

REPORT
ON
FOREST INVENTORY SURVEY
IN
HONDURAS
(Aerial Photography & Signalization Works)

April 1981

Japan International Cooperation Agency
(J.I.C.A.)

FDD
JR
81-50



No.

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PREFACE

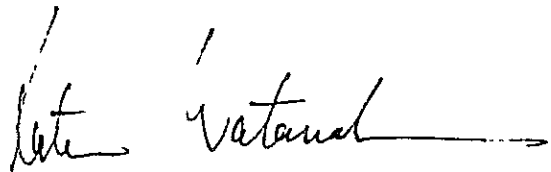
In compliance with the "Scope of Work for Forest Inventory Survey in Honduras" signed in September 1980, JICA has carried out aerial photography and signalization during the period between January and April 1981, which were required for the preparation of topographic maps of the project area, La Mosquitia, covering approx. 200,000ha.

This report summerizes the various activities in implementing the above-mentioned project and the final survey results obtained. I sincerely wish that this report will be utilized as the base materials for the succeeding topographic mapping and various forestry studies of the same type.

I would like to express my hearty appreciation to the officials concerned of both Honduras and Japanese Governments, as well as to the members of survey mission, for their generous assistance and cooperation.

Yours very truly,

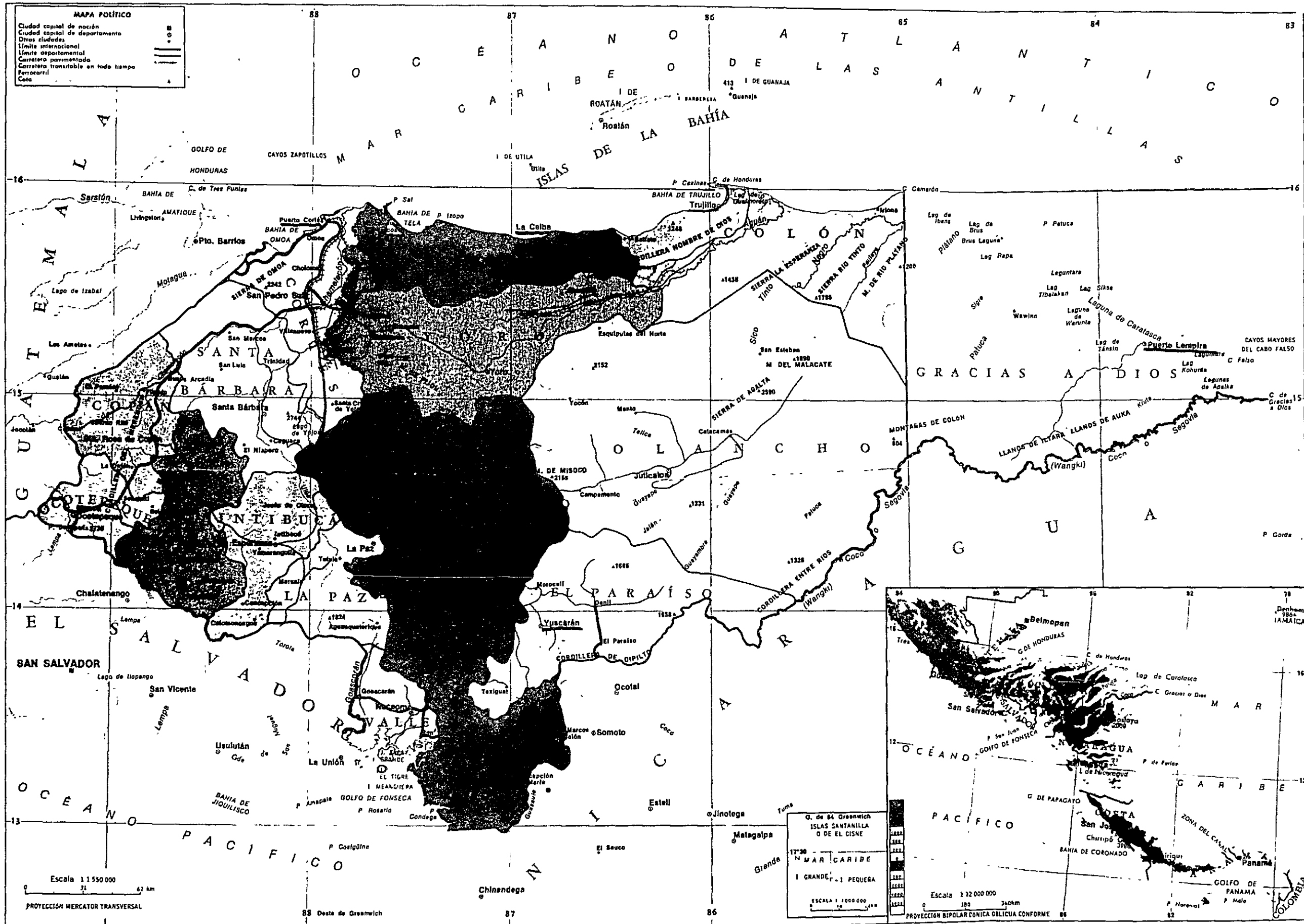
April, 1981

A handwritten signature in black ink, appearing to read 'Katsura Watanabe', with a long horizontal flourish extending to the right.

Katsura Watanabe

Director

Forestry & Fisheries Development
Cooperations Department
Japan International Cooperation Agency



HONDURAS



Location Map

PROJECT AREA





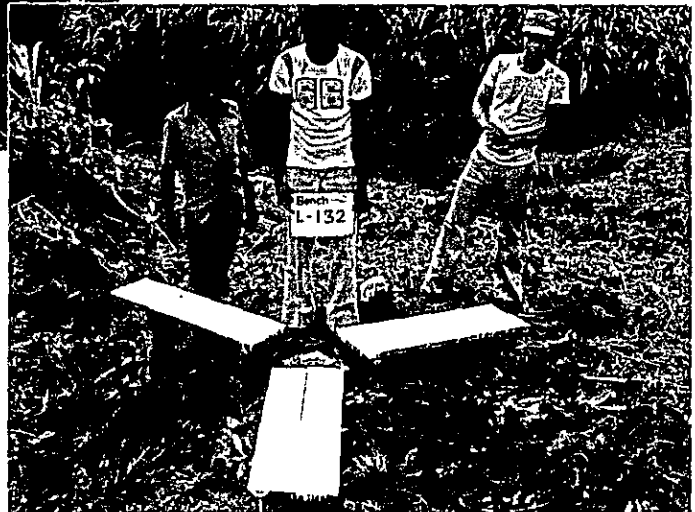
Mosquitia Puerto Lempira District Forestry Office



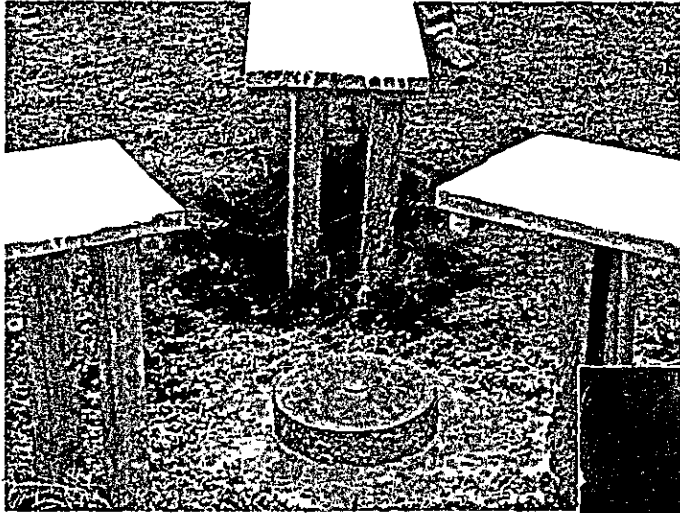
Mosquitia Dursuna Field Office



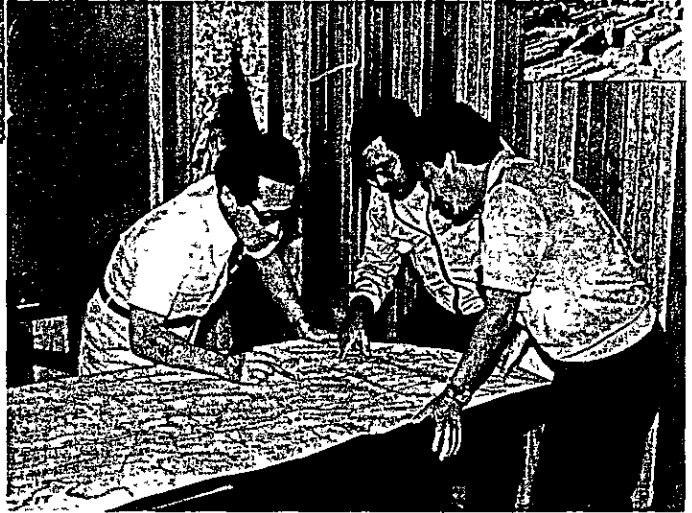
Setting up Aerial Signal



Aerial Signal for Existing Bench Mark



Aerial Signal for Newly Established Control Point



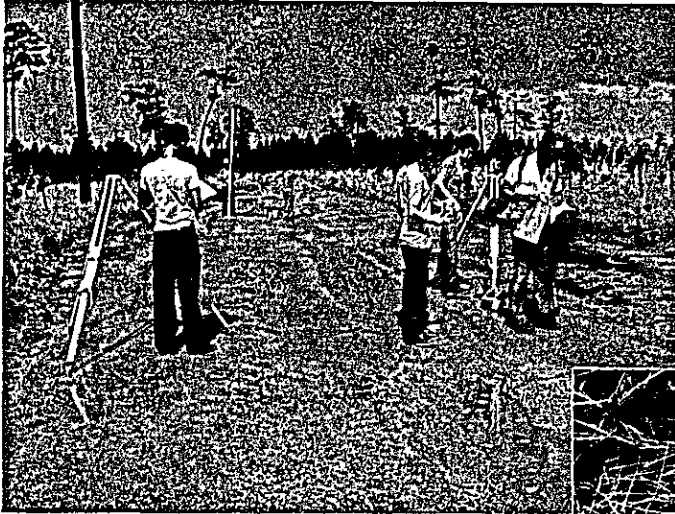
Aerial Photography Flight Planning



PIPER PA23-250 N626Y awaiting Flight Mission



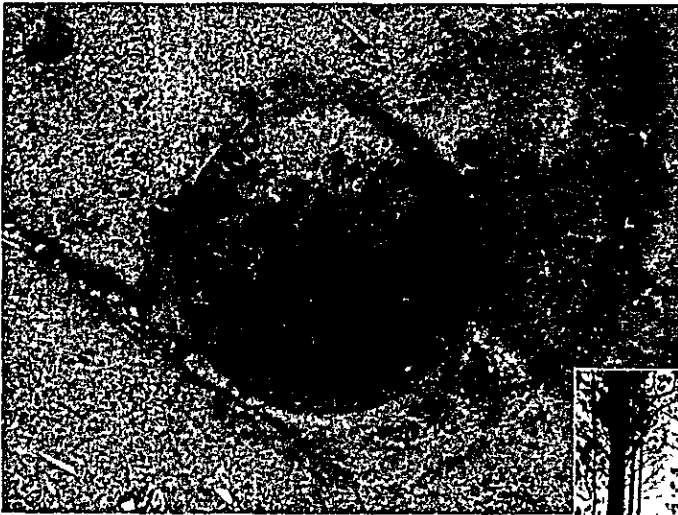
Runway of the Puerto Lempira Photographic Base



Levelling Survey in Progress



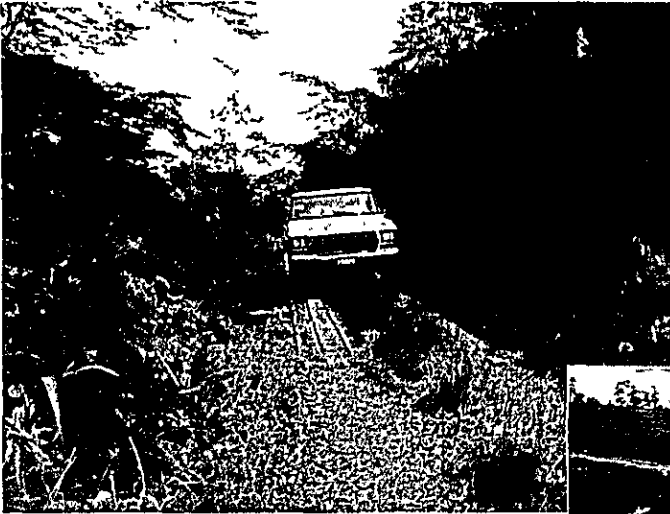
Existing Bench Mark (Metallic Marker)



Existing Triangulation Point (Metallic Marker)



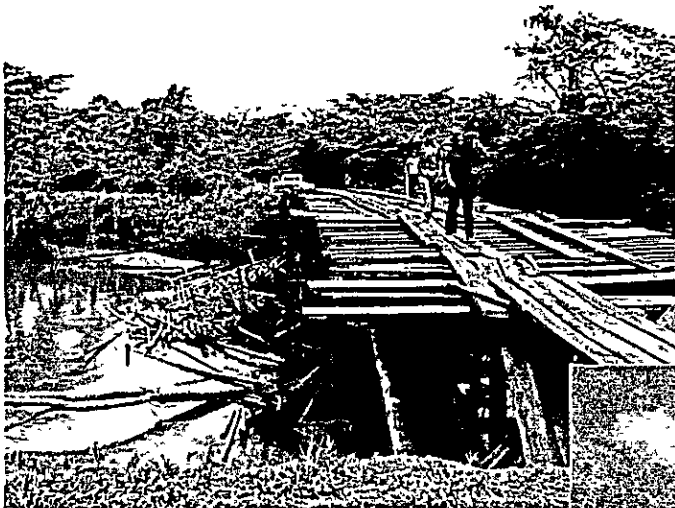
Index Monument for Existing Bench Mark



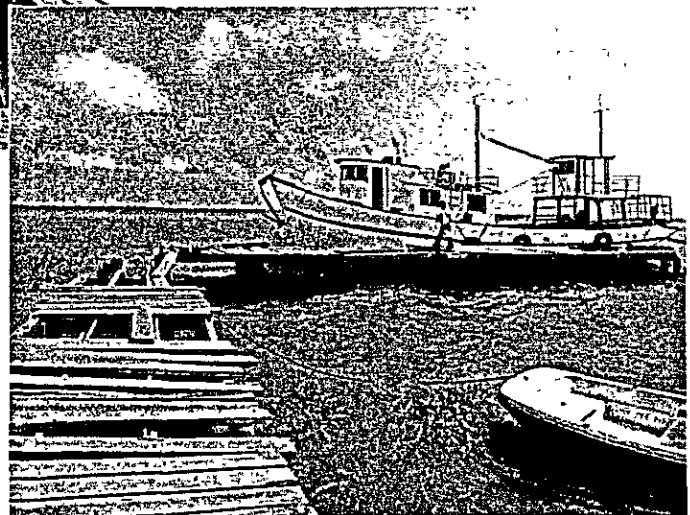
Trunk Road and Bridge in the Rus Rus District



Road between Dursuna and Mocoron



Washed Away Bridge at 1.3 km East of Rus Rus



Port Facility at Puerto Lempira

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I. SUMMARY OF WORK

1. Objective

Preparation of basic maps and other drawings required for the Forestry Resources Development Survey in Honduras and investigation and accumulated estimation of the forestry to study the Forestry Management Plan.

As the first step of this Survey, conduct the signalization and aerial photography to newly establish the control points required for preparing the basic maps.

2. Project Area

Dursuna and Rus Rus in the La Mosquitia district in Honduras extending approximately 20,000 ha.

3. Members of Survey Team and Schedule

3-1 Members of Survey Team

The aerial photography and signalization work were conducted by the following survey team:

Duty	Name	Term	Position
General photographing control and inspection	Mr. Tadami Imai	83 days (Jan. 8 ~ Mar. 31, 1981)	Japan Forestry Survey Association
Signalization	Mr. Soichi Ichikawa	68 days (Jan. 8 ~ Mar. 16, 1981)	Pacific Aero Survey Co., Ltd.
Signalization	Mr. Aiki Takahashi	68 days (Jan. 8 ~ Mar. 16, 1981)	Ditto.
Photography planning and consulting	Mr. Yukihiro Kitagawa	83 days (Jan. 8 ~ Mar. 31, 1981)	Ditto.

3-2 Survey Schedule

The aerial photography and signalization work were conducted on the following schedule:

Days	Date	Day of the Week	Aerial Photography		Signalization	
			Journey	Work	Journey	Work
1	Jan. 8, 1981	Thurs.	Tokyo (Narita) New York			
2	9	Fri.	New York Tegucigalpa			
3	10	Sat.		Inspected and furnished materials and equipment.		
4	11	Sun.		Procured materials and equipment.		
5	12	Mon.		Visited the Japanese Embassy and Economic Planning Agency.		
6	13	Tues.		Visited the Forest Survey Corporation (COHDEFOR) for discussion.		Same as on the left.
7	14	Wed.		Decided to order the aerial photography from Aero Service. Collected the data at the Geographic Survey Institute (IGN).		Same as on the left.
8	15	Thurs.		Discussed survey work at Japanese Embassy.		
9	16	Fri.		Discussed survey work with COHDEFOR staff.		

Days	Date	Day of the Week	Aerial Photography		Signalization	
			Journey	Work	Journey	Work
10	Jan. 17 1981	Sat.		The section chief of the Forestation Office, chief of the Mosquitia Forest Office, and Mr. Imai plotted the plan of aerial photography on a 1/50,000 topographic map.		Procured signalization materials.
11	18	San.				Ditto.
12	19	Mon.		Discussed on the progress of survey work with COHDEFOR staff.		Prepared materials and equipment for shipment.
13	20	Tues.		Mr. Brookes, vice president of Aero Service, arrived at Tegucigalpa.	Tegucigalpa Puerto Lempira	Mr. Ichikawa and Mr. Takahashi moved to Puerto Lempira.
14	21	Wed.		Discussed and signed the agreement by the COHDEFOR, survey team, and Aero Service and completed flight application procedures.	Puerto Lempira Dursuna	Mr. Ichikawa and Mr. Takahashi moved to Dursuna Site.
15	22	Thurs.				Selected existing control points (one at Pranzail and two others).
16	23	Fri.				Selected new control point No. 1.
17	24	Sat.				Established aerial signals at three existing control points.

Days	Date	Day of the Week	Aerial Photography		Signalization	
			Journey	Work	Journey	Work
18	Jan. 25 1981	Sun.		Prepared aerial photography and flight applications.		Established new control point No. 5, monumentation, and aerial signals.
19	26	Mon.		Submitted aerial photography application to the Defence Agency and Geographic Survey Institute (IGN).		Selected new control point No. 3 and installed aerial signals.
20	27	Tues.		Discussed the aerial photography plan with the vice president of Aero Service.		Selected new control point No. 2 and established aerial signals.
21	28	Wed.		Obtained the permission for aerial photography. The aircraft arrived at Tegucigalpa Airport.		Established new control point No. 1, monumentation, and aerial signals.
22	29	Thurs.		Discussed the detailed plan of aerial photography with the aerial photography crew.		Selected new control point No. 7 and established aerial signals.
23	30	Fri.		Flow from Tegucigalpa Airport at 3:20 AM, but no aerial photographs due to excessive clouds.		Selected new control point No. 6 and established aerial signals.
24	31	Sat.		Phoned from head office of Aero Service concerning the dispatch of a control engineer.		Selected new control point No. 4 and established aerial signals.

Days	Date	Day of the Week	Aerial Photography		Signalization	
			Journey	Work	Journey	Work
25	Feb. 1 1981	Sun.		Flew at 2:30 AM, but no aerial photographs taken due to excessive clouds.		Selected new control point No. 8 and established aerial signals.
26	2	Mon.		Took off at 0:30 AM, but returned immediately.		Selected new control point No. 14. Vehicles could not enter area.
27	3	Tues.	Tegucigalpa Puerto Lempira	Mr. Imai and Mr. Kitagawa moved to Puerto Lempira.		Selected new control point No. 14 on foot.
28	4	Wed.	Puerto Lempira Dursuna	Mr. Kitagawa stayed at Puerto Lempira. Mr. Imai moved to Dursuna.		Indoor work due to rain.
29	5	Thurs.		The aircraft moved from Tegucigalpa Airport to Puerto Lempira Airbase.		Inspected and adjusted the level.
30	6	Fri.		Flew for an hour and 50 minutes, but no aerial photographs taken due to excessive clouds.		Planned the level line.
31	7	Sat.		Accompanied party for investigation of bench marks.		Investigated bench marks.
32	8	Sun.		Flew at 2:10 AM, but took only outline aerial photographs due to clouds.		Established bench marks and aerial photographs.

Days	Date	Day of the Week	Aerial Photography		Signalization	
			Journey	Work	Journey	Work
33	Feb. 9 1981	Mon.		Flew at 1:30 AM, but no aerial photographs taken due to excessive clouds.		Investigated bench marks.
34	10	Tues.		Accompanied party for investigation of bench marks.		Ditto.
35	11	Wed.		Reported to Tokyo that aerial photographing work was delayed by abnormal meteorological conditions.		Leveling (by two groups).
36	12	Thurs.		Intermittent heavy rain with thunder.		Work interrupted by rain.
37	13	Fri.		Ordered aerial photography at 8:00 AM by radio. Flew at 1:30 AM, but no aerial photographs taken due to excessive clouds.		Investigated bench marks (accompanied by Mr. Imai).
38	14	Sat.		Ordered flight at 8:00 AM by radio, but clouds appeared at 8:30 AM. Ordered interruption of the flight.		Ditto.
39	15	Sun.		Informed Puerto Lempira of unfavorable weather conditions in Lursuna at 8:30 AM.		Ditto.

Days	Date	Day of the Week	Aerial Photography		Signalization	
			Journey	Work	Journey	Work
40	Feb. 16 1981	Mon.		Took about 40 aerial photographs, but unacceptable due to clouds.		Investigated bench marks (accompanied by Mr. Imai).
41	17	Tues.		Communicated by radio at 6:00 AM and 7:00 AM. Flight impossible.		Due to rain, new control point No. 10 not selected.
42.	18	wed.		Due to unfavorable weather conditions, accompanied signalization group.		Selected new control point No. 10.
43	19	Thurs.		Leveled due to unfavorable weather conditions.		Levelling (by two groups).
44	20	Fri.		Selected aerial signals due to unfavorable weather conditions.		Selected new control point No. 9.
45	21	Sat.		Weather gradually cleared, but radio communications still impossible.		Established new control point No. 10 and aerial signals.
46	22	Sun.		Flew at 1:10 AM, but returned due to excessive clouds.		Established new control point No. 9 and aerial signals.
47	23	Mon.		Reported unfavorable weather conditions to Tokyo by TELEX.		Selected new control point No. 11 and established aerial signals.

Days	Date	Day of the Week	Aerial Photography		Signalization	
			Journey	Work	Journey	Work
48	Feb. 24 1981	Tues.		Flew at 2:10 AM and took aerial photographs Cl3 ^u Cl6.		Patrolled and painted aerial signals.
49	25	Wed.		Flew at 1:30 AM, but returned due to excessive clouds.		Ditto.
50	26	Thurs.		Accompanied signalization group.		Investigated bench marks.
51	27	Fri.		Ditto.		Ditto.
52	28	Sat.		Ditto.		Ditto.
53	Mar, 1	Sun.		Flew at 0:40 AM, but returned due to excessive clouds.		Posted the field book.
54	2	Mon.		Reported the progress of aerial photographing work to Tokyo by TELEX.		Overhauled and inspected equipment and materials.
55	3	Tues.		Received aerial photographs Cl3 ^u Cl6 from aerial photography crew.		Posted computation book.
56	4	Wed.		Inspected aerial photography results.	Dursuna Puerto Lempira	Mr. Ichikawa and Mr. Takahashi moved to Puerto Lempira.

Days	Date	Day of the Week	Aerial Photography		Signalization	
			Journey	Work	Journey	Work
57	Mar. 5 1981	Thurs.	Dursuna Puerto Lempira Tegucigalpa	Mr. Imai moved to Tegucigalpa to report the progress of aerial photographing work to the COHDEFOR and Japanese Embassy.	Puerto Lempira Tegucigalpa	Mr. Ichikawa and Mr. Takahashi moved to Tegucigalpa.
58	6	Fri.		Ordered partial aerial photographing of C13.		Posted the field book and computation book.
59	7	Sat.		Inspected aerial photography results.		Ditto.
60	8	Sun.		Filed the aerial photographing results.		Ditto.
61	9	Mon.		Ditto.		Filed the results.
62	10	Tues.	Tegucigalpa Puerto Lempira	Received C13 and C16 negative. Mr. Imai moved to Puerto Lempira.		Ditto.
63	11	Wed.		Inspected the negative films.		Ditto.
64	12	Thurs.	Puerto Lempira Dursuna	Inspected the negatives shot on Feb. 24.		Reported to the Forest Survey Corporation.
65	13	Fri.		Flew at 0:50 AM, but returned due to excessive clouds.		Reported return to Japan to the Japanese Embassy.

Days	Date	Day of the Week	Aerial Photography		Signalization	
			Journey	Work	Journey	Work
66	Mar. 14 1981	Sat.		Aerial photography impossible due to excessive clouds.	Tegucigalpa New York	Mr. Ichikawa and Mr. Takahashi moved to New York.
67	15	Sun.		Aerial photographing impossible due to 50% clouds and strong wind.	New York	Mr. Ichikawa and Mr. Takahashi returned to Tokyo.
68	16	Mon.		Flew at 1:30 AM and took aerial photographs C8 and C12, but there was strong wind.	Tokyo (Narita)	
69	17	Tues.		Aerial photography impossible due to excessive clouds.		
70	18	Wed.		Ditto.		
71	19	Thurs.		Flew at 2:00 AM and took aerial photographs C1 through C7 and BC5.		
72	20	Fri.		Films shot on March 16 and 19 transported to Tegucigalpa.		
73	21	Sat.		Trouble occurred with landing gear of the aircraft. Inspected and overhauled it.		

Days	Date	Day of the Week	Aerial Photography		Signalization	
			Journey	Work	Journey	Work
74	Mar. 22 1981	Sun.		Flew at 2:00 AM and took aerial photographs C3 (partially) and BC4.		
75	23	Mon.		Aerial photography impossible due to strong wind.		
76	24	Tues.	Dursuna Puerto Lempira	Mr. Imai moved to Puerto Lempira.		
77	25	Wed.	Puerto Lempira Tegucigalpa	Mr. Imai and Mr. Kitagawa moved to Tegucigalpa.		
78	26	Thurs.		Reported the results of the survey to the COHDEFOR.		
79	27	Fri.		Visited the president of the COHDEFOR and Japanese Embassy.		
80	28	Sat.		Inspected the results of aerial photographing conducted on March 16 and 19.		
81	29	Sun.	Tegucigalpa New York	Mr. Imai and Mr. Kitagawa moved to New York.		

Days	Date	Day of the Week	Aerial Photography		Signalization	
			Journey	Work	Journey	Work
82	Mar. 30 1981	Mon.	New York	Mr. Imai and Mr. Kitagawa returned to Tokyo.		
83	31	Tues.	Tokyo (Narita)			

II. SITUATIONS OF PROJECT AREA

1. Weather Conditions

Regarding weather conditions in the Mosquitia area, meteorological data observed at eight places in Honduras, including Puerto Lempira, are available. As listed in Table II-1, precipitation is relatively high on the coast of the Caribbean Sea. In particular, annual precipitation of 2,855 mm was recorded at many places in Puerto Lempira and Mosquitia. The monthly precipitation is 87 mm in February, 66 mm in March, 57 mm in April, and 200 mm to 400 mm in other months. As listed in Table II-1, a remarkable difference can be noted between the February-to-April period and the May-to-January period.

The former period is the so-called "dry season". Generally, clear skies can be expected in this period. This year, clear skies without wind and clouds was observed at dawn (5:30 AM). However, wind blew from the north of the Caribbean Sea toward the south of the inland area from 7:00 AM to 8:00 AM. At the same time, a nimbostratus formed at altitudes of up to 2,000 m and a cumulonimbus formed at altitudes of up to 10,000 m in the coastal area passing at considerably high speed through the Mosquitia area. These clouds provided occasional rain. If it rained all day, two or three layers of clouds spread between the clouds formed at altitudes of 700 m to 800 m and those formed at altitudes of 7,000 m to 8,000 m.

If fog sets in the early morning, the wind blew and clouds formed one to two hours later on the ordinary days. On such days, the chances of aerial photo taking could only be expected between 9:00 AM and 10:00 PM.

During the aerial photographing period, there was no means for instantaneous communication of meteorological data between Mosquitia and Tegucigalpa base. Therefore, we utilized the weather forecasts announced at Tegucigalpa Airport.

Since the aerial photography base was moved to Puerto Lempira on February 5, the weather conditions observed at Dursuna work site located around the center of the project area were frequently reported by radio to the photographing crew staying at Puerto Lempira base about 70 km east of Dursuna.

Table II-3 lists the weather conditions during the work period (January 29 through March 29).

Table II-1 Monthly Precipitation

(mm)

Administrative Division		Above Sea Level	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Caribbean Sea Coast	Puertolempira	10m	208	87	66	57	222	305	353	282	284	340	433	219	2,855
	Trujillo	29	349	291	99	97	88	60	94	60	85	198	697	275	2,289
	La Ceiba	5	62	257	226	46	132	101	80	209	197	285	599	392	2,784
	Sanpedro Sula	5	55	171	105	31	93	94	194	189	253	245	496	355	2,481
Mountain Region	Juticalpa	600	54	32	35	22	180	231	234	167	199	202	77	71	1,505
	Yoro	660	13	30	11	33	169	155	101	150	102	171	218	53	1,206
	Comayagua	579	3	6	32	31	106	157	108	162	186	168	51	25	1,032
	Tegucigalpa	1,007	9	3	7	47	159	152	65	105	222	118	29	10	925

Table II-2 Daily Average Cloud Coverage in Puerto Lempira
in January and February, 1981

January				February			
Day	Cloud Coverage (%)	Day	Cloud Coverage (%)	Day	Cloud Coverage (%)	Day	Cloud Coverage (%)
1	88	16	38	1	50	16	63
2	63	17	50	2	63	17	50
3	75	18	63	3	63	18	63
4	100	19	75	4	63	19	63
5	100	20	38	5	75	20	63
6	88	21	38	6	63	21	63
7	50	22	38	7	63	22	63
8	50	23	63	8	63	23	63
9	63	24	63	9	63	24	50
10	50	25	50	10	63	25	63
11	63	26	38	11	63	26	63
12	63	27	38	12	63	27	63
13	75	28	38	13	63	28	63
14	38	29	38	14	63		
15	25	30	63	15	63		
		31	38				

Table II-3

Weather	Fair	Cloudy	Rainy	Total
No. of days	8	43	9	60
Percentage (%)	13	72	15	100

Note: Localized or occasional rainfall is shown as cloudy or fair.

Table II-4 lists the meteorological data collected in the past 13 years by the Puerto Lempira Weather Station. The annual mean temperature, humidity, and precipitation are listed below.

Temperature	26.7°C
Humidity	84%
Precipitation	3,043 mm

The lowest temperatures (25~26°C) were recorded in December, January, and February and the highest temperatures were recorded in April through August. Intermediate temperatures were recorded in March (the month following the low-temperature months), October, and November (the month immediately before the low-temperature months).

The lowest humidity (78%) was recorded in March and April and humidity ranging from 84% to 87% was recorded in other months.

The minimum annual precipitation was 2,204 mm. That year, the minimum precipitation (11 mm) was recorded in March and the maximum precipitation (245 mm) was recorded in October.

The maximum annual precipitation was 4,219 mm. In that year, the minimum precipitation (240 mm) was recorded in April and the maximum precipitation (1,564 mm) was recorded in November. These data imply that the maximum monthly precipitation in the years of minimum annual precipitation is equal to the minimum monthly precipitation in the years of maximum annual precipitation.

According to weather forecaster, the temperatures seem to be gradually lowered and the humidity seems to be gradually raised toward the south of Puerto Lempira. However, this tendency has not been proved yet by reliable data.

Table II-4

13-year observation by Puerto Lempira Civil
Aeronautical Observation

A. Temperature		
1. Mean temperature	:	26.7°C
2. Lowest temperature in December, January and February	:	25° - 26°C
3. Medium temperature in March, October and November	:	26° - 27°C
4. Highest temperature from April to August	:	27° - 28°C
B. Precipitation		
1. Mean precipitation	:	3,043mm
2. Yearly lowest precipitation		
i Annual precipitation	:	2,204mm
ii Lowest precipitation in March	:	11mm
iii Highest precipitation in October	:	245mm
3. Yearly highest precipitation		
i Annual precipitation	:	4,219mm
ii April was the month of less precipitation	:	240mm
iii November was the month of highest precipitation	:	1,564mm
C. Humidity		
1. Mean humidity	:	84%
2. Lowest humidity in March and April	:	78%
3. Lowest humidity in other months	:	84% and 87%

2. Transportation Facilities

2-1 Tegucigalpa - Puerto Lempira

- (1) The civil aviation (LANSA) DC-3 30-seater plane flies weekly. Departed Tegucigalpa Tuesday afternoon, stayed overnight at La Ceiba departed La Ceiba early Wednesday morning for Puerto Lempira, immediately returned to Tegucigalpa via La Ceiba and San Pedro Sula, and arrived in the afternoon of the same day. The one-way fare was L.136 as of March 1981. Since many passengers utilize this flight, it is recommended to reserve seat(s) as early as possible.
- (2) The COHDEFOR often utilizes rental planes (5- to 8-seater PIPERS and CESSNAS). These planes are not suitable for transporting large materials and equipment. (It takes about an hour and half one way on this route.)
- (3) Also, DC-3 army aircraft provide unscheduled flights. If vacant seat(s) exist, they can be utilized by requesting through the COHDEFOR. (It takes about two hours one way.)
- (4) Large equipment and materials (such as vehicles and fuel) were transported from Tegucigalpa to Puerto Cortes on the Caribbean Sea by land and then transported from Puerto Cortes to Puerto Lempira by sea. Although no problems were associated with inland transportation, marine transportation consists of unscheduled small freighters. Since the freight schedule depends upon the amount of cargo, it is quite irregular. Also, port facilities at Puerto Lempira, consist of only a pier unsuitable for vehicles is available. Therefore, vehicles and other large cargo usually wait a week to unload. At least one month will be required for transporting large equipment and materials from Tegucigalpa to Puerto Lempira.

2-2 Puerto Lempira - Dursuna

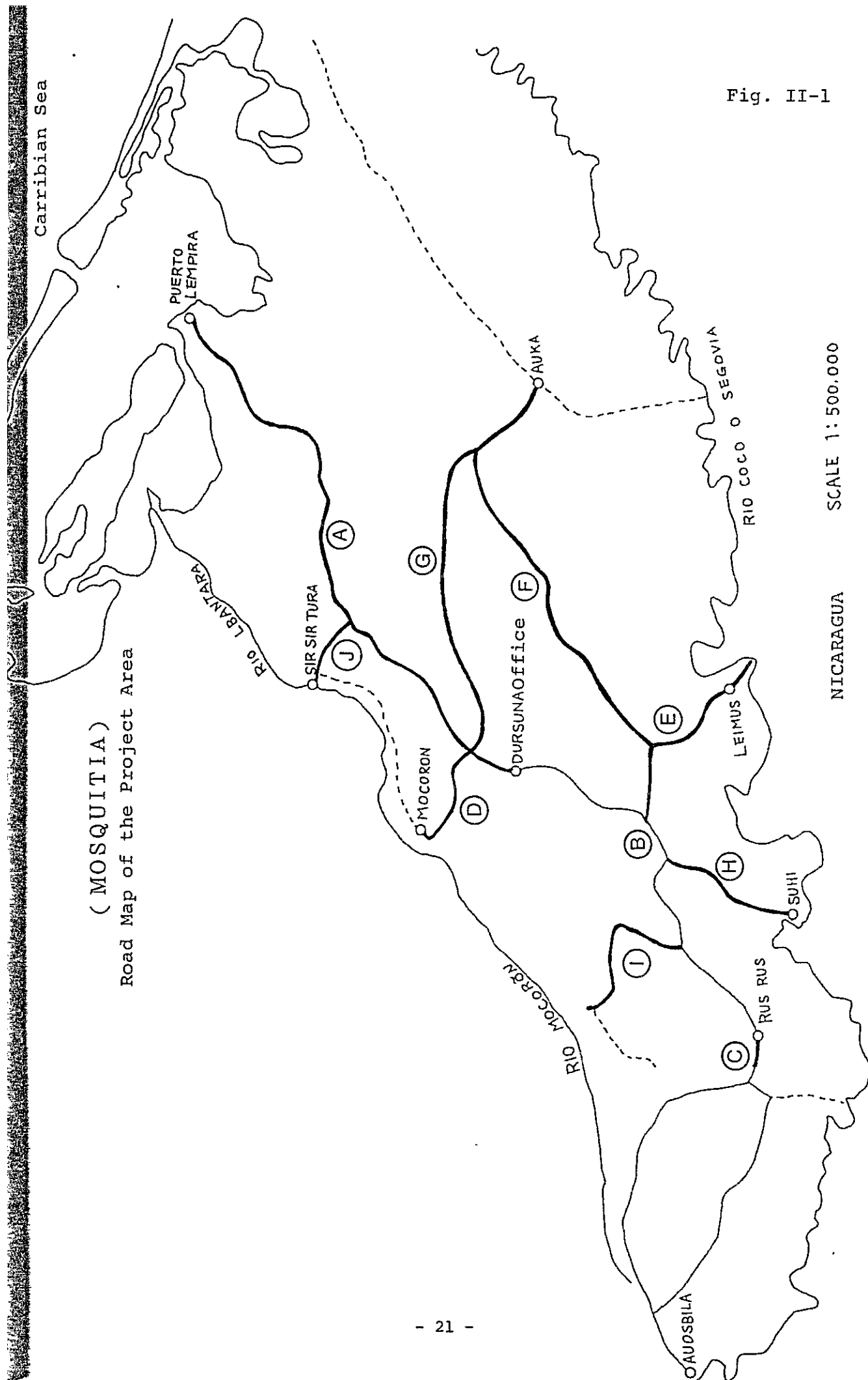
This route measures approximately 70 km. The COHDEFOR's vehicles such as Toyota Land Cruisers, Ford Trucks, Mercedes passenger cars, and Toyota trucks were used for transportation along this route. It takes about three hours. Conditions of the partially unpaved road were considered to be fair. The paved sections of this road were partially damaged and pitted. Therefore, we had to detour around such sections.

2-3 Road Conditions within Project Area

Only the boulevard running from Puerto Lempira via Dursuna and Rus Rus to Avasbila and several roads leading off from this boulevard to Sirsirtara, Mocoron, Auka, Leimus, and Sahi are available within the project area. All these roads were unpaved and not repaired.

Fig. II-1 is a road map of the project area. Conditions of each road are outlined on the subsequent pages.

Fig. II-1



(1) Route A (Puerto Lempira - Dursuna)

Measuring about 6 m wide, this route has no waterways, but is well drained. The lower lying portions had some potholes, and although we had to detour around these potholes, the Route could be utilized even in the rainy season.

(2) Route B (Dursuna - Rus Rus)

Conditions of this Route are similar to that of the Route A. Although there is a marshy district about 1 km away from Dursuna and about 3 km away from the wooden bridge over the Dursuna River, a detour could be made through the grasslands.

(3) Route C (South of Rus Rus)

Since a part of the wooden bridge (about 10 m) located 1.3 km south of Rus Rus village was swept away, vehicles could not cross the bridge. It could only be crossed on foot. Although no recent traces of vehicle traffic were observed on the west site of this bridge, condition of the road measuring about 4 m wide was fair.

(4) Route D (Route A - Mocoron village)

This Route measuring about 4 m wide was not well drained. Thus, only tractors and other special vehicles could travel on this road.

(5) Route E (Route B - Leimus)

Measuring about 6 m wide, this Route has no waterways, but is well drained. The road conditions here seemed to be the most favorable in the project area.

(6) Route F (Route E - Auka)

Measuring about 4 m wide, this Route was newly established along the ridgeline. The road conditions were fair.

(7) Route G (Route A - Auka)

This Route is the shortest way from Route A to Auka. There was no bridge over the river running along the road. This is a footpath covered with grass.

(8) Route H (Route B - Suhi)

Measuring 3 to 4 m wide, this Route has no waterways, and is not well maintained. The road width was narrowed due to erosion.

(9) Route I (Route B - Rio Rus Rus)

This is a timber road measuring 2 m wide. Vehicles could not enter the road.

(10) Route J (Branch road of the Route A)

This Route, about 3 m wide, is passable by vehicles.

2-4 Vehicles and Fuel

(1) While taking into account location of the project area (Mosquitia), details of survey work, and situations in Honduras (COHDEFOR), two Toyota Land Cruisers were supplied from the COHDEFOR. One of them was transported to Tegucigalpa on March 7 and the other one was requested to be transported immediately after installing the accessories. It seems that the latter vehicle will be utilized for the subsequent survey project.

(2) Rental cars were available at the airport and in cities in Tegucigalpa. The rental fee excluding fuel charge was about L.100 per day. The monthly rental fee was about L.1,500. The fuel charge per gallon is listed below.

Gasoline	L.4 (US\$2)
Engine oil	L.2 (US\$1)

3. Communications

3-1 Tegucigalpa - Puerto Lempira

Telegrams of the Empresa Hondureña de Telecomunicaciones (hereinafter referred to as "HONDUTEL") were available for communications between Tegucigalpa and Puerto Lempira.

The COHDEFOR has its own radiotelephone system for wireless communications in the route of Tegucigalpa - Puerto Lempira - local forestry office - Dursuna work site. However, wireless communications between Tegucigalpa and Puerto Lempira and between Tegucigalpa and Dursuna could not be utilized during the period of survey work. These wireless communication routes are unreliable for emergency use.

The rated frequencies are listed below.

National frequency	5,085 Hz (high frequency)
Mosquitia regional frequency	4,328 Hz (high frequency)

3-2 Puerto Lempira - Dursuna

The COHDEFOR has its own radiotelephone system between Puerto Lempira and Dursuna. Conditions for wireless communications were favorable. For reference, the communication apparatus now being used at Puerto Lempira local forestry office is listed below.

Handie-Talkie FM Radiophone

Model	: P31DDN-1100AR
Type	: CC1505
Serial No.	: HJ4371
Manufacturer	: Motorola Inc., Chicago 51, Ill.

4. Facilities

4-1 Dursuna Work Site

The COHDEFOR local office was located here. It consisted of office, a dining hall, warehouses, lodgings, a power generation

room, and a vehicle repair building.

4-2 Puerto Lempira Local Forestry Office

The COHDEFOR's office in the Puerto Lempira local forestry office was located in the vicinity of the airport. It was convenient for management of aerial photography work. The office building was of the raised-cottage type similar to that at the Dursuna work site. This building was furnished with offices and warehouses.

5. Co-operation of Honduras

5-1 General

Cooperation and necessary advice to the survey team and communications to the other authorities concerned were provided by the officers who govern the Mosquitia district. Names of the officers are listed below.

Tegucigalpa:

Ing. Manul Hernández P.
La. Oficina de Coordinación
de la Asistencia Externa
COHDEFOR

Sr. René Serrano C.
Coordinacion Distoritos Forestales
COHDEFOR

Puerto Lempira:

Ing. Jose Aden Maradiaga
Jefe Distoritos Forestales
La. Mosquitia

III. PROGRESS OF SURVEY ACTIVITIES

1. Signalization

1-1 Planning and Preparations

To clearly identify the location of aerial signals on aerial photographs, the size and shape of each aerial signal were determined as illustrated in Fig. III-1 while taking into account the photographing scale of 1:20,000.

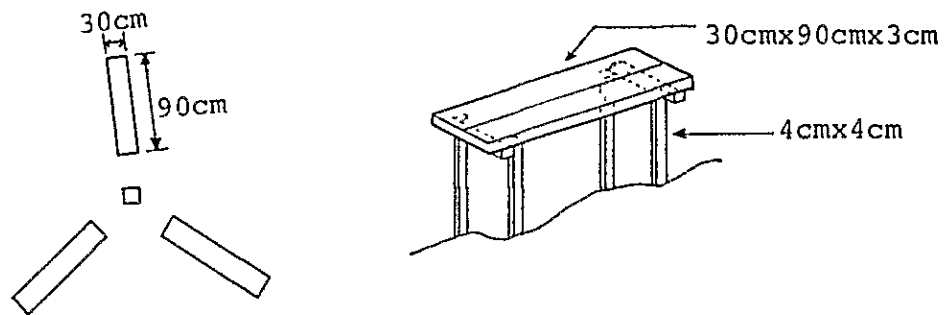


Fig. III-1

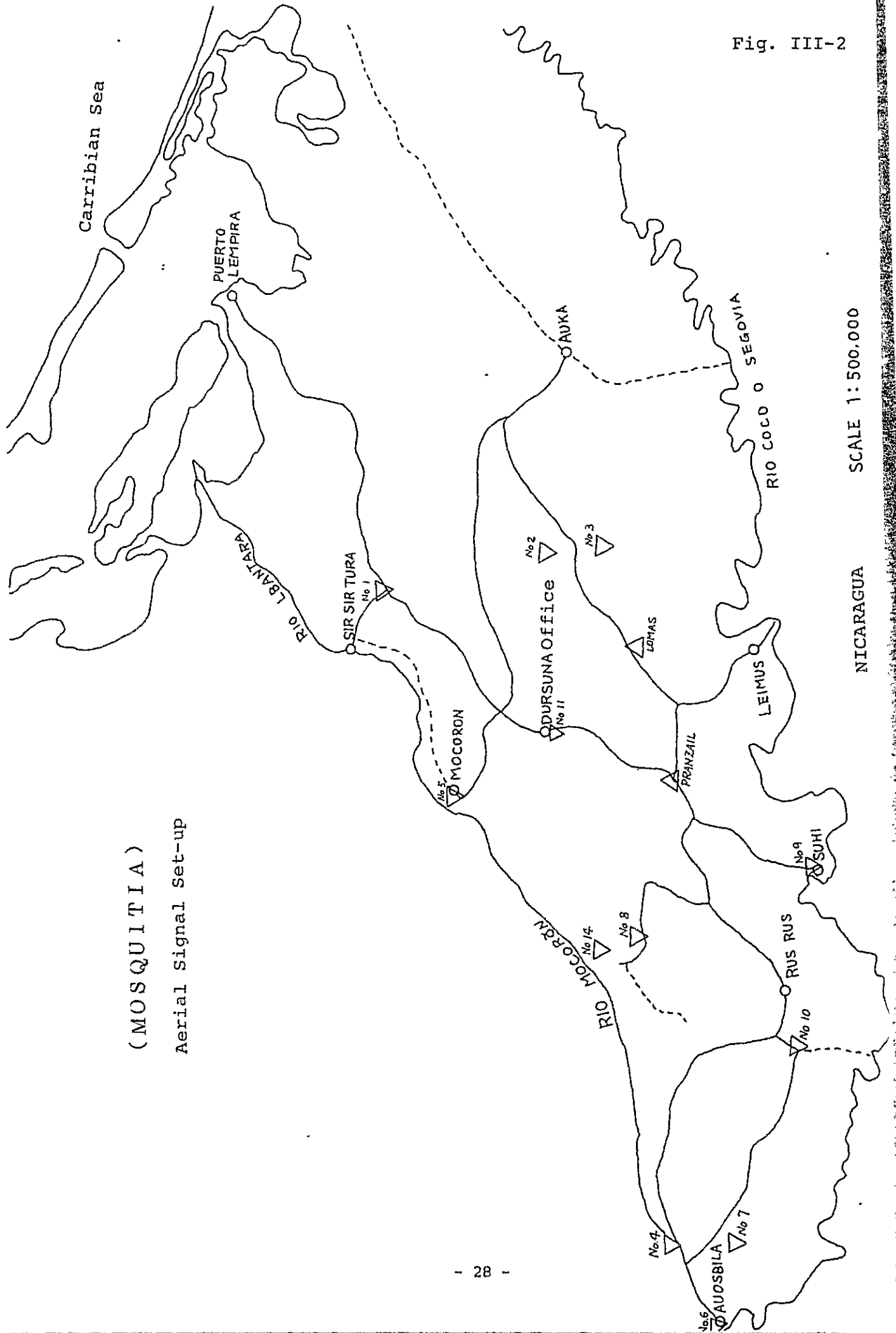
- (1) As illustrated in Fig. III-1, the aerial signals basically consist of three vanes, each measuring 90 cm wide by 30 cm deep by 3 cm thick, coated with white paint.
- (2) To maintain the strength of the aerial signals, square boards, each measuring 4 cm by 4 cm, were used as support members.
- (3) While taking into account shape and topography of the project area, the location of aerial signals were planned as shown in Fig. III-2.
- (4) The aerial signals were established to minimize eccentricity. If eccentric establishment was unavoidable, eccentric elements were planned to be measured by plane table surveying or by using a compass. It was decided to record the measured data of eccentric elements in the specified record sheets (Format III-1 and III-2).

(5) While taking into account the photographing period, it was decided that the aerial signals would be established from the mountainous district to minimize the likelihood of damage.

(6) Details of aerial signals and computation

It was decided to record details of aerial signals and computation results in the specified record sheet (Format III-3).

Fig. III-2



(MOSQUITIA)

Aerial Signal Set-up

NICARAGUA

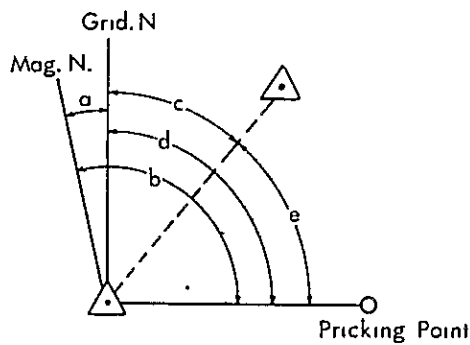
SCALE 1:500,000

COMPUTATION OF COORDINATES & HEIGHTS

STATION:

Computed by:

Checked by:



Azimuth	° ' "
Convergence	° ' "

Variation (a) or Dir. Angle (c)	° ' "
Included Angle (b or e)	° ' "
Dir. Angle (d)	° ' "

COORDINATES		HEIGHTS	
Dis.	m .	Dis.	m .
Dir. Angle (d)	° ' "	Division $\tan \theta$.
Sin (d)	.	Diff.	m .
Cos (d)	.	Ins. Height	.
ΔE	m .	Targets Height	.
ΔN	m .	Diff. of Elevation (ΔH)	.
Main Point (E)	m .	Main Point (H)	m .
ΔE	.	ΔH	.
Pricking Point (E')	.	Pricking Point (H')	.
Main Point (N)	m .		
ΔN	.		
Pricking Point (N')	.		

OBSERVATION SHEET
OF
ECCENTRIC ELEMENTS

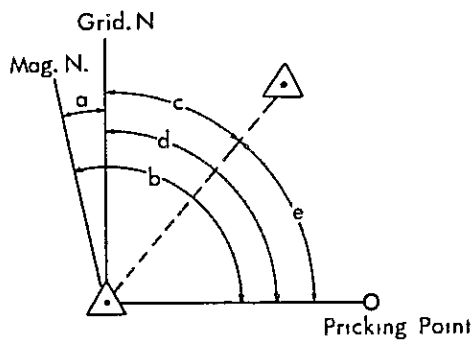
Station No.				Operated by	
Date				Checked by	
	Distance	Ins. Height	Division	Targets Height	
1		m .	--	m .	
2		.	--	.	
3		.	--	.	
Mean		.	--	.	

COMPUTATION OF COORDINATES & HEIGHTS

STATION:

Computed by:

Checked by:



Azimuth	° ' "
Convergence	° ' "

Variation (a) or Dir. Angle (c)	° ' "
Included Angle (b or e)	° ' "
Dir. Angle (d)	° ' "

COORDINATES		HEIGHTS	
Dis.	m .	Dis.	m .
Dir. Angle (d)	° ' "	Division $\tan \theta$.
Sin (d)	.	Diff.	m .
Cos (d)	.	Ins. Height	.
ΔE	m .	Targets Height	.
ΔN	m .	Diff. of Elevation (ΔH)	.
Main Point (E)	m .	Main Point (H)	m .
ΔE	.	ΔH	.
Pricking Point (E')	.	Pricking Point (H')	.
Main Point (N)	m .		
ΔN	.		
Pricking Point (N')	.		

OBSERVATION SHEET
OF
ECCENTRIC ELEMENTS

Station No.		Operated by	
Date		Checked by	
	Distance	Ins. Height	Targets Height
1		m .	m .
2		.	.
3		.	.
Mean		.	.

DESCRIPTION OF AIR PHOTO SIGNAL

Station No.		Operated by													
		Checked by													
		Date													
Zone No.	Coordinates of Station														
	N	E	H												
Main Point	-- .	-- .	. .												
Eccentric Point	-- .	-- .	. .												
Supplementary Point	-- .	-- .	. .												
Sketch-map of Station and Neighborhood		Photograph of Station													
<table style="width: 100%; border: none;"> <tr> <td style="border: 1px solid black; padding: 2px;">C</td> <td style="border: 1px solid black; padding: 2px;">No.</td> <td style="text-align: center;">NORTH </td> <td style="border: 1px solid black; padding: 2px;">EAST</td> <td style="border: 1px solid black; padding: 2px;">C</td> <td style="border: 1px solid black; padding: 2px;">No.</td> </tr> <tr> <td colspan="2" style="border: none; text-align: center;"> <div style="border: 1px solid black; padding: 5px; width: 80%; margin: 0 auto;"> <div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 2px;">LEFT</div> <div style="border: 1px solid black; padding: 2px;">RIGHT</div> </div> <p style="text-align: center; margin: 0;">(Stereoscopically Slick Enlarged Photographic Pair)</p> </div> </td> <td colspan="2" style="border: none;"></td> <td colspan="2" style="border: none;"></td> </tr> </table>				C	No.	NORTH	EAST	C	No.	<div style="border: 1px solid black; padding: 5px; width: 80%; margin: 0 auto;"> <div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 2px;">LEFT</div> <div style="border: 1px solid black; padding: 2px;">RIGHT</div> </div> <p style="text-align: center; margin: 0;">(Stereoscopically Slick Enlarged Photographic Pair)</p> </div>					
C	No.	NORTH	EAST	C	No.										
<div style="border: 1px solid black; padding: 5px; width: 80%; margin: 0 auto;"> <div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 2px;">LEFT</div> <div style="border: 1px solid black; padding: 2px;">RIGHT</div> </div> <p style="text-align: center; margin: 0;">(Stereoscopically Slick Enlarged Photographic Pair)</p> </div>															

SPECIFICATIONS OF PRICKING POINT

Station No.			Operated by	
			Checked by	
			Date	
Zone No.	Coordinates of Station			
	N	E	H	
Main Point	-- .	-- .	. .	
Pricking Point	-- .	-- .	. .	
Supplementary Point	-- .	-- .	. .	
Sketch-map of Station and Neighborhood			Photograph of Station	
<div style="display: flex; justify-content: space-between; align-items: center; margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 2px;">C No.</div> <div style="text-align: center;">NORTH </div> <div style="text-align: center;">EAST</div> <div style="border: 1px solid black; padding: 2px;">C No.</div> </div> <div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 5px;">LEFT</div> <div style="border: 1px solid black; padding: 5px;">RIGHT</div> </div> <p style="text-align: center;">(Stereoscopically Stick Enlarged Photographic Pair)</p>				

1-2 Equipment and Instruments Employed

Automatic levels (Nikon)	2
Plane tables	2
Compasses	2

1-3 Materials Employed

Wood for aerial signals (90 cm x 30 cm x 3 cm pine)
Square boards for aerial signals (4 cm x 4 cm)
White paint
Cement
Gravel
Sand
Nails

1-4 Results of signalization

(1) Planning and results

	Scheduled	Completed
Triangulation	0 point	2 points
Stone monumentation	2 points	2 points
Wooden markers	9 points	10 points
Total	11 points	14 points

(2) Method

Since obstacles within approximately 45° against zenith could be eliminated by cutting down trees, all the aerial signals could be established to permit direct observation.

Each aerial signal was established as follows:

- a) Reconnaissance was conducted while checking the field of view and approach in accordance with planning maps.
- b) To ensure sufficient field of view, trees were cut down while taking into account the scheduled aerial photographing course.

- c) To secure location of the aerial signals, circumstances, approach route, and relationship with objects were recorded in the field book.
- d) The aerial signals were established in accordance with scheduled standards.
- e) Ground photographs were taken to review circumstances at site.

To maintain the aerial signals, the following items were clearly marked on the signboards:

- A. Name of builder (COHDEFOR)
- B. Name and number of aerial signal
- C. Date established
- D. Destruction prohibited

(3) Recording details of aerial signals

Details of aerial signals established were recorded in the specified record sheet (Format III-3) while referring to the field book, ground photographs, and photographing results. See Appendix for typical recording.

2. Aerial Photographing Work

2-1 Planning and Preparations

Initially, we planned to employ an aerial camera with an $f=21$ cm focal length, 75° angle of view, and 23 cm x 23 cm frame size and to take aerial photographs at an altitude of 4,200 m. Because according to meteorological data for La Mosquitia Area, both the mean precipitation and amount of clouds were greater than other areas in the Honduras and the clouds were mostly lower clouds (formed at altitudes of up to 2,000 m), it was pointed out that the photographing altitude should be set as low as possible. Therefore, we changed the photographing scale, number of flights,

number of aerial photographs, and location and number of aerial signals. Also, to lower the photographing altitude, we decided to employ an aerial camera with an $f=15$ cm focal length, 93° angle of view, and 23 cm x 23 cm frame size and to take aerial photographs at an altitude of 3,000 m. We considered that the differential distortion of the photographed images produced by reducing the focal length will not affect the subsequent basic mapping and forest analyzing work. The above plan was drawn on the 1:50,000 topographic map to prepare a photographing planning map.

Regarding selection of the subsidiary aviation company to directly conduct the aerial photographing work, we discussed with the COHDEFOR the four companies already listed in the Report on the 1st Basic Survey: Photo Sur Inc. in Canada, KLM in Netherlands, and Mark Hurd Surveys Inc. and Aero Service in the U.S.A. Because technological cooperation has been made with Pacific Aero Survey Co., Ltd., a member of Honduras Forest Resources Survey Organization, and the company is located nearer to the project area than any other companies, we decided to select Aero Service.

2-2 Equipment and Instruments Employed

a. Airplane

Name of manufacturer : Piper Aircraft Corporation (U.S.A.)
Model : Piper PA-23-250 (Aztec)
Manufacturing No. : 27-132
Register No. : N626Y

b. Camera

Zeiss RMK A-15/23 aerial photographic camera, Machine
No. 21174

Wild RC-8 aerial photographic camera, Machine No. 2771

c. Lens

Zeiss Preogon A, Lens No. 98153, focal length $f=152.58$ mm

Wild Universal Aviogon, Lens No. VAG 270, focal length
 $f=152.46$ mm

d. Film magazine

No. 43

e. Developers

For films : United pequeña de revelado (Compact developer)

For printing : Yokoyama Photomatic No. 3263

f. Drier

JAPO MD-2 No.5268

g. Printer

Ziess KG-30 No. 115310

Log/E MKIII No. 4638

2-3 Materials Employed

(1) Film

Kodak Plus X

(2) Printing paper

Mitsubishi aerial photographic printing paper

(3) Developing solution

Morimoto Kagaku printing paper developing solution

2-4 Photographing Conditions

a. Photographing scale

Approx. 1:20,000

b. Photographing altitude

Altitude specified : 3,150 m above mean sea level
Allowance : Within 7% of the above.

c. Overlap

Forward overlap : 60% ± 5%
Lateral overlap : Over 10% of 30%

d. Angle of inclination

Within 5° of inclination against the perpendicular direction
of the camera axis.

e. Angle of deflection

Within 10° against the center of the photographing direction;
should not have any effect on subsequent mapping work.

f. Allowable cloud volume

The volume of clouds appearing on five serial photographs
shall not exceed 5% within the effective range of the
stereocompiler. Clouds should not exist on or over the
important areas, control points, and principal points.

2-5 Photographing Work

(1) Selecting aerial photographing company

Upon discussions with the COHDEFOR on January 14, 1981, we
decided to select the following company whose head office
is located in Houston, Texas, U.S.A. while taking into
account various conditions:

Name of the company : Aero Service

Address : 8100 Westpark Drive, Houston, Texas 77063

(2) Negotiations on the progress of photographing work

The survey team, COHDEFOR, and Aero Service negotiated and
agreed on January 22, 1981 on the progress of photographing
work.

(3) Permission

The domestic flight application was submitted to the Aviation Service Division, Civil Aviation Bureau, Department of Communications and Transportation Public Service on January 22, 1981.

The aerial photographing applications were submitted to the the Department of Defense, General Staff Office, and Geographic Survey Institute.

All the permissions were obtained on January 28, 1981.

(4) Airplane

The Piper PA23-250 No. N626Y arrived at Tegucigalpa International Airport from Houston on January 28, 1981. This aircraft was immediately inspected and overhauled there.

(5) Progress of photographing work

A. Photographing period

From January 29, 1981 to March 29, 1981.

B. Record of photographing work

Record of Photographing Work

Date	Weather		Taking Off Time	Landing Time	Flight Hour	Types of Work
	AM	PM				
Jan. 29, 1981	Cloudy	Cloudy				Waiting at Tegucigalpa International Airport due to excessive clouds.
30	Cloudy	Cloudy	8:00	11:20	3:20	Photographing impossible due to excessive clouds.
31	Cloudy	Rainy				Waiting for favorable weather conditions.
Feb. 1,	Cloudy	Cloudy	8:45	11:15	2:30	Could not photograph due to excessive Ns.
2	Cloudy	Rainy	9:00	9:25	0:25	Returned immediately after taking off due to rain.
3	Cloudy	Rainy				Waiting for favorable weather conditions.
4	Cloudy	Rainy				Waiting for favorable weather conditions. Volume of clouds was 2/8 at 6:00 AM ~ 9:00 AM. Thereafter, clouds formed and rain fell.
5	Cloudy	Cloudy	7:30	9:50	2:20	The airplane flew from Tegucigalpa International Airport to Puerto Lempila airport. Patrolled the project area.
6	Cloudy	Cloudy	9:00	10:50	1:50	The airplane returned to Tegucigalpa International Airport. Could not photograph due to excessive Ns.
7	Cloudy	Cloudy				Waiting for favorable weather condition. Volume of clouds was 1/8 at 6:00 AM ~ 8:30 AM. Heavy rain at 9:00 AM

Date	Weather		Taking Off Time	Landing Time	Flight Hour	Types of Work
	AM	PM				
Feb. 8, 1981	Fair	Cloudy	7:45	9:55	2:10	Photographed circumstances. Returned to Puerto Lempira airport.
9	Cloudy	Cloudy	7:15	8:40	1:25	Could not photograph due to excessive Ns.
10	Rainy	Cloudy				Waiting for favorable weather conditions. Fog formed in the early morning.
11	Cloudy	Rainy				Waiting for favorable weather conditions. Started wireless communications between Dursuna and Puerto Lempira.
12	Rainy	Rainy				Waiting for favorable weather conditions. Intermittent rain all day.
13	Cloudy	Rainy	8:00	9:05	1:05	Could not photograph due to excessive Ns. St formed at 8:10 in Dursuna.
14	Cloudy	Fain				Waiting for favorable weather conditions. St formed at 8:30 AM.
15	Rainy	Rainy				Waiting for favorable weather conditions.
16	Cloudy	Cloudy	8:00	9:50	1:50	Photographed 40 shots, but not acceptable due to excessive Ns.
17	Rainy	Rainy				Waiting for favorable weather conditions.
18	Cloudy	Rainy				Waiting for favorable weather conditions. Rainfall after 12:00.
19	Cloudy	Rainy				Waiting for favorable weather conditions. Rainfall after 12:00.

Date	Weather		Taking Off Time	Landing Time	Flight Hour	Types of Work
	AM	PM				
Feb. 20, 1981	Rainy	Rainy				Waiting for favorable weather conditions. Rainfall all day.
21	Cloudy	Cloudy				Waiting for favorable weather conditions. Called Tegucigalpa, but no answer.
22	Fair	Cloudy	8:00	9:05	1:05	Could not photograph due to Ns which increased after taking off.
23	Rainy	Rainy				Waiting for favorable weather conditions. Intermittent rain all day.
24	Cloudy	Cloudy	8:45	10:55	2:10	Photographed strip Nos. C-13 through C-17 (122 shots).
25	Rainy	Rainy	8:10	9:40	1:30	Returned to Tegucigalpa International Airport to renew of visa. Could not photograph.
26	Cloudy	Cloudy	9:50	11:30	1:40	Returned to Puerto Lempira. Could not photograph.
27	Cloudy	Cloudy				Waiting for favorable weather conditions.
28	Cloudy	Cloudy				Waiting for favorable weather conditions.
Mar. 1	Fair	Cloudy	8:35	9:10	0:35	Could not photograph due to excessive Ns.
2	Cloudy	Cloudy				Waiting for favorable weather conditions.
3	Cloudy	Cloudy				Waiting for favorable weather conditions.
4	Cloudy	Cloudy				Waiting for favorable weather conditions.

Date	Weather		Taking Off Time	Landing Time	Flight Hour	Types of Work
	AM	PM				
Mar. 5, 1981	Cloudy	Cloudy				Waiting for favorable weather conditions.
6	Cloudy	Cloudy				Waiting for favorable weather conditions.
7	Cloudy	Cloudy				Waiting for favorable weather conditions.
8	Cloudy	Cloudy				Waiting for favorable weather conditions.
9	Cloudy	Rainy				Waiting for favorable weather conditions.
10	Cloudy	Rainy				Waiting for favorable weather conditions.
11	Cloudy	Rainy				Waiting for favorable weather conditions.
12	Cloudy	Cloudy				Waiting for favorable weather condition. Fair sky in the early morning. Gradually strong winds and Ns extended.
13	Cloudy	Cloudy	8:00	8:50	0:50	Could not photograph due to smoke and mist. Shot evidential photograph.
14	Cloudy	Cloudy				Waiting for favorable weather conditions. Fair sky in the north-east and smoke rose in the west. Fair sky only in the early morning.
15	Cloudy	Cloudy				Waiting for favorable weather conditions. Strong wind was blowing from the northeast in the afternoon.
16	Fair	Fair	10:30	14:45	4:15	Photographed strip Nos. C-3 through C-12.

Date	Weather		Taking Off Time	Landing Time	Flight Hour	Types of Work
	AM	PM				
Mar. 17, 1981	Cloudy	Cloudy				Waiting for favorable weather conditions. St extended in the west.
18	Cloudy	Cloudy				Waiting for favorable weather conditions. Fair sky in the early morning and St extended in the west.
19	Fair	Cloudy				Photographed strip Nos. C-1, C-2, and BC-5.
20	Cloudy	Cloudy				Waiting for favorable weather conditions. Observed Ns all day. Strong wind.
21	Fair	Fair				Trouble occurred in the gear down (wheels lowered) display lamp.
22	Fair	Fair	7:40 12:30	8:40 13:50	2:20	Partially photographed strip Nos. BC-3 and BC-4. Trouble resolved.
23	Fair	Cloudy				Waiting for favorable weather conditions. Strong wind.
24	Fair	Cloudy				Waiting for favorable weather conditions. Strong wind.
25	Cloudy	Cloudy				Waiting for favorable weather conditions. Mr. Kitagawa returned from Puerto Iempira to Tegucigalpa.
26	Cloudy	Cloudy				Waiting for favorable weather conditions.
27	Cloudy	Cloudy				Waiting for favorable weather conditions.
28	Cloudy	Cloudy				Waiting for favorable weather conditions.

Date	Weather		Taking Off Time	Landing Time	Flight Hour	Types of Work
	AM	PM				
Mar. 29, 1981	Cloudy	Cloudy				Waiting for favorable weather conditions.

Notes: 1) Localized or occasional rain is regarded as cloudy or fair sky.

2) Fair sky until 9:00 AM and cloudy thereafter regarded as cloudy.

3) Symbols for clouds

Upper clouds (Altitude of 5 ~ 13 km)

Ci : Cirrus, CC : Cirrocumulus, CS : Cirrostratus

Intermediate clouds (Altitude of 2 ~ 7 km)

Ac : Altocumulus, AS : Altostratus

Lower clouds (Altitude of up to 2 km)

Sc : Stratocumulus, ST : Stratus, Ns : Nimbostratus,

Cu : Cumulus, Cb : Cumulonimbus

The photographing work was started on January 29, 1981. At that time, the photographing base was established in Tegucigalpa and patrol and photographing flight was conducted on January 30. However, since the Mosquitia area was entirely covered with clouds, the project area could not be photographed even after flying for 3 hours and 20 minutes.

Although flights continued on February 1 and 2, the project area could not be photographed due to unfavorable weather conditions.

The photographing base was then shifted to Puerto Lempira on February 5. Patrol flights were repeated on February 6, 8, 9, and 13, but aircraft returned due to unfavorable weather conditions. Eight strips were photographed between clouds on February 16, but all these photographs were unacceptable due to excessive clouds.

Strip Nos. C-13 through C-16 was successfully photographed on February 24. However, since strip No. C-13 was partially covered with clouds, we decided to photograph it again. The other strips were accepted. Thereafter, patrol flights were repeated on February 25, March 1, and March 13, but aircraft returned due to unfavorable weather conditions. Strip Nos. C-8 through C-11 was photographed on March 16. At that time, although the flight courses were slightly unstable due to strong north wind, we considered that this would not affect the subsequent work and adopted them. Subsequently, strips Nos. C-1 through C-7 and BC-5 were photographed on March 19, strip Nos. C-3 (supplement), and BC-4 on March 22, and strip Nos. C-14 through C-16 (supplement) and C-17 on March 24.

The flight hours totalled 33.

The progress of photographing work is listed below.

As of February 12	0%
As of February 27	19%
As of March 16	78%
As of March 29	100%

As already mentioned in item 1, Weather Conditions, the waiting time for favorable weather conditions was too long. The rate of No. of photographing to number of flights was excessively low. However, this rate was increased in the latter half of the photographing period. As to accidents to the aircraft and other equipment and materials, trouble occurred only once with the wheel lowering display lamp on March 21. No other trouble occurred during the photographing period.

(6) Photographing record

See Appendix.

2-6 Results of Photographing

After taking aerial photographs, inspection prints were produced to check whether or not the photographs were acceptable. Those photographs which included many clouds and not suitable for subsequent map compilation and analysis of forestry resources and those which had large angles of inclination not suitable for aerial triangulation were eliminated and photographed again.

Due to a strong wind constantly blowing at right angles (from the north), deflection from the scheduled course was unavoidable. The side of photographing strips Nos. C-9 and C-10 had to be supplemented by strip No. C-9A. Also, strip No. C-16 had to be supplemented by strip No. C-16A. In this instance, sufficient overlap was provided on these strips. Unclear parts (due to clouds) existed at the east end of strip No. C-5. Although we intended to photograph again, we were unable to during the photographing period. However, these photographs covered the project area almost entirely; thus, it was suitable for aerial

triangulation. Due to the supplemental strips, overlapped parts were increased and number of models was also increased. Still some adopted strips contain small clouds. However, they were considered to be suitable for subsequent map compilation and analysis of forestry resources.

All the established aerial signals were clearly identified. To improve accuracy of the subsequent aerial triangulation, however, three to four pricking points are considered to be required in the western area.

Upon eliminating unacceptable photographs from the total of 685 aerial photographs, we adopted 644 photographs.

As a result of negotiations with the COHDEFOR, the items shown in Fig. III-3 will be specified on each photograph.

L - 1 1:20000 M-8102001 No. 1

L = Flight Line
Photo-Scale = 1:20,000
M = Mosquitia
81 = Year
02 = Month of year
001 = Roll number
N. 1 = Aerial Photographed number

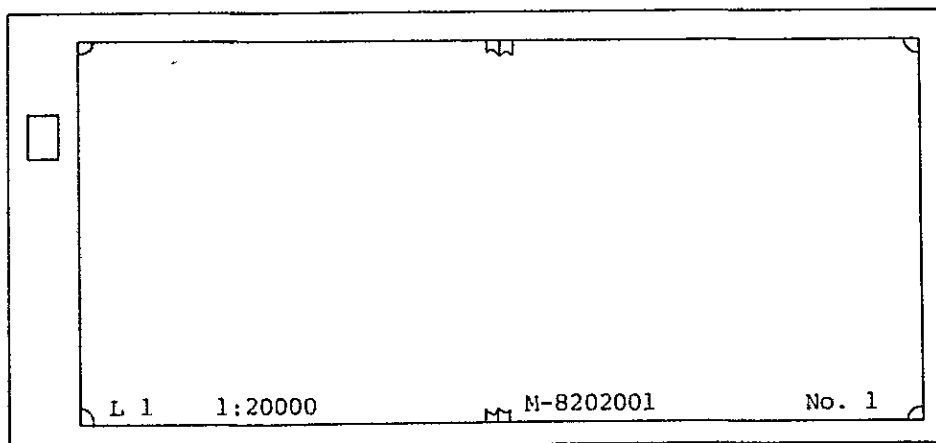


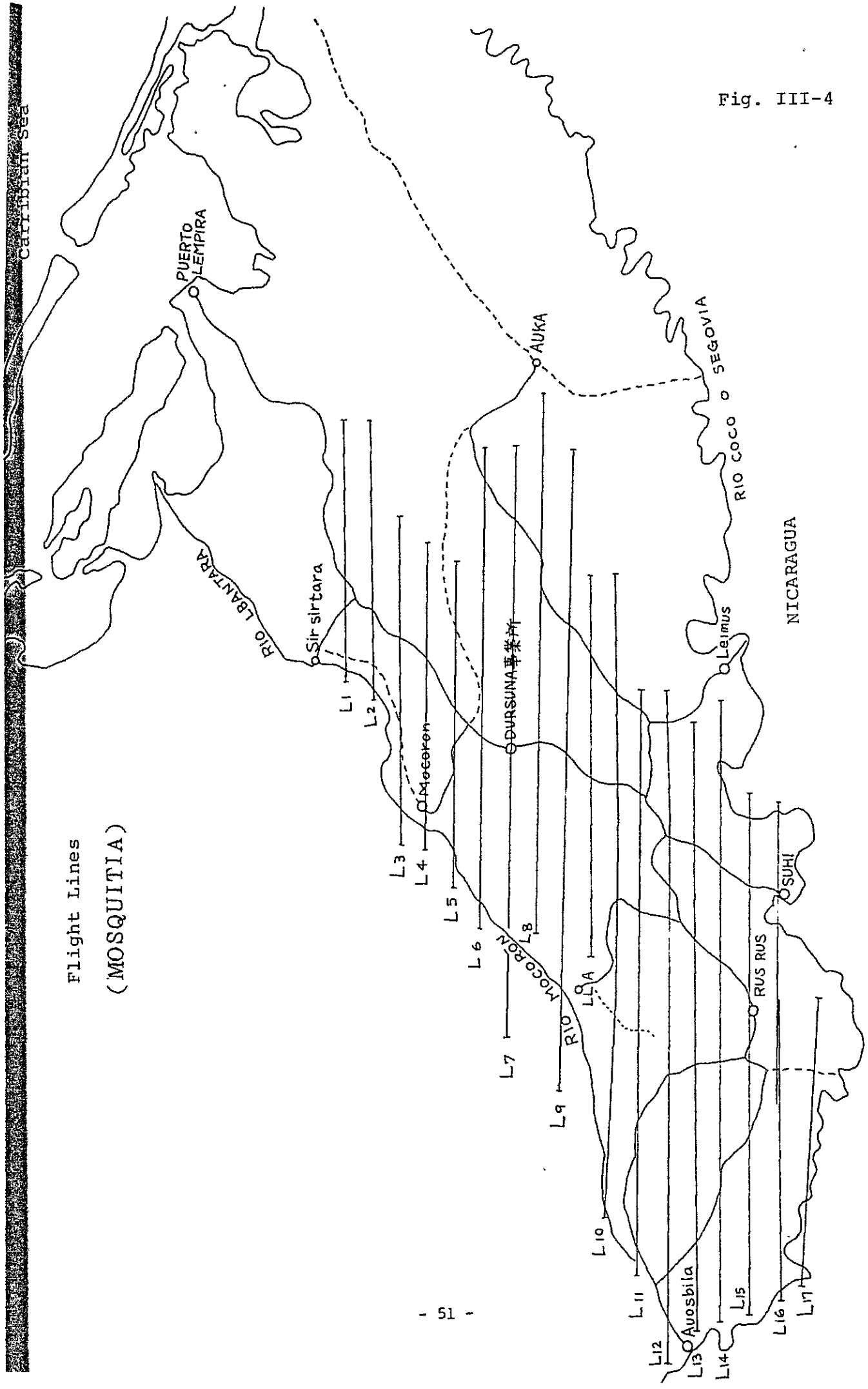
Fig. III-3

Table III-2 lists the relationship between strip No. and photograph No.

Table III-2 List of Aerial Photographs

Strip No.	Photograph No.	Q'ty	Strip No.	Photograph No.	Q'ty
1	1 - 18	18	15	1 - 31	31
2	1 - 19	19	16	1 - 20	20
3	1 - 22	22	16A	1 - 18	18
4	1 - 21	21	17	1 - 16	16
5	1 - 21	21	BC4	1 - 23	23
6	1 - 34	34	BC5	1 - 47	47
7	1 - 43	43			
8	1 - 37	37	Total		155
9	1 - 51	51			
9A	1 - 30	30			
10	1 - 44	44			
11	1 - 36	36			
12	1 - 42	42			
13	1 - 36	36			
14	1 - 35	35			
Total		489	G. total		644

Fig. III-4



Flight Lines
(MOSQUITIA)

IV. TECHNICAL GUIDANCE OF AERIAL PHOTOGRAPHING WORK

1. The counterparts in Honduras are listed below.

Rense Serrano Calderon, chief of Eastern District Coordination Section (Coordinacion Distritos Forestales)

Cristobal Vasquez Valladares, leader of Forestry Survey Group (Director Inventario Forestal Nacional)

Jose Adan Maradiaga, chief of Mosquitia Forestry Office (Jefe del Distrito Forestal la Mosquitia)

2. Technical Guidance of Signalization and Aerial Photographing

In Tegucigalpa, we provided technical guidance to the counterparts listed above. First, we provided guidance in planning and design while taking into account weather conditions, topographic features, and other special conditions inherent to the project area. Then, we provided technical guidance on actual onsite work. The items of technical guidance are listed below.

2-1 Signalization

- (1) Definition of aerial signals
- (2) Timing of signalization
- (3) Size and standards of aerial signals
- (4) Signalization
- (5) Eccentricity of aerial signals
- (6) Measuring and recording eccentric elements
- (7) Determining constants of magnetic needle
- (8) Computation

2-2 Aerial Photographing

- (1) Definition of aerial photographing work
- (2) Applicable cameras

- (3) Calibration of cameras
- (4) Applicable films
- (5) Airplanes
- (6) Planning aerial photographing
- (7) Preparation of flight map
- (8) Photographing flight
- (9) Various requirements
- (10) Processing photographed films
- (11) Preparation of contact prints
- (12) Preparation of blow-up
- (13) Preparation of contact positive films
- (14) Compilation of films
- (15) Judging the need for reflights
- (16) Reflights
- (17) Preparation of photograph orientation map
- (18) Preparation of photographing record

V. NEGOTIATIONS WITH COHDEFOR

- (1) We asked the COHDEFOR that two vehicles supplied be exclusively used by the Japanese project team and survey team until the project is completed. (See Appendix 4.)
- (2) The flight application dated January 19 was approved by the Department of Defense and Civil Aviation Bureau on January 28. (See Appendix 5.)
- (3) Written instructions to regulations on aerial photographing in Honduras and handling procedures for aerial photographs dated February 11 were submitted to us by Sr. R. Serrano. (See Appendix 6.)
- (4) As a result of negotiations with COHDEFOR, insurance of the two vehicles was determined to be provided by the COHDEFOR. (See Appendix 7.)
- (5) Upon consulting with the Japanese Embassy, COHDEFOR, and Tokyo headquarters on aerial photographing work delayed due to abnormal weather conditions, we have decided to apply for an extension of the survey period and executed necessary procedures through the general manager of the COHDEFOR to the Japanese Embassy and through the sub-general manager of the COHDEFOR to the executive secretary of the CONSPLANE. (See Appendix 8.)
- (6) We asked the COHDEFOR for cooperation on urgent shipment of the two vehicles to Puerto Lempira. (See Appendix 9.)
- (7) We have requested the COHDEFOR to provide us notes, format, and samples of the aerial photographs. (See Appendix 10.)
- (8) We have requested the COHDEFOR to urgently repair the partially destroyed bridge located beyond Rus Rus. (See Appendix 11.)
- (9) We have requested cooperation of the Flight Service on dispatch of the subsequent survey team and transportation of equipment and materials to Mosquitia. (See Appendix 12.)

VI. COHDEFOR'S CAPABILITIES OF AERIAL PHOTOGRAPHING WORK (MAP COMPILATION)

Since the COHDEFOR has no map compilation facilities, aerial photographs are compiled by using topographic maps issued by the Geografica Nacional Instituto (I.G.N.). The INFONAC owned by the COHDEFOR and aerial photographic facilities owned by the I.G.N. are listed below for reference.

EQUIPO DEPTO DE FOTOGRAMETRIA

- 1.- Máquina quemadora de placas Marca NU-ARC serie N.93K
- 2.- Mimeógrafo eléctrico Ges.ener serie 4-C5440.
- 3.- Prensa reproductora de nombres.
- 4.- Copiadora marca Metem-67(máquina heliográfica H -A50/261)
- 5.- Cámara para reproducción litográficas serie 12503
- 6.- Proyector reflectante Kargl keufie esser N. K-239
- 7.- Estereoscopio de espejo marca wild N.834.
- 8.- Estereoscopilador kelsh plotter N.54, con su pantógrafo transfer
- 9.- Estereoscopilador kelsh plotter N.259 con su pantógrafo transfer
- 10.- Estereoscoplador kelsh plotter serie N.284 con su pantógrafo
- 11.- Aparato "AVIOPLAN" OR-1 marca wild heerbrug se ien. FNR-5351
- 12.- barra de multiples con 6 proyectores bauch and lamb serie N.TF-126
- 13.- Autógrafo: instrumento ploteador wild B-8
- 14.- Estereoscopios de bolsillos plegables
- 15.- Estereostopo marca zeiss N.5522 con su pantógrafo.
- 16.- Estereostopo marca zeiss N.56278, con su transformador zeiss y su pantógrafo Rott N.16092.
- 17.- Estereostopo marca zeiss N.56251-87011,56759 con su transformador zeiss y su pantógrafo rott N.16099
- 18.- Estereostopo marca zeiss N. 6252-87012-66741 con su transformador zeiss y su pantógrafo N.15068

- 19.- Aerotopo master marca zeiss
- 20.- Estereoscopio de 2 espejos marca zeiss N.211433.
- 21.- Estereoplanímetro C-8 con cordinatógrafo marca zeiss N.71125, con perfilómetro c/8, dispositivo receptor para el orto-proyector.
- 22.- Autógrafo marca wild A-7618.
- 23.- Barra de multiplex con seis (6) proyectores bausch and lom, serie N.1980-657-Xa34
- 24.- Barra de multiplex con 6 proyectores bausch and. lam serie N.XA-42.
- 25.- Barra de multiplex con 66 proyectores bausch and lam. serie XA-126.
- 26.- Barra de multiplex con 6 proyectores bausch and. lam serie N. 6675-11-0182-XA 35
- 27.- Rectificador de fotografías de áreas. marca "Zeiss" N.SCG7-55074
- 28.- Máquina impresora de contacto marca zeiss KGN N. 129
- 29.- Ampliadora de fotografía marca "Choromega" serie N.223523 con su marginador de 11"x14", tres lentes un reláj omega.
- 30.- Visor de negativos de 35mm del aparato microbox
- 31.- Unidad pequeña de revelado.
- 32.- Cámara fotografica Linhor N.81826 de 6X9 cm.
- 33.- Cámara para fotografía aérea marca fair-child N.41
- 34.- Cámara fotográfica Linhor serie N.201164.
- 35.- Secadora de negativos aéreos zeiss N. 20255
- 36.- Guillotina Spied Ezz de 25"x25"
- 37.- Reductor e impresor de diapositivas bausch and. lam serie N.YA37
- 38.- Computador para negativos wester fatovol MOD.747
- 39.- Cámara fotográfica maniya C-33
- 40.- Secadora de fotografías sin marca

- 41.- Copiadora especial KG-30,121690 zeiss.
- 42.- ~~Sacapunta de mesa N.50170~~
- 43.- Cámara fotográfica grannangular aérea Standar RMKA-15/23 marca zeiss
- 44.- Pileta para crevalado de fotografías aéreas modelo KN-65
- 45.- Aeronave Seneca II bimotor equipada para toma de fotografía aérea.
- 46.- Autógrafo Wild A+10
- 47.- Log- A Tronig impresora de contactos.

Information on INFONAC :

Total floor area	:	190 square metre	
No of staff	:	26	
Breakdown of staff	:	Photo-interpreters	: 3
		Draftmen	: 5
		Forest technicians	: 8
		Computer supervisor (Canadians)	: 4
		Computer supervisor (Hondurans)	: 4
		Secretaries	: 2

With cooperation from the CIDA, forestry inventory compilation system is scheduled to be developed by April, 1981.

Vertical sketchmaster : One
 (Keuffel & Esser Co.,
 Photo-Grammetric Systems Div.,
 Bethesda, MD, Made in Swiss)

VII. SUBSEQUENT PHOTOGRAPHING WORK

- (1) Although control points are usually surveyed immediately after completing the aerial photographing work, it is recommended to conduct the survey work in April and May because of the weather conditions at site.
- (2) As already mentioned in item , Results of Aerial Photographing Work, two to three pricking points are required in addition to aerial signals.
- (3) In addition to four to five triangulation points, monumentation of bench marks were provided on the main roads in the project area at intervals of approximately 1.5 km. Although all these points and marks were surveyed and recorded, pricking is necessary during the subsequent survey work.
- (4) As mentioned in item III 2-6, Transportation Facilities, two Toyota Land Cruisers were procured. During subsequent phases of the survey, it is necessary to check on the arrival of these vehicles, repair of the bridge, and fuel storage in advance.
- (5) Since the control point survey team has to transport a large amount of equipment and materials, a written request for COHDEFOR's cooperation on transportation by air was made. However, it is recommended to confirm it in advance.

VIII. ACKNOWLEDGMENT

First of all, the COHDEFOR showed us its exceptionally great interest on this aerial photographing work. So the survey team felt we had a serious responsibility because of its expectations. Although we encountered some difficulties during the period of the survey, fortunately, we have completed all the signalization and aerial photographing work as scheduled and prepared new aerial photographs required for the subsequent survey work. We consider that such success was the result of the cooperation of the COHDEFOR which is highly concerned with the progress of the project of the forestry resources development survey in Honduras.

We hereby express our heartfelt gratitude to the officials of the Japan International Cooperation Agency and the Japanese Embassy in Honduras who provided kind cooperation and advice, and the staff members of the COHDEFOR who cooperated with us during the period of the survey and aided us in drawing up this report. At the same time, it is our hope that conditions will permit subsequent survey projects to be conducted without delay.

REFERENCE MATERIALS

EXHIBIT A

FORESTRY RESOURCES DEVELOPMENT SURVEY IN HONDURAS

SPECIFICATIONS FOR AERIAL PHOTOGRAPHY

1. General

The specifications shall be designed for aerial photography of Forestry Resources Development Survey in Honduras around Mosquitia area, of which survey and mapping have been entrusted to the PACIFIC AERO SURVEY CO., LTD. by Japan International Cooperation Agency.

2. Photographic Coverage

The area to be photographed is shown on the attached map, Exhibit B. The total area to be photographed is approximately 2,500 km².

3. Photographic Scale

Aerial photography shall be carried out for preparing a topographic map at scale 1:20,000 and for further photo interpretation work. The photographic scale for the whole project area shall be at 1:20,000.

4. Equipment and Materials to be used

1) Aircraft

A modern aircraft mounted with the designated aerial camera shall be used.

2) Wild Aviogon RC-8 or equivalent camera with wide angle lens (focal length 15 cm.) shall be used. The camera and lens to be used shall have been calibrated by an authorized agency within the previous three years.

3) Navigation Instrument

A WILD NF2 Navigation Sight or equivalent instrument shall be used in connection with the aerial camera.

4) Film

Kodak XX or equivalent distortion free film shall be used.

U. Y.

J. P.

5) Printing Paper

Kodak RC Poly Contrast or Kodabrome II RC medium weight printing paper or equivalent shall be used for the reproduction of contact prints and 2-times enlarged prints.

5. Requirement of Photographic Flying

1) Altitude of Photography

The designed altitude shall be 3,000 meters from mean ground level and the tolerable errors of altitude shall be within 5% of the designated altitude.

2) Tolerable Shifting Error

Tolerable shifting error of flight strip shall not exceed 15% of designated flight altitude.

3) Overlaps

Fore and aft overlap shall be 60% \pm 5% and lateral overlap shall be 30% and not less than 10% in any case.

4) Tip

Tip shall not exceed 5 degrees.

5) Crab

Crab shall not exceed 10 degrees.

6) Tilt

Tilt shall not exceed 5 degrees.

7) Haze, Mist and Smoke

Distortion of clarity of the image caused by haze, mist or smoke, etc., shall be avoided.

8) Cloud content

Although cloud free photography shall be required, in the case of bad weather, cloud content shall not impede the succeeding mapping and photo-interpretation work. However, on the effective stereoscope photographs, the important areas for mapping such as villages and cultivated lands shall not be obscured. Principal points of the photography shall not be cloud covered.

Ug

J.P.

-9) Dividing of Strip

If a designated strip is divided into two or more strips for any reason, new strips shall be started and ended at the cross point of main strips. In this case, the overlap of the two strips shall consist of an least three photographs.

10) Additional Requirement

- a) Two extra photographs shall be taken to cover the outside of the boundary before the strip starts and after it ends in order not to miss some of the required area.
- b) More than one meter of both ends of rolled films shall not be used for regular photography.

6. Photographic Processing

- 1) The film shall be developed in Honduras and shall be inspected by the designated person of the PASCO in Honduras.
- 2) The film shall be developed to have homogeneous tone and clear contrast of the negatives.
- 3) Fixing shall be done with sufficient time for thoroughly removing unexposed emulsion.
- 4) Washing shall also be done with sufficient time for thoroughly removing remaining fixing solution.
- 5) Drying shall be carefully done for avoiding film distortion caused by rapid heating, etc.,

7. Negative Numbering

Each negative shall have the following information on it and shall be marked:

- 1) Date of photography
- 2) Scale of photography
- 3) Number of strip
- 4) The serial number of camera, magazine and the lens
- 5) Other information required.

4/2

J.P.

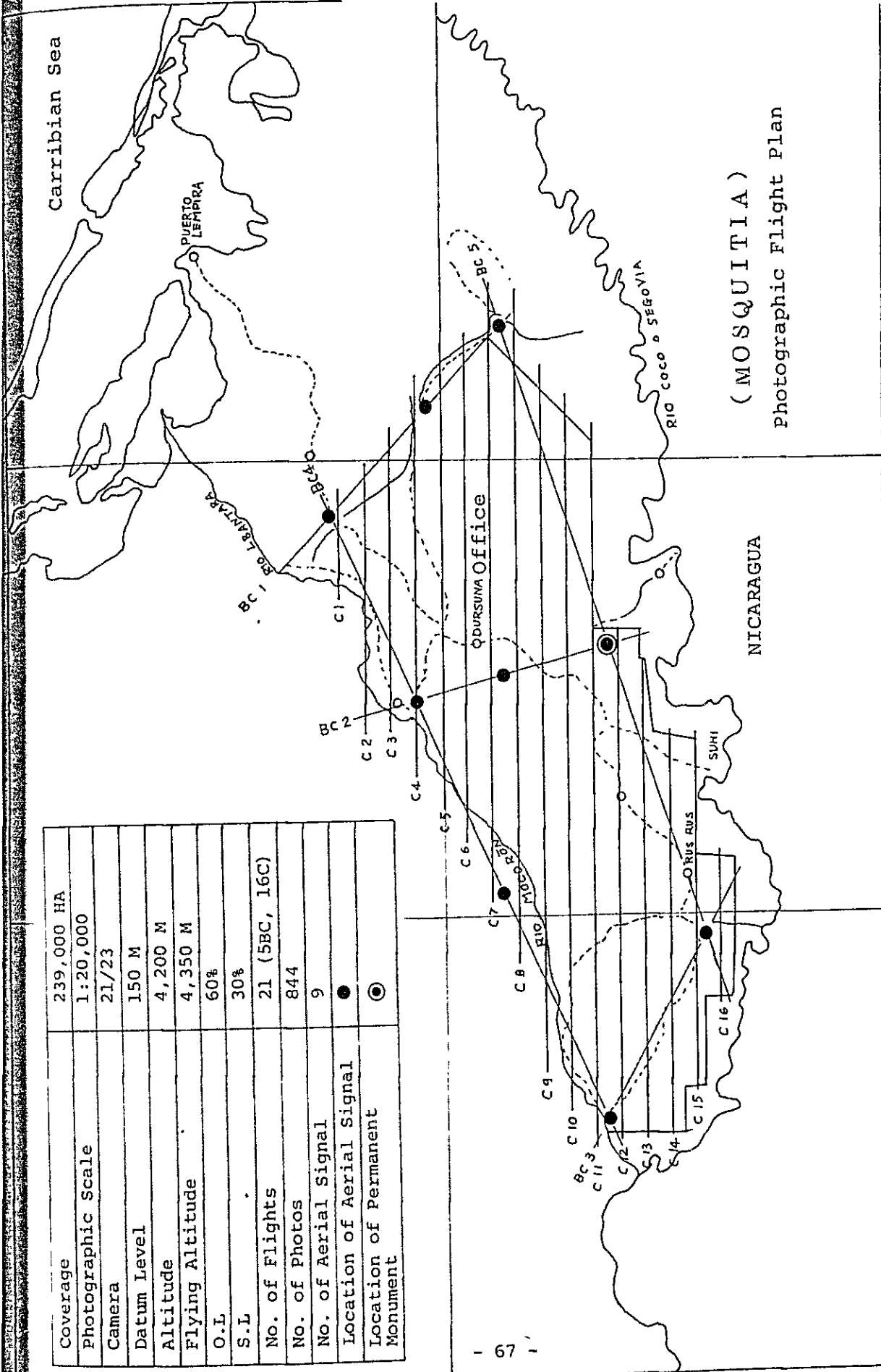
8. Delivery Items

- 1) Film Negatives one (1) set
- 2) Original Photo Index one (1) set
- 3) Contact Prints four (4) sets
- 4) 2-times enlarged prints one(1) set

U-2

J.P.

Coverage	239,000 HA
Photographic Scale	1:20,000
Camera	21/23
Datum Level	150 M
Altitude	4,200 M
Flying Altitude	4,350 M
O.L.	60%
S.L.	30%
No. of Flights	21 (5BC, 16C)
No. of Photos	844
No. of Aerial Signal	9
Location of Aerial Signal	●
Location of Permanent Monument	⊙



Note

This brief report on photographing -
activity has been prepared in Tegucigalpa
upon the request of the COHDEFOR.

The Spanish version has been made
by the COHDEFOR based upon the original report
written in English.

(Japanese Photographing Mission)

~~HONDURAS~~
Photographing Team in Mosquitia
INTERIM. REPORT.

As the initial steps to perform forest inventory in La Mosquitia, aerial photo-taking in the project area covering approximately 200,00 ha. has been agreed to be made for mapping the areas at the scale of 1/20,000.

Led by Mr. Tadami Imai, forester, the Japanese Photographing Team made up of four (4) experts, proceeded to the project area late January, 1981.

Based at Dursuna, the Team organized field reconnaissance party with COHDEFOR Staff, and conducted preview to the proposed work sites in the area. With a close collaboration with the COHDEFOR Staff both in Puerto Lempira and Dursuna, the Team successfully signalized fifteen (15) control points necessary for aerial photography and subsequent aerial triangulation, carefully consuming gasoline which was then reportedly going out in the locality.

This was followed by aerial photo-taking with Puerto Lempira Airfield as flight base. Unfortunately however, due to continued unfavourable weather in the project area, the Japanese Team had to confront much difficulty in flight operation for exposing photographs. In an effort to complete photographing in the area, the Team extended the stay until the end of March, 1981.

After patient standing-by for the advent of cloudless weather, the Team has finally obtained photographic coverage for all of the proposed flight paths.

In fact, the Mission was favoured by a few cloud-free weather, though by no means continuous, that popped out without any advance sign whatsoever.

The aerial photographs which will later be enlarged will be used by Japanese Survey Mission and/or forestry inventory survey team, the former scheduled to conduct JMR survey in La Mosquitia to obtain necessary geodetic data for the mapping of the area.

Another trouble the Team had to face was forest fire that entailed smoke over a vast area. True, during flight operations in the project area, that big forest fires were reported and COHDEFOR's fire-fighters rushed to the sites to make them out. According to Engineer Julio Eguigurems, Chief of COHDEFOR's District Office, La Mosquitia, most of the fires have been caused by local people engaged in hunting of deer, turtles, and others for their food, aggravated by dried shrub and low moisture.

While wireless communication between Dursuna and Puerto Lempira was excellent, which helped the Team a great deal in many respects all through

the work period on the one hand, vehicle fuel shortage caused by some reasons beyond our control affected the ground work on the other.

It seems that transportation of freight from Puerto Cortes or La Ceiba to Puerto Lempira still remains a problem due to irregular sea service and cruising speed of freights.

This is rather important for the future execution of the project in La Mosquitia, for transportation by sea, as we understand it so far, is the only way available locally, except weekly flight in which bulk cargoes would cost much in transportation.

For the survey parties whose work will be for the most part ground work requesting efficient removal in the field, the Mission has already arranged, with the help of the Embassy of Japan in Tegucigalpa and COHDEFOR, two diesel-engine Toyota jeeps (Japan's aid in grant to Honduras) to be transported to Puerto Lempira so that these vehicles could reach the project area in time for their ground survey work.


Assisted and sometimes encouraged by COHDEFOR Staff concerned, the Japanese Team thus covered through both ground work and flight schedules. Thus, with COHDEFOR who have been eager to promote the

project for the preservation and management of forest resources for this country, the first phase of the in-field work has been completed successfully.

The Japanese Photographic Team would like to express a deep appreciation for the support and assistances it received during the work period from all those who have concerned with this Honduran Japanese Project.

This Mission would feel it most grateful if all those who have taken part in this project in any way, and those in the Embassy of Japan and in COHDEFOR in particular, could continue their cooperation or collaboration with our experts who are scheduled to come up to this country for the subsequent operations in this project until the completion in 1982 of the forest inventory - a final goal set up in the project.

The listed on the next page are Japanese Experts who have jointly taken part in the project with the Staff of COHDEFOR :


Tadami Imai
Leader
Japanese Photographing Mission

Mr. Tadami Imai	Leader of the Mission
Mr. Sohichi Ichikawa-surveyor	Member of the Mission
Mr. Aiki Takahashi-surveyor	Member of the Mission
Mr. Yukihiro Kitagawa-surveyor	Member of the Mission

TI/rsb

c.c. : Sr.Céleo Arias Moncada - COHDEFOR
Sr.Manuel Hernández - COHDEFOR
Sr.René Serrano - COHDEFOR
Sr.Adán Maradiaga - COHDEFOR
Sr.Julio Eguigurems - COHDEFOR
Sr.Cristóbal Vásques - COHDEFOR
Sr.Yukihiro Kitagawa - JAPANESE MISSION

EXITOSA PRIMERA PARTE DE LA ASISTENCIA JAPONESA A COHDEFOR

Con fecha 22 de septiembre de 1980 se firmó el Convenio de Asistencia titulado "Alcances del trabajo de Inventario Forestal en el Distrito de la Mosquitia", Honduras, C.A. entre el Jefe de la Misión Japonesa (JICA) y el Gerente General de la Corporación (COHDEFOR).

El referido Convenio marca el inicio de las relaciones de Asistencia Técnica Forestal del Gobierno del Japón al Gobierno de Honduras ; dicha Asistencia concretamente se define en dos (2) etapas :

- a). Toma de la fotografía aérea a una escala de 1/20,000 sobre una área prioritaria de 200,000 has. con bosques de pino caribaea; y,
- b). Ejecución del trabajo de Inventario Forestal en la sub-Unidad de Rus Rus, Unidad de Manejo Segovia, en una extensión de 75,000 has.

A finales del mes de enero de 1980 inició sus actividades la Misión Japonesa responsable de la FASE I (Toma de la fotografía aérea); el equipo de expertos japoneses han sido dirigidos por el señor Tadami Imai a su vez responsable de la dirección e inspección de la toma de la fotografía con sus colaboradores en la Misión, señores Soichi Ichikawa

y Aiki Takahashi, especialistas topográficos para la demarcación, y Yukihiro Kitagawa, responsable de la Planificación fotográfica y conducción.

Los servicios de la empresa "Aeroservice" de Houston, Texas, U.S.A. fueron contratados para realizar los vuelos y toma de la fotografía siendo dirigidos y supervisados por el equipo japonés.

A pesar del mal tiempo imperante en aquella región, al 29 de marzo se ha logrado una cobertura del 100% sobre la cobertura total propuesta.

La capacidad profesional de los expertos debidamente apoyados por el personal de las Oficinas centrales y distritales de la corporación, han hecho posible el éxito de la Misión en el desarrollo de esta Primera Fase. En esta forma, ^y posible proseguir con la Fase II, para desarrollar ^{yá es} el inventario, aunque el área a inventariar sea reducida, de acuerdo a la disponibilidad de la fotografía aérea.

La fotografía aérea obtenida servirá para la elaboración de mapas, estratificación del bosque y otras necesidades técnicas en la ejecución del inventario, a su vez será una valiosa herramienta para el Distrito de la Mosquitia en la planificación de actividades futuras de Manejo Foresta.

Al concluir su cometido la Misión de Expertos Japoneses han expresado su aprecio por el apoyo y asistencia recibida durante esta fase del

Proyecto entre Honduras y el Japón, manifestando a la vez que esperan que dicha cooperación sea extendida al grupo de Expertos Japoneses que vendrán luego para la continuación del proyecto de cooperación en su Segunda Fase.

Para la Corporación es motivo de profunda satisfacción concluir esta Primera Etapa de la Asistencia Japonesa en forma exitosa, esperando que en igual forma será desarrollada la etapa sub-siguiente cuyos trámites seguirán de inmediato.

Al Equipo Japonés pionero en el desarrollo de Proyecto en su parte operativa, de deseamos exitos profesionales y la mejor suerte al regresar a su Patria, expresándoles además, nuestro sincero agradecimiento.

OFICINA COORDINACION DE ASISTENCIA EXTERNA

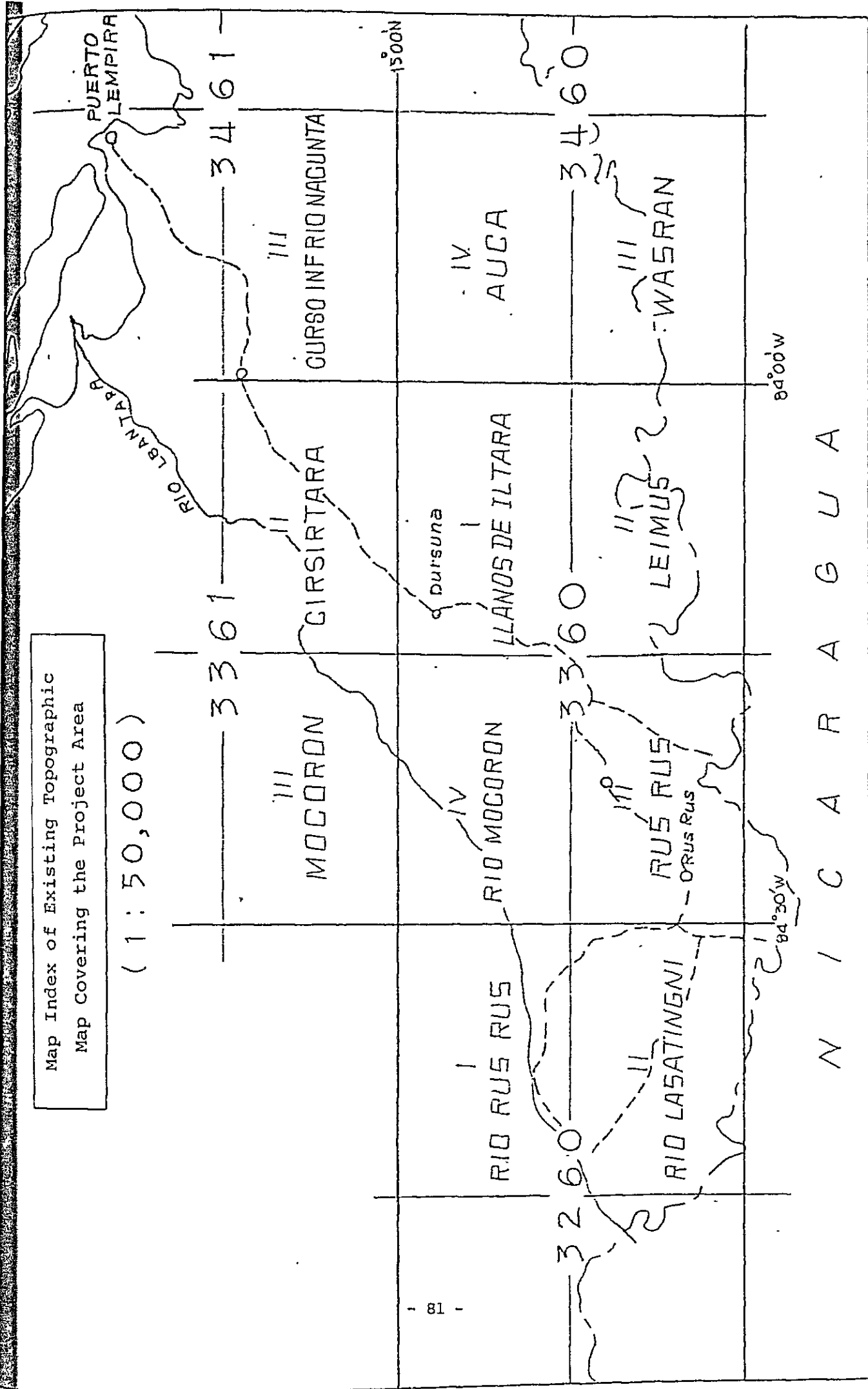
MHP/rsb

APPENDED MATERIALS

1. MAP INDEX OF EXISTING TOPOGRAPHIC
MAP COVERING THE PROJECT AREA

Map Index of Existing Topographic
Map Covering the Project Area

(1:50,000)

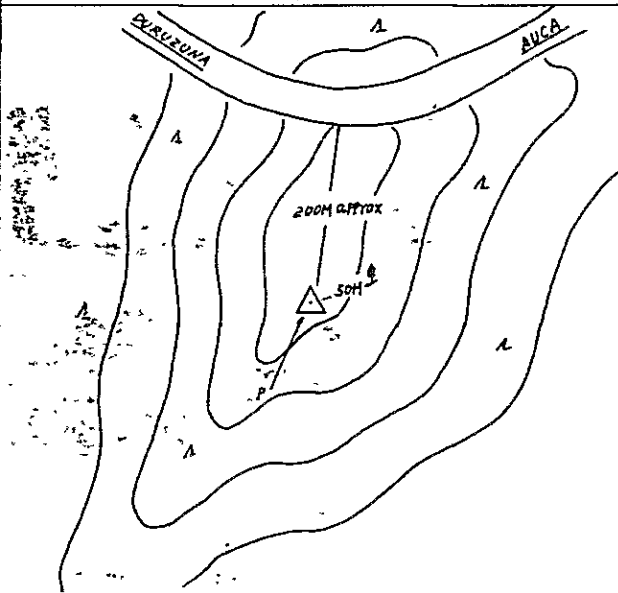
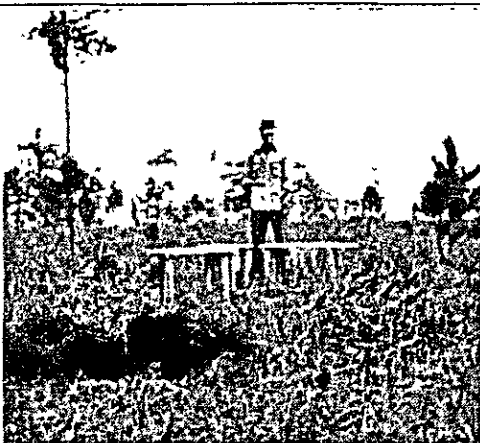
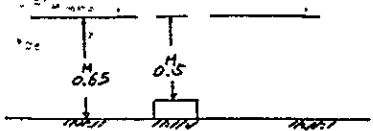
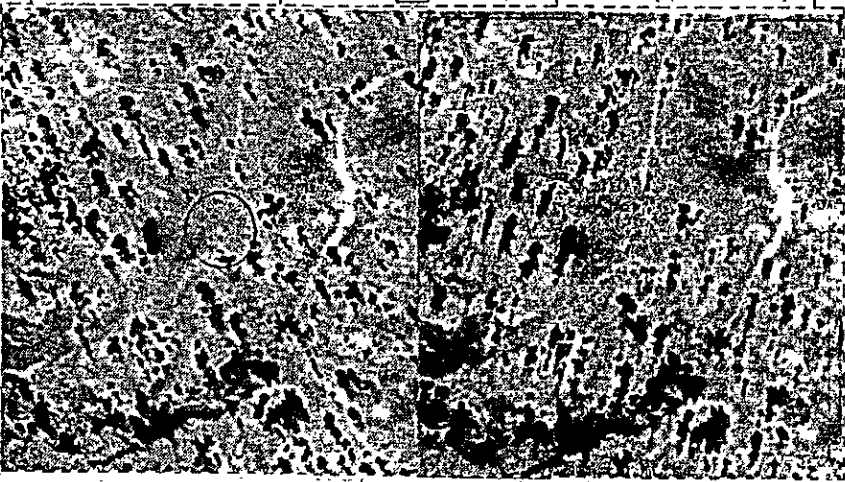


2. DESCRIPTION OF AIR PHOTO SIGNAL

DESCRIPTION OF AIR PHOTO SIGNAL

Station No.				Operated by	AIKI TAKAHASHI
50				Checked by	SOICHI ICHIKAWA
				Date	28-1-1981
Zone No.	Coordinates of Station				
16	X	Y	H		
Main Point	+ 1662 889.807	+ 792 275.449	39.670		
Eccentric Point	--	.	--	.	.
Supplementary Point	--	.	--	.	.
Sketch-map of Station and Neighborhood				Photograph of Station	
C No.		NORTH ↑	← EAST	C No.	

DESCRIPTION OF AIR PHOTO SIGNAL

Station No.				Operated by	AIKI TAKAHASHI
	E S T LOMAS			Checked by	SOICHI ICHIKAWA
				Date	24-1-1981
Zone No.	Coordinates of Station				
16	X	Y	H		
Main Point	+1 645 165.396	810 578.866	143.187		
Eccentric Point	--	--			
Supplementary Point	--	--			
Sketch-map of Station and Neighborhood			Photograph of Station		
					
					
<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 2px;">C No.</div> <div style="text-align: center;"> NORTH ↑ ↓ EAST </div> <div style="border: 1px solid black; padding: 2px;">C No.</div> </div> 					

3. MATERIALS RELATED TO APPLICATION
FOR AERIAL PHOTO PERMIT

MEMORANDUM OF UNDERSTANDING

This document is a memorandum of understanding signed by Mr CELEO ARIAS MONCADA, General Manager of CORPORACION HONDURENA DE DESARROLLO FORESTAL (COHDEFOR), Mr TADAMI IMAI, DIRECTOR OF JOINT VENTURE (J.V.), Mr YUKIHKO KITAGAWA, COORDINATOR OF JOINT VENTURE and Mr GEORGE A. BROOKES, VICE-PRESIDENT of AERO SERVICE CORPORATION (AERO).

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA) has funded a mapping project over an area of Honduras as shown on the attached flight plan and entered into an agreement with the COHDEFOR for the performance of that project.

JAPAN FOREST TECHNICAL ASSOCIATION (JFTA) and PASIFIC AERO SURVEY COMPANY, LIMITED (PASCO) have formed a joint venture for the performance of the project. The J.V. has entered into a contract with the AERO for the flying phase of the project as well as the production of certain materials.

In performing its contract for the J.V., AERO and AERO's personnel will respect the aviation and general laws of Honduras. The AERO will provide the services and products to the J.V. as required by the terms and conditions of the contract between J.V. and AERO.

After initial inspection of the product by the AERO, they will be handed to the representatives of the J.V. in Tegucigalpa. The J.V. representatives will be solely responsible for approval of the products. After approval of the initial products, the J.V. is authorized under the terms of the COHDEFOR/JICA contract to ship the film negatives and a set of contact prints to Japan (or U.S.A. as appropriate).

To produce the additional products, the COHDEFOR will arrange for such export. Rejected negatives will be handed to the COHDEFOR by the J.V. The parties to J.V. and AERO will keep all data confidential and not reveal it to others unless authorized in writing by the COHDEFOR.

The COHDEFOR will obtain for both J.V. and AERO all flying and other permits as may be required to perform the survey ; ensure that all equipment and materials required in the performance of the survey are imported free of duty and that no taxes are imposed whether they may be corporate, personnel or any other type. It will also assist in getting aircraft fuel to

the base of operations should such assistance be needed. All such services will be without charge to the J.V. or the AERO.

Mr ROBERT H. HARDWICK will be the AERO's representative in Tegucigalpa for technical matters relative to the flying. Questions which cannot be handed in Tegucigalpa should be referred to Mr GEORGE A. BROOKES at AERO SERVICE in Houston :

Aero Service
8100 Westpark Drive
Houston Texas 77063
Telephone : (713) 784-5800
Telex : 775-909

(COHDEFOR)

(JOINT VENTURE)

(AERO SERVICE)



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APENDICE J.

ANEXO "A"

ESPECIFICACIONES TECNICAS

1. CAMARA A USARSE
 - A. Las fotografías serán tomadas con cámara cartográfica aérea de lente de precisión manufacturada por Wild & Zeiss o su equivalente adaptada para fotografía infrarrojo, blanco y negro. La distancia focal será calibrada a 153 milímetros en una precisión más o menos 2.0 milímetros. La cámara funcionará apropiadamente desde el nivel del mar hasta los 20,000 pies de altura sobre el nivel del mar; tomando exposiciones con negativos de 9" x 9" (pulgadas). El lente, el plano focal y las marcas fiduciarias deberán estar permanentemente fijas en orientación rígida, entre una exposición y otra. Es deseable un mecanismo que registre la altitud de vuelo en cada exposición.
 - B. La coincidencia del eje óptico y la perpendicular del polo del lente al plano de la película será tal que no indicará ninguna asimetría por el poder de resolución en los cuatro bordes del área de la película. Las marcas fiduciarias indicarán la posición perpendicular del polo del lente al plano de la película, con una desviación máxima de más o menos 0.051 de milímetro. Las líneas que conecten las marcas fiduciarias opuestas, interceptarán a 90° con una variación de más o menos un minuto de arco.
 - C. Una vez instalados el filtro y el lente en la cámara, la distorsión óptica en la parte del campo dentro de 42.50° del eje óptico no excederá a 0.010 milímetros.

OR HT



APARTADO CESTAL 1378
G. 22-7-50. 22-1052
22-1-46. 22-1027

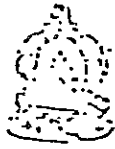
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- D. Las dimensiones fijas en el plano focal deberán ser anotadas en el reporte de calibración de la cámara. Las medidas anotadas deberán ser las distancias entre las marcas fiduciaras, según la imagen de la fotografía en una placa de vidrio sensitivo expuesto a través del lente de la cámara. Cuatro medidas deberán tomarse entre cada par de marcas fiduciaras localizadas en cada lado del marco de calibración de la cámara, o las distancias anotadas deberán ser entre dos marcas fiduciaras apropiadas. Los puntos usados para tomar las medidas serán definidos en el reporte de calibración y su imagen será recuperable en el negativo expuesto. Las medidas se harán al 0.001 de milímetro y su exactitud estará dentro de más o menos 0.0002 milímetros.

- E. Cualquier ensamblaje o desmontaje de la cámara aérea que afecte las constantes de calibración requerirá una recalibración de tal cámara.

- F. Toda la superficie del plano focal de la cámara será un plano bajo condiciones de operación dentro de más o menos 0.051 milímetros. La película deberá mantenerse plana con respecto al plano focal en el momento de exposición entre más o menos 0.051 milímetros. La platina de la cámara será probada haciendo cien medidas uniformemente distribuidas. Las medidas serán hechas a intervalos máximos de una pulgada sobre toda la superficie de 9x9 plgs. que es parte de la platina total que será usada para aplanar la película en el instante de la exposición.



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- G. La luz deberá ser transmitida a través de los lentes del disparador en forma simultánea a todas las partes del plano de la emulsión durante la operación fotográfica. La eficiencia del disparador será un mínimo de 75% del valor de la velocidad máxima.
- Las velocidades deberán ser exactas dentro de un 10% del valor anotado en la prueba de calibración hecha a temperatura ambiental. Los resultados de la prueba de eficiencia y la fecha de la prueba serán anotados.
- H. Se usará un filtro apropiado, plano, eficientemente sujeto en forma paralela al plano del lente con una desviación máxima de un minuto. El filtro tendrá un diseño tal que compensará las reducciones en iluminación del campo a medida que se acerca a la mitad del campo angular.
- I. Cuando la cámara sea equipada con altímetro a presión, éste deberá ser conectado al sistema estático del avión si éste está bajo control de presión.



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2. PRUEBA DE SERVICIO

- A. El contratista presentará una prueba de servicio a alturas apropiadas de vuelo.

Dicha prueba se efectuará con el personal y el equipo que pretende utilizar en el desarrollo del presente proyecto e incluirá una certificación de la eficiencia del personal y equipo.

La certificación deberá establecer que el equipo llena los requisitos requeridos para su uso en triangulaciones aéreas de primer orden con estereo-planígrafos. La prueba de servicios deberá ser completada y presentada al inicio del trabajo y podrá repetirse en cualquier otro tiempo durante el progreso del trabajo, sin perjuicio de la certificación de calibración requerida por COHDEFOR antes de iniciar el trabajo. Cualquier ajuste o corrección de las cámaras que sea necesario al final de la prueba, cuyo fin es obtener modelos estereoscópicos satisfactorios se harán antes de comenzar o continuar con el trabajo bajo este contrato.

Todos los costos de prueba requeridas iniciales y subsiguientes y los costos de ajuste y corrección del equipo serán sufragados por el contratista sin cargos adicionales a COHDEFOR.



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- B. La prueba de servicio consistirá en realizar tomas fotográficas con la cámara y accesorios, en una línea de tres (3) o cuatro (4) exposiciones consecutivas de un área a indicarse por el IGN en las cercanías de Tegucigalpa para probar la calidad de los modelos estereoscópicos resultantes. Todos los negativos expuestos serán considerados parte de esta prueba. El IGN indicará en su informe el área, y resultados para sustentar que la prueba fué llevada a cabo de acuerdo con los requisitos, que incluyen las especificaciones concernientes al traslaje, alabeo, flamdeo, sesgo y calidad de la película.
- C. Si las cámaras tienen cartucheras intercambiables, cada cámara y cada cartuchera deberá ser probada por servicio tal como se especifica aquí. Una vez probada y certificada la cartuchera, ésta podrá ser usada en cualquier cámara aprobada.
- D. La película expuesta durante la prueba de servicio deberá indentificarse completamente y contener:
- Número de exposición, número de contrato, nombre del contratista, localización del área de prueba, alturas topográficas, distancia focal calibrada de la cámara al 0.001 de milímetro; fecha de la fotografía, tipos y números de lentes, cuerpo de la cámara, cono, cartu-



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de licencia del avión, nombre del fotógrafo y del

chera, marco, nombre del proyecto, tipo y número
piloto. Todo lo anterior también deberá aparecer
en el informe rendido.

3. ALTURA DE VUELO

Las fotografías deberán ser tomadas a una altura de vuelo apropiada. La altura de vuelo, determinada por la escala de la fotografía, no deberá variar en más o menos 5%.

4. LINEAS Y FAJAS DE VUELO

El número de líneas de vuelo deberá ser determinado por el contratista. Cada línea de vuelo deberá ser fotografiada de tal manera que los puntos principales de la primera y última exposición comprendan áreas que estén en el límite o más allá del límite del área especificada en los mapas proporcionados. Esto se hace para asegurar que el área completa de mapeo aparezca en por lo menos un modelo estereoscópico.

Cuando una línea de vuelo sea interrumpida, ese extremo del vuelo donde la fotografía fué descontinuada deberá ser cubierto posteriormente con un traslape de cuatro exposiciones. Cuando parte de alguna línea de vuelo sea rechazada, esta parte deberá ser sobrevolada completamente. Este sobre-vuelo deberá extenderse cuatro exposiciones más allá del límite de



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la parte rechazada.

5. TRASLAPE

- A. El traslape longitudinal no deberá ser menor al 55% ni mayor al 65% entre exposiciones.

Cualquier traslape longitudinal menor del 55% o mayor del 65% a través del ancho total de la fotografía o faja, será suficiente base para rechazo; excepto el caso donde el desplazamiento de imágenes en la fotografía, causado por cambios bruscos en elevación dentro del área de traslape longitudinal se acerca o excede los valores límites anotados arriba. Donde las fotografías sean tomadas bajo tales condiciones de terreno, no habrá valor máximo para el traslape longitudinal siempre y cuando en algún punto en ambos bordes del traslape fotográfico normal a la dirección de vuelo, haya un punto en el cual el traslape longitudinal sea entre el 55% y 60%. Esto se determinará haciendo coincidir imágenes idénticas de dos fotografías que se traslapan y midiendo el porcentaje en sus bordes. Se prevé de antemano que los cálculos deberán mostrar que todo traslape longitudinal mayor al 65% se debe al cambio de elevación dentro del área de traslape. El mínimo del 55% de traslape longitudinal, es efectivo en todo caso.



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B. El traslape lateral entre fajas adyacentes promediará un 30%.

El traslape lateral mínimo entre fajas adyacentes será un 10%.

El traslape lateral será determinado después de realizadas todas las reducciones por sesgo, alabeo, relieve y otros factores que hayan sido considerados. Para medir el traslape lateral, la única parte del vuelo considerado es aquella en el cual todos los puntos del terreno cubierto por dicho vuelo aparecen en por lo menos dos líneas o fajas de vuelo adyacentes.

6. SESGO

El sesgo no deberá exceder de 5 grados medidos con respecto a la línea de vuelo. En cualquier serie de dos fotografías el sesgo relativo permitido estará limitado por las condiciones del párrafo 5.

7. ALABEO

El alabeo no excederá de 3 grados para cualquier exposición.

El alabeo promedio para una sección de 10 exposiciones no excederá de 2 grados.

El alabeo promedio para todo el proyecto no excederá un grado.



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8. PELICULA

Sólo película aérea de base topográfica, reciente, de grano fino e infrarrojo blanco y negro, será usada.

La fecha de vencimiento de exposición de la película, establecida por el fabricante, nunca podrá ser excedida; y el contratista será responsable por su conservación en refrigeración.

9. EXPOSICION PROCESADO Y SECADO DE LA PELICULA

A. La velocidad del disparador será aquella que las condiciones de la película, el filtro y la luz lo permitan.

En ningún caso, la velocidad relativa al terreno, en millas por hora, excederá a la altura de vuelo, en miles de pies, dividida por cinco veces la velocidad del disparador, en segundos.

B. Los negativos deberán ser expuestos y revelados de tal manera que los detalles del terreno en partes que tengan mucha luz o mucha sombra sean claramente visibles.

La mínima densidad del negativo, medida con densitómetros con una escala de 0 a 3.0, no será menor de 0.3 y la máxima densidad no será mayor de 1.7. Los negativos deberán ser nítidos en detalle, grano fino, libres de nubes y sombras de nubes, cambios de luz, marcas estáticas y otros defectos, lo que en opinión de COHDEFOR limiten las finalidades propuestas. A ca-



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da extremo del rollo de la película deberá haber una sección sin exponer, de 45 pulgadas antes y después de la primera y última fotografía.

C. Todos los empalmes serán permanentes y la película no será ajustada más cerca de 45 pulgadas a una película expuesta.

D. No se cortarán los rollos expuestos. Los rollos de fotografía deberán ser numerados en orden consecutiva comenzando por uno. Los rollos fraccionarios serán empalmados para ser enrollados, pero cada parte del rollo llevará el número de su rollo original.

E. Se tomará cuidado especial para asegurar el revelado apropiado a través de la fijación, lavado de la película y para el enrollado de los negativos o cualquier otra acción que pueda afectarlos durante el proceso y secado. La película no será revelada por ningún método sujeto a apreciable tensión. No se permitirán gotas de agua en el lado de la emulsión de la película en ningún tiempo.

Cualquier gota de agua que pudiera quedar en la película después del lavado final, deberá ser eliminada por secado cuidadoso o por aire a chorro, dirigido apropiadamente.



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F. Si el Contratista desea usar cualquier máquina especial en el revelado y secado de la película, deberá demostrar por prueba en copias de contacto o plantillas convenientes, que los métodos de sus máquinas no introducen distorsiones que excedan a más o menos 0.01 milímetros.

G. Después del procesado y secado los negativos no mostrarán cambios diferenciales en dimensiones de más de 0.1 mm. ni cualquier distorsión introducida dará negativos inconvenientes para su uso en el equipo-planígrafo Zeiss C-8. Los cambios diferenciales en las dimensiones del filmado serán determinados comparando las dimensiones del plano dadas en el reporte de calibración de la cámara, con las dimensiones determinadas por medición entre dos mismos puntos tomados en la película. Los cambios uniformes en las dimensiones de la película no están comprendidos en esta provisión,

10. COPIAS

Un juego de copias de contacto para control, en papel de peso ligero, será ajustado al borde de la imagen con la excepción de aquel borde en el que aparecen los datos fotográficos y será ajustado de tal manera que esta información aparezca en cada copia de contacto. Las copias serán secadas como desee el contratista. Estas copias serán usadas por el contratista y por CONDEFOR para realizar la inspección de las copias.



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11. INDICES

- A. Cada exposición deberá ser numerada en orden consecutivo, comenzando en el número uno en el rollo número uno. La numeración se continuará en orden consecutivo a través de todos los rollos.

- B. La información titular requerida en la primera y última exposición de cada faja continua (o línea de vuelo) de fotografías será como se muestra en el ejemplo adjunto y será rotulada en la parte ^{interior} ~~exterior~~ de la sección de la película expuesta, ~~para las letras de la~~
~~esta información se colocará en un espacio~~
~~de la película expuesta.~~ El número de la exposición solo aparecerá entre los límites de la porción de la película expuesta.
Cada sección será espaciada para diferenciarla de las otras secciones. La información requerida puede ser colocada en dos líneas si se considera necesario, pero toda la información con la excepción del número de la exposición deberá ser colocada fuera de la imagen del negativo.



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- C. Cada exposición deberá tener la información titular dispuesta en la misma forma como es mostrada en el ejemplo e incluirá los artículos del (1) al (6).
- D. Cada rollo tendrá en la porción libre de la película a cada extremo adyacente a las exposiciones extremas y de manera visible en un formato ligeramente mayor que el de la copia, la siguiente información: Nombre del Contratista, Tipo y Número de Serie de la Cámara, Tipo y Número de Serie de la Cartuchera, Tipo y Número de Serie del Lente y Tipo y Número de Serie del Cono.
- E. Las máquinas de estampado y/o cualquier otro utensilio de estampado y las guías de letras mecánicas o equipo equivalente, serán usadas con tinta opaca especial para numerar los negativos. Dicha tinta deberá estar seca antes de enrollar la película en su carrete.
- F. La caja metálica para cada rollo de película (que pasará a ser propiedad de CONDEFOR) será rotulada con la información completa del formato que le será adherido.

ECRÁFICA:
OR"
DICEPOR HT



() APARTADO POSTAL 1370
TELS. 22-7050, 22-6452
22-4346, 22-1027

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Tezuczalpa, S. C., Honduras, C. A.

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12. REQUISITOS PARA PERSONAL DE VUELO

El contratista usará únicamente personal de vuelo experimentado.

La experiencia mínima en horas de vuelo fotográfico del piloto será 500 horas y del fotógrafo 100 horas en proyectos aerofotográficos de similar naturaleza.

SAMPLE OF ACTUAL FILM CONTAINER LABEL

F. OFFERUM FILLED OUT

ETIQUETA DE PELICULA AEROCARTOGRAFICA

Project No 74-1 (62) Roll No 1 and 2
 Contract No 5824 Contractor AEC Air Photo Corp.
 Exposures Nos. 1 through 272 Camera Type WILD RC 5A
 Calibrated focal length 153.4 mm No. & Type of Lens Avicron 537
 Approximate Scale 1:16,000 Magazine No 520

Listing Data for the first and last
 Exposures of each Working Day and for each Block of Photographs

ITEM	ROLL NO.	EXPOSURE NO.	DAY	MONTH	YEAR	TIME OF DAY	FLIGHT ALTITUDE. ABOVE SEA LEVEL	GEOGRAPHIC COORDINATES OF NORTH AND SE CORNERS OF EACH OF GROUP OR BLOCK OF PHOTOGRAPHS
1st Exposure	1	1	4	Jan	1951	0840	3,400	N18° 30' W 63° 24'
Last Exposure		142				1120		
1st Exposure	1	142	10	Jan	1951	0850	3,000	
Last Exposure		164				1045		N18° 30' W 71° 45'
1st Exposure	2	165	10	Jan	1951	0830	3,700	N18° 00' W 71° 45'
Last Exposure		265				1045		
1st Exposure	2	265	10	Jan	1951	1001	- 106 -	

MODELO PARA LA ROTULACION DE LA
PRIMERA Y ULTIMA EXPOSICION DE
CADA VUELO

(1) Numero de exposicion	(2) Proyecto ICM No.	(3) Mision No.	(4) Hoja No. (Precedida de una V)	(5) Rollo No.	(6) Fecha	(7) Hora standard	(8) Altura de vuelo	(9) Dist focal calibrada	(10) Coordenadas (Aprox)
Apareceran en cada exposicion									
Apareceran en la primera y ultima exposiciones de cada vuelo									
Lmites de area de exposicion									

