic Surveillance

(1) Major, Advisor, Division Level, III Corps Area

(From TWX) "SLAR very effective. Information produced by SLAR extremely valuable. SLAR inflight reports timely and accurate, enabled ARVN to strike Viet Cong supply boats in river/canal with UTT's and artillery, verified by daylight air and agent observations. SLAR inflight reports enabled ARVN to strike VC while their operations were in progress. Extremely valuable especially disrupting VC lines of supply. ARVN division commander extremely satisfied with SLAR ability to locate VC activities. Desires further use. Division G-2 expressed satisfaction in being able to confirm routes and patterns of VC activities. NOTE: Letter from CO 25th Division to follow. All types aerial surveillance necessary, due to topography in our area of operations. SLAR contributes immensely to our capability to find, fix and destroy enemy. This is a definite necessity."

(2) Captain, Advisor, Division Level, III Corps Area

(From TWX) "SLAR in conjunction with a sound population control is highly effective. SLAR if continuous can be used to develop and follow troop movements."

(3) Captain, Advisor, Division Level, IV Corps Area

"SLAR showing movement and direction of movement used in conjunction with curfew restrictions, indicates enemy movement. For the few times that we have employed SLAR, airborne readouts were radioed to this division TOC where they were received, correlated and processed for immediate tactical action (i.e. artillery and air strikes when feasible)."

(4) Captain, Advisor, Division Level, IV Corps Area

"Red haze (IR) and SLAR are still of limited value because the division requests are not filled with any degree of reliability. Until more equipment is available the division surveillance plan cannot depend on SLAR or IR. Imagery interpretation reports from SLAR and red haze missions were useful."

(5) Major, Advisor, Division Level, IV Corps Area

"SLAR and IR surveillance cannot yet be evaluated. The availability of these two types of surveillance was insufficient to develop control cases for comparison of normal and VC military occupied areas. Initial use of SLAR indicates that SLAR is an excellent device for detecting night time water movement.

"SLAR missions in March 1965 began to develop areas of water movement in the Vinh Binh area. During the last week in April when SLAR missions were requested to confirm an agent report, all missions were aborted because of either mechanical failure or higher priority missions. Although May indicates few requests, coordination with TRAC by the ARLNCO stationed at G2 9th Infantry Division predetermined that our requests could not be filled, therefore a request was not forwarded. A situation overlay was delivered to TRAC by the ARLNCO; the overlay contained areas for red haze and SLAR coverage of Long Toan, Vinh Binh. No results were ever received at the 9th Infantry Division. Until the SLAR program can render more reliable service, the information gathered by piecemeal surveillance produces little useable intelligence."

(6) Lieutenant Commander (USN), TRAC Operations Officer, MACV J-245

"All surveillance assets of the 73d Aviation Company were effective in providing information on Viet Cong activities. The relative effectiveness depended on many factors, such as, which sensor

was utilized over which type of terrain, weather conditions, operator's ability, etc. The most effective type of surveillance for the TRAC as performed by the 73d Aviation Company were the red haze and SLAR.

"Red haze and SLAR were unique to the TRAC in providing information on Viet Cong activities due to the fact that the surveillance effort during the hours of darkness was almost exclusively performed by these sensors. This is most important in this theater of operations and in the counterinsurgency effort due to the fact that insurgents and particularly the Viet Cong are most active during the hours of darkness or inclement weather when visual and photo surveillance cannot operate effectively.

"The terrain in the Republic of Vietnam creates difficult navigational problems for pilots resulting in inaccurate coordinate reporting of visual sightings. This factor is, of course, in addition to the obvious danger to daylight aircraft from hostile ground fire which neccessitates flying irregular patterns and at a relatively high altitude. Also, the terrain is marked by heavy jungle vegetation upwards to a triple canopy over the ground which makes visual reporting of Viet Cong activities, bivouac areas, assembly areas, etc., extremely difficult. Moreover there is also the obvious difficulty of the imagery interpreter to locate Viet Cong activities in this terrain. Due to the above reasons and the fact that the Viet Cong are most active at night, the TRAC has felt that the red haze and SLAR surveillance missions are all important in providing timely information on Viet Cong activities in the TRAC's area of interest. This area of interest is relatively all encompassing in that the TRAC's primary mission is to provide timely intelligence to combat echelons and higher headquarters for immediate and preplanned attack and study.

"SLAR surveillance has repeatedly detected Viet Cong activity in the form of movement on the open sea, inland waterways, and roads and highways. With SLAR inflight reports of moving targets for on-the-spot target exploitation, the value of SLAR is obvious. SLAR is also valuable to the TRAC and requesting units in that after a period of time of SLAR surveillance over a given area of interest, a revealing traffic analysis can be developed. The use of this technique and the making of consequent analysis was done in the Rung Sat Special Zone. In addition, within TRAC itself, data is daily analyzed for the purpose of determining Viet Cong sea and inland waterway infiltration routes, stopover points, and landing areas.

"The ultimate use of red haze is to locate Viet Cong and consequent target exploitation. Red haze mission requests are requested over areas where varying collateral information received by the TRAC has indicated that there has been recent Viet Cong activity. Perhaps the most accurate, reliable, and timely information that is received by the TRAC, and from which numerous red haze missions are based, is the information gained from Army radio direction finding (ARDF) "fixes" on Viet Cong radio transmitters organic to a relatively large-size Viet Cong unit.

Reliability of such fixes as to exact location, however, is not accurate to the point where immediate target exploitation is determined desirable. Red haze missions, therefore, flown over an area encompassing the radio fix, report the same day that the transmission was detected, which quite often gives the TRAC the "added ingredient" for actual target exploitation. There are many other sources of intelligence information from which possible target areas are developed both as the basis for consequent red haze missions and target exploitation. Without going into detail as to the nature of these various other sources and agencies from which TRAC gains intelligence, let it suffice to say that the TRAC receives all known intelligence reports made by all echelons of command within Republic of Vietnam. Thus the most significant use and overall value of information as received from red haze surveillance is that of locating lucrative targets, both for immediate and long range exploitation. A lucrative target is one that is determined to be exploitable by either artillery, air strike, ground operation, or a combination of such actions, within a framework of a short period of time. A long range target is usually a large area type target within which at least one large Viet Cong unit is located and will have to have continued surveillance for a massive type exploitation such as the use of high performance aircraft strikes. It is no exaggeration to say that the vast majority of all targeting, target development, and consequent target exploitation as recommeded by the TRAC has utilized red haze surveillance results as one of the prime factors in such development.

"Although not a question in itself, the subject of future aircraft requirement is considered most pertinent to comment on. As the TRAC's interest is primarily concerned with infrared and side looking airborne radar (SLAR) surveillance, comments will be limited to the OV-1B and OV-1C.

"As stated above, all surveillance requests for the use of Mohawk infrared and SLAR made within RVN are processed through the TRAC. Currently, all requests from the TRAC and the Corps cannot be fulfilled due to the limited availability of Mohawk aircraft. The TRAC itself could easily task the infrared and SLAR assets of the 73d Aviation Company on a daily basis.

"It is the considered opinion of the TRAC that to best utilize the surveillance capability of OV-1 aircraft, that each Corps within RVN should have its own organic surveillance capability. This capability would include an organic surveillance aviation organization to the Corps to include an imagery interpretation section. The size of this organization would initially be that of a company and would ideally include a minimum of 12 aircraft, consisting of 3 OV-1B models and 9 OV-1C models. As more assets became available, and depending on the deployment of US divisions to RVN, it may become advantageous to eventually have ASTA platoons organic to each US division, either in lieu of or in addition to the corps aviation company. In addition to the corps,

it is also recommended that a similar company or initially an ASTA platoon as a minimum, be attached to MACV with operational control being exercised by J-2. This company would have a general support role, but would specifically receive its mission from the TRAC. The TRAC in turn could either assist the intelligence collection effort of all the corps or could call in turn upon the corps and its assets to support the COMUS-MACV collection effort. As an interim measure an ASTA platoon could perhaps satisfy the requirement."

(7) Captain, Advisor, Division Level, III Corps Area

(From TWX) "Night movement and trail use was detected by SLAR and red haze. An agent report that was confirmed by red haze has led to several successful operations.

"Aerial surveillance is the best combat intelligence that is available in Vietnam. With ARVN intelligence sorely out of balance between overt and covert efforts, the advisory effort should be directed towards balancing this situation. I recommend more red haze and SLAR ships give immediate read out.

"The majority of the time red haze and SLAR information was received 8 to 12 hours after TOT. Sometimes information was obtained 4 to 6 hours after TOT. Although the information obtained was always used for intelligence purposes most of the time immediate action could not be taken. - - - - - - - - More red haze and SLAR equipment should be made available to using units. Each division in III Corps could utilize SLAR and red haze nightly and not have to request several days in advance of need. Then and only then could comparison be made night to night."

(8) Captain, Special Forces Photo Interpreter, III Corps Area

"VC movement was detected, or at best (least) the presence of movement up to a week prior to the battle of Song Be and again before the battle of Dong Nai. Some of the red haze and SLAR return(s) were checked out by low level recon but the tree canopy was just too thick to permit a good visual reconnaissance. The sensors were being true, but in my opinion taken lightly. - - - - - - - - We use red haze, SLAR, photo for validation of existing order of battle as previously mentioned and also to seek out new targets or an imminent threat to a special forces camp or installation. If we recognize a threat at some location other than our own we pass this information on. Sometimes it is quite startling to find out that the area most concerned has not been notified or aware of the results or possible existing enemy threat. - - - - - - - In remote areas or areas where it is difficult to get information out of, then red haze and SLAR have been tremendously successful. These missions when combined with our own low level recon provide much information. - - - - - - - In III Corps Special Forces could use one SLAR and one red

haze ship to fly just us every night. Special Forces have 17 sites in III Corps alone and there is an imminent threat at one or more of these sites each night. If we had just a red haze ship it would be fully utilized."

(9) Staff Sergeant, Intelligence Analyst, Division Level, III Corps Area

"Prior to the battle of Dong Xoai we received many red haze readbacks; however, due to ARVN's lack of reaction and disinterest, this information was negated. After the battle of Dong Xoai we located and traced the VC units for a period of about 6 days, but again, due to the lack of ARVN reaction and interest, it was again to no avail.

"We (US) place the value of this information very high and so does some of the ARVN; however, due to the inability of the ARVN to react on short notice and inability to conceive targets of this nature, the information received is reduced in value.

"Agent reports had indicated there was a movement back into an area that had been very throughly bombed. SLAR reports showed a little water and trail traffic towards said area. Red haze reports over a period of 3 days also showed a trend toward said area. All information was received and we requested a Special Forces patrol investigate. They found that approximately two VC companies were in the area; however, ARVN failed to react again and the project was then only followed for large scale buildup. If this headquarters could have a SLAR ship and a red haze ship available to it on short term notice (2 hours) and we could employ it to meet our tactical needs, we feel the information received from this type of surveillance would be of a great value to us. At present the red tape which we must go through to receive this support and the coordinating which we must do is a great burden on this office because we do not have an operational headquarters, only an advisory staff."

(10) The following operation summaries from the Senior Advisor, 25th Infantry Division, Duc Hoa to the Senior Advisor, III Corps, Bien Hoa are quoted in part:

SPECIAL OPSUM: JOINT SLAR, ARMED HELICOPTERS,

AND ARTILLERY ACTIVITY ON THE NIGHT OF 15 MAY

IN THE 31ST D.T.A.

1. ARTILLERY FIRED IN RESPONSE TO SLAR INFORMATION AS FOLLOWS:

TIME	COORDINATES	EXPENDITURE	TYPE
152150	XT 555015	6	VT
2200	XS 500925	6	VT
2230	XS 428137	4	SQ
2230	XS 433149	4	SQ
2245	XS 495962	4	SQ
2245	XS 457992	4	SQ
160100-0145	XS 540928	6	VT
"	XS 545926	6	VT
"	XS 550925	6	VT
"	XS 552929	6	VT
"	XS 555933	6	VT
"	XS 524929	6	VT
"	XS 552929	6	VT
160100-0145	XS 545932	6	VT
"	XS 548901	6	VT
0300	XS 610860	4	TIME
0300	XS 610870	4	TIME

2. TOTALS: 84 ROUNDS (60VT, 8 TIME, AND 16 SQ) AT 16 LOCATIONS IN RESPONSE TO 6 SIGHTINGS.

3. ARMED HELICOPTERS (PLAYBOY 13) STRUCK ALONG RIVER FROM XS 535929 TO XS 560934, UNDER LIGHT FURNISHED BY A US FLARE SHIP (SMOKEY RED) AT 160030. THE RESULTS OF THIS STRIKE ARE DEFINITELY POSITIVE. THE ARMED HELICOPTERS CREW SAW MORE SAMPANS THAN THEY COULD ENGAGE. THEY EXPENDED ALL AMMUNITION ON THE TARGET, BUT DUE TO LIGHT CONDITIONS

WERE UNABLE TO ASSESS CASUALTIES INFLICTED

4. L-19 OBSERVATION THIS MORNING CONFIRMS DESTROYED SAMPANS AS FOLLOWS: 1 SMALL AT XS 490962, 1 LARGE AT XS 525945, 1 LARGE AT XS 528935, AND 1 SMALL AT XS 562920.

5. CONFIRMED RESULTS OTHER THAN THOSE ABOVE ARE UNAVAILABLE AT THIS TIME, PENDING RECEIPT OF INTELLIGENCE (AGENCY) INFORMATION. THIS WILL BE FORWARDED ON RECEIPT.

6. THERE IS ABSOLUTELY NO QUESTION THAT THIS WAS A HIGHLY SUCCESSFUL OPERATION. IT REQUIRES EXCLUSIVE USE OF SLAR FOR A REASONABLE PERIOD, ARMED HELICOPTERS OR FIGHTERS, AND A LIGHT SOURCE (HAWK EYE OR A FLARE SHIP), IN COORDINATED ACTION.

7. FURTHER STUDY OF THIS TYPE OF ACTION WILL BE CONDUCTED TONIGHT, IF APPROVED. AN AIR REQUEST HAS BEEN SUBMITTED AS FOLLOWS:

A. SLAR: 162230 - 170100

B. HAWKEYE (WHICH INCLUDES 1 LIGHT FIRE TEAM): 162300 - 170100.

C. 1 ADDITIONAL LIGHT FIRE TEAM: 162300 - 170100

SPECIAL OPSUM: JOINT SLAR (HAWK 14), ARMED HELICOPTERS (HAWKEYE), FIGHTERS (USAF & USA L-19) AND ARTILLERY ACTIVITY ON THE NIGHT OF 18 MAY IN THE 31ST DTA.

1. (2230 - 2245) HAWK 14 ON STATION: ACQUIRES TARGETS AS FOLLOWS:

A. XS 518865

B. 549814

C. 552812

D. 577795

CAW 63 (USAF L-19) ALSO ON STATION

2. (2250 - 2315) DRAGON 26 (HAWKEYE ARMED HELICOPTERS) ON STATION: IS DIRECTED TO TARGET B (ABOVE). SIGHTED 1 LARGE SAMPAN; SANK SAME. (LARGE SECONDARY EXPLOSION).

DRAGON 36 WAS THEN DIRECTED TO TARGET C, WHICH WAS A LARGE SAMPAN. IT WAS ENGAGED AND DAMAGED BUT NOT SUNK. DURING THE ENGAGEMENT OF TARGET C, AUTO WEAPONS FIRE WAS RECEIVED FROM ANOTHER LARGE SAMPAN AT XS 569866. THIS TARGET WAS ENGAGED AND THE FIRE STOPPED: UNKNOWN DAMAGE TO SAMPAN.

3. (2315) HAWK 14 REPORTS THE FOLLOWING SINGLE MTI'S:

E. XS 606791

F. XS 566820

G. XS 592927

4. (2310) DRAGON 36 RETURNS TSN TO REARM AND REFUEL

5. (2330) HAWK 14 REPORTS 5 WELL DEFINED MTI'S

H. XS 562738 TO XS 578762

6. (2340) HAWK 14 REPORTS 5 MTI'S

I. XS 551821 TO XS 555834

7. (182400) AIE'S LAUNCHED

8. (190005) HAWK 14 REPORTS MTI'S AS FOLLOWS:

J. XS 550813

K. XS 580794

L. XS 587789

M. XS 523857

9. (0034) DRAGON 36 BACK ON STATION: DIRECTED TO TARGET G, OBSERVED SEVERAL LARGE SAMPANS AND ENGAGED THEM. VERY HEAVY RETURN FIRE RECEIVED FROM VIC XS 615923. (TGT G)

10. (0045) DRAGON 36, COMPLETELY EXPENDED, RETURNS TO TSN BED & BOARD.

11. (0045) HAWK 14 REPORTS SINGLE MTI'S AS FOLLOWS:

N. XS 586770

O. XS 582782

P. XS 555813

12. (0050) HAWK 14 RETURNS HOME STATION TO REFUEL.

13. (0110) FIGHTER AIRCRAFT RETURNED TSN UNEXPENDED, DUE TO LACK OF A LARGE TARGET.

14. MISCELLANEOUS COMMENTS:

A. MOVEMENT AT NIGHT IN 31ST DTA IS PROHIBITED; ANY OF THE TARGETS LISTED WAS APPROVED BY VIETNAMESE TOC.

B. ARTILLERY WAS FIRED AT TGT Q

C. SINCE THE VC HAVE A PRACTICE OF CARRYING HEAVY WEAPONS OR AMMUNITION FOR A UNIT IN 1 SAMPAN, IT IS QUITE POSSIBLE THAT SINKING ONE SAMPAN WILL PUT HALF THE HEAVY WEAPONS OF A WEAPON COMPANY AT THE BOTTOM OF A CANAL. THUS, A SINGLE SAMPAN IS NOT NECESSARILY A TARGET OF NO IMPORTANCE.

D. THE TIME BETWEEN ACQUISITION OF A TARGET AND ENGAGEMENT IS CRITICAL. (OBVIOUSLY, SINCE A TARGET TO BE DETECTED MUST BE MOVING.)

E. THIS GENERAL SYSTEM OF TARGET ENGAGEMENT IS SUPERIOR TO NORMAL DAYLIGHT ENGAGEMENT BECAUSE THAT ATTACK AIRCRAFT ARE VECTORED DIRECT TO THE TARGET AND ATTACK IT IMMEDIATELY, RATHER THAN HAVING AN L-19 CIRCLE THE TARGET FOR A PERIOD OF TIME PRIOR TO THE ARRIVAL OF STRIKE AIRCRAFT.

F. HAWK 14 RETURNED AT 0220 TO PROVIDE FURTHER SURVEILLANCE: THIS OPSUM CLOSED AT THAT TIME.

(C) ANNEX D

IMAGERY INTERPRETATION SECTION

This annex contains a list of personnel authorized in the imagery interpretation section and the major items of equipment authorized by TOE. Normal duties of the imagery interpretation section are described and total number of man-hours spent on duty per 24 hours by the 73d imagery interpretation section and by the TRAC imagery interpretation section are broken down into tasks.

1. PERSONNEL, IMAGERY INTERPRETATION SECTION

Auth	Assigned	Training	Experience	DEROS
Capt	Capt	23 Weeks	80 Months	29 Nov 65
Lt	Capt	22 Weeks	30 Months	4 Dec 65
Lt	Lt	23 Weeks	27 Months	4 Dec 65
WO	WO	19 Weeks	53 Months	4 Dec 65
WO	WO	8 Weeks	107 Months	29 Nov 65
E-7	E-7	15 Weeks	5 Months	5 Dec 65
E-6	E-6	15 Weeks	10 Months	5 Dec 65
E-6	E-6	15 Weeks	80 Months	5 Dec 65
E-5	E-5	15 Weeks	6 Months	5 Dec 65
E-5	E-5	15 Weeks	10 Months	5 Dec 65
E-5	E-5	15 Weeks	10 Months	5 Dec 65
E-5	E-5	15 Weeks	9 Months	30 Nov 65
E-5	E-5	15 Weeks	10 Months	22 Nov 65
E-5	E-5	15 Weeks	6 Months	5 Dec 65
E-5	E-5	15 Weeks	8 Months	5 Dec 65
E-5	E-5	13 Weeks	21 Months	5 Dec 65
E-4	E-4	11 Weeks	18 Months	5 Dec 65
E-4	E-4	15 Weeks	9 Months	5 Dec 65

2. MAJOR ITEMS AUTHORIZED BY TOE

Federal Stock Number	Nomenclature	Auth	On Hand
6675-641-3531	Drafting inst set ofc	1	1
6675-641-5741	Table tracing draft wood adj tilt 0-40 deg illum glass surface 36 x 24 in., 48 x 36 in. top, 37 in. H	2	2
6675-647-1573	Interpretation kit photo	19	19
6675-809-6684	Lettering set vert & ang lettering	2	2
6230-299-7771	Light desk AC 115V - 125V lamps accomp lamp position adj rigid sec	10	10
6675-283-0020	Scale plot flat L-shaped 4 3/4-in. L meters yd 1:25,000 1:50,000	19	19
6675-240-6620	Stereometer photogram 0-25mm	2	1
NSN	Draft mach 24 in. lg arm protr grad 0-360 degrees quadrant 1 deg	2	2
NSN	Straight edge stl draft 42 in. lg	2	2
6675-190-5275	T square 12 in. swvl hd 42 in. blade	2	2
NSN	Magnifier self-illum 2 in. dia	4	4
2320-542-4636	Truck cargo 3/4-ton 4 x 4	2	2
2320-440-8318	Truck van expansible 2½-ton 6 x 6	2	2
7490-267-8138	Case fld office mach plywood 18½ in. L 13¼ in. W 17 in. D	2	2
7110-551-5259	Filling cabinet stl gray 4 dr H 1 dr W w/comb lock	4	4
7110-305-0821	Filing cabinet map & plan stl gray 5 dr H 1 dr W	4	4
7110-273-8876	Filing cabinet card size 16 in. 2 dr for 5 x 8 in. cards	2	2

Federal Stock Number	Nomenclature	Auth	On Hand
7110-273-8774	Filing cabinet card size 16 in. 2 dr for 3 x 5 in. cards	2	2
7105-269-9275	Table, folding legs wood top 36 in. L, 24 in. W, 27 in. H	4	4
5210-262-1996	Desk field plywood 20 in. W, 14 in. H, 15 in. D	2	2
7110-269-9250	Stool revolving leg type with seat raising 30 in. wood	12	12
582300	Trimmer paper drop knife wood (instal prop)	2	2
7430-286-9023	Typewriter portable elite 42 keys	2	2
7430-286-9023	Typewriter non-portable 20 in. paper size 42-44 keys elite	1	1
5805-543-0012	Telephone set TA 312/PT	4	4
945835	Stereoscope prism-mirror w/case carrying	2	1
910421	Light table Richards model GFL 940 MC	2	0
960202	Power stereoscope Richards equipment combination of one each catalog number 91533 & two each catalog number 960202	2	0
910103	Light table Richards model GFL 918 115V 60 cy 2 Amp	4	0
960261	Optics Kit Richards model MC 2	2	0
	Microscope zoom model MO 53-71-01 B&L	2	2
	Magnifier tube 10X B&L	2	0
	Viewer printer Fairchild model F512 plotting table photo film AR-28	2	2

3. DUTIES OF THE IMAGERY INTERPRETATION SECTION

a. Mission Planning

The imagery interpretation section spent 4 man-hours a day on mission planning. Upon receipt of a mission request, the section, assisted by the aviator liaison officer, checked the size and locations of the target areas to determine if they were within the range capability of the aircraft. They also determined if the sensor would have a sufficient film capacity to record the areas.

Depending on location and requested TOT, several missions could be accomplished on one flight. The section determined which missions were to be accomplished on each flight and recommended the sequence in which the missions be flown.

Check points for updating the doppler navigation computer for IR and SLAR flights were selected and recommended to the aviator. The recommended flight path was then checked to assure that the aircraft had sufficient range to complete all the missions assigned for that flight.

For all IR missions, an overlay of each target area was prepared and the doppler coordinates for each corner of the area were computed. Check points that could be readily identified by the sensor operator in the terrain display scope were selected near the target area.

Upon completion of the mission planning the requests were sent to the operations section for final coordination.

b. Imagery Interpretation Preparations

An imagery interpreter was selected for each specific mission. He checked the mission request to determine the TOT, area to be covered, type of information desired, and units to which reports were to be sent and he selected the appropriate maps from the map files (1:50,000 for IR and photo and 1:250,000 for SLAR missions). The target areas were drawn on the maps and checked to determine the location and types of activities which might be detected.

Infrared missions required more preparation since photographic coverage of the area was first obtained from the photo library. The photos were checked in the same manner as the maps.

Debriefing and immediate report forms were prepared for each mission and attached to the mission request. The forms were placed with the maps in readiness for the arrival of the flight crew upon the completion of the flight.

These preparations required approximately 9 man-hours per day.

c. Debriefing

Upon completion of a flight the sensor operator/observer delivered the film to the photo lab and accompanied the aviator to the imagery interpretation vans for debriefing. During the debriefing the following items were recorded:

1) Name of aviator

2) Aircraft number

3) Date/time of debriefing

4) Control settings on sensors (IR or SLAR)

5) Focal length of lens (photo)

6) Altitude over target areas

7) Actual time over target

8) Number of flight paths over each target area

9) Direction of flight paths

10) Visual sightings

11) Spot reports

   a) Time spot report made

   b) To whom report was made

   c) Nature of spot reports

12) Any problems encountered during the flight

After the above information was recorded the aviator marked on the map the approximate location, sequence, and direction of all flight paths flown over each target area. Debriefing required approximately 3 man-hours per day.

d. Interpretation of 73d Imagery

(1) Photo Missions

When the negatives arrived at the imagery interpretation

section they were scanned and all apparent targets were circled. The negatives were then studied closely in an attempt to locate additional targets, after which imagery was plotted and the location of all targets recorded.

If required or desired, selected negatives were printed as contact prints or as enlargements. These prints were studied to obtain additional information on specific areas of interest.

The immediate report was written and phoned to the requestor. A typewritten copy of the immediate report, the debriefing report, a plot of the imagery, and all prints were sent to the requestor. If interpretation was not required the imagery was plotted and the requested number of prints were made. A copy of the imagery and all prints were sent to the requestor.

(2) SIAR Missions

When the imagery was received by the interpreter it was plotted on the appropriate maps. All stationary or moving returns were plotted and their locations recorded. Each return, other than normal traffic, was considered as a target of military significance.

The immediate report was written and phoned to the unit having responsibility for the areas covered on the SIAR mission.

(3) IR Missions

Upon receipt from the photo lab the imagery was interpreted and all emissions detected were circled. The imagery was then oriented with the map and the exact location of each flight path was plotted. At the same time the emissions were plotted and their locations recorded on an IPIR form.

The photography was oriented with the maps and the emissions were plotted on the photographs. The photos were then analyzed to determine the cause of the emission. Upon completion of the interpretation, an immediate report for the mission was written and disseminated to the requesting agency.

e. Preparation of Mosaics

Mosaics were required for operational briefings, development of targets, and to fulfill other requirements of the requestor. The mosaics had to be constructed, annotated, and UTM or arbitrary grid drawn. The average mosaic consisted of 30 prints and required 4 hours to complete.

f. Photo Library

The II section was required to maintain a photo library of basic film coverage. As new photo missions were flown, the new photos replaced the older, outdated photos.

These new photo missions were interpreted and plotted prior to being placed in the library. Each photo mission was indexed and a file card made for the appropriate files.

When coverage for a photo mission was required from the library the files were checked to determine which missions covered the area. The mission was then located and taken to the imagery interpretation vans. After photo mission coverage was used it was returned to the proper location.

If individual photos were removed and used to construct a mosaic, the print numbers were recorded and replacements were requested.

g. Interpretation of Air Force Photo Missions

Some photo missions were requested that were beyond the capability of the KS-61A camera system. These missions were flown by the US Air Force and the photography interpreted by 73d imagery interpreters.

4. IMAGERY INTERPRETER MAN-HOUR UTILIZATION

Total number of man-hours spent on duty per 24 hours by the 73d Aviation Company imagery interpretation section and the TRAC imagery interpretation section are shown below.

The man-hours spent on photo, IR, and SIAR missions include all man-hours required for mission planning, preparation, debriefing, interpretation, dissemination of information, and filing of completed forms.

Activity	TRAC	Vung Tau	Total	Percent
Maintenance	6:52	4:28	11:20	5.6
Mess	4:21	2:40	7:01	3.4
Supervision	29:23		29:23	14.4
Air Force Photo Missions	15:42	4:20	20:02	9.8
Air Force Infrared Missions	20:57		20:57	10.3
73d Avn Co Infrared Missions	38:34	6:02	44:36	22.0

Activity	TRAC	Vung Tau	Total	Percent
73d Avn Co SLAR Missions	1:00	7:50	8:50	4.3
73d Avn Co Photo Missions		4:34	4:34	2.3
Mosaics	9:15		9:15	4.6
SLAR Reports	5:55		5:55	2.9
Overlays	0:35		0:35	.3
Hit Reports	5:41		5:41	2.8
Briefings	1:25	0:56	2:21	1.2
Personnel	4:20		4:20	2.2
Administration		5:29	5:29	2.7
Meetings		0:38	0:38	.3
Company Duty		18:05	18:05	8.9
Burning Classified Waste		0:38	0:38	.3
Special Projects		3:20	3:20	1.7
	144:00	59:00	203:00	100.0

(U) ANNEX E

TOE L-128T (MODIFIED)

US ARMY AVIATION COMPANY (AERIAL SURVEILLANCE)

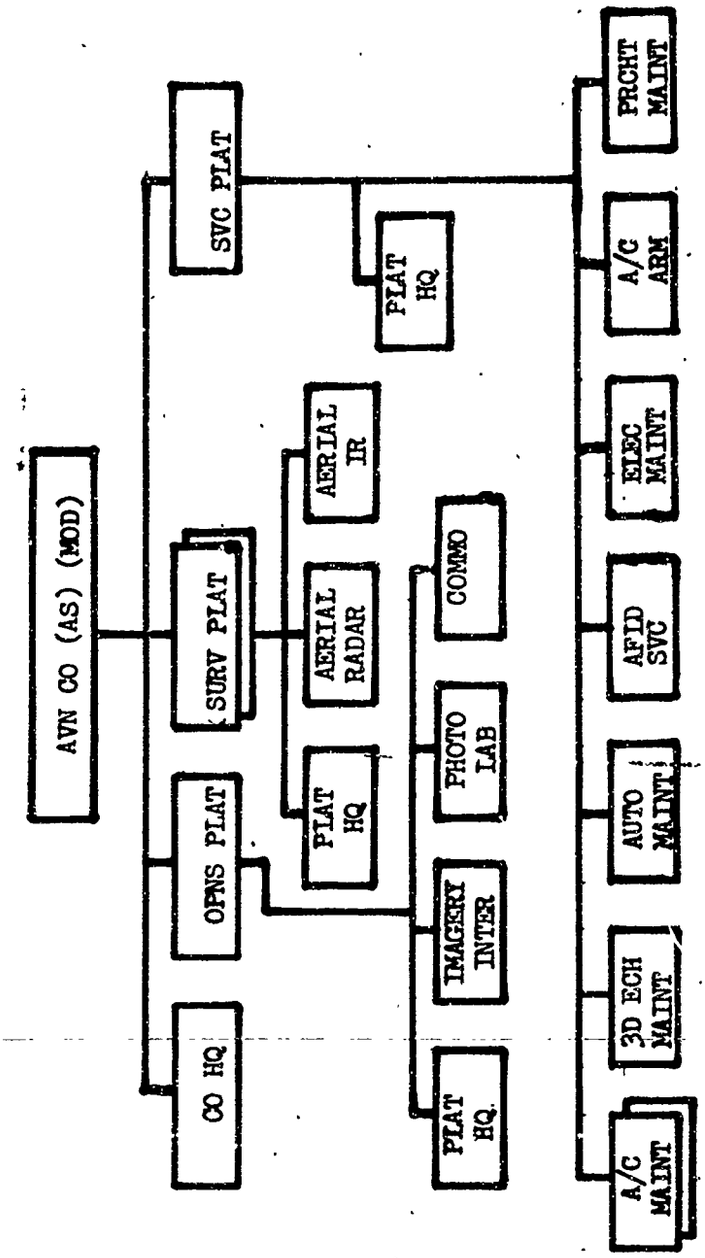
Annex E presents the TOE 1-128T (modified), Aviation Company (Aerial Surveillance) approved by DA and USARPAC for operations in the RVN. Authorized personnel are listed by platoon and section and items of equipment are listed by technical service.

Recommended additions, deletions, and changes for maximum effectiveness with sensor equipment currently authorized are also presented.

See annex H for the TOE recommended by ACTIV for the US Army aviation company (aerial surveillance), which proposes a change in the number and mix of sensor equipment.

1. TOE 1-128T (MODIFIED) APPROVED BY DA

a. Organization Chart



b. Personnel

PAR	LINE	DESIGNATION	MOS	GRADE	NO. AUTH
01		Company Headquarters			
	01	Company Commander	1983	Major	1
	02	Executive Officer	1983	Capt	1
	03	First Sergeant	672.80	E-8	1
	04	Mess Steward	941.60	E-6	1
	05	Supply Sergeant	768.60	E-6	1
	06	First cook	941.10	E-5	3
	07	Armorer	768.20	E-4	1
	08	Company Clerk	716.10	E-4	1
	09	Cook	941.10	E-4	3
	10	Cooks Helper	940.00	E-3	1
	11	Lt Truck Driver	710.00	E-3	1
	12	Suppy Clerk	760.00	E-3	1
					16
02		Operations Platoon Headquarters			
	01	Flight Op Officer	1982	Capt	1
	02	Flight Op Chief	907.70	E-7	1
	03	Sr Flight Op Sp	907.10	E-4	1
	04	Flight Op Sp	907.10	E-4	2
	05	Flight Op Helper	907.10	E-3	1
					6
03		Imagery Interpretation Section			
	01	Imagery Interp Off	9309	Capt	1
	02	Asst Imagery Interp Off	9309	Lt	2
	03	Imagery Interp Tech	962A	WC	2
	04	Section Sergeant	969.70	E-7	1
	05	Imagery Interp Sgt	969.70	E-6	2
	06	Imagery Interp	969.10	E-5	8
	07	Imagery Interp	969.10	E-4	3
					19
04		Photo Laboratory Section			
	01	Photo Lab Supv	843.60	E-6	1
	02	Sr Photo Lab Sp	843.10	E-5	2
	03	Photo Lab Sp	843.10	E-4	4
	04	Photo Eq Rpmn	401.20	E-4	1
					8
05		Communications Section			
	01	Commo Chief	311.60	E-5	1
	02	Radio TT Team Chief	053.60	E-5	1
	03	Radio TT Op	053.10	E-4	2
	04	Sr Wireman	310.00	E-4	1
	05	Switchboard Op	310.00	E-4	1
	06	Wireman	310.00	E-3	2
					8

PAR	LINE	DESIGNATION	MOS	GRADE	NO. AUTH
06		Surveillance Platoon Headquarters (2)			
	01	Platoon Commander	1980	Capt	2
	02	Lt Truck Driver	670.00	E-3	2
					4
07		Aerial Radar Sections (2)			
	01	Section Leader	1980	Capt	2
	02	Fixed Wing Aviator	1980	It	5
	03	Aerial Sensor Op	207.10	E-5	2
					9
08		Aerial Infrared Sections (2)			
	01	Section Leader	1980	Capt	2
	02	Fixed Wing Aviator	1980	It	9
	03	Aerial Sensor Op	207.10	E-5	6
					17
09		Service Platoon Headquarters			
	01	Platoon Commander	64823	Capt	1
	02	Airplane Maint Tech	671B	WO	1
	03	Platoon Sergeant	672.70	E-7	1
	04	Airplane Tech Insp	679.40	E-6	2
	05	Aircraft Parts Sp	766.10	E-4	2
	06	Shop Clerk	711.10	E-4	1
	07	Signal Parts Sp	765.10	E-4	1
	08	Acft Supply Clerk	760.00	E-3	1
					10
10		Aircraft Maintenance Sections (2)			
	01	Section Chief	672.60	E-6	2
	02	Crew Chief	672.20	E-5	12
	03	Senior Airplane Mech	672.20	E-5	6
	04	Airplane Mech	672.20	E-4	8
	05	Airplane Mech Helper	670.00	E-3	4
					32
11		Third Echelon Aircraft Maintenance Section			
	01	Repair Foreman	679.70	E-7	2
	03	Machinist	443.10	E-5	1
	04	Sr Airplane Rpmn	672.40	E-5	2
	05	Sr Acft Eng Rpmn	681.10	E-5	1
	06	Sr Prop Rpmn	684.10	E-5	1
	07	Sr Elect Rpmn	685.10	E-5	1
	08	Sr Airframe Rpmn	686.10	E-5	1
	09	Parachute Packer	464.27	E-5	1
	10	Airplane Rpmn	672.40	E-4	2
	11	Aircraft Eng Rpmn	681.10	E-4	2
	12	Elect Rpmn	685.10	E-4	2

PAR	LINE	DESIGNATION	MOS	GRADE	NO. AUTH
	13	Parachute Packer	464.27	E-4	2
	14	Propeller Rpmn	684.10	E-4	1
	15	Airframe Rpmn	686.10	E-4	2
	16	Hydraulic Sys Rpmn	687.10	E-4	1
	17	Acft Parts Sp	766.10	E-4	1
					23
12	Automotive Maintenance Section				
	01	Section Chief	631.60	E-6	1
	02	Sr Power Gen Sp	351.20	E-5	1
	03	Sr Wheel Veh Mech	631.10	E-5	1
	04	Ordnance Parts Sp	763.10	E-4	1
	05	Power Gen Sp	351.20	E-4	3
	06	Wheel Veh Mech	631.10	E-4	2
	07	Wrecker Operator	631.10	E-4	1
	08	Wheel Veh Mech Helper	630.00	E-3	2
					12
13	Airfield Service Section				
	01	Section Chief	672.60	E-5	1
	02	Acft Fuel Hand Sp	552.10	E-4	6
	03	Crash Rescue Sp	525.10	E-4	3
					10
14	Electronics Maintenance Section				
	01	Sr Air Sensor Rpmn	207.10	E-5	1
	02	Survl Photo Rpmn	401.30	E-5	4
	03	Avn Elect Eq Rpmn	284.20	E-5	2
	04	Aerial Sensor Mech (IR)	207.10	E-4	2
	05	Aerial Sensor Mech (SLAR)	296.10	E-4	2
	06	Avn Elect Equip Mech	284.10	E-4	5
	07	Radio Rpmn	296.10	E-4	1
					17
15	Aireraft Armaments Section				
	01	Acft Armaments Supv	427.60	E-6	1
	02	Sr Acft Armorer	427.10	E-5	2
	03	Acft Armorer	427.10	E-4	6
	04	Sr Ammo Storage Sp	411.60	E-6	1
	05	Ammo Storage Sp	411.10	E-4	3
					13

RECAPITULATION

0 - 27 WO - 3 EM - 174 AGGREGATE - 204

c. Equipment

LINE ITEM NO.	ITEM DESCRIPTION	NO. AUTH
	CHEMICAL ITEMS	
106505	Compressor reciprocating power driven	2
108050	Decontaminating apparatus portable 1½ qt	48
108171	Detector kit chemical agent VGH	5
	ENGINEER ITEMS	
202670	Bag water sterilizing cotton duck porous stitched seams 36-gal	2
222752	Compass magnetic 1.58 in diameter	20
226964	Draft mach 24 in. lg arm protr gad 0 to 360	2
226966	Draft inst set ofc	1
229910	Ext fire carbon diox charged hand 15 lb	12
230037	Ext fire monobromotrifluoromethane chg hand w/brkt 2.75 lb	3
232542	Filter separator liq fuel 50 gpm 75 psi 2 in.inlet 2 in.outlet	1
232872	Fire fighting equip set truck mtd Ch 300	1
232940	Flashlight plastic right angle 2 cell miniature flange lamp watertight	42
232941	Flashlight plastic baton 2 cell watertight	32
232942	Flashlight plastic right angle 2 cell miniature flange lamp explosion proof and watertight	5
233452	Forced entry and rescue equip set aircraft crash	1
235133	Generator set gas eng 3 kw DC 28 V skid shock mtd	4
235134	Generator set gas eng 5 kw 60 cy AC 120/240 120/208V skid mtd	1
235152	Generator set gas eng 1.5 kw 28 V	2
235155	Generator set dsl eng 15 kw 60 cy 3 ph 4 wire AC 120/208 240/416 V conv to 12.5 kw 50 cy skid mtd	1
235163	Generator set gas eng 1.5 kw 60 cy 1 ph 2 wire AC 120 V skid mtd	2
235205	Generator set gas eng 3 kw 60 cy 1 and 3 ph wire AC 120/240 V 120/208 V skid mtd	4
235624	Generator set gas eng 5 kw 400 cy 1 and 3 ph 4 wire reconnectable to 3 wire AC 120/240 120/208V air cooled skid shock mtd	2
235651	Generator set gasoline engine 7.5 kw DC 28.5 V 2 wire liquid cooled whl mtd 2 wheels	1
239614	Heater immersion liq fuel fired 30 in.lg of heater	12
239621	Heater immersion liq fuel fired 37¼ in.lg of heater	1
243805	Interpretation kit photographic	19
247984	Lettering set vert and ang lettering	2
249042	Light desk AC 115V to 125V lamps accomp lamp position adj rigid sec	10
249076	Light set gen illum 25 outlet	2

LINE ITEM NO.	ITEM DESCRIPTION	NO. AUTH
249086	Light traffic aircraft w/2 filters green red	1
249092	Light set marker emergency airfield runway ptbl battery operated	3
250575	Magnifier self-illuminated 2 in.dia	4
268860	Scale plot flat L shape 4 3/4 in.L meters yd 1:25,000 1:50,000	19
274210	Sprayer insect hand 2 gal cap	1
275565	Stereometer photogram 0 to 25mm	2
277540	Straight edge stl draft 42 in.L	2
280160	Table tracing drafting wood adj tilt 0 to 40 deg illum glass surface 30X24 in (48X36 in.top 37 in.H FSN 6675-641-5741)	2
289403	Trailer oxy servicing 3 whl	1
291490	T square 12 in.swvl hd 42 in.bl	2
	ORDNANCE ITEMS	
401088	Bayonet knife w/scabbard for 7.62mm rifle	201
401250	Binocular 7X50 military reticle	3
416404	Grinding machine utility bench mtr ¼ hp AC 110 V 60 cy 1 ph	3
417125	Gun machine 7.62mm lig tweight general purpose	4
420670	Launcher grenade 40mm	4
422950	Measuring and layout tool set machinist	1
425565	Mount tripod machine gun 7.62mm	4
429280	Pistol automatic cal .45	37
428300	Pistol pyrotechnic	1
435965	Rifle 7.62mm semi-automatic lt barrel	165
439005	Semi-trailer van cargo 6 ton 2 wheel	4
440004	Shop ser fld maint spare parts storage set no. 2	3
453890	Tool kit org maint no. 1 common	1
453905	Tool kit org maint no. 1 supplemental	1
453995	Tool kit sa rpmn	2
457110	Trailer amphibious cargo ¼ ton 2 wheel	2
457190	Trailer cargo 3/4 ton 2 wheel	10
457220	Trailer cargo 1½ ton 2 wheel	20
457495	Trailer tank water 1½ ton 2 wheel	4
460050	Truck cargo 3/4 ton 4X4	10
460110	Truck cargo 2½ ton 6X6 lwb	11
460141	Truck cargo 2½ ton 6X6 lwb w/wn	7
461328	Truck tank fuel servicing 2½ ton 6X6	4
461490	Truck tractor 5 ton 6X6 swb w/wn	7
461790	Truck utility ¼ ton 4X4	4
461828	Truck van expansible 2½ ton 6X6	2
461834	Truck van shop 2½ ton 6X6	1
461885	Truck wrecker medium 5 ton 6X6 w/wn	1
465380	Watch wrist grade II	29
465395	Watch wrist grade II type D	27

QUARTERMASTER ITEMS

LINE ITEM NO.	ITEM DESCRIPTION	NO. AUTH
500022	Accessory outfit gasoline field range 33 components	1
500559	Add-sub mach hand columnar 10 digit stationary carriage	2
503120	Barber kit	1
506300	Cabinet spare parts steel 11 drawers	11
510321	Case field office mach plywood 18-½ in. L 13-¼ in. W 17 in. D	9
510324	Case field office mach plywood 22½ in. L 13¼ in. W 17 in. D	3
510477	Control pressure filling non-vented drum 5 psi pressure shut off	1
510550	Cook set field	14
513139	Filing cabinet card size 16 in. 2 dwr for 3x5 cards	2
513129	Filing cabinet card size 16 in. 2 dwr for 5x8 cards	2
513302	Cleaner vacuum hand 26500 ft per minute discharge velocity	3
513620	Clock message center Chelsea clock M-2	1
515202	Cook set field 4 components	3
516300	Desk field plywood 20 7/8 in. W 14 7/16 in. H 15 5/8 in. D	3
518320	Desk field plywood 22 5/8 in. W 25 7/8 in. H 14½ in. D	4
519800	Dispensing pump hand driven continuous flow 12 gal per 100 rev.	1
524320	File visible index br unit 50 pkts	1
524890	Filing cabinet steel grey 4 dr H w/comb lock	5
526281	Food container insulated rectangular 5 gal capacity aluminum	8
528911	Filing cabinet map and plan steel grey 5 dr H 1 dr W	6
529100	Goggles sun wind dust 2 plastic colorless neutral grey	39
529969	Guidon nylon wool blank 1 ft 8 in. hoist 2 ft 3 3/4 in. fly	1
541075	Paulin ctn duck 17 ft lg 12 ft wd	6
549225	Range outfit field gasoline	3
552633	Repair kit tentage	1
554125	Safe 2 shelves 1 drawer 2 compartment 26 in. H 17 in. W 17½ in. D	2
554983	Screen laterine FMWWR OD 55 ft lg 8 pins 10 poles	2

LINE ITEM NO.	ITEM DESCRIPTION	NO. AUTH
555620	Sewing machine industrial darning pwr drvn 6 7/8 to 8 7/8 in. depth	1
555775	Sewing machine industrial gen treadle dr 10¼ in. throat	1
555927	Sewing machine industrial 12 in. throat wo table stand	1
558400	Sling carrying universal individual load	38
559290	Pumping assy flammable liquid bulk trans 225 gpm	1
561114	Stove gasoline burner 11 oz rated fuel tank cap	3
561225	Strapping kit steel strapping hand 3/4 in. to 2 in. strap W	1
562161	Table folding legs wood top and legs 36 in. L 24 in. W 27-32 in. H	19
563450	Tableware outfit field 14 components	5
565794	Tent frame type maint med lt metal FMWWR OD 32 ft lg	1
566001	Tent kitchen fly proof FMWWR olive drab complete w/pins and poles	1
566059	Tent liner for 32 ft tent frame type maint med lt metal	1
569051	Tool kit armorers 42 components	2
569151	Tool kit automotive mechanics 52 components	9
569850	Tool kit electricians 29 components	4
570336	Tool kit general use tools sig drawing TE-33	10
570931	Tool kit photographic repair 15 components w/ case	3
571325	Tool kit radar and radio 47 components	8
571733	Tool kit supplementary radar & radio repair sig P/N TD 88/U	2
575950	Trunk locker plywood 31 in. L 15 1/8 in. W 11 7/8 in. D w/tray	13
575870	Typewriter nonptble 13 in. paper size 42 to 44 keys elite type	1
575900	Typewriter nonptble 11 or 12 in.	2
575901	Typewriter nonptble 15 in.	2
575910	Typewriter 20 in. paper size 42 to 44 keys elite type nonptble	1
575970	Typewriter ptbl upper and lower case elite style 42 keys	3
576700	Table parachute pack sectional 4 sect 576 in. tot L 36 in. W 32 in. H	1
583660	Truck lift fork gas 6000 lb pneumatic tire rough terrain	2
588495	Tent maint frame type with liner frame pins	1
596684	Typewriter nonportable 14-15 in. carriage	5

SIGNAL ITEMS

LINE ITEM NO.	ITEM DESCRIPTION	NO. AUTH
602636	Analyzer portable compass TS-1662/ASW	1
603114	Antenna AT-984/C	5
603250	Antenna group RC-292	1
604010	Reeling machine cable hand RL-27B	1
604550	Barometer ML-102	1
608433	Camera set still picture KA-30A	17
609625	Charger radio detector PP-1578/PD	3
606932	Charger battery PR-1451/C	2
606970	Case BC-5	1
612945	Darkroom photographic ptbl ES-29	3
614915	Electronic tactical teletypewriter, security equipment TSEC/KW-7	1
616820	Frequency meter AN/URM-32	1
618094	Generator set diesel engine trailer mtd PU-402M	1
618102	Generator set 10KW gas eng tlr mtd PU-474M	2
618103	Generator set 45 KW diesel eng tlr PU-551M	2
618115	Generator set gas eng tlr mtd PU-290/MR	2
621124	Indicator standing wave radio AN/URM-120	1
622430	Dark room photo lab AN/TFQ-7	3
624981	Maintenance kit, electronic equipment MK-6521 1/APS-94	1
625002	Maintenance kit, electronic equipment MK-426/ARN	1
627520	Modification kit, electronic equipment MK-345/6R	1
628139	Multimeter AN/URM-105	10
628230	Multimeter TS-352/U	9
628314	Multimeter ME-26/U	1
628960	Ocilloscope OS-8U	1
630996	Plotting table photographic film AR-18	2
631511	Power supply PP-2953/U	1
631581	Power supply PP-1104/G	1
634620	Radiac set AN/PDH-27J	3
634670	Radiacmeter IM-93/UD	28
634671	Radiacmeter IM-174/PD	21
638400	Radio set AN/ARC-73	1
638600	Radio set AN/URC-10	36
641686	Radio set AN/GRR-5 mtd in truck van expansible	1
643107	Radio set AN/VRC-53 mtd in truck 2½ ton cargo	1
644300	Radio set AN/PRC-25	2
651204	Radio set AN/VRC-24 mtd in truck 3/4 ton cargo	1
651269	Radio set AN/VRC-24 mtd in truck van expansible	1
655201	Radio set AN/VRC-46 mtd in truck ¼ ton	1
655204	Radio set AN/VRC-46 mtd in van AN/TAQ-1	2
655701	Radio set AN/VRC-47 mtd in truck ¼ ton	1
655707	Radio set AN/VRC-47 mtd in truck 2¼ ton cargo	3

LINE ITEM NO.	ITEM DESCRIPTION	NO. AUTH
657124	Radio set control group AN/GRA-39	6
657222	Radio teletypewriter set AN/GRC-46	2
660000	Reeling machine cable hand RL-39	11
660120	Reeling machine cable hand RL-31	1
665028	Generator signal AN/URM-25	1
670356	Surveillance info cntr infrared AN/TAQ-1 mtd on truck 3/4 ton	2
672380	Switchboard telephone manual SB-22PT	2
678260	Telephone set TA-312/PT	17
681680	Terminal board TM-184	2
681715	Telegraph terminal group AN/TCC-14	1
682695	Generator signal BC-376	1
683375	Test set flight line AN/AMS-80	4
683407	Test set A-6 photograph cartridge ejector IM-27	1
683408	Test set photographic surveillance system LS-40A	1
683409	Test set photographic preflight LS-39	2
683801	Test set radar AN/GPM-46	2
683805	Test set radar AN/APM-176	1
685603	Test set optical alignment infrared AN/AAM-8	1
685621	Test set aircraft fuel system AN/AJM-1	1
685665	Test set electron tube TV-7/U	1
685684	Test set radar AN/APM-156	1
685795	Test system photographic surveillance LS-34	1
685810	Test target thermal AN/AAM-10	1
689616	Tool kit radio repairman TM-115 ( ) /G	7
689620	Tool kit radar and radio rpmm TK-87/U	17
689932	Tool kit battery service RK-90/G	1
689940	Tool kit photographic repair TK-166/GF	1
689943	Tool kit still picture camera maint LS-58	1
694790	Inverter vibrator PP-68/U	1
697839	Wind measuring set AN/PMQ-3	1
698400	Wire WD-1/TT RL-159/U	10
698535	Splicing kit telephone cable MK-356/G	1

TRANSPORTATION ITEMS

700840	Airplane combat surveillance	12
711740	Chain assy 5 gl leg w/pear links and 1 grab hook 5/8 in. by 1 ft	8
712730	Computer air navigation dead reckoning type MB-4	24
744410	Life preserver under arm aircraft gas or oral inflation	39
763200	Plotter aircraft scale 1: 500,000 and 1: 1,000,000	31

LINE ITEM NO.	ITEM DESCRIPTION	NO. AUTH
775400	Shop set acft maint stlr mtd A-1 tool crib elec flaw detect	1
775401	Shop set acft maint stlr mtd A-2 sheet metal welding hydraulic	1
775423	Shop set acft maint tlr mtd machine and eng shop	1
775424	Shop set acft maint stlr mtd B-5 propeller & rotor	1
775670	Shop set ord hdlg and servicing fld maint Army acft set A	1
784030	Tool kit aircraft inspection technical	3
784040	Tool kit aircraft mechanics general	45
784490	Tool kit airframe repairmans Army acft	3
784495	Tool kit engine and power train repairmans	2
784510	Tool kit hydraulic repairmen Army acft	1
784540	Tool kit propeller and rotor repairmen	2
785220	Tool set organizational maint Army acft set A	3
785230	Tool set organizational maint Army acft set A supplement	1
	Compressor reciprocating power drive M1A1 7 CPM	2
	TM-3-4240-206 15 May 59 respirator, paint, type M5	2
	Survival kits FSN 6545-611-0976	12
	Individual quick adjust harness	4
	Kit special tools Martin Baker	1
	Douglas bomb hoist	6
	Ordnance trailer Mark 7	6
	Multiple servicing unit MA-1	4
	Bomb lift sling	6
	Oxygen cart w/tanks	3
	DEVELOPMENTAL ITEMS	
960010	Artenna AT-791/C	1
	Survival kit FSN 6545-611-0978	24
	Liquid nitrogen generating plant Gas Engr Corp pn G215	1
	Electronic shop semi tlr mtd AN/ASM-189	4
	Electronic shop semi tlr mtd AN/ASM-190	2
	Zoom microscope model No. 53-1701 Bausch & Lomb	2
	Tube magnifier 10X Bausch & Lomb	2
	File visible index metal 19 dwr type	24
	Case set transportable storage (FSN 8115-663-0213)	1
	Air compressor lt wgt high pressure 110V 60 cy	2
	Stool revolving leg type with seat raising 30 in. wood (FSN 7110-269-9250)	12

LINE ITEM NO.	ITEM DESCRIPTION	NO. AUTH
	Light table Richards model GFL 918 mfg catalog no. 910103	4
	Power stereoscope Richards equip combination of 1 ea catalog no. 91533 & 2 ea catalog no. 960202	2
	Light table Richards model GFL 840 MC catalog no. 910421	2
	Optics kit Richards model MC2 catalog no. 960261	2
	Viewer-Printer Fairchild F 512 (Fairchild Camera & Instrument Corp, Syosset, New York)	3

2. RECOMMENDED PERSONNEL ADDITIONS

PAR

02 Operations Sergeant, E-7, MOS 907.70 (1) Required to assist operations officer in plans and operations of the company.

02 Flight Operations Chief, E-7, MOS 907.70 (1) Should be reduced from E-7 to E-6 MOS 907.60 because the operations sergeant will assist the operations officer in plans and operations.

03 Clerk Typist, E-4, MOS 711.10 (2) Two required for typing and clerical work of imagery interpretation section.

04 Senior Photo Lab Specialist, E-5, MOS 843.10 (1) Required for sustained operations of photo lab section.

04 Photo Lab Specialist, E-4, MOS 843.10 (2) Required for sustained operation of photo lab section.

05 Communications Chief E-5 to E-6 (1) Communications chief should be authorized E-6 grade because of increased size of section as per AR 611-201.

05 RTT Team Chief, E-5, MOS 053.60 (1) Required for operation of second AN/GRC-46 radio set.

05 RTT Operator, E-4, 053.10 (2) Required for operation of second AN/GRC-46 radio set.

05 Radio Repairman, E-4, MOS 296.10 (1) Required for maintenance of nineteen radio sets.

06 Platoon Sergeant, E-7, MOS 207.70 (1) Required for supervision and control of IR/SIAR platoon.

PAR

(*) Signal Platoon Commander, Capt, MOS 60210 (1) Required for command and control of signal platoon.

(*) Commo Electronics Repair Technician, WO, MOS 286A (1) Required for technical supervision of signal and electronics maintenance.

(*) Platoon Sergeant, E-7, MOS 284.70 (1) Required for supervision of signal platoon.

(*) Signal Supply Specialist, E-5, MOS 765.60 (1) Required for maintenance of signal supply system.

(*) Signal Supply Specialist, E-4, MOS 765.10 (1) Required for maintenance of signal supply system.

09 Aircraft Parts Specialist E-4, MOS 766.10 (1) NCOIC of aircraft supply section. Should be authorized E-5 grade as field maintenance supply responsibility has been added to normal company aircraft supply.

09 Clerk Typist E-4, MOS 711.10 (1) Required for typing and clerical assistance of technical inspectors.

10 Repair Foreman E-7, MOS 679.70 (1) Formerly in field maintenance section. Required for supervision of the organizational maintenance section.

10 Senior Airplane Mechanic, E-5, MOS 672.30 (2) Required for optimum maintenance effectiveness of aircraft service platoon.

10 Airplane Mechanic, E-4, MOS 672.20 (2) Required for optimum maintenance effectiveness of aircraft service platoon.

11 Sr Airframe Repairman, E-5, MOS 686.10 (2) Required for extensive repair of hostile fire damage.

11 Hydraulic Systems Repairman, E-5, MOS 687.10 (1) Required for backup and 24 hour maintenance capability.

11 Airplane Repairman, E-4, MOS 672.40 (2) Required for 3d echelon maintenance section.

11 Machinist, E-4, MOS 443.10 (1) Required for backup and 24 hour maintenance capability.

11 Supply Clerk (tool crib) E-3, MOS 760.10 (1) Required for operation of tool crib shop van for continuous operation.

PAR

11 Airplane Mech Helper, E-3, MOS 670.00 (2) Required for optimum maintenance by field maintenance section.

14 Senior Aerial Sensor Repairman, MOS 207.10 Should be raised from E-5 to E-6, MOS 207.60 commensurate with size of the section.

14 Aerial Infrared and SLAR Repairman, MOS 207.10 Should be authorized E-5 grade in line with new training and MOS structure.

14 Avionics Electronics Equipment Repairman, E-4, MOS 284.10 (1) Required for repair of doppler navigation systems.

3. RECOMMENDED EQUIPMENT ADDITIONS

Bayonet knife w/scabbard for 7.62mm rifle, line item 401088 (34) Required for one bayonet per person in the company.

Pistol automatic cal .45 line item 429280 (12) Required for one per officer, warrant officer, sensor operator, grenade launcher operator, and observer.

Rifle 7.62mm semi-automatic, lt barrel, line item 435965 (21) Required for additional recommended personnel.

Trailer Cargo 3/4 ton, 2 wheel, line item 457190 (3) Required with 3/4 ton trucks listed below.

Truck, cargo 3/4 ton 4X4, line item 460050 (3) Required for transportation of personnel and equipment in Ordnance Section, Aircraft Maintenance Section, and 3rd Echelon Maintenance Section.

Generator set diesel engine trailer, mtd PU 420/M, line item 618094 (2) Required for ES-29 photo labs.

Computer air navigation dead reckoning type MB-4, line item 712730 (3) One required per aviator.

Life Preserver under arm aircraft gas or oral inflation; line item 74410 (6) One per crew member, sensor operator, observer, and passenger in the utility aircraft.

Aircraft utility (1) Required for administrative and logistical support.

4. RECOMMENDED EQUIPMENT DELETIONS

Generator set gas eng 5 kw 60 cy AC 120 120/200 120/208V skid mtd, line item 235134 (1) Considered excessive to requirements of company.

Generator set gas eng 5 kw 400 cy 1 and 3 ph 4 wire reconnectable to 3 wire AC 120/240 120/208V air cooled skid shock mtd, line item 235624 (2) Considered excessive to requirements of the company.

Heater immersion liq fuel fired 30 in. lg of heater, line item 239614 (6) Considered excessive to the needs of the company.

Light traffic aircraft w/2 filters green red, line item 249086 (1) Considered excessive to the needs of the company.

Trailer cargo 1½ ton 2 wheel, line item 457220 (4) Not required for below deleted vehicles.

Truck, cargo 2½ ton 6X6 lwb, line item 460110 (4) Not required for airfield service section.

Case field office machine plywood 18⅜ L, 13½ W, 17 D, line item 510321 (1) Declared excessive to the requirements of the company.

Desk field plywood 22 5/8 in W, 25 7/8 in L, 14½ in D, line item 518320 (3) Declared excessive to the requirements of the company.

Goggles, sun wind dust 2 plastic colorless neutral grey, line item 529100 (6) Not required with deletion of certain vehicles.

Typewriter nonportable 15 in. line item 575901 (2) Considered excessive to the needs of the company.

Typewriter portable upper and lower case elite style 42 keys, line item 575970 (1) Considered excessive to the needs of the company.

Tent maint frame type with liner frame pins, line item 588495 (1) Considered excessive to the requirements of the company.

Typewriter non-portable 14-15 in. carriage, line item 596684 (4) Considered excessive to the needs of the company.

Charger battery PP-1451/G line item 606932 (1) Considered excessive to the needs of the company.

Camera set still picture KA-30A, line item 608433 (17) Should not be included in the TOE as separate line item since 12 are component parts of the 12 aircraft and five included as floats are obtainable through normal float procedures (SB 11-244).

Frequency meter AN/URM-32 line item 616820 (1) Not required by the company.

Darkroom photo lab AN/TFQ-7, line item 622430 (3) Considered excessive to the requirements of the company when the three ES-29 photo labs are available.

Plotting table photographic film AR-18, line item 630996 (1) Not required by the company.

Radio set AN/ARC-73 line item 638400 (1) Considered excessive to the needs of the company.

Radio set AN/URC-10, line item 638600 (12) Only 2 per aircraft are required.

Radio set AN/VRC-24 mtd in truck van expansible, line item 651269 (1) Considered excessive to the needs of the company.

Radio set AN/VRC-47 mtd in truck 2½ ton cargo, line item 655707 (3) Considered excessive to the needs of the company.

Test set aircraft fuel system AN/AJM-1, line item 685621 (1) Not required by the company.

Test target thermal AN/AAM-10, line item 685810 (1) Not required by the company.

Tool kit battery service TK-90/G, line item 689932 (1) Not required by the company.

Tool kit still picture camera maint IS58, line item 689943 (1) Not required as KA-30A deleted from TOE.

Wind measuring set AN/PMQ-3, line item 697839 (1) Not required by the company.

Plotter aircraft scale 1:500,000 and 1:1,000,000, line item 763200 (4) One required per aviator.

Individual quick adjust harness (4) Not required since each aircraft has two harnesses.

File visible index, metal, 19 dwr type (24) Not needed by the company.

(C) ANNEX F

DEFINITION OF TERMS

AAOS	Army Aviation Operations Section, an element of Joint Operations Center, MACV J-3.
Absolute altitude	The height of an aircraft directly above the surface or terrain over which it is flying.
Add-on targets	Target areas assigned for surveillance after the mission is airborne.
ARVN	Army of the Republic of Vietnam
Availability (aircraft)	The term aircraft availability as used in this report means that the basic aircraft is available and safe to fly.
Avionics	Aviation electronics.
COMUSMACV	Commander, United States Military Assistance Command, Vietnam.
CRT	Cathode ray tube
CSA	Consolidated Supply Agency
Deficiency	Deficiencies are defects or malfunctions discovered during the life cycle of a piece of equipment that constitute a safety hazard to personnel, will result in serious damage to the equipment if operation is continued, or indicate improper design or other cause, which seriously impairs the equipment operational capability. A deficiency normally disables or immobilizes the equipment.
Emissions (IR)	Infrared radiation distinctly above the normal background radiation level recorded on IR imagery.
Float aircraft	Immediately available replacement aircraft, normally assigned to maintenance companies to issue against combat losses or aircraft undergoing extensive maintenance.

Immediate mission ———— A mission generated by unforseen requirements for immediate intelligence information. A portion of the air effort is allocated to meet this requirement. Aerial surveillance requests for immediate missions are performed as expeditiously as possible and may be allocated by diverting preplanned flights from important missions.

In-flight spot reports ——— One-time reports containing information or intelligence for which speed of transmission is a prime essential. The aircraft's radios are used.

IP - Initial point ———— A well-defined point easily distinguished visually, used as a starting point for a surveillance run over a target.

IPIR ———————————— Immediate photo intelligence report

IR ———————————— AN/UAS-4 Aerial Infrared System

Mission ———————————— The dispatching of one or more aircraft to accomplish a specific task or tasks.

Mission ready (aircraft) —— The term mission ready aircraft as used in this report means that the aircraft is capable of safe flight and all equipment necessary to perform its primary mission is on board and operational.

Multi sensor surveillance —— Simultaneous surveillance of a point or area target by more than one surveillance means.

Preplanned mission ———— Anticipated requirements for intelligence information are met by preplanned missions. The most productive results accrue from aerial surveillance missions when planning is initiated in advance of operations. This procedure permits proper selection and allocation of platforms and sensors and allows thorough briefings for operational personnel.

Shortcomings ———————— Shortcomings are imperfections or malfunctions discovered during the life cycle of equipment which should be reported and

	which must be corrected to increase the efficiency and to render the equipment completely serviceable. It will not cause an immediate breakdown, jeopardize safe operation, or greatly reduce the usability or the material or end product.
SLAR	AN/APS-94 (A) Side Looking Airborne Radar System
Sortie	One sortie is one aircraft making one take-off and one landing for purposes of acquiring or delivering information, imagery, ordnance, personnel, or fuel.
Spot report	The spot report is rendered at the earliest possible time after the imagery is interpreted. It provides information in response to the specific purpose for which the mission was flown, or reports any new developments vital to current operations. The report is disseminated by the most rapid means of communications available.
Target of military significance	Actual or probable enemy activity as determined by review of all available information.
Target area	A specific location defined by one or more coordinates to be surveyed.
TRAC - RPI Branch	The Target Research Analysis Center - Reconnaissance and Photographic Intelligence Branch.

(U) ANNEX G

EQUIPMENT FAULTS

1. DEFICIENCIES

None.

2. SHORTCOMINGS

Shortcoming	Suggested Corrective Action	Remarks
Accuracy of the AN/APN-129 Doppler and Marconi Computer Composite System was not satisfactory to aviators although maintenance found no faults in either system.	None recommended.	A newer, standard system has been type-classified and is identified as the AN/ASN-64, for use in OV-1 aircraft. In this system both the radar and the computer are manufactured by the same company (Marconi).
Lack of film brackets on the base of the Richards light table, IB-46, created difficulty in the handling of imagery.	Provide film brackets for base.	Film must be rolled by hand. Spools often rolled off the table and unravelled on the floor. See figure G-1.

(U) FIGURE G-1. Richards light table, model IB-46.

(C) ANNEX H

TOE FOR US ARMY AVIATION COMPANY (AERIAL SURVEILLANCE)
RECOMMENDED BY ACTIV

It is the conclusion of the Army Concept Team in Vietnam that the 73d Aviation Company (AS) functioned effectively as a unit, accomplished the assigned surveillance mission consistant with their resources, and had a positive effect on the success of tactical operations in RVN. However, the limited number of aircraft available made it impossible to support all the areas in RVN requiring reconnaissance and surveillance and rigid priorities had to be established by J3 MACV. In view of the need for an expanded electronic reconnaissance surveillance effort, it is recommended that the TOE presented in annex H be adopted in order to provide effective support to an army headquarters or a corps in RVN.

This TOE differs from TOE 1-128T (Modified) and changes recommended in annex E primarily in the number and mix of electronic sensors (three SLAR and nine IR). The total number of assigned aircraft (12) remains the same, but the 6 OV-1A's presently authorized would be exchanged for 1 OV-1B (SLAR) and 5 OV-1C (IR) aircraft. The current IR/SLAR platoon and visual/photo platoon would be replaced by an aerial surveillance platoon with four sections (one SLAR and three IR) of three aircraft each. For sustained 24-hour operations, an increase in personnel of one aviator and eight aerial sensor operators would be required to augment the currently authorized TOE 128-T (Modified) and its recommended additions, deletions, and changes (annex E).

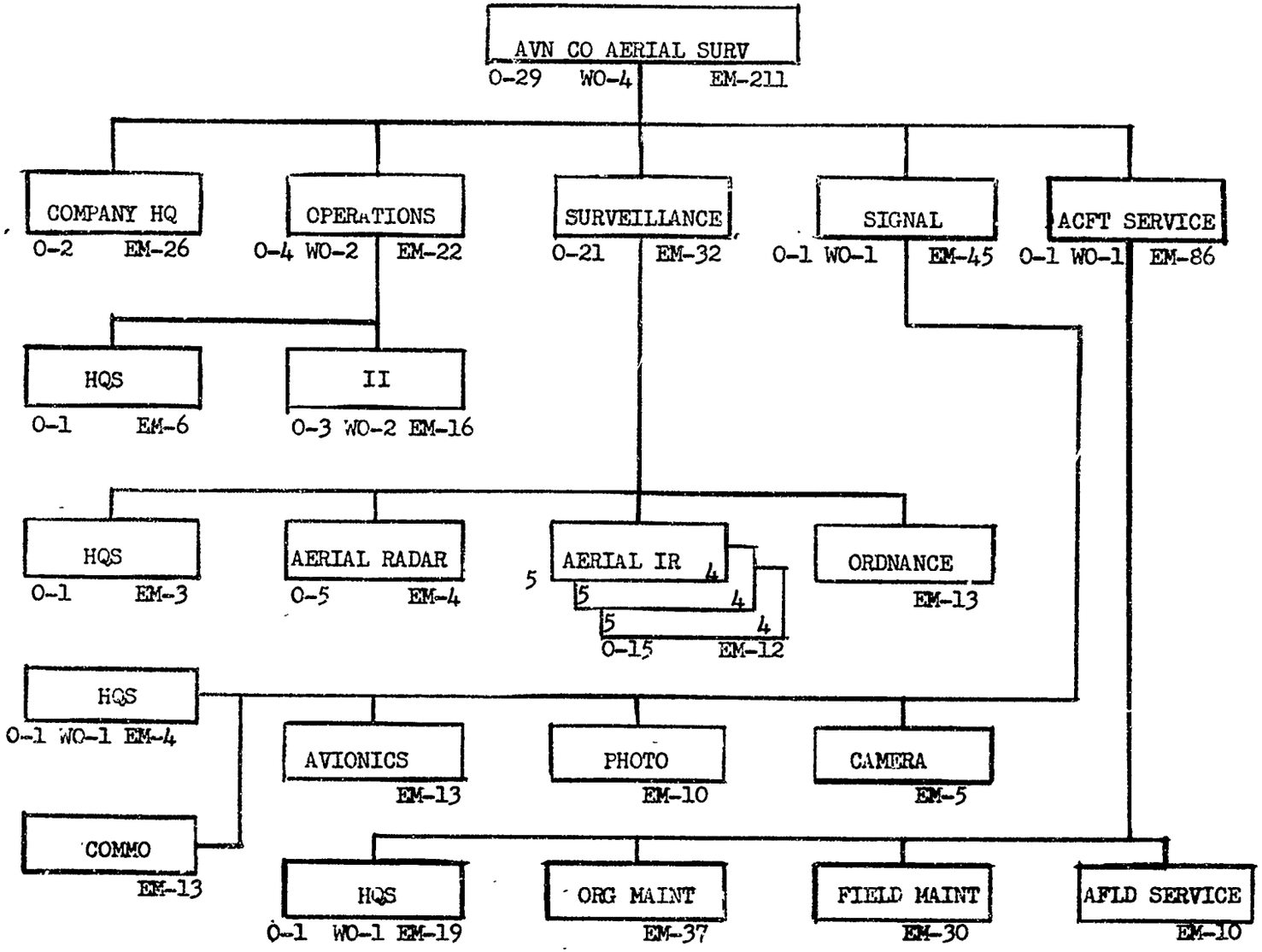
Although emphasis is placed on electronic surveillance means, the photo/visual capability of the company will be retained, in that all OV-1 series aircraft would be equipped with the KA-30 aerial camera. In addition, the OV-1C's would also be equipped with the KA-60 forward looking panoramic cameras presently installed in the OV-1A aircraft.

It is anticipated that the requirement for visual surveillance and reconnaissance missions by OV-1 aircraft will be reduced. An integrated plan for visual surveillance, using O-1 and U-17 observation aircraft, has been established by COMUSMACV. These aircraft will be allocated to corps, divisions, and subordinate units as required to provide direct reconnaissance support to unit intelligence staffs. The visual reconnaissance capability of the OV-1 series aircraft will, however, still be organic.

The need for increased IR and SLAR equipped aircraft is best shown by comparing the average daily aircraft availability and area of coverage using the present mix of OV-1B and OV-1C aircraft with the anticipated aircraft availability and area of coverage using the proposed TOE. Projected operational capabilities are derived from actual operational factors.

The average size of area taken under IR surveillance daily by the 73d Aviation Company (AS) was 450 square kilometers, or approximately 2 percent of an average ARVN corps area. Since an average of two IR aircraft was available during each 24-hour period, each aircraft covered approximately one percent of an average corps area nightly. With nine OV-1C aircraft assigned, six aircraft would normally be flyable during the average 24-hour period. The increased number of IR aircraft, coupled with shorter distances to target areas because the airplanes would be stationed within the corps area, would allow for IR coverage up to 10 percent of the average corps area daily.

The average area taken under daily surveillance with the SLAR was 27,465 square kilometers, which is slightly larger than the average ARVN corps area. Since an average of only one OV-1B per day was available, considerable distances were flown before reversing course on most missions. As a result, targets located on the initial pass could not always be identified on the return pass, thereby making it impossible to determine their direction and speed of movement. With three OV-1B's assigned, an average of two should be available daily. This would allow the aircraft to fly in trail over the entire corps area or individually over shorter flight patterns.


AVN CO AERIAL SURV
0-29 WO-4 EM-211
COMPANY HQ
0-2 EM-26
OPERATIONS
0-4 WO-2 EM-22
SURVEILLANCE
0-21 EM-32
SIGNAL
0-1 WO-1 EM-45
ACFT SERVICE
0-1 WO-1 EM-86
HQS
0-1 EM-6
II
0-3 WO-2 EM-16
HQS
0-1 EM-3
AERIAL RADAR
0-5 EM-4
AERIAL IR
5
4
5
4
5
4
0-15 EM-12
ORDNANCE
EM-13
HQS
0-1 WO-1 EM-4
AVIONICS
EM-13
PHOTO
EM-10
CAMERA
EM-5
COMMO
EM-13
HQS
0-1 WO-1 EM-19
ORG MAINT
EM-37
FIELD MAINT
EM-30
AFLD SERVICE
EM-10

2. PERSONNEL RECOMMENDED

PAR	LINE	DESIGNATION	MOS	GRADE	NO. RECOMMENDED
01		Company Headquarters			
	01	Company Commander	1983	Major	1
	02	Executive Officer	1983	Capt	1
	03	First Sergeant	672.80	E-8	1
	04	Mess Steward	941.60	E-6	1
	05	Supply Sergeant	768.60	E-6	1
	06	First Cook	941.10	E-5	3
	07	Armorer	768.20	E-4	1
		Company Clerk	716.10	E-4	1
	09	Cook	941.10	E-4	3
	10	Cooks Helper	940.00	E-3	1
	11	Lt Truck Driver	710.00	E-3	1
	12	Supply Clerk	760.00	E-3	1
	13	Motor Sergeant	631.60	E-6	1
	14	Sr Power Gen Sp	351.20	E-5	1
	15	Sr Wheel Veh Mech	631.10	E-5	1
	16	Ordnance Parts Sp	763.10	E-4	1
	17	Power Gen Sp	351.20	E-4	3
	18	Wheel Veh Mech	631.10	E-4	2
	19	Wrecker Operator	631.10	E-4	1
	20	Wheel Veh Mech Helper	630.00	E-3	2
					28
02		Operations Platoon Headquarters			
	01	Flight Op Officer	1982	Capt	1
	02	Operations Sergeant	907.70	E-7	1
	03	Flight Op Chief	907.70	E-6	1
	04	Sr Flight Op Sp	907.10	E-5	1
	05	Flight Op Sp	907.10	E-4	2
	06	Flight Op Helper	907.10	E-3	1
					7
03		Imagery Interpretation Section			
	01	Imagery Interp Officer	9309	Capt	1
	02	Asst Imagery Interp Officer	9309	Lt	2
	03	Imagery Interp Tech	962A	WO	2
	04	Section Sergeant	969.70	E-7	1
	05	Imagery Interp Sgt	969.10	E-6	2
	06	Imagery Interp	969.10	E-5	8
	07	Imagery Interp	969.10	E-4	3
	08	Clerk Typist	711.10	E-4	2
					21

PAR	LINE	DESCRIPTION	MOS	GRADE	NO. RECOMMENDED
04		Surveillance Platoon Headquarters			
	01	Platoon Commander	1980	Capt	1
	02	Platoon Sergeant	207.70	E-7	1
	03	Lt Truck Driver	670.00	E-3	2
					4
05		Aerial Radar Section			
	01	Section Leader	1980	Capt	1
	02	Fixed Wing Aviator	1980	It	4
	03	Sr Aerial Sensor Op	207.60C	SP/6	1
	04	Aerial Sensor Op	207.10C	SP/5	3
					9
06		Aerial Infrared Section (3)			
	01	Section Leader	1980	Capt	3
	02	Fixed Wing Aviator	1980	1/Lt	12
	03	Senior Aerial Sensor Op	207.60D	SP/6	3
	04	Aerial Sensor Op	207.10D	SP/5	9
					27
07		Ordnance Section			
	01	Aircraft Armaments Spv	427.60	E-6	1
	02	Sr Aircraft Armorer	427.10	E-5	2
	03	Aircraft Armorer	427.10	E-4	6
	04	Sr Ammo Storage Sp	411.60	E-6	1
	05	Ammo Storage Sp	411.10	E-4	3
					13
08		Signal Platoon Headquarters			
	01	Platoon Commander	60210	Capt	1
	02	Comm Elec Equip Rpmn	286A	WO	1
	03	Platoon Sergeant	284.70	E-7	1
	04	Signal Supply Sp	765.60	E-5	1
	05	Signal Supply Sp	765.10	E-4	2
					6
09		Communications Section			
	01	Communciations Chief	311.60	E-6	1
	02	Radio TT Chief	053.60	E-5	2
	03	Radio TT Operator	053.10	E-4	4
	04	Wireman	310.00	E-4	3
	05	Radio Repairman	296.10	E-4	2
	06	Switchboard Operator	310.00	E-4	1
					13
10		Avionics Repair Section			
	01	Sr Aerial Sensor Rpmn	207.60	E-6	1
	02	Avn Elec Equip Rpmn	284.20	E-5	2
	03	Aerial Infrared Rpmn	207.10	E-5	2
	04	SLAR Repairman	207.10	E-5	2
	05	Avn Elec Equip Rpmn	284.10	E-4	6
					13

PAR	LINE	DESCRIPTION	MOS	GRADE	NO. RECOMMENDED
11		Photo Laboratory Section			
	01	Photo Lab Supv	843.60	E-6	1
	02	Sr Photo Lab Sp	843.10	E-5	3
	03	Photo Lab Sp	843.10	E-4	6
					10
12		Camera Repair Section			
	01	Sr Surv Photo Rpmn	401.30	E-4	4
	02	Photo Equip Rpmn	401.20	E-4	1
					5
13		Aircraft Service Platoon Headquarters			
	01	Platoon Commander	64823	Capt	1
	02	Airplane Maint Tech	67100	WO	1
	03	Platoon Sergeant	672.70	E-7	1
	04	Airplane Tech Insp	679.40	E-6	2
	05	Aircraft Parts Sp	766.10	E-5	1
	06	Aircraft Parts Sp	766.10	E-4	2
	07	Shop Clerk	711.10	E-4	1
	08	Clerk Typist	711.10	E-4	1
	09	Aircraft Supply Clerk	760.00	E-3	1
					11
14		Organizational Maintenance Section			
	01	Repair Foreman	679.70	E-7	1
	02	Section Chief	672.20	E-6	2
	03	Crew Chief	672.20	E-5	12
	04	Senior Aircraft Mech	672.20	E-5	8
	05	Aircraft Mech	672.20	E-4	10
	06	Aircraft Mech Helper	670.00	E-3	4
					37
15		Aircraft Field Maintenance Section			
	01	Repair Foreman	679.70	E-7	1
	02	Machinist	443.10	E-5	1
	03	Sr Aircraft Rpmn	672.40	E-5	2
	04	Sr Acft Eng Rpmn	681.10	E-5	1
	05	Sr Prop Rpmn	684.70	E-5	1
	06	Sr Elect Rpmn	685.10	E-5	1
	07	Sr Airframe Rpmn	686.10	E-5	3
	08	Parachute Packer	464.27	E-5	1
	09	Hydraulic System Rpmn	678.10	E-5	1
	10	Airplane Rpmn	672.40	E-4	4
	11	Aircraft Eng Rpmn	681.10	E-4	2
	12	Elec Rpmn	685.10	E-4	2
	13	Parachute Packer	464.27	E-4	2
	14	Propellor Rpmn	684.10	E-4	1
	15	Airframe Rpmn	686.10	E-4	2

PAR	LINE	DESCRIPTION	MOS	GRADE	NO. RECOMMENDED
15	16	Hydraulic Sys Rpmn	687.10	E-4	1
	17	Machinist	443.10	E-4	1
	18	Supply Clerk (Tool Crib)	760.10	E-3	1
	19	Airplane Mech Helper	670.00	E-3	1
					30
16		Airfield Service Section			
	01	Section Chief	672.60	E-5	1
	02	Acft Fuel Hand Sp	552.10	E-4	6
	03	Crash Rescue Sp	525.10	E-4	3
					10

RECAPITUIATION:

Officers - 29 Warrant Officers - 4 Enlisted Men - 211 Aggregate - 244

3. EQUIPMENT RECOMMENDED

LINE ITEM NO.	ITEM DESCRIPTION	NO. RECOMMENDED
	Company Headquarters	
106505	Compressor reciprocating power drive	1
108050	Decontaminating apparatus portable 1½ qt	13
108171	Detector kit chemical agent VGH	1
202670	Bag water sterilizing cotton duck porous stitched seams 36 gal	2
222752	Compass magnetic lensatic 1.58 in. dia card	20
229910	Extinguisher fire carbon dioxide charged hand 15 lb	9
232940	Flashlight plastic right angle 2 cell minature flange lamp watertight	9
235163	Generator set gas eng 1.5 KW 60 cy 1 hp 2 wire ac 120 skid mtd	1
239614	Heater immersion liq fuel fired 30 in. lg of heater	6
239621	Heater immersion liq fuel fired 37¼ in. lg of heater	1
274210	Sprayer insect hand 2 gal cap	1
401088	Bayonet knife w/scabbard for 7.62mm rifle	28
401250	Binocular 7 X 50 military reticle	1
417125	Gun machine 7.62mm lightweight general purpose	4
420670	Launcher grenade 40mm	2
425565	Mount tripod machine gun 7.62mm	4
429280	Pistol automatic cal .45	5
435965	Rifle 7.62mm semiautomatic lt barrel	23
453890	Tool kit org maint no. 1 common	1
453905	Tool kit org maint no. 1 supplemental	1

LINE ITEM NO.	ITEM DESCRIPTION	NO. RECOMMENDED
453995	Tool kit [illegible] rpmm	2
457110	Trailer amphibious cargo ¼ ton 2 wheel	1
457190	Trailer cargo 3/4 ton 2 wheel	2
457220	Trailer cargo 1½ ton 2 wheel	3
457495	Trailer tank water 1½ ton 2 wheel	1
460050	Truck cargo 3/4 ton 4X4	2
460110	Truck cargo 2½ ton 6X6	2
460141	Truck cargo 2½ ton lwb w/wn	2
461790	Truck utility ¼ ton 4X4	2
461885	Truck wrecker medium 5 ton 6X6 w/wn	1
465380	Watch wrist grade II	29
465385	Watch wrist grade II type D	27
500022	Accessory outfit gasoline field range 33 components	1
503120	Barber kit	1
510324	Case field office mach plywood 22½ in.L 13¼ in.W 17 in.D	1
510550	Cook set field	14
515202	Cook set field 4 components	3
524890	Filing cabinet steel grey 4 door H w/comb lock	1
526281	Food container insulated rectangular 5 gal capacity aluminum	8
529100	Goggles sun wind dust 2 plast colorless neutral grey	9
529969	Guidon nylon-wool blank 1 ft 8 in.hoist 2 ft 3 3/4 in.fly	1
541075	Paulin ctn duck [illegible] ft lg 20 ft wd	3
549225	Range outfit field gasoline	3
552633	Repair kit tentage	1
554983	Screen latrine FMWWR OD 55 ft lg 8 pins 10 poles	2
558400	Sling carrying universal individual load	38
561114	Stove gasoline burner 11 oz rated fuel tank cap	3
561225	Strapping kit steel strapping hand 3/4 in. to 2 in.strap	1
562161	Table folding legs wood top and legs 36 in.L 27 in.W 27 25/32 in.H	4
563450	Tableware outfit field 14 components	5
565794	Tent frame type maint med lt metal FMWWR OD 32 ft lg	1
566001	Tent kitchen fly proof FMWWR OD complete w/pins and poles	1
566059	Tent liner for 32 ft tent frame type maint mdm lt metal	1
569151	Tool kit automotive mechanics 52 components	9
569850	Tool kit electricians 29 components	4

LINE ITEM NO.	ITEM DESCRIPTION	NO. RECOMMENDED
570336	Tool kit general use tools sig drawing TE-33	1
575870	Typewriter nonportable 13 in. paper size 42 to 44 keys elite type	1
575950	Trunk locker plywood 31 in. L 15 1/8 in. W 11 7/8 in. D w/tray	1
575970	Typewriter portable upper and lower case elite type 42 keys	1
588537	Tent GP small w/cover line pins poles vestibule	10
604550	Barometer ML-102	1
609625	Charger radiac detector PR-1567/PF	3
628230	Multimeter TS-352/U	4
634670	Radiacmeter IM-93/UD	8
634671	Radiacmeter IM-174-PD	2
655701	Radio set AN/VRC-47 mtd in truck 1/4 ton	1
657124	Radio set control group AN/GRA-39	1
660000	Reeling machine cable hand RL-39	1
678260	Telephone set TA-312/PT	3
711740	Chain assy sgl leg w/pear links and 1 grab hook 5/8 in. by 16 ft	5
712730	Computer air navigation dead reckoning type MB-4	2
744410	Life preserver under arm aircraft gas or oral inflation	2
763200	Plotter aircraft scale 1:500,000 and 1:1,000,000	2
	Operations Platoon Headquarters	
108050	Decontaminating aparatus portable 1½ qt	3
108171	Detector kit chemical agent VGH	1
232940	Flashlight plastic right angle 2 cell miniature flange lamp watertight	4
235155	Generator set dsl eng 15 kw 60 cyc skid mtd	1
249076	Light set gen illum 25 outlet	1
401088	Bayonet knife w/scabbard for 7.62mm rifle	7
420670	Launcher grenade 40mm	1
428300	Pistol pyrotechnic	1
429280	Pistol automatic cal .45	3
435965	Rifle 7.62mm semiautomatic lt barrel	4
457110	Trailer amphibious cargo ¼ ton 2 wheel	1
461790	Truck utility ¼ ton 4X4	1
500559	Add-sub mach hand columnar 10 digit stationary carriage	1
510321	Case field office mach plywood 18½ in. L 13½ in. W 17 in. D	1
513620	Clock message center Chelsea clock M-2	1
516300	Desk field plywood 20 7/8 in. W 14 7/16 in. H 15 5/8 in. D	1

LINE ITEM NO.	ITEM DESCRIPTION	NO. RECOMMENDED
528911	Filing cabinet 5 dr map and plan steel grey	2
529100	Goggles sun wind dust 2 plast colorless neutral grey	2
554125	Safe 2 shelves 1 dwr 2 compartment 26 in.H 17 in.W 17½ in.D	1
562161	Table folding legs wood top and legs 36 in.L 24 in.W 27 25/32 in.H	6
570336	Tool kit general use tools sig drawing TE-33	1
575900	Typewriter non-portable 11 or 12 in. paper size	2
575910	Typewriter non-portable 20 in. paper size 42 to 44 keys elite type	1
575950	Trunk locker plywood 31 in.L 15 1/8 in.W 11 7/8 in.D w/tray	2
603114	Antenna AT-984/G	2
631511	Power supply PP/2953/U	1
634670	Radiacmeter IM-93/UD	2
634671	Radiacmeter IM-174-PD	2
651200	Radio set AN/VRC-24 mtd in 3/4 ton truck	1
655201	Radio set AN/VRC-46 mtd in truck ¼ ton	1
657124	Radio set control group AN/GRA-39	1
678260	Telephone set TA-312/PT	2
	Utility airplane	1
711740	Chain assy sgl leg w/pear links and 1 grab hook 5/8 in.by 16 ft	1
712730	Computer air navigation dead reckoning type MB-4	1
744410	Life preserver under arm aircraft gas or oral inflation	6
763200	Plotter aircraft scale 1:500,000 and 1:1,000,000	1
960010	Antenna AT-791/G	1
	Imagery Interpretation Section	
108050	Decontaminating apparatus portable 1½ qt	4
226964	Draft mach 24 in.lg arm protr grad 0 to 360 deg	2
226966	Draft inst set ofc	1
243805	Interpretation kit photographic	19
247984	Lettering set vert and ang lettering	2
249042	Light desk AC 115 V to 125 V lamps accomp lamp position adj rigid sec	10
250575	Magnifier self-illuminated 2 in.dia	4
268860	Scale plot flat L shape 4 3/4 in.L meters yd 1:25,000 1:50,000	19
275565	Stereometer photogram 0 to 25mm	2
277540	Straight edge stl draft 42 in lg	2
280160	Table tracing drafting wood adj tilt 0 to 40 deg illum glass surface 36X24 in.(48X36 in.top 37 in.H FSN 6675-641-5741)	2

LINE ITEM NO.	ITEM DESCRIPTION	NO. RECOMMENDED
401088	Bayonet knife w/scabbard for 7.62mm rifle	21
429280	Pistol automatic cal .45	5
435965	Rifle 7.62mm semi-automatic lt barrel	16
457190	Trailer cargo 3/4 ton 2 wheel	2
457220	Trailer cargo 1½ ton 2 wheel	1
460050	Truck cargo 3/4 ton 4X4	2
461828	Truck van expansible 2½ ton 6X6	2
510321	Case fld office mach plywood 18½ in.L 13¼ in.W 17 in.D	2
513129	Filing cabinet card size 16 in. 2 dr for 5X8 in. cards	2
513139	Filing cabinet card size 16 in. 2 dr for 3X5 in. cards	2
524890	File cab steel grey 4 dr w/comb lock	4
528911	File cab map and plan steel grey 5 dr	4
562161	Table folding legs wood top 36 in.L 24 in.W 27 in.H	4
575970	Typewriter ptbl upper and lower case elite style 42 keys	2
596684	Typewriter non-portable 14 to 15 in. carriage	1
618115	Gen set gas eng tlr mtd PU-290/MR	2
641686	Radio set AN/GRR-5 mtd in truck van expansible	1
678260	Telephone set TA-312 PT	4
	Zoom microscope model no. 53-71-01 Bausch & Lomb	2
	Tube magnifier 10X Bausch & Lomb	2
	Stool revolving leg with seat raising 30 in wood FSN 7110-269-9250	12
	Light table Richards model GFL 918 mfg catalog no. 910103	4
	Power stereoscope Richards Equip Corp combination of 2 ea catalog no. 91533 & 2 ea catalog no. 960202	2
	Optics kit Richards model MC2 catalog no 960261	2
	Viewer-printer Fairchild model F512 (Fairchild Camera & Instrument Corp, Syosset, New York)	3
	Light table Richards Model GFL 940 MC catalog no 910421	2
	Surveillance Platoon Headquarters	
108050	Decontaminating apparatus portable 1½ qt	1
108171	Detector kit chemical agent VGH	1
232940	Flashlight plastic right angle 2 cell minature flange lamp watertight	2
401088	Bayonet knife w/scabbard for 7.62mm rifle	4
429280	Pistol automatic cal .45	2
435965	Rifle 7.62mm semi-automatic lt barrel	2

LINE ITEM NO.	ITEM DESCRIPTION	NO. RECOMMENDED
457110	Trailer utility ¼ ton 2 wheel	1
457190	Trailer cargo 3/4 ton 2 wheel	2
460050	Truck cargo 3/4 ton 4X4	2
461790	Truck utility ¼ ton 4X4	1
618102	Generator set gas eng trailer mtd PU 474/M	2
634670	Radiacmeter IM-93/UD	1
634671	Radiacmeter IM-174/PD	1
655204	Radio set AN/VRC-46 mtd in van AN/TAQ-1	2
670356	Surveillance information center infrared AN/TAQ-1	2
678260	Telephone set TA-312/PT	1
712730	Computer air navigation dead reckoning MB-4	1
744410	Life preserver under arm aircraft gas or oral inflation	1
763200	Plotter aircraft scale 1:500,000 and 1:1,000,000	1
	Aerial Radar Section	
108050	Decontaminating apparatus portable 1½ qt	1
232940	Flashlight plastic right angle 2 cell minature flange lamp watertight	5
401088	Bayonet knife w/scabbard for 7.62mm rifle	9
429280	Pistol automatic cal .45	9
634670	Radiacmeter IM-93/UD	2
634671	Radiacmeter IM-174/PD	1
638600	Radio set AN/VRC-10	6
678260	Telephone set TA-312/PT	1
700840	Airplane combat surveillance	3
712730	Computer air navigation dead reckoning MB-4	5
744410	Life preserver under arm aircraft gas or oral inflation	9
763200	Plotter aircraft scale 1:500,000 and 1:1,000,000	5
	Aerial Infrared Sections (3)	
108050	Decontaminating apparatus portable 1½ qt	3
232940	Flashlight plastic right angle 2 cell minature flange lamp watertight	15
401088	Bayonet knife w/scabbard for 7.62mm rifle	27
429280	Pistol automatic cal .45	27
634670	Radiacmeter IM-93/UD	3
634671	Radiacmeter IM-174/PD	3
638600	Radio set AN/VRC-10	18
678260	Telephone set TA-312/PT	3
700840	Airplane combat surveillance	9
712730	Computer air navigation dead reckoning MB-4	15
744410	Life preserver under arm aircraft gas or oral inflation	27
763200	Plotter aircraft scale 1:500,000 and 1:1,000,000	15

LINE ITEM NO.	ITEM DESCRIPTION	NO. RECOMMENDED
	Ordnance Section	
106505	Compressor reciprocating power drive	1
108050	Decontaminating apparatus portable 1½ qt	2
232940	Flashlight plastic right angle 2 cell minature flange lamp watertight	6
401088	Bayonet knife w/scabbard for 7.62mm rifle	13
435965	Rifle 7.62mm semi-automatic lt barrel	13
457190	Trailer cargo 3/4 ton 2 wheel	1
457220	Trailer cargo 1½ ton 2 wheel	1
460050	Truck cargo 3/4 ton 4X4	1
460110	Truck cargo 2½ ton 6X6 lwb	1
569051	Tool kit armorers 42 components	2
583660	Truck lift fork gas 6000 lb pneumatic tire rough terrain	2
634670	Radiacmeter IM-93/UD	2
634671	Radiacmeter IM-174/PD	2
	Douglas bomb hoist	6
	Ordnance trailer mark 7	6
	Bomb lift sling	6
	Signal Platoon Headquarters	
108050	Decontaminating apparatus portable 1½ qt	1
232940	Flashlight plastic right angle 2 cell minature flange lamp watertight	3
401088	Bayonet knife w/scabbard for 7.62mm rifle	6
429280	Pistol automatic cal .45	3
435965	Rifle 7.62mm semi-automatic lt barrel	3
634670	Radiacmeter IM-93/UD	1
634671	Radiacmeter IM-174/PD	1
712730	Computer air navigation dead reckoning MB-4	1
744410	Life preserver under arm aircraft gas or oral inflation	1
763200	Plotter aircraft scale 1:500,000 and 1:1,000,000	1
	Electronic shop semi-trailer mtd AN/ASM-190	1
	Communication Section	
108050	Decontaminating apparatus portable 1½ qt	2
232940	Flashlight plastic right angle 2 cell minature flange lamp watertight	1
235133	Generator set gas engine 3 kw dc 28 V skid shock mtd	2
235152	Generator set gas engine 1.5 kw dc 28 V skid mtd	2
235163	Generator set gas engine 1.5 kw 60 cy 1 ph 2 wire AC 120 V skid mtd	1
401088	Bayonet knife w/scabbard for 7.62mm rifle	13
435965	Rifle 7.62mm semi-automatic lt barrel	13
457190	Trailer cargo 3/4 ton 2 wheel	2

LINE ITEM NO.	ITEM DESCRIPTION	NO. RECOMMENDED
460050	Truck cargo 3/4 ton 4X4	2
510321	Case field office machine plywood 18½ in.H 13¼ in.W 17 in D	1
554125	Safe 2 shelves 1 dwr 2 compartment 26 in.H 17 in.W 17½ in.D	1
570336	Tool kit general use tools TE-33	8
571325	Tool kit radar & radio 47 components	8
571733	Tool kit supp radar & radio repair TK 98/U	2
603114	Antenna AT-984 G	3
603250	Antenna group RC 292	1
604010	Reeling machine hand RL 27B	1
609670	Case BC-5	1
614915	Electronic tactical teletypewriter security equipment TSEC/KW-7	1
628139	Multimeter AN/URM-105	2
628230	Multimeter TS-352/U	1
634670	Radiacmeter IM-93/UD	3
634671	Radiacmeter IM-174/PD	1
644300	Radio set AN/PRC-25	2
657124	Radio set control group AN/GRA 39	4
657222	Radio teletypewriter set AN/GRC-46	2
660000	Reeling machine cable rand RL-39	2
660120	Reeling machine cable hand RL-31	1
665028	Generator sig AN/URM-25	1
672380	Switchboard telephone manual SB-22/PT	2
678260	Telephone set TA-312/PT	3
681690	Terminal board TM-184	2
681715	Telegraph terminal group	1
685665	Test set electron tube TV-7/U	1
689616	Tool kit radio repairman TK-115	3
689620	Tool kit radar and radio repairman TK-87/U	8
698400	Wire WD-1/TT RL-159/U	10
698535	Splicing kit telephone cable MK-356/G	1
	Electronic shop semitrailer mtd AN/ASM-189	1
	Avionics Repair Section	
108050	Decontaminating apparatus portable 1½ qt	4
232940	Flashlight plastic right angle 2 cell minature flange lamp watertight	3
401088	Bayonet knife w/scabbard for 7.62mm rifle	13
435965	Rifle 7.62mm semi-automatic lt barrel	13
602636	Analyzer for compass TS-1662/ASW	1
618103	Generator set diesel tlr mtd 45 kw PU-551/M	2
621124	Indicator standing wave radio AN/URM-120	1
624981	Maint kit elec equip MK-652 AN/APS-94	1
625002	Maint kit elec equip MK-426/ARM	1
627520	Modification kit electronic equipment MK-345/6R	1

LINE ITEM NO.	ITEM DESCRIPTION	NO. RECOMMENDED
628139	Multimeter AN/URM-105	4
628230	Multimeter TS-352/U	3
628314	Multimeter ME-26/U	1
628960	Oscilloscope OS-8U	1
631511	Power supply PP-2953/U	1
631581	Power supply PP-1104/G	1
634670	Radiacmeter IM-93/UD	2
634671	Radiacmeter IM-174-PD	2
678260	Telephone set TA 312/PT	1
682695	Generator signal BC-376	1
683375	Test set flight line AN/ASM-80	4
683665	Test set electron tube TV-7/U	1
683801	Test set radar AN/GPM-46	2
683805	Test set radar AN/APM-176	1
685603	Test set optical alignment infrared AB/AAM-8	1
685684	Test set radar AN/APM-156	1
689616	Tool kit radio repairman TK-115	9
689620	Tool kit radio & radar TK-87/U	4
694790	Inverter vibrator PP-68/U	1
	Electronic shop semi-trailer mtd AN/ASM 189	3
	Electronic shop semi-trailer mtd AN/ASM 190	2
	Liquid nitrogen generating plant Gas Engineer Equipment Corp PN G215	1
	Energizer engine FSN 1730-863-5743	2
	Photo Lab Section	
108050	Decontaminating apparatus portable 1½ qt	3
401088	Bayonet knife w/scabbard for 7.62mm rifle	10
435965	Rifle 7.62mm semi-automatic lt barrel	10
457495	Trailer tank water 1½ ton 2 wheel	3
460110	Truck cargo 2½ ton 6X6 lwb	3
612945	Darkroom photographic portable ES-29	3
618094	Generator set diesel engine trailer mtd PU-402/M	3
634670	Radiacmeter IM-93/UD	3
634671	Radiacmeter IM-174/PD	3
	Camera Repair Section	
108050	Decontaminating apparatus portable 1½ qt	1
401088	Bayonet knife w/scabbard for 7.62mm rifle	5
435965	Rifle 7.62mm semi-automatic lt barrel	5
461834	Truck van shop 2½ ton 6X6	1
570931	Tool kit photographic repair 15 components w/case	3
628139	Multimeter AN/URM-105	4
628230	Multimeter TS-352/U	1
634670	Radiacmeter IM-93/UD	1
634671	Radiacmeter IM-174/PD	1
683407	Test set A-6 photo flash cartridge ejection IM-27	1

LINE ITEM NO.	ITEM DESCRIPTION	NO. RECOMMENDED
683408	Test set photographic surveillance system IS-40A	1
683409	Test set photographic preflight IS-39	2
685795	Test set photographic surveillance IS-34	1
689616	Tool kit radio repairman TK-115	1
689620	Tool kit radio & radar TK-87/U	2
689940	Tool kit photographic repair TK-116/GF	1
	Headquarters Aircraft Service Platoon	
108050	Decontaminating apparatus portable 1½ qt	3
108171	Detector kit chemical agent VGH	1
232940	Flashlight plastic right angle 2 cell minature flange lamp watertight	3
249076	Light set gen illum 25 outlet	1
401088	Bayonet knife w/scabbard for 7.62mm rifle	11
420670	Launcher grenade 40mm	1
429280	Pistol automatic cal .45	4
435965	Rifle 7.62mm semi-automatic lt barrel	7
457190	Trailer cargo 3/4 ton 2 wheel	1
457220	Trailer 1½ ton 2 wheel	2
460050	Truck cargo 3/4 ton 4X4	1
460110	Truck cargo 2½ ton 6X6 lwb	2
461790	Truck utility ¼ ton 4X4	1
500559	Add-sub mach hand columnar 10 digit stationary carriage	1
506300	Cabinet spare parts steel 11 drawer	11
510321	Case field office mach plywood 18½ in.L 13¼ in.W 17 in.D	2
510324	Case field office mach plywood 22½ in.L 13¼ in.W 17 in.D	1
516300	Desk field plywood 20 7/8 in.W 14 7/16 in.H 15 5/8 in.D	1
524320	File visible index bk unit 50 pkts	1
529100	Goggles sun wind dust 2 plast colorless neutral grey	3
562161	Table folding legs wood top and legs 36 in L 24 in W 27 25/32 in H	5
575950	Truck locker plywood 31 in.L 15 1/8 in.W 11 7/8 in.D w/tray	2
575970	Typewriter portable upper and lower case elito type 42 keys	2
634670	Radiacmeter IM-93/UD	2
634671	Radiacmeter IM-174/PD	2
678260	Telephone set TA-312/PT	1
712730	Computer air navigation dead reckoning type MB-4	2
744410	Life preserver under arm aircraft gas or oral inflation	2
763200	Plotter aircraft scale 1:500,000 and 1:1,000,000	2

LINE ITEM NO.	ITEM DESCRIPTION	NO. RECOMMENDED
784030	Tool kit acft inspection technical	2
	Organizational Maintenance Section	
108050	Decontaminating apparatus portable 1½ qt	3
229910	Ext fire carbon diox charged hand 15 lb	3
230037	Ext fire momobromotrifuloromethane chg hand w/brkt 2.75 lb	3
232941	Flashlight plastic baton 2 cell watertight	12
235205	Generator set gas eng 3 kw 60 cy 1 and 3 ph 4 wire AC 120/240 V 120/208 V skid mtd	4
235651	Generator set gas eng 7.5 kw DC 28.5 V 2 wire liquid cooled whl mtd 2 wheels	1
401088	Bayonet knife w/scabbard for 7.62mm rifle	37
416404	Grinding machine utility bench mtd ½hp ac 110V 60 cy 1 ph	3
435965	Rifle 7.62mm semi-automatic lt barrel	37
457190	Trailer cargo 3/4 ton 2 wheel	1
457220	Trailer cargo 1½ ton 2 wheel	2
460050	Truck cargo 3/4 ton 4X4	1
460141	Truck cargo 2½ ton 6X6 w/wn	2
513302	Cleaner vacumn hand 26500 ft per minute discharge velocity	3
529100	Goggles sun wind dust 2 plast colorless neutral grey	2
541075	Paulin ctn duck 40 ft L 20 ft W	3
634620	Radiac set AN/PDR-27J	3
678260	Telephone set TA-312/PT	1
711740	Chain assy sgl leg w/pear links and 1 grab hook 5/8 in.by 16 ft	2
784040	Tool kit acft mechanics general	34
785220	Tool set organizational maintenance Army acft set A	2
785230	Tool set organizational maintenance Army acft set A supplement	1
	Air compressor lt wt high pressure 110V 60 cy	2
	Tow bar aircraft FSN 1730-023-5320	2
	Grease gun hand FSN 4930-837-5516	1
	Nutrunner & screwdriver FSN 5130-990-2874	3
	Airfield Service Section	
108050	Decontaminating apparatus portable 1½ qt	2
232542	Filter separator liq fuel 50 gpm 75 psi 2 in.inlet 2 in.outlet	1
232872	Fire fighting equip truck mtd CH300	1
232941	Flashlight plastic baton 2 cell watertight	4
232942	Flashlight plastic right angle 2 cell minature flange lamp explosion proof watertight	5

LINE ITEM NO.	ITEM DESCRIPTION	NO. RECOMMENDED
233452	Forced entry and rescue equip set aircraft crash	1
249011	Light set marker emergency airfield runway ptbl battery operated	3
289403	Trailer oxy servicing 3 wheel	1
401088	Bayonet knife w/scabbard for 7.62mm rifle	10
435965	Rifle 7.62mm semi-automatic lt barrel	10
457190	Trailer cargo 3/4 ton 2 wheel	1
457220	Trailer cargo 1½ ton 2 wheel	5
460050	Truck cargo 3/4 ton 4X4	1
460141	Truck cargo 2½ ton 6X6 w/wn	1
461328	Truck tank fuel servicing 2½ ton 6X6	4
510324	Case field office machine plywood 22½ in.L 13¼ in.W 17 in.D	1
510477	Control pressure filling non-vent drum 5 psi pressure shut off	1
518320	Desk field plywood 22 5/8 in.W 25 7/8 in.H 14¼ in.D	1
519800	Dispensing pump hand driven continuous flow 12 gal per 100 rev	1
529100	Goggles sun wind dust 2 plast colorless neutral grey	7
559290	Pumping assy flammable liquid bulk transfer 225 gpm	1
634670	Radiacmeter IM-93/UD	2
634671	Radiacmeter IM-174/PD	1
643107	Radio set AN/VRC-53 mtd in truck 2½ ton cargo	1
678260	Telephone set TA-312/PT	1
	Nozzle single pt 2½ in.FSN 1730-289-0096	4
	Sling drum lifting FSN 3940-676-3439	2
	Field Maintenance Section	
108050	Decontamination apparatus portable 1½ qt	3
401088	Bayonet knife w/scabbard for 7.62mm rifle	30
422950	Measuring and layout tool set machinist	1
435965	Rifle 7.62mm semi-automatic lt barrel	30
439005	Semi-trailer van cargo 6 ton 2 wheel	4
440704	Shop set field maint spare parts storage No. 2	4
457220	Trailer cargo 1½ ton 2 wheel	2
460141	Truck cargo 2½ ton lwb	2
461490	Truck tractor 5 ton 6X6 swb w/wn	7
510324	Case field office machine plywood 22½ in.L 13¼ in.W 17 in.D	1
518320	Desk field plywood 22 5/8 in.W 25 7/8 in.H 14½ in.D	1
519800	Dispensing pump hand driven continuous flow 12 gal per 100 rev	1

LINE ITEM NO.	ITEM DESCRIPTION	NO. RECOMMENDED
529100	Goggles sun wind dust 2 plast colorless neutral grey	4
555620	Sewing machine 6 7/8 in. to 8 7/8 in. depth	1
555775	Sewing machine 10½ in. throat	1
555927	Sewing machine 12 in. throat without tablestand	1
576700	Table parachute pack sectional 4 sect 576 in. tot L 36 in. W 32 in. H	1
634670	Radiacmeter IM93/UD	3
634671	Radiacmeter IM-174/PD	1
775400	Shop set acft maint stlr mtd A-1 tool crib elect flaw detector	1
775401	Shop set acft maint stlr mtd A-2 sheet metal welding hydraulic	1
775423	Shop set acft maint tlr mtd B4 machine and engine shop	1
775424	Shop set acft maint stlr mtd B-5 propeller and rotor	1
775670	Shop set ord hdlg and servicing field maint Army acft set 1	1
784040	Tool kit acft mechanic general	11
784490	Tool kit airframe repairmans Army acft	3
784495	Tool kit engine & power train repair	2
784510	Tool kit hydraulic repairmans Army acft	2
784540	Tool kit propeller & rotary repair	2
	Case set transportable storage FSN 8115-663-0213	1
	Oxygen cart w/tanks	3
	Multiple servicing unit MA-1	3
	Kit special tools Martin Baker	4
	Survival kits FSN 6545-611-0976	12
	Compressor reciprocating power drive M1A1 7 cfm	2
	TM3-4340-206-15 May 59 respirator paint type M-5	2
	Survival kit, FSN 6545-611-0978	24
	Kit tester vibration FSN 4920-973-2149	1

4. RECAPITULATION

CHEMICAL ITEMS

106505	Compressor reciprocating power driven	2
108050	Decontaminating apparatus portable 1½ qt	49
108171	Detector kit chemical agent VGH	4

ENGINEER ITEMS

202670	Bag water sterilizing cotton duck porous stitched seams 36 gal	2
222752	Compass magnetic 1.58 in. dia card	20
226964	Draft mach 24. in lg arm protr grad 0 to 360 deg	2
226966	Draft inst set ofc	1

LINE ITEM NO.	ITEM DESCRIPTION	NO. RECOMMENDED
229910	Ext fire carbon diox charged hand 15 lb	12
230037	Ext fire monobromotrifluoromethane chg hand w/brkt 2.75 lb	3
232542	Filter seperator liq fuel 50 gpm 75 psi 2 in. inlet 2 in.outlet	1
232872	Fire fighting equip set truck mtd CH300	1
232940	Flashlight plastic right angle 2 cell miniature flange lamp watertight	51
232941	Flashlight plastic baton 2 cell watertight	16
232942	Flashlight plastic right angle 2 cell minature flange lamp explosion proof and watertight	5
233452	Forced entry and rescue equip set aircraft crash	1
235133	Generator set gas eng 3 kw DC 28 V skid shock mtd	2
235152	Generator set gas eng 1.5 kw 28 V skid mtd	2
235155	Generator set dsl eng 15 kw 60 cy 3 ph 4 wire AC 120/208 240/416 V conv to 12.5 kw 50 cy skid mtd	1
235163	Generator set gas eng 1.5 kw 60 cy 1 ph 2 wire AC 120 V skid mtd	2
235205	Generator set gas eng 3 kw 60 cy 1 and 3 ph 4 wire AC 120/240 V 120 208 V skid mtd	4
235651	Generator set gasoline engine 7.5 kw DC 28.5 V 2 wire liquid cooled whl mtd 2 wheels	1
239614	Heater immersion liq fuel fired 30 in.lg of heater	6
239621	Heater immersion liq fuel fired 37½ in.lg of heater	1
243805	Interpretation kit photographic	19
247984	Lettering set vert and ang lettering	2
249011	Light set marker emergency airfield runway portable battery operated	3
249042	Light desk AC 115 V to 125 V lamps accomp lamp position adj rigid sec	10
249076	Light set gen illum 25 outlet	2
250575	Magnifier self-illuminated 2 in.dia	4
268860	Scale plot flat L shape 4 3/4 in.lg meters yd 1:25,000 1:50,000	19
274210	Sprayer insect hand 2 gal cap	1
275565	Stereometer photogram 0 to 25mm	2
277540	Straight edge stl draft 42 in.lg	2
280160	Table tracing drafting wood adj tilt 0 to 40 deg illum glass surface 36X24 in.(48X36 in.top 37 in.H FSN 6675-641-5741)	2
289403	Trailer oxy servicing 3 whl	1
	ORDNANCE ITEMS	
401088	Bayonet knife w/scabbard for 7.62mm rifle	244
401250	Binocular 7X50 military reticle	1
416404	Grinding mach utility bench mtd ½HP AC 110V 60 cy 1 ph	3

LINE ITEM NO.	ITEM DESCRIPTION	NO. RECOMMENDED
417125	Gun machine 7.62mm lightweight general purpose	4
420670	Launcher grenade 40mm	4
422950	Measuring and layout tool set machinist	1
425565	Mount tripod machinegun 7.62mm	4
428300	Pistol pyrotechnic	1
429280	Pistol automatic cal .45	58
435965	Rifle 7.62mm semi-automatic lt barrel	166
439005	Semi-trailer van cargo 6 ton 2 wheel	4
440704	Shop set fld maint spare parts storage set no. 2	4
453890	Tool kit org maint no. 1 common	1
453905	Tool kit org maint no. 1 supplemental	1
453995	Tool kit SA rpmn	2
457110	Trailer amphibious cargo ¼ ton 2 wheel	3
457190	Trailer cargo 3/4 ton 2 wheel	12
457220	Trailer cargo 1½ ton 2 wheel	16
457495	Trailer tank water 1½ ton 2 wheel	4
460050	Truck cargo 3/4 ton 4X4	12
460140	Truck cargo 2½ ton 6X6 lwb	8
460141	Truck cargo 2½ ton 6X6 lwb w/wn	7
461328	Truck tank fuel servicing 2½ ton 6X6	4
461490	Truck tractor 5 ton 6X6 swb w/wn	7
461790	Truck utility ¼ ton 4X4	5
461828	Truck van expansible 2½ ton 6X6	2
461834	Truck van shop 2½ ton 6X6	1
461885	Truck wrecker medium 5 ton 6X6 w/wn	1
465380	Watch wrist grade II	29
465385	Watch wrist grade II type D	27
	QUARTERMASTER ITEMS	
500022	Accessory outfit gasoline field range 33 components	1
500559	Add-sub mach hand columnar 10 digit stationary carriage	2
503120	Barber kit	1
506300	Cabinet spare parts steel 11 drawers	11
510321	Case field office machine plywood 18½ in. L 13¼ in. W 17 in. D	6
510324	Case field office machine plywood 22½ in. L 13¼ in. W 17 in. D	4
510477	Control pressure filling non-vented drum 5 psi pressure shut off	1
510550	Cook set field	14
513129	Filing cabinet card size 16 in. 2 dwr for 5X8 in. cards	2
513139	Filing cabinet card size 16 in. 2 dwr for 3X5 in. cards	2
513302	Cleaner vacumn hand 26500 ft per minute discharge velocity	3

LINE ITEM NO.	ITEM DESCRIPTION	NO. RECOMMENDED
513620	Clock message center Chelsea clock M-2	1
515202	Cook set field 4 components	3
516300	Desk field plywood 20 7/8 in.W 14 7/16 in.H 15 5/8 in.D	2
518320	Desk field plywood 22 5/8 in.W 25 7/8 in.H 14½ in.D	2
519800	Dispensing pump hand driven continuous flow 12 gal per 100 rev	2
524320	File visible index br unit 50 pkts	1
524890	Filing cabinet steel 4 dr H w/comb lock	5
526281	Food container insulated rectangular 5 gal capacity aluminum	8
528911	Filing cabinet map and plan steel grey 5 dr H 1 dr W	6
529100	Goggles sun wind dust 2 plastic colorless neutral grey	27
529969	Guidon nylon wool blank 1 ft 8 in.hoist 2 ft 3 3/4 in.fly	1
541075	Paulin ctn duck 40 ft L 20 ft W	6
549225	Range outfit field gasoline	3
552633	Repair kit tentage	1
554125	Safe 2 shelves 1 drawer 2 compartment 26 in.H 17 in.W 17½ in.D	2
554983	Screen latrine FMWWR OD 55 ft L 8 pins 10 poles	2
555620	Sewing machine industrial darning pwr drvn 6 7/8 in.to 8 7/8 in.depth	1
555775	Sewing machine industrial gen treadle dr 10¼ in. throat	1
555927	Sewing machine industrial 12 in.throat wo table stand	1
558400	Sling carrying universal individual load	38
559290	Pumping assy flammable liquid bulk trans 225 gpm	1
561114	Stove gasoline burner 11 oz rated fuel tank cap	3
561225	Strapping kit steel strapping hand 3/4 in.to 2 in.strap W	1
562161	Table folding legs wood top and legs 36 in.L 24 in.W 27-32 in.H	19
563450	Tableware outfit field 14 components	5
565794	Tent frame type maint med lt metal FMWWR OD 32 ft L	1
566001	Tent kitchen fly proof FMWWR OD complete w/pins and poles	1
566059	Tent liner for 32 ft tent frame type maint med lt metal	1
569051	Tool kit armorers 42 components	2
569151	Tool kit automotive mechanics 52 components	9
569850	Tool kit electricians 29 components	4

LINE ITEM NO.	ITEM DESCRIPTION	NO. RECOMMENDED
570336	Tool kit general use tools sig drawing TE-33	10
570931	Tool kit photographic repair 15 components w/case	3
571325	Tool kit radar and radio 47 components	8
571733	Tool kit supplementary radar & radio repair sig P/N TK 88/U	2
575870	Typewriter non-portable 13 in. paper size 42 to 44 keys elite type	1
575900	Typewriter non-portable 11 or 12 in. paper size	2
575910	Typewriter 20 in. paper size 42 to 44 keys elite type non-portable	1
575950	Trunk locker plywood 31 in. L 15 1/8 in. W 11 7/8 in. D w/tray	5
575970	Typewriter ptbl upper and lower case elite type 42 keys	5
576700	Table parachute pack sectional 4 sect 576 in. tot L 36 in. W 32 in. H	1
583660	Truck lift fork gas 6000 lb pneumatic tire rough terrain	2
588537	Tent GP small w/cover line pins poles vestibule	10
596684	Typewriter non-portable 14 to 15 in. carriage	1
	SIGNAL ITEMS	
602636	Analyzer portable compass TS-1662/ASW	1
603114	Antenna AT-984/G	5
603250	Antenna group RC-292	1
604010	Reeling machine cable hand RL-27B	1
604550	Barometer ML-102	1
609625	Charger radio detector PP-1578/PD	3
609670	Case BC-5	1
612945	Darkroom photographic rtbl ES-29	3
614915	Electronic tactical teletypewriter security equipment TSEC/KW-7	1
618094	Generator set diesel engine tlr mtd PU-402/M	3
618102	Generator set gas eng tlr mtd PU-474/M	2
618103	Generator set 45kw diesel eng tlr mtd PU-551/M	2
618115	Generator set gas eng tlr mtd PU-290/MR	2
621124	Indicator standing wave radio AN/URM-120	1
624981	Maintenance kit electronic equipment MK-6521 AN/APS 94	1
625002	Maintenance kit, electronic equipment MK-426/ARN	1
627520	Modification kit, electronic equipment MK-345/6R	1
628139	Multimeter AN/URM-105	10
628230	Multimeter TS-352/U	9
628314	Multimeter ME-26/U	1
628960	Oscilloscope OS-8U	1
631511	Power supply PP-2953/U	2
631581	Power supply PP-1104/G	1

LINE ITEM NO.	ITEM DESCRIPTION	NO. RECOMMENDED
634620	Radiac set AN/PDK-27J	3
634670	Radiacmeter IM-93/UD	35
634671	Radiacmeter IM-174/PD	23
638600	Radio set AN/VRC-10	24
641686	Radio set AN/GRR-5 mtd in trk van expansible	1
643107	Radio set AN/VRC-53 mtd in truck 2½ ton cargo	1
644300	Radio set AN/PRC-25	2
651204	Radio set AN/VRC-24 mtd in trk 3/4 ton cargo	1
655201	Radio set AN/VRC-46 mtd in trk ¼ ton	1
655204	Radio set AN/VRC-46 mtd in van AN/TAQ-1	2
655701	Radio set AN/VRC-47 mtd in trk ¼ ton	1
657124	Radio set control group AN/GRA-39	6
657222	Radio teletypewriter set AN/GRC-46	2
660000	Reeling machine cable hand RL-39	3
660120	Reeling machine cable hand RL-31	1
665028	Generator signal AN/URM-25	1
670356	Surveillance info cntr infrared AN/TAQ-1	2
672380	Switchboard telephone manual SB-22PT	2
678260	Telephone set TA-312/PT	21
681690	Terminal board TM-184	2
681715	Telegraph terminal group AN/TCC-14	1
682695	Generator signal BC-376	1
683375	Test set flight line AN/AMS-80	4
683407	Test set A-6 photograph cartridge ejector IM-27	1
683408	Test set photographic surveillance system IS-40A	1
683409	Test set photographic preflight IS-39	2
683665	Test set electron tube TV-7/U	2
683801	Test set radar AN/GPM-46	2
683805	Test set radar AN/APM-176	1
685603	Test set optical alignment infrared AN/AAM-8	1
685684	Test set radar AN/APM-156	1
685795	Test system photographic surveillance IS-34	1
689616	Tool kit radio repairman TK-115( )/G	13
689620	Tool kit radar and radio rpmn TK-87/U	14
689940	Tool kit photographic repair TK-166/GF	1
694790	Inverter vibrator PP-68/U	1
698400	Wire WD-1/TT RL-159/U	10
698535	Splicing kit telephone cable MK-356/G	1
	TRANSPORTATION ITEMS	
700840	Airplane combat surveillance	12
	Utility airplane	1
711740	Chain assy sgl leg w/pear links and 1 grab hook 5/8 in. by 16 ft	8
712730	Computer air navigation dead reckoning type MB-4	27
744410	Life preserver under arm aircraft gas or oral inflation	48

LINE ITEM NO.	ITEM DESCRIPTION	NO. RECOMMENDED
763200	Plotter aircraft scale 1:500,000 and 1:1,000,000	27
775400	Shop set acft maint stlr mtd A-1 tool crib elec flaw detect	1
775401	Shop set acft maint stlr mtd A-2 sheet metal welding hydraulic	1
775423	Shop set acft maint tlr mtd B-4 machine and eng shop	1
775424	Shop set acft maint stlr mtd B-5 propeller & rotor	1
775670	Shop set ord hdlg and servicing fld maint Army acft set 1	1
784030	Tool kit aircraft inspection technical	2
784040	Tool kit aircraft mechanics general	45
784490	Tool kit airframe repairmans Army acft	3
784495	Tool kit engine and power train repairmans	2
784510	Tool kit hydraulic repairmans Army acft	2
784540	Tool kit propeller and rotor repairmans	2
785220	Tool set organizational maint Army aircraft set A	2
785230	Tool set organizational maint Army aircraft set A supplement	1
	Compressor reciprocating power drive M1A1 7 cfm	2
	TM-3-4340-206 15 May 59 respirator paint type M5	2
	Survival kits FSN 6545-611-0976	12
	Kit special tools Martin Baker	4
	Douglas bomb hoist	6
	Ordnance trailer mark 7	6
	Multiple servicing unit MA-1	3
	Bomb lift sling	6
	Oxygen cart w/tanks	3
	Sling drum lifting FSN 3940-676-3439	2
	Nozzle single pt 2½ FSN 1730-289-0096	4
	Kit tester vibration FSN 4920-973-2149	1
	Energizer engine starter FSN 1730-863-5743	2
	Tow bar aircraft FSN 1730-023-5320	2
	Grease gun hand FSN 4930-837-5516	1
	Nutrunner & screwdriver FSN 5130-990-2874	3
	DEVELOPMENTAL ITEMS	
960010	Antenna AT-791/C	1
	Survival kit FSN 6545-611-0978	24
	Liquid nitrogen generating plant Gas Engr Equip Corp PN G215	1
	Electronic shop stlr mtd AN/ASM-189	4
	Electronic shop stlr mtd AN/ASM-190	2
	Zoom microscope model no. 53-71-01 Bausch & Lomb	2
	Tube magnifier 10X Bausch & Lomb	2
	Case set transportable storage FSN 6115-663-0213	1
	Air compressor lt wgt high pressure 110V 60cy	2