Name	Coordinates	Class	Runways	Remarks
Masamba	2° 34' S 120° 19' E	ELG	1950'	Reported extensible.
Paloe	0° 50' S 119° 50' E	FLG	3440'	Auxiliary field. Some facilities.
Lahia Bay	4° 25' S 122° 37' E	ASS		Some facilities. Used by Japanese float planes.
Tasoeka	1° 15' N 124° 54' E	ASS		At SW corner of Lake Tondano. Former Dutch Military Anchorage. Some facilities. No evidence of Japanese use or development.
Kakas	1° 15' N 124° 53' E	ASS		At SW corner of Lake Tondano. Former Dutch Civil Anchorage. No evidence of Japanese use or development.
		MOLUCCAS - AIRFIELDS		
Djailolo North	1° 09' N 127° 28' E	ELG	1650'	Under construction November 1943.
Djailolo South	1° 07' N 127° 28' E	MLG	5280'	Dispersal reported.
Galela	1° 55' N 127° 45' E	MAD	4500' 5000'	Undergoing development July 1944. Extensive facilities. 100 dispersal points.
Hatetabako	1° 19' N 128° 06' E	HLG	5000'	One mile S of Lolobata A/D.
Kaoe U/C	1° 15' N 127° 49' E	MLG	4500' 3600'	Auxiliary field on NW side of Kaoe Bay. Some facilities. 4500' strip probably abandoned.
Laboeha	0° 35' S 127° 26' E	LLG		Under construction March 1944.

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Name	Coordinates	Class	Runways	Remarks
Lolobata	1° 17' N 128° 06' E	HAD	6900'	On E side of Kaoe Bay. Some facilities. 30 bomber dispersal points. Anti-aircraft. Coral surfaced.
Miti	1° 38' N 128° 00' E	MAD	5000'	On Miti Island in Kaoe Bay. 35 dispersal points.
Oba	0° 45' N 127° 34' E	FLG	3400'	Defense field on central W coast of Halmahera. Extensible to 6000'.
Pitoe	2° 03' N 128° 18' E	MLG	5000'	On S end of Morotai Island. Satellite of Galela.
Ternate	0° 52' N 127° 20' E	ASS		On Ternate Island. Some facilities. Used by flying boats.
		BOERGE ISLAND		
Namlea Township	3° 12' S 127° 06' E	MAD	5800'	Extensive dispersal. Under construction April 1944. 13 bomber revt's.
Old Namlea	3° 10' S 127° 06' E	MAD	3500' 2700' 4500' 4780'	Important air base. 30 bomber and 8 fighter dispersal points. Some facilities. Undergoing expansion. Only runways 2 and 4 are serviceable.
		CERAM ISLAND		
Amahai	3° 20' S 128° 54' E	HAD	7500' 2400'	Important air base. Extensive facilities being developed. Suitable for heavy bombers. 13 bomber revt's. Anti-aircraft.
Boela	3° 06' S 130° 30' E	FAD	4100' 3300'	Adjacent to Boela Oil field. Some facilities. 7 bomber and 8 fighter revt's. Anti-aircraft.

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Name	Coordinates	Class	Runways	Remarks
Boela South	3° 11' S 130° 31' E	FLG	3000'	Constructed by Dutch as "Secret" landing ground. No evidence of Japanese use or development.
Haroekoe	3° 28' S 128° 27' E	MAD	4500'	On Haroekoe Island, 4 miles S of Ceram. Some facilities. 5 bomber revt's and 19 dispersal points.
Kairatoe	3° 20' S 128° 21' E	MLG	5000'	Auxiliary landing ground. Dispersal loop along SW side of runway.
		AMBON ISLAND		
Halong	3° 39' S 128° 11' E	SS		Important seaplane base. Extensive facilities.
Lana	3° 39' S 128° 05' E	MAD	4500' 3000'	Important air base. Extensive facilities. 6 fighter revt's. 34 bomber dispersal points. Anti-aircraft. Searchlights.
Liang	3° 27' S 128° 20' E	HAD	7000'	Important air base. Extensive facilities. Suitable for heavy bombers. 8 revt's (fighter), 42 fighter dispersal points.

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AIRFIELDS - SUNDA - TIMOR AREA

Airfield development in this area has been limited in the West and intensive in the East. These islands, with Java, form the outer Southern defense line of the area of Japanese conquest, serving as a protective screen for the areas to the North. Airfields in the Western part have been used as bases for Japanese air attacks on Northern Australia.

Important fields in this part of the Archipellago include Den Pasar on Bali; three newly constructed fields on Soemba; Maomere and its auxiliary Maomere Town on Flores; Fuiloro, Lautem West, and Atamboea on Timor; Langgoer and Faan in the Kai Islands; and Doka Barat in the Aroe Islands.

AIRFIELDS - SUNDA-TIMOR AREA

Name	Coordinates	Class	Runways	Remarks
		BALI		
Den Pasar	8° 45' S 115° 10' E	MLG	5000'	Former Dutch Military field. Some facilities. 9 revt's.
		LOMBOK		
Rambang	8° 44' S 116° 32' E	ELG	2800'	Has been used by the Japanese.
		SOEMBAWA		
Bima	8° 33' S 118° 42' E	MAD	4900'	Not extensible.
		SOEMBA		
Melelo	9° 51' S 120° 39' E	FLG	3500'	Auxiliary to Petawang. Under construction May 1944. 7 fighter revt's. Dispersal lane to Petawang, 4 miles to NW.
Petawang	9° 48' S 120° 37' E	MLG	4600'	Extensive dispersal under construction May 1944.
Waikalo U/C	9° 24' S 119° 13' E	HAD	6300' 2800'	Dispersal and bomber revt's.
Waingapoe U/C	9° 40' S 120° 10' E	MLG	5400'	Dispersal loop. 7 fighter revt's. Anti-aircraft.
Waitaboela U/C	9° 27' S 119° 14' E	MAD	4600' 4700' 3100'	Dispersal under construction. 3 fighter, 7 bomber revt's. A/A
Waiwalla U/C	9° 23' S 119° 12' E	MAD	4400'	Dispersal under construction. 7 fighter revt's.

CONFIDENTIAL

Name	Coordinates	Class	Runways	Remarks
		TIMOR		
Atamboea	9° 05' S 124° 54' E	MAD	4800'	Some facilities, dispersal, anti-aircraft. Evidence of neglect March 1944.
Cape Chater	8° 20' S 127° 00' E	HAD	4900'	Some facilities. Anti-aircraft.
Cape Lore	8° 41' S 127° 01' E	MLG	4900'	Unserviceable after heavy rain.
Dilli	8° 33' S 125° 33' E	MAD	3795'	Some facilities. Shelters. Anti-aircraft.
Fuiloro	8° 27' S 126° 59' E	MAD	5700' 5000' 4200' 2800'	Some facilities. Anti-aircraft. Bomber and fighter revt's. Undergoing expansion April 1944.
Koepang Golf Course	10° 11' S 123° 37' E	MLG	5500'	Anti-aircraft.
Kolbano	10° 02' S 124° 31' E	ELG	2200'	Overgrown and obstructed April 1944.
Lautem West	8° 25' S 126° 50' E	MLG	6800'	Some facilities. Dispersal. Anti-aircraft. Suitable for use by heavy bombers.
Mina River Plains	10° 09' S 124° 14' E	ELG	2400'	
Oesaoe	10° 08' S 123° 49' E	MLG	4500'	Dispersal.

Name	Coordinates	Class	Runways	Remarks
Watoeata	9° 37' S 120° 28' E	HLG	9000'	Along NE shore of Cape Watoeata.
Watoembaka	9° 41' S 120° 21' E	MAD	4800'	Best airfield on Soemba. Undergoing expansion May 1944. 6 fighter revt's. Extensive dispersal. Anti-aircraft.
		FLORES		
Larantoeka	8° 20' S 123° 00' E	ELG	2280'	
Maoemere	8° 38' S 122° 15' E	MAD	4900' 4500'	Best airfield on Flores. Dispersal. Anti-aircraft.
Maoemere Town	8° 37' S 122° 12' E	MAD	5300'	Auxiliary to Maoemere. Surfaced runways. Dispersal loops.
Reo	8° 18' S 120° 33' E	ELG	2000'	No evidence of use by Japanese.
Sissa River	8° 31' S 121° 18' E	MLG	5000'	Some facilities. 2 bomber revt's. Dispersal under construction.
Waioti	8° 38' S 122° 16' E	FAD	4600'	Nearly serviceable, May 1944. Extensive dispersal under construction.
		SAWOE		
Seba	10° 31' S 121° 47' E	ELG	2200'	No evidence of use by Japanese.
		ROTI		
Nembrala	10° 54' S 122° 49' E	ELG	5500'	Reported obstructed November 1943.

CONFIDENTIAL
CONFIDENTIAL

Name	Coordinates	Class	Runways	Remarks
		AROE ISLANDS		
Doka Timoer	6° 38' S 134° 14' E	MLG	4850'	3 miles of dispersal facilities and 16 dispersal points.
Trangan	6° 45' S 134° 17' E	MLG	4600' 3000'	Some facilities. Dispersal.

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CONFIDENTIAL

Name	Coordinates	Class	Runways	Remarks
Penfoei	10° 11' S 123° 40' E	MAD	4600' 3500' 3300' 3100' 3000'	Dispersal, revt's, hangars, A/A.
Poeloeti	10° 07' S 123° 45' E	FAD	4300'	Some facilities. 11 bomber and 5 fighter revt's.
Poepoet	10° 15' S 123° 52' E	ELG		Constructed by Dutch. No evidence of use by Japanese.
		TANIMBAR ISLANDS		
Selaroe	8° 16' S 130° 50' E	MLG	5500'	Some facilities. Dispersal. Anti-aircraft.
		KAI ISLANDS		
Doelah	5° 35' S 132° 46' E	MAD	5900'	5 bomber revt's, 10 bomber and 12 fighter dispersal points.
Doeroa	5° 32' S 132° 43' E	MAD	6300' 3800'	25 bomber and 15 fighter dispersal points.
Faan	5° 42' S 132° 43' E	MAD	4800'	Some facilities. 30 bomber revt's, 5 fighter revt's, 24 fighter and 2 bomber dispersal points.
Langgoer	5° 40' S 132° 43' E	MAD	4900'	Some facilities. 16 bomber and 15 fighter revt's, 18 bomber and 41 fighter dispersal points. A/A.
Letfoear	5° 45' S 132° 42' E	MAD	6400'	Some facilites. 7 bomber revt's, 13 fighter and 27 bomber dispersal points. A/A

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TIMOR
SPECIAL STRATEGIC MAP
Scale 1 : 2,000,000

10 0 10 20 30 40 50 60 70 80 90 100 110 Miles
20 0 20 40 60 80 100 120 140 Kilometers

Mercator Projection
Standard Parallel 9°
HEIGHTS IN METERS

LEGEND

Towns of First Importance
" " Second "
" " Third "
" " Fourth "
Primary Roads
Secondary Roads
Trails
International Boundaries

LEGEND

AIRFIELDS

"AIRFIELD" signifies the existence of an all-weather runway or complete facilities, or both.

HAD-HEAVY BOMBER AIRFIELD: An airfield which will permit operational use by Heavy Bombers; or an airfield with a run of at least 6000 ft. at sea level, suitable for Heavy Bombers.

MAD-MEDIUM BOMBER AIRFIELD: An airfield which will permit operational use by Medium Bombers; or an airfield with a run of at least 4500 ft. at sea level, suitable for Medium Bombers.

FAD-FIGHTER AIRFIELD: An airfield which will permit operational use by Fighters; or an airfield with a run of at least 3000 ft. at sea level, suitable for Fighters.

LANDING GROUNDS

"LANDING GROUND" signifies a suitable landing area without all-weather runway and with incomplete facilities.

HLG-HEAVY BOMBER LANDING GROUND: A landing ground which will permit operational use by Heavy Bombers; or a landing ground with a run of at least 6000 ft. at sea level, suitable for Heavy Bombers.

MLG-MEDIUM BOMBER LANDING GROUND: A landing ground which will permit operational use by Medium Bombers; or a landing ground with a run of at least 4500 ft. at sea level, suitable for Medium Bombers.

FLG-FIGHTER LANDING GROUND: A landing ground which will permit operational use by Fighters; or a landing ground with a run of at least 3000 ft. at sea level, suitable for Fighters.

ELG-EMERGENCY LANDING GROUND.

POSSIBLE SITES: lacking confirmation or recent information.

SEAPLANE BASES

SS-A fully equipped SEAPLANE STATION.

ASS-AUXILIARY SEAPLANE STATION: incomplete facilities.

GLOSSARY

Baai	Bay	P	Island
Eilanden	Islands	Pta	Point
G	Mount, mountain	Straat, Str	Strait
Geb	Mountains, range	Tg	Cape, point
I	Island	Tn	Point
M	River	Vila	Borough
N	Island	W	West
Noord	North	Zuid	South

Prepared under the direction of the Chief of Engineers, U. S. Army, Washington, D. C.
Compiled by the Army Map Service May 1943, from the following sources;
Internationale Wereldkaart, 1:1,000,000, Zuid (South) B-51, B-52, Batavia, 1942; C-51, C-52, Batavia, 1941.

AMS 9101

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ARMY MAP SERVICE, U. S. ARMY, WASHINGTON, D. C., 301501
4-45 1943

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Not for sale or distribution

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FIRST EDITION - AMS 1

SOENDA (SUNDA) ISLANDS

SPECIAL STRATEGIC MAP

Scale 1 : 2,000,000

10 0 10 20 30 40 50 60 70 80 90 100 110 Miles

20 0 20 40 60 80 100 120 140 Kilometers

Mercator Projection
Standard Parallel 9°
HEIGHTS IN METERS

LEGEND

Towns of First Importance
" " Second "
" " Third "
" " Fourth "

Primary Roads
Secondary Roads
Trails

LEGEND

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"AIRFIELD" signifies the existence of an all-weather runway or complete facilities, or both.

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FLG-FIGHTER LANDING GROUND: A landing ground which will permit operational use by Fighters; or a landing ground with a run of at least 3000 ft. at sea level, suitable for Fighters.

ELG-EMERGENCY LANDING GROUND.

POSSIBLE SITES: lacking confirmation or recent information.

SEAPLANE BASES

SS-A fully equipped SEAPLANE STATION.

ASS-AUXILIARY SEAPLANE STATION: incomplete facilities.

GLOSSARY

B.	Bay
Br.	River
D.	Mountain
Eiland(en)	Island(s)
G.	Mount, mountain
Groote	Great, large, big
J.	River
Kk.	Creek
L.	Port, harbor
L.	River
N.	Island
P.	Island
Piek	Peak
S.	River
Schiereiland	Peninsula
Straat, Str.	Strait
Tg.	Cape, point
Tk.	Bay

Prepared under the direction of the Chief of Engineers, U. S. Army, Washington, D. C.
Compiled by the Army Map Service May 1943, from the following sources:
Internationale Wereldkaart, 1:1,000,000, Sheets S.C-51, 1941; S.B-50; S.B-51; S.C-50; Batavia, 1942.

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ARMY MAP SERVICE, U. S. ARMY, WASHINGTON, D. C. 301500
4-45 1943

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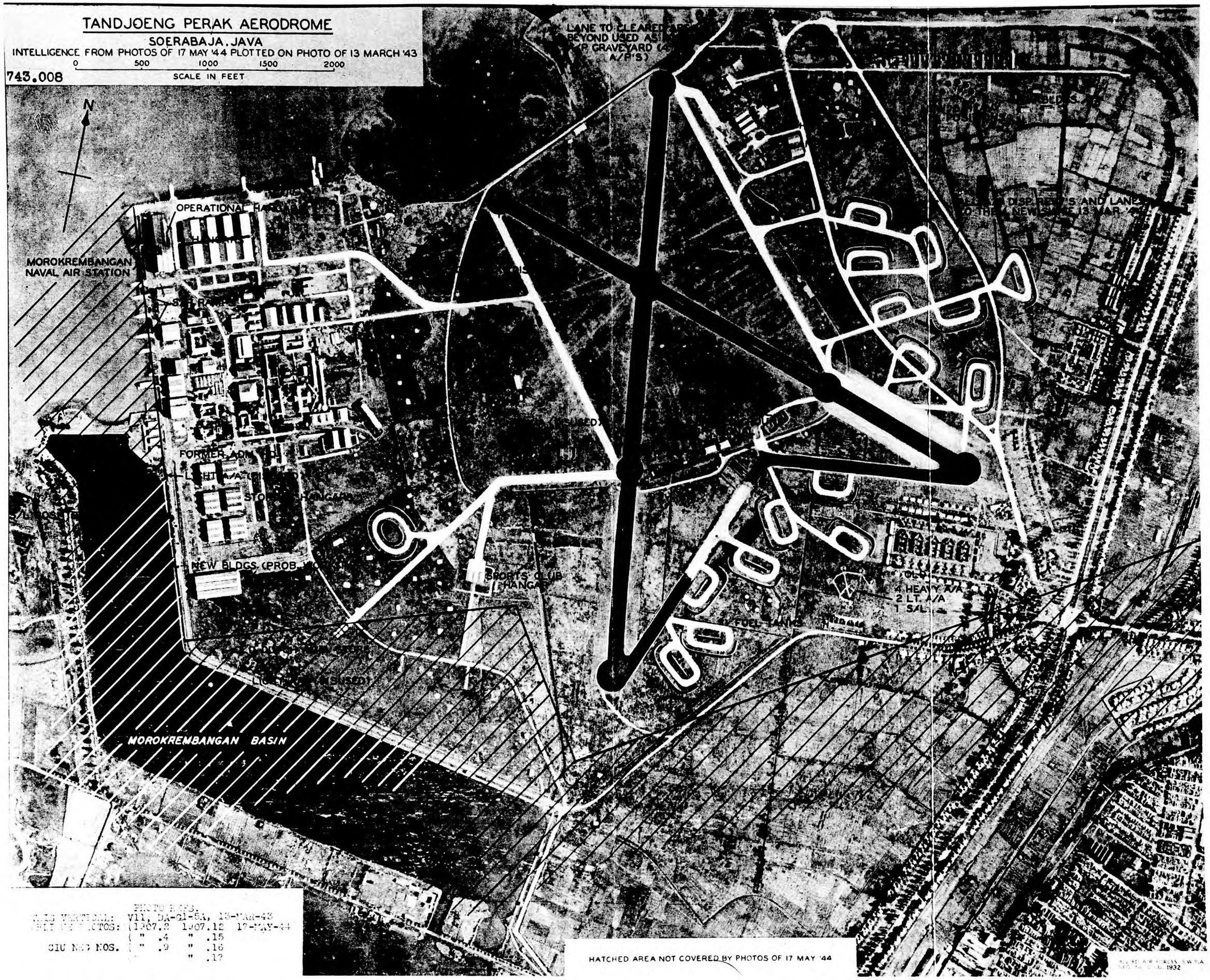
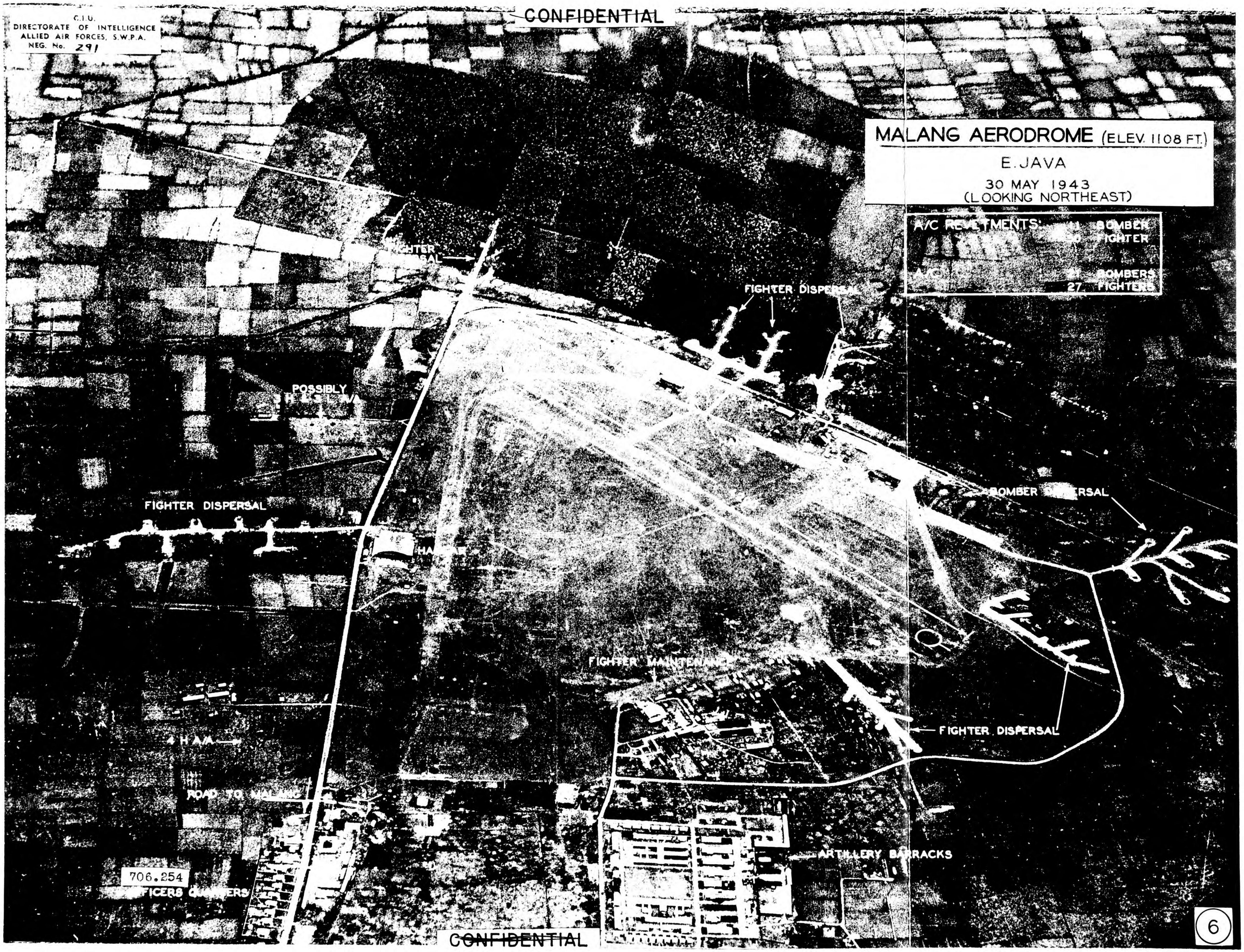


PHOTO REFS.
THIS VERTICAL: V11, DA-G1-5A, 13-MAR-43
OBLIQUE PHOTOS: (1907.2 1907.12 17-MAY-44
(" .4 " .15
CIU NEG NOS. (" .9 " .16
(" .17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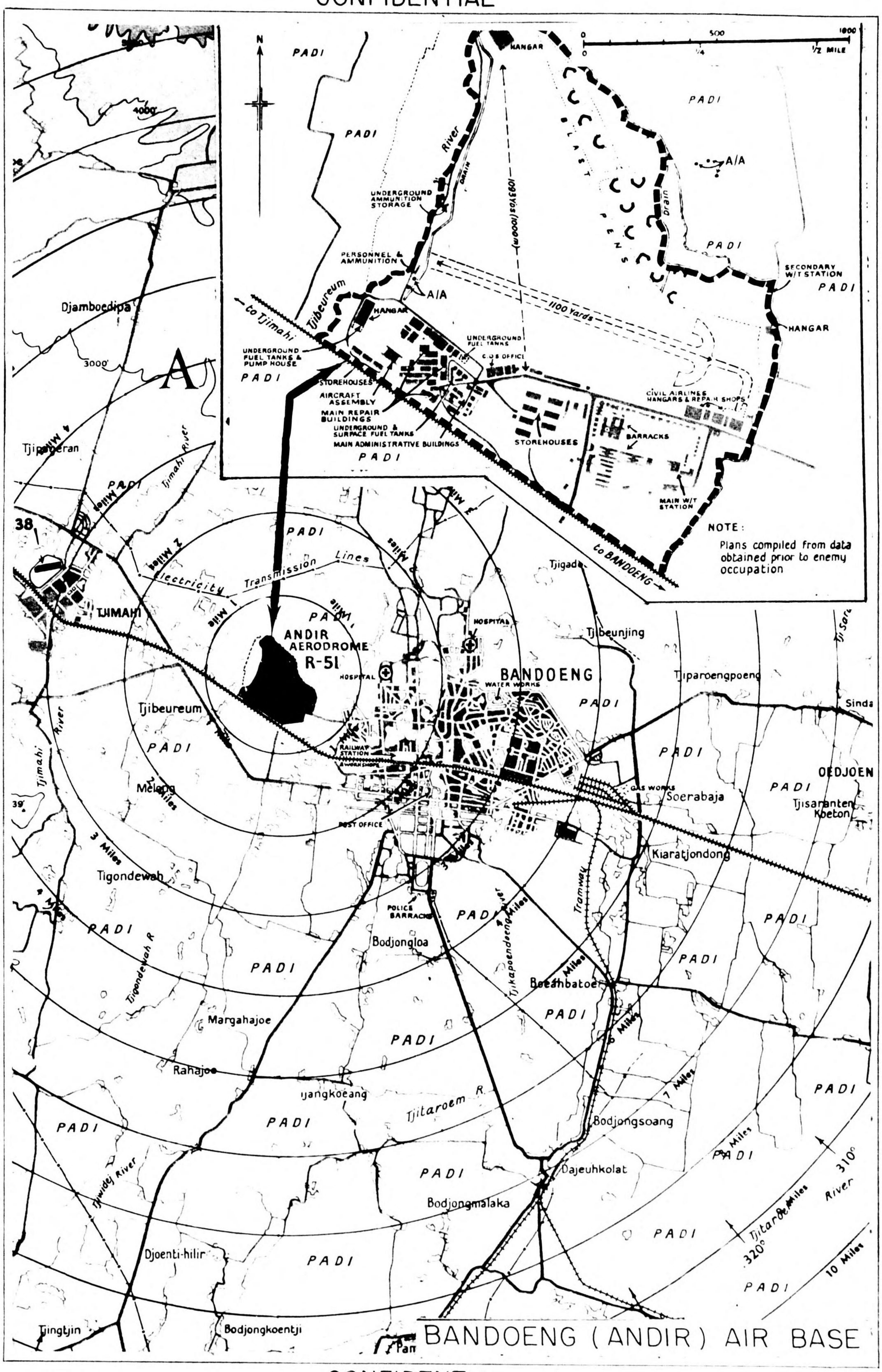
C.I.U.
DIRECTORATE OF INTELLIGENCE
ALLIED AIR FORCES, S.W.P.A.
NEG. No. 291
MALANG AERODROME (ELEV. 1108 FT.)
E. JAVA
30 MAY 1943
(LOOKING NORTHEAST)
A/C REVETMENTS:
BOMBER
FIGHTER
BOMBERS
27 FIGHTERS
FIGHTER DISPERSAL
POSSIBLY
FIGHTER DISPERSAL
BOMBER DISPERSAL
FIGHTER MAINTENANCE
FIGHTER DISPERSAL
4 H A/A
ROAD TO MALANG
ARTILLERY BARRACKS
706.254
OFFICERS QUARTERS
CONFIDENTIAL
6

~~CONFIDENTIAL~~



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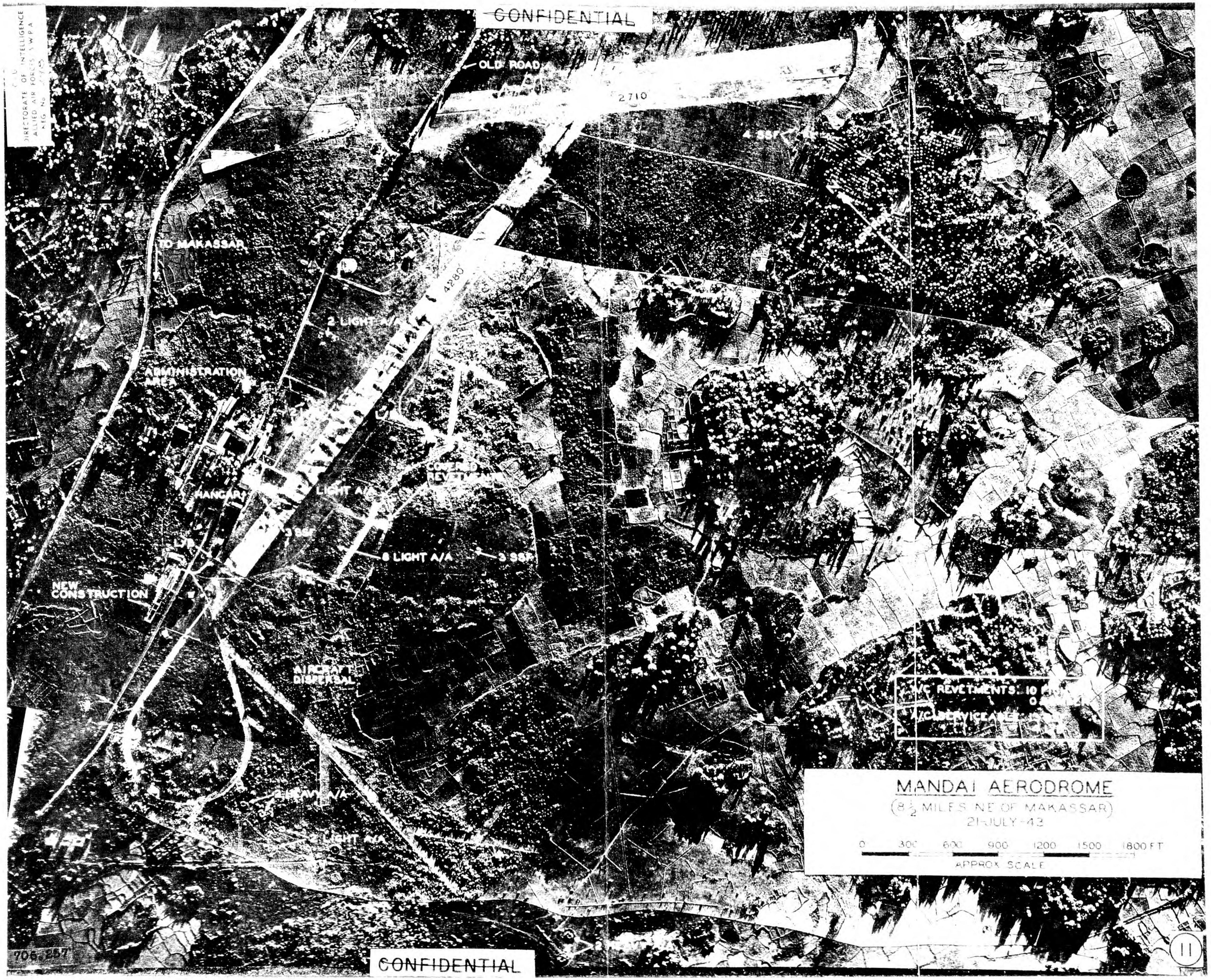
CONFIDENTIAL
DIRECTORATE OF INTELLIGENCE
ALLIED AIR FORCES S.W.P.A.
OLD ROAD
2710
4 SSF
TO MAKASSAR
4280
2 LIGHT A/A
ADMINISTRATION AREA
HANGAR
LIGHT A/A
3 SSF
8 LIGHT A/A
3 SSF
NEW CONSTRUCTION
AIRCRAFT DISPERSAL
2 HEAVY A/A
2 LIGHT A/A
A/C REVETMENTS
A/C SERVICE AREA
MANDAI AERODROME
(8½ MILES NE OF MAKASSAR)
21-JULY-43
0 300 600 900 1200 1500 1800 FT
APPROX SCALE
706.257
11
CONFIDENTIAL

~~CONFIDENTIAL~~

DIRECTORATE OF INTELLIGENCE
HQ. AIR FORCES S.W.P.A.
A.P.O. 500

KENDARI AERODROME
9 FEB-43
0 500 1000
A/C REVETMENTS: 2
FROM PHOTOS OF 2
(V 93)
A/C SERVICEABLE: 39

3 L A/A
DUMMY A/C
8 M/G
2 M A/A
DUMP
BOMBER PARK
CONTROL
RUNWAY EXTENDED TO 5400' IN PHOTOS 3 JULY 43
11 L A/A
FIGHTER CONTROL
FIGHTER PARK
NEW REVETMENTS
ZEKES
PARTLY ASSEMBLED SSP
CONTROL TOWER
BOMBER PARK
4 L A/A
STORES
BLDGS DAMAGED
CONSTRUCTION
BOMB BURSTS IN WORKSHOP AREA
KONDA RIVER
CONSTRUCTION
CONSTRUCTION
BARRACKS AREA
BLDG MATERIAL
DRA

706.264

706.264A

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ALLIED AIR FORCES, S.W.P.A.
NEG. No. C.I.U. A-91

~~CONFIDENTIAL~~

LOOKING WEST
PHOTO REF.: 6 FEN 30/20 (5 FEB.'44)

HALMAHERA I.

KAOE A/D 2M.

KAOE BAY

BOEBALE I.

C.PATJIKARA

MITI A/D
15M.

PROBABLE H.A/A
LOLOBATA A/D

27 FTHMS.+

+
16 FTHMS.

WASILE BAY

PROBABLE BARRACKS

JETTIES

NARROW REEF

WIDE REEF

UNDULATING HILLS

HALMAHERA I.

RAIN FOREST

LOOKING SOUTHEAST
PHOTO REF.: 6 FEN 49/7 (23 MAR.'44)

JETTIES

WASILE BAY
+
32 FTMS.

LOLOBATA R.

LOLOBATA PT.

FLAT TERRAIN
RAIN FOREST

SINCE 19 FEB.

PROB. H.A/A

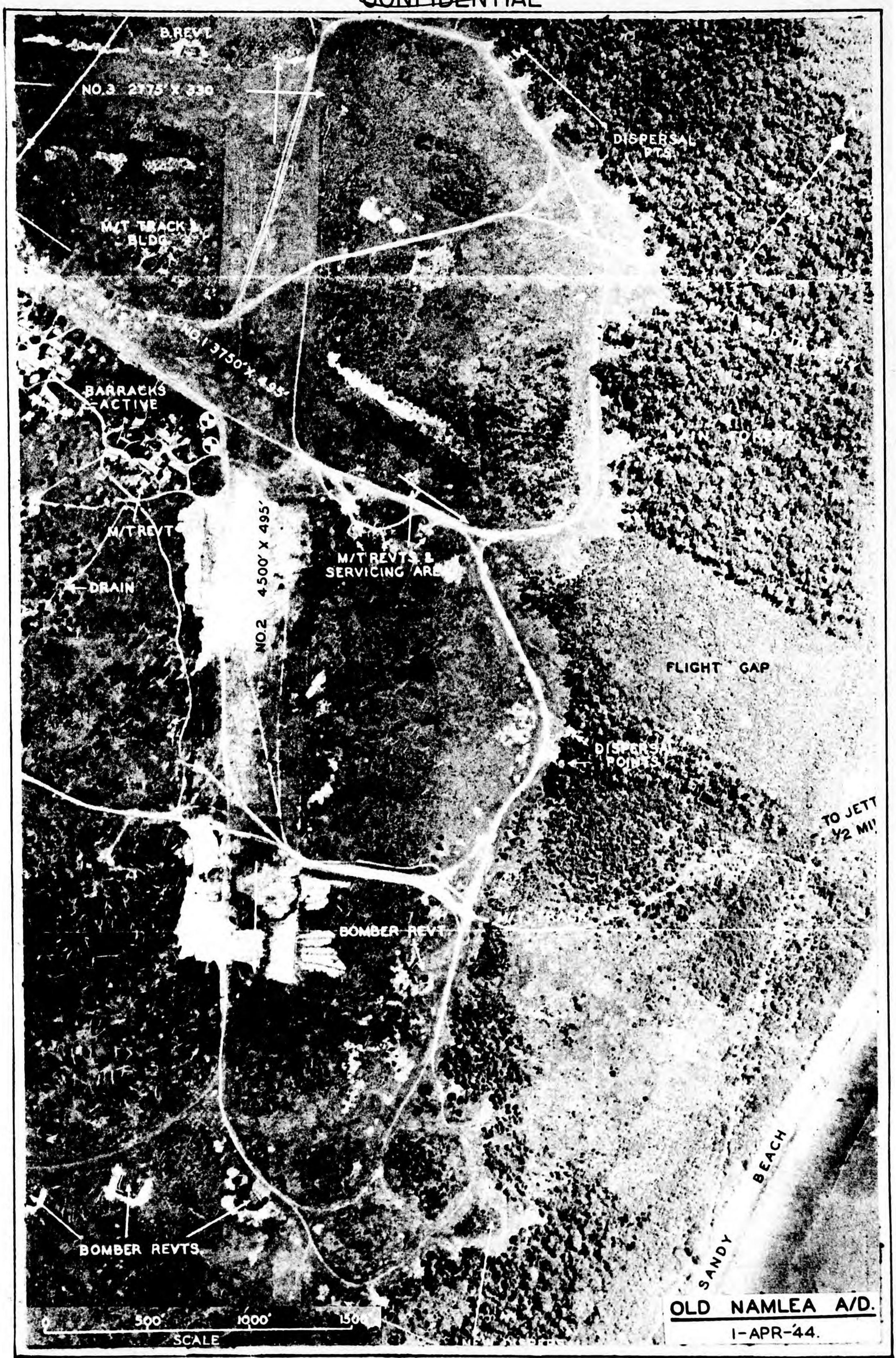
WIDE REEF

+
17 FTMS.

LOLOBATA AIR BASE
HALMAHERA
LAT. 1°17' N. LONG. 128°06' E.
INTELLIGENCE AS AT 23 MAR.'44

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~



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~~CONFIDENTIAL~~

BOELA AIR BASE

PHOTO REF: 1,4,7,8-FEN 19/1A 24,29,34,39 FEN 19/3B (3 NOV.'43)
7 FEN 49/7A (7 JAN.'44)

0 600 1200 1800 2400 3000 FT.
0 1/4 1/2 Mi.

A/F Parties: 5B, 5F.
Dispersal Pits: 0
Type A/A: 6H, 2M, 15L.
Type H/A: 0

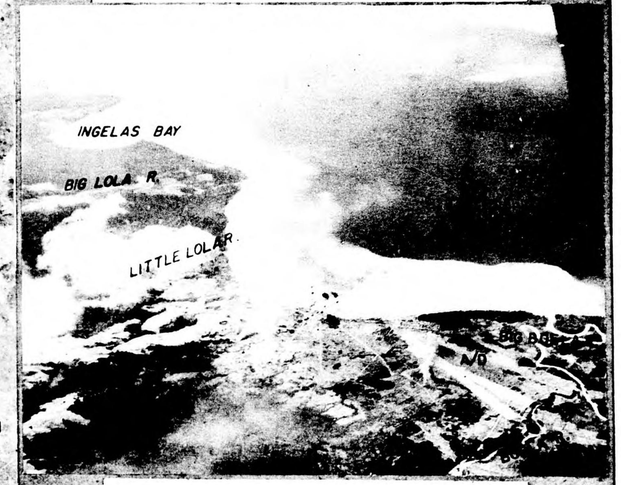
N
APPROX.

LITTLE LOLA R.
REEF
NARROW SANDY BEACH
SWAMPY
GARDENS
M/T ROAD
OIL WELLS
PULL RODS
OFF SHORE WELLS
CENTRAL PUMPING POWER
FIELD TANKS
MAIN JETTY
SHIPS
SHALLOW WATER
SAND & MUD BANKS
NARROW SANDY BEACH
RADIO STN.
PUMPING STN. 4-4
OIL WELL
HOSPITAL
PROP. H/B DUMP
ELECTRIC POWER STN.
CENTRAL PUMPING POWER
FIELD TANKS
OIL WELLS
BOMBER REVTS.
TAXIWAY
FIGHTER REVT.
STORAGE TANKS UNDER CONSTR.
ELEV. 130
PUMPING STATION
OIL WELLS
FIELD TANKS
RAIN FOREST
ELEV. 100
REVT. U/C
STORAGE TANKS
STORAGE TANKS
NO1 RUNWAY NO2 RUNWAY 4100 FEET 3300 FT.
ELEV. 25
BIG BOELA RIVER
M/T ROAD
GRASS
ALANG ALANG
U/C
3-2 (U/C)
RAIN FOREST
CONTROL TOWERS
CULTIVATION

A 54

BOELA OILFIELD & A/D 1
INTELLIGENCE AS AT 7 JAN.'44

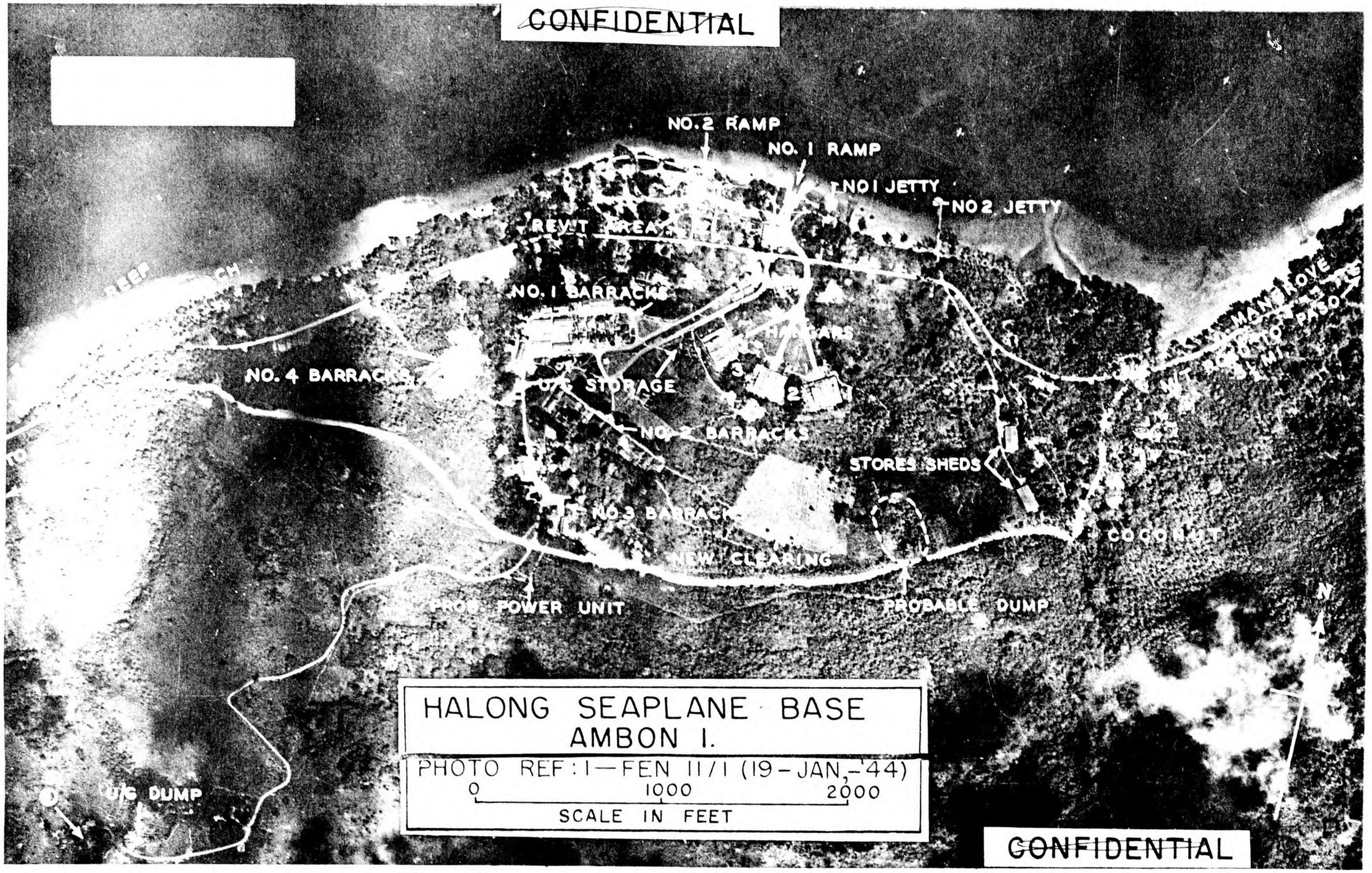
APPROACH TO BOELA
LOOKING SW
PHOTO REF: 7FEN 48/1B (30 SEPT '43)



APPROACH TO BOELA
LOOKING N.
PHOTO REF: 23 FEN 12/9B (28 JULY '43)

~~CONFIDENTIAL~~

CONFIDENTIAL



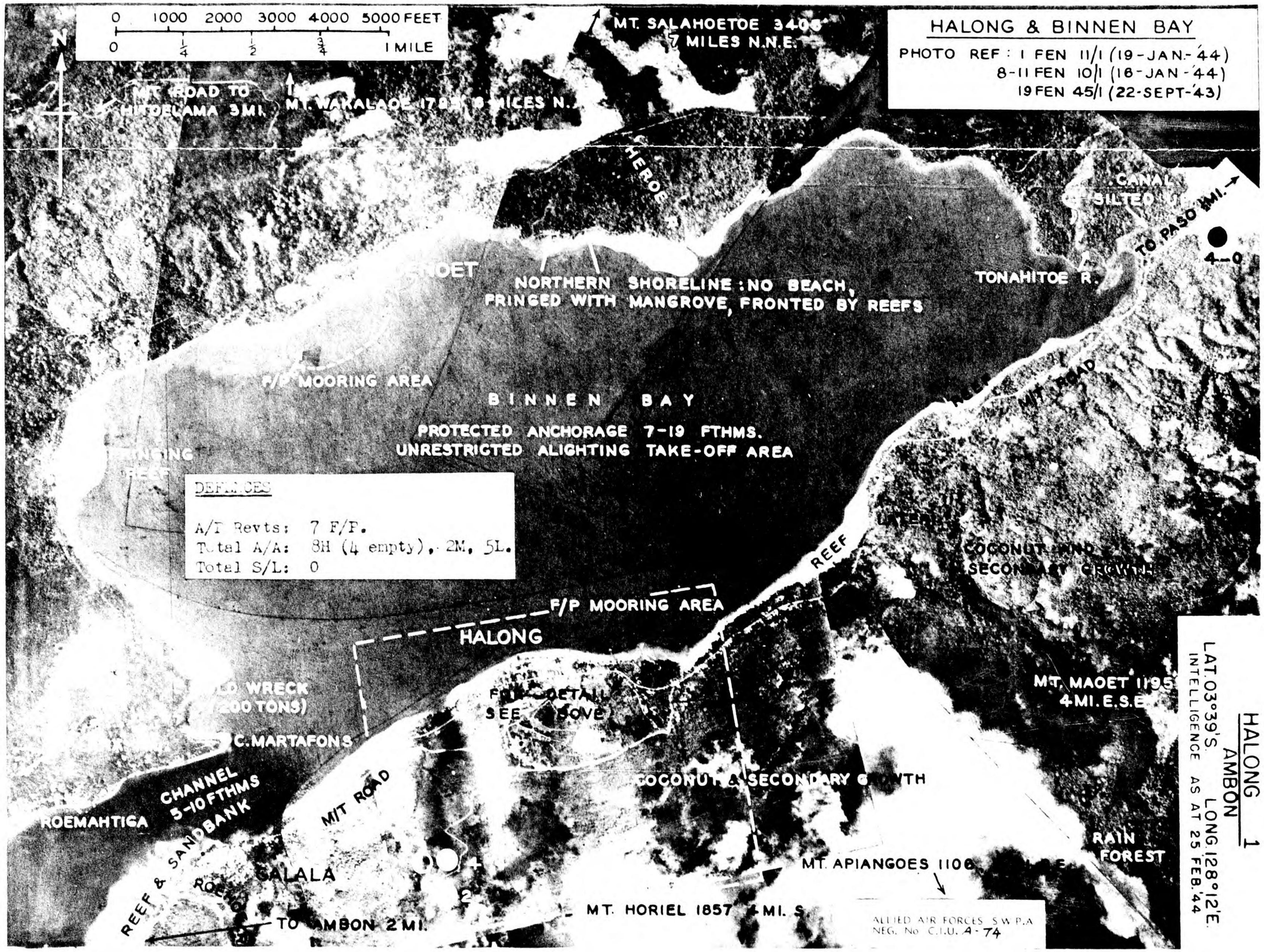
HALONG SEAPLANE BASE
AMBON I.

PHOTO REF: I—FEN II/I (19-JAN,-44)

0 1000 2000

SCALE IN FEET

CONFIDENTIAL



DEFENCES

A/P Revts: 7 F/P.
Total A/A: 8H (4 empty), 2M, 5L.
Total S/L: 0

HALONG 1
AMBON
LAT. 03°39'S. LONG. 128°12'E.
INTELLIGENCE AS AT 25 FEB. '44

~~CONFIDENTIAL~~

LIANG A/D

AMBON ISLAND

PHOTO REF: 4, 6 FEN 35/5 (25-FEB-44)

0 1000 2000 3000 4000 5000 FT.

0 1 MI.

SCALE

N.

APPROX.

E REEF

CAPE METIELA

DISPERSAL LANE

CAPE HONIMOEA

FOREST

TRACK

REVTS.

DISPERS

GOOD

RUNWAY 7000' X 280'

REEF

BEACHES

REVTS.

PROB. DUMP

DISPERSED BLOGS.

REVTS.

RRACES RISE TO 1,700' ABOUT
LE WEST, AND 3,405' 5MI. S.W.

GA

OBSERVATION TOWERS

BARRACKS AREA

PROB. POWER & PUMPING UNIT

GRASS

ROAD

SMALL STORES

DUMP

JETTY

APE TOE-AM

WIDE REEF

CLEARING

58

A 106

~~CONFIDENTIAL~~

CONFIDENTIAL

LAHA A/D

PHOTO REF: 340-343, 1 PRU, K17/11 (16-JAN-43.)

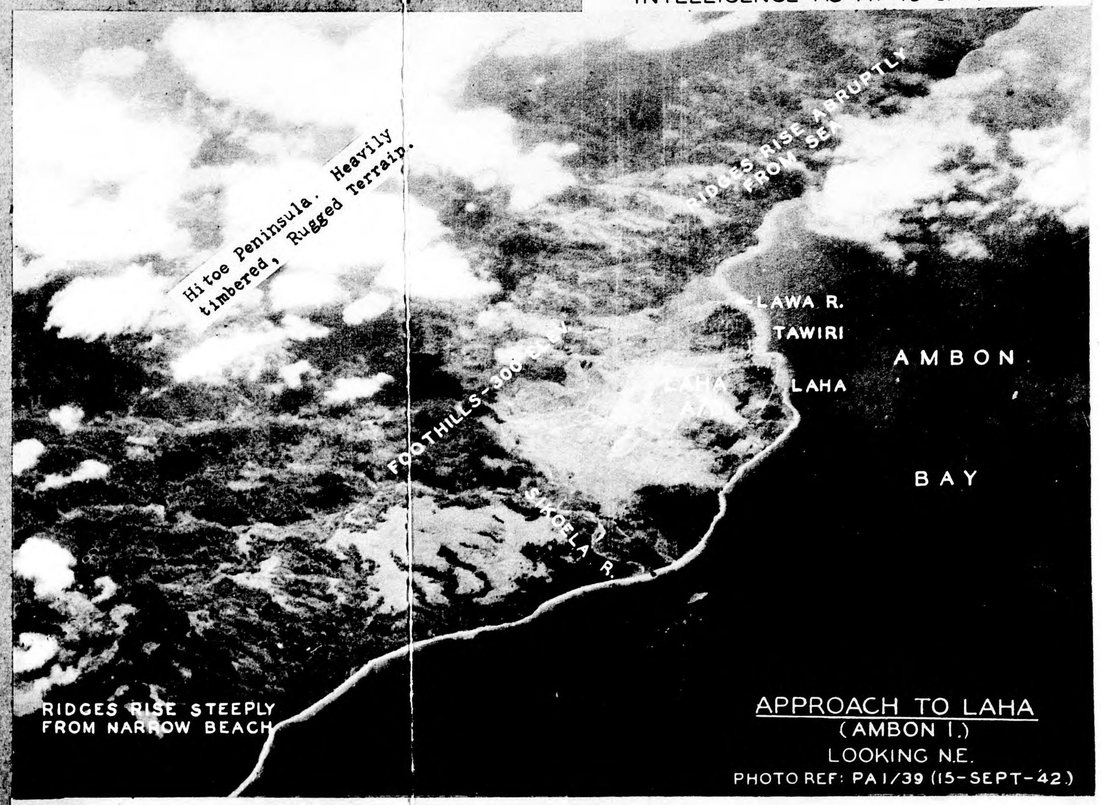
0 1000 2000 3000 4000

SCALE IN FEET

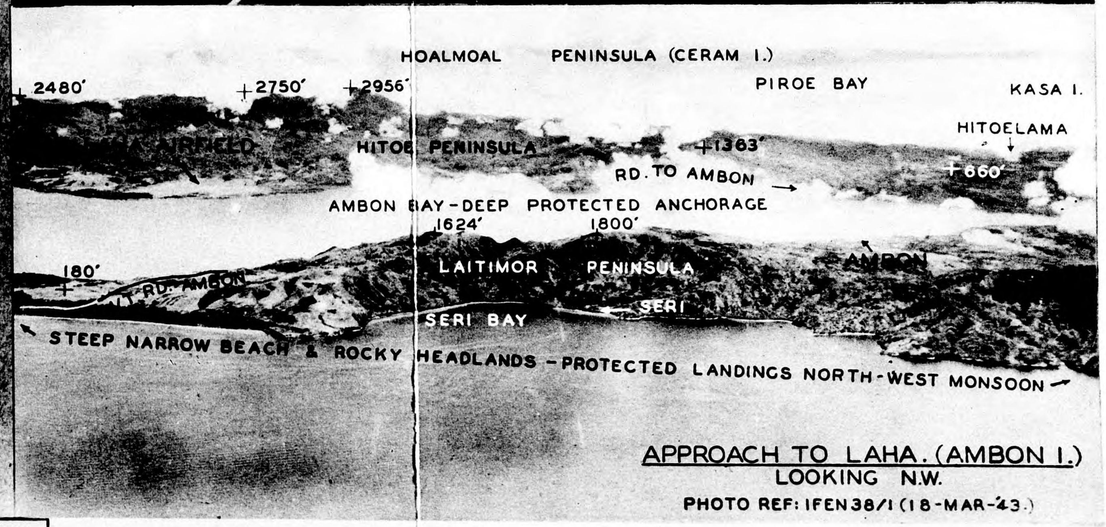
ALLIED A.P. SERIES 3 W.A.C. REG. No. G.S.G.S. A 105

LAHA 1

AMBON, LAT. 03°43' S.-LONG. 128°05' E.
INTELLIGENCE AS AT 19 JAN. '44



APPROACH TO LAHA
(AMBON I.)
LOOKING N.E.
PHOTO REF: PA 1/39 (15-SEPT-42.)



APPROACH TO LAHA. (AMBON I.)
LOOKING N.W.
PHOTO REF: IFEN 38/1 (18-MAR-43.)

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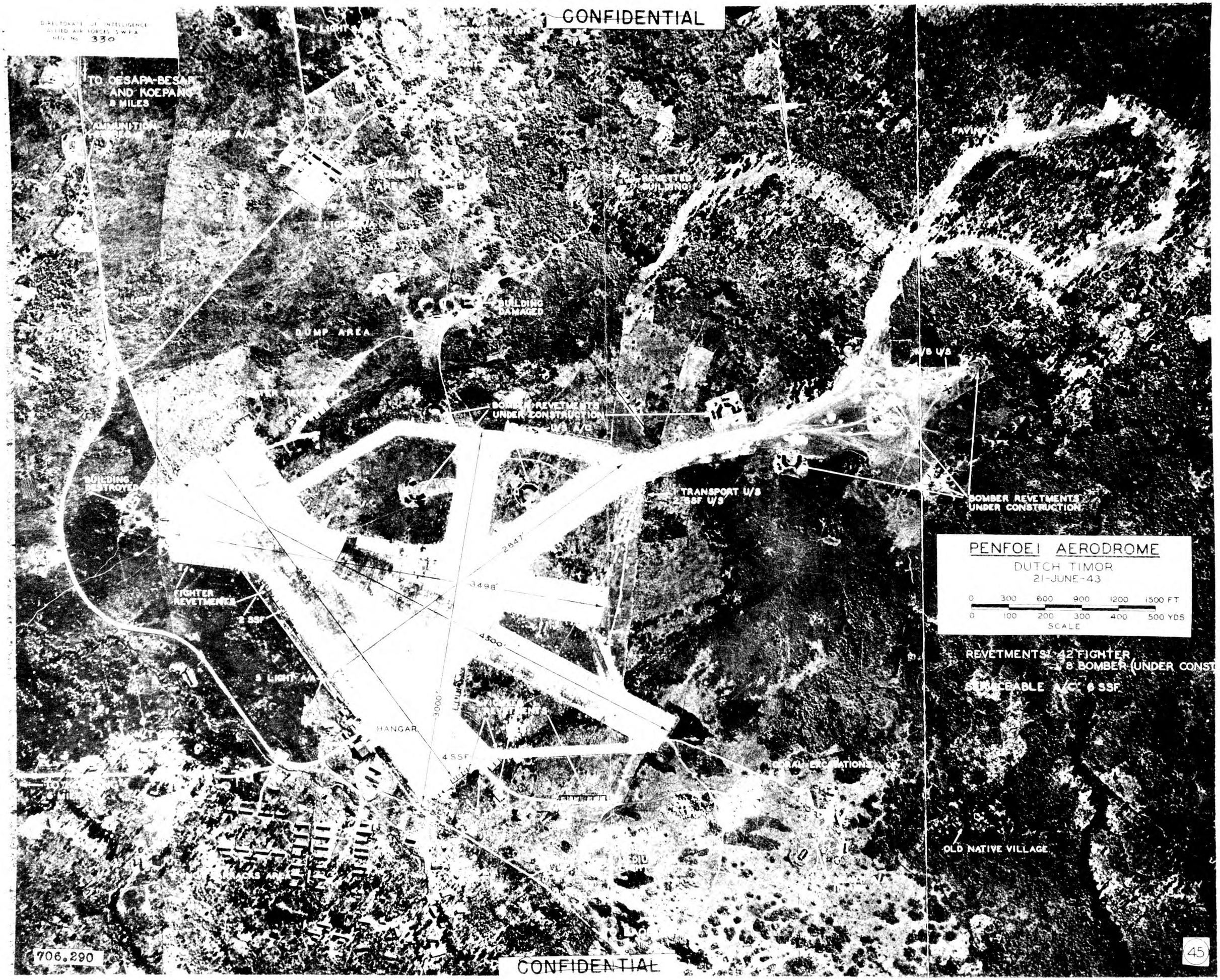
DIRECTORATE OF INTELLIGENCE
ALLIED AIR FORCES, SWPA
INT. No. 330



PENFOEI AERODROME

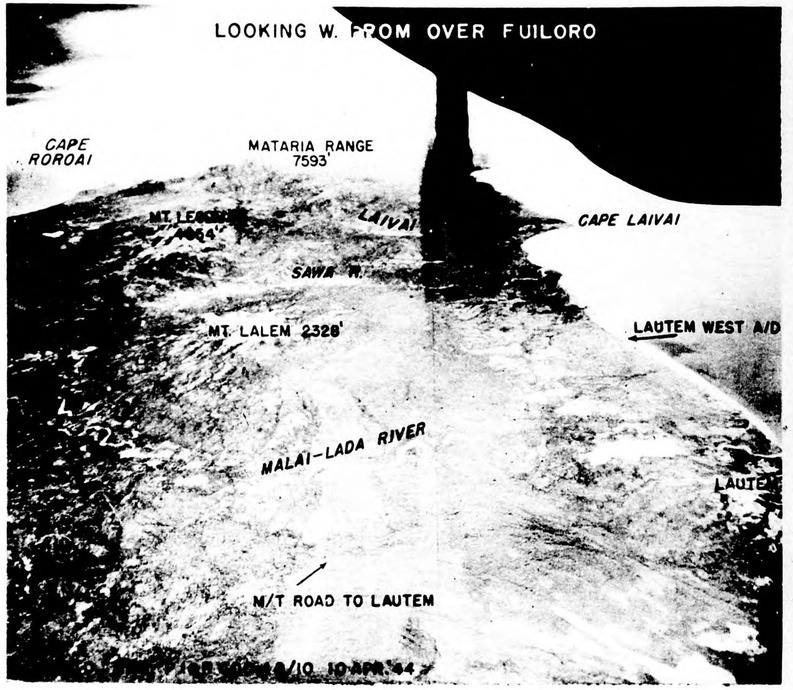
DUTCH TIMOR
21-JUNE-43

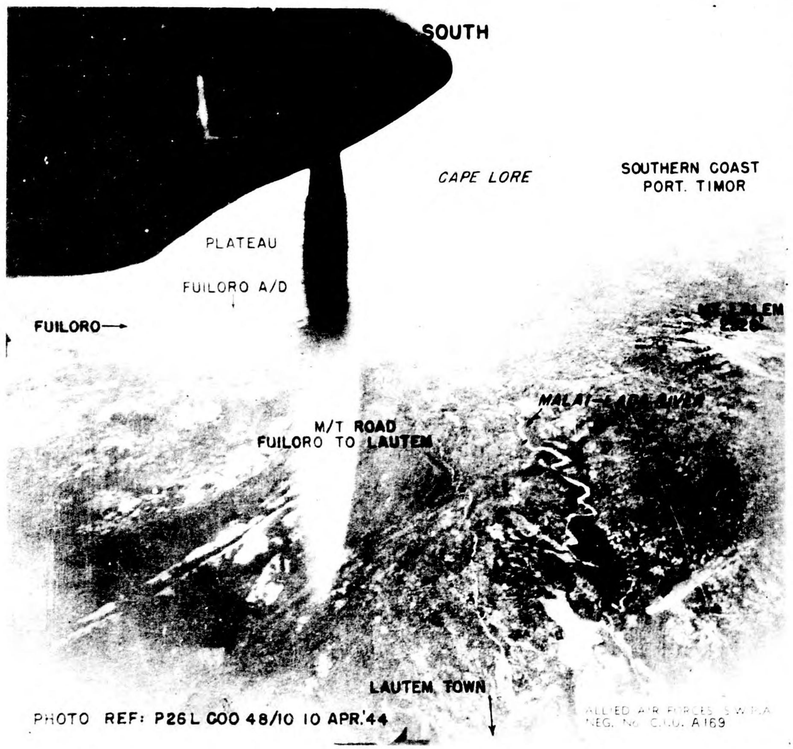
0 300 600 900 1200 1500 FT
0 100 200 300 400 500 YDS
SCALE

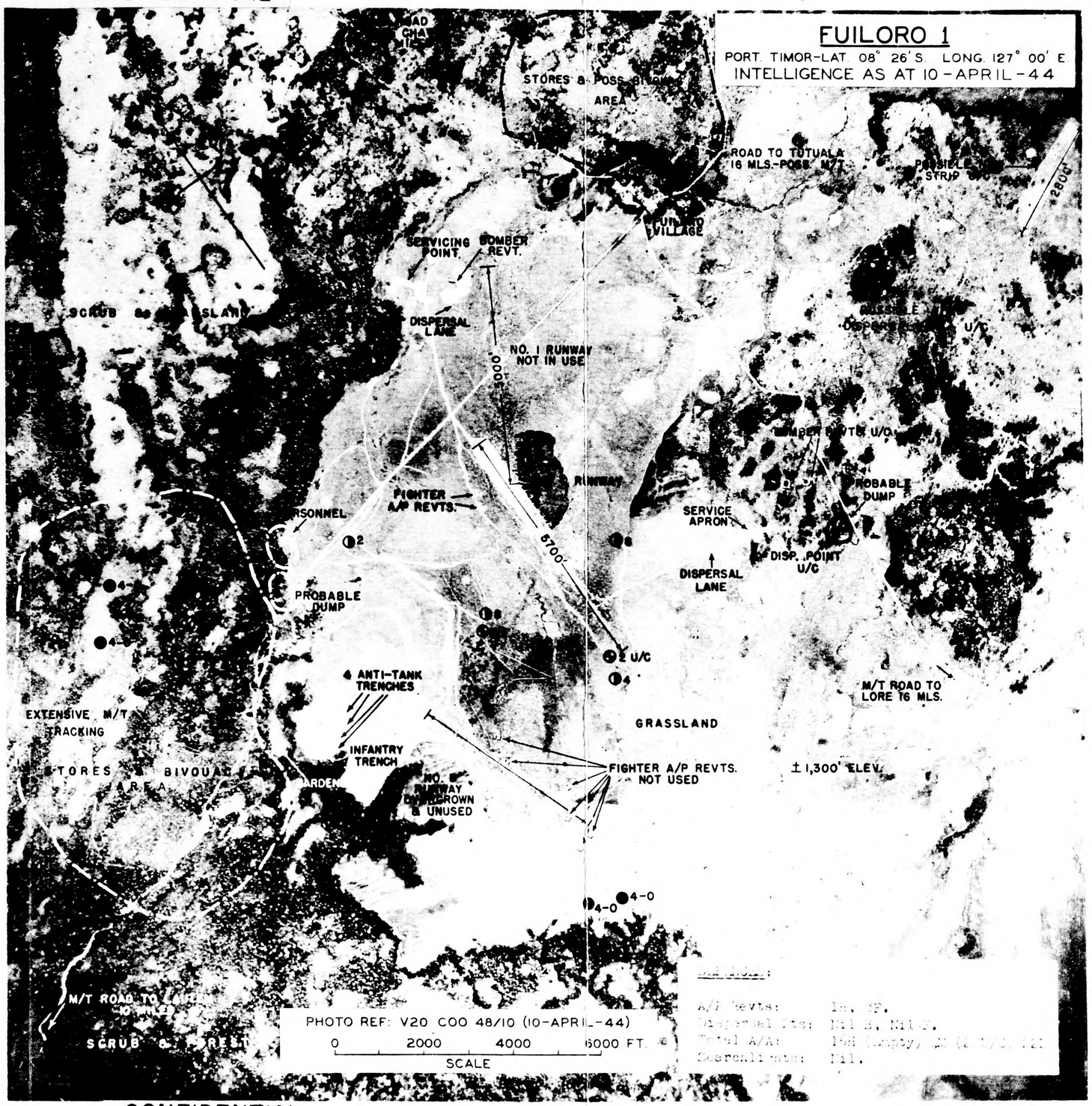
REVETMENTS: 42 FIGHTER
8 BOMBER (UNDER CONST
SERVICEABLE A/C: 6 SSF

OLD NATIVE VILLAGE

706.290


LOOKING W. FROM OVER FUILORO
CAPE RORDAI
MATARIA RANGE 7593'
MT. LEGUBA 4054'
LAIVAI
CAPE LAIVAI
SAWA R.
MT. LALEM 2328'
LAUTEM WEST A/D
MALAI-LADA RIVER
LAUTE
M/T ROAD TO LAUTEM


SOUTH
CAPE LORE
SOUTHERN COAST PORT. TIMOR
PLATEAU
FUILORO A/D
FUILORO
M/T ROAD FUILORO TO LAUTEM
LAUTEM TOWN
PHOTO REF: P26L COO 48/10 10 APR. 44


FUILORO 1
PORT. TIMOR-LAT. 08° 26' S. LONG. 127° 00' E.
INTELLIGENCE AS AT 10-APRIL-44
STORES & POSS. AREA
ROAD TO TUTUALA 16 MLS.-POSS. M/T
POSSIBLE STRIP U/C
2800'
SERVICING POINT
BOMBER REVTS.
DISPERSAL LANE
NO. 1 RUNWAY NOT IN USE
5000'
5700'
RUNWAY
FIGHTER A/P REVTS.
PROBABLE DUMP
SERVICE APRON
DISP. POINT U/C
DISPERSAL LANE
2 U/C
4
4 ANTI-TANK TRENCHES
EXTENSIVE M/T TRACKING
INFANTRY TRENCH
STORES & BIVOUAC AREA
NO. 2 RUNWAY OVERGROWN & UNUSED
GRASSLAND
M/T ROAD TO LORE 16 MLS.
FIGHTER A/P REVTS. NOT USED
±1,300' ELEV.
4-0
M/T ROAD TO LAUTEM 10 MILES
SCRUB & SCATTERED TREES
PHOTO REF: V20 COO 48/10 (10-APRIL-44)
0 2000 4000 6000 FT.
SCALE
A/F Revts: 1m. SE.
Dispersal Pits: Nil S. Nil E.
Petrol A/As: 1 on (empty) 2 (2 U/C) 1 (1 U/C)
Searchlights: Nil.

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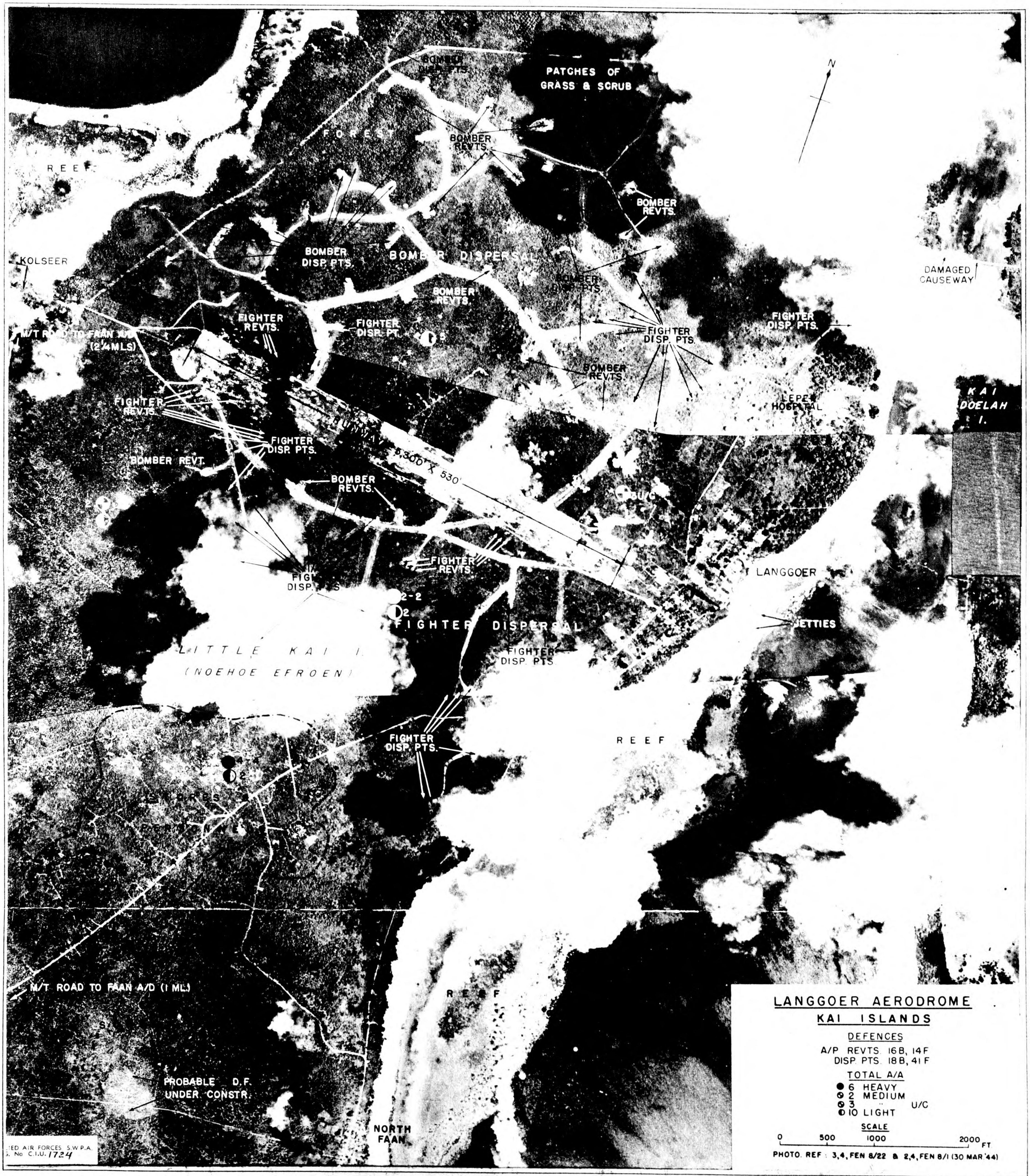

LANGGOER AERODROME
KAI ISLANDS

DEFENCES

A/P REVTS. 16B, 14F
DISP. PTS. 18B, 41F

TOTAL A/A

● 6 HEAVY
⊗ 2 MEDIUM
⊗ 3 " U/C
◐ 10 LIGHT

SCALE

0 500 1000 2000 FT

PHOTO. REF : 3,4, FEN 8/22 & 2,4, FEN 8/1 (30 MAR '44)

...ED AIR FORCES S.W.P.A.
...s. No C.I.U. 1724

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WEATHER DATA

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PUBLICATIONS OF THE WEATHER DIVISION
HEADQUARTERS ARMY AIR FORCES

WEATHER AND AIR OPERATIONS OVER THE NETHERLANDS INDIES

(INCLUDING BRITISH POSSESSIONS IN BORNEO AND EXCLUDING NETHERLANDS NEW GUINEA)

REPORT NO. 742

Prepared by the Weather Division
Headquarters Army Air Forces
May 1944

DECLASSIFIED
Authority NND 760120
By BRL NARA, Date 9/25/80

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WEATHER AND AIR OPERATIONS OVER THE NETHERLANDS INDIES

(INCLUDING BRITISH POSSESSIONS IN BORNEO AND EXCLUDING NETHERLANDS NEW GUINEA)

INTRODUCTION

Seasonal Contrasts in Weather

Two great air streams, the well-known monsoons of the East Indies, constitute the major controls of weather in the Netherlands Indies. These streams originate in the great middle latitude high pressure centers of the Northern and Southern Hemispheres. They converge toward the equatorial low pressure trough, where they meet along the equatorial front or doldrum belt.

The equatorial front migrates northward and southward with the changing seasons (figs. 1a and 1b). From December through February, when the equatorial front lies farthest south, air from the Northern Hemisphere flows steadily over the Netherlands Indies. In various regions this windflow bears different names, according to its local direction, but throughout this report will be designated simply as the north monsoon. From March through April, the front moves gradually northward over the Netherlands Indies; the north monsoon and the south monsoon each dominates part of the area. From May through October, when the front usually lies well to the north, air from the Southern Hemisphere flows steadily over the Netherlands Indies. This windflow will here be designated simply as the south monsoon. In November, during its southward migration, the equatorial front again lies across the region.

Both the north and south monsoons have had sufficiently long trajectories over tropical seas to be warm and moist in the surface layers. Temperature and humidity are remarkably high in this area in all seasons. However, south monsoon air is characteristically drier aloft and less unstable than north monsoon air. Soundings at Batavia (Java)* give the following mean values for relative humidity in the two air streams:

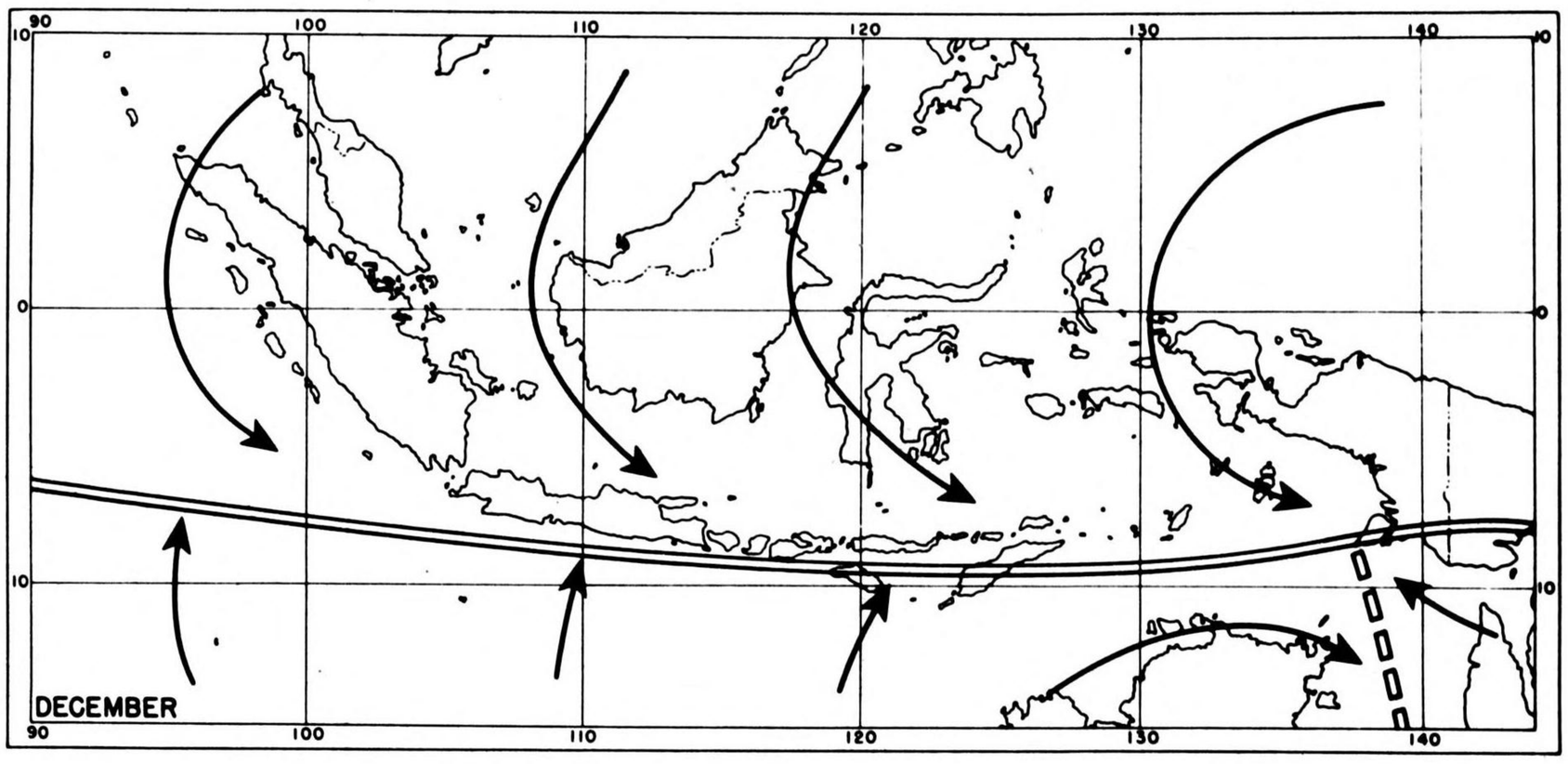
Elevation (feet)	North Monsoon Dec-Feb	South Monsoon May-Oct
Surface	86	81
1,500-10,000	77	71
11,000-18,000	70	52
19,000-26,000	66	41

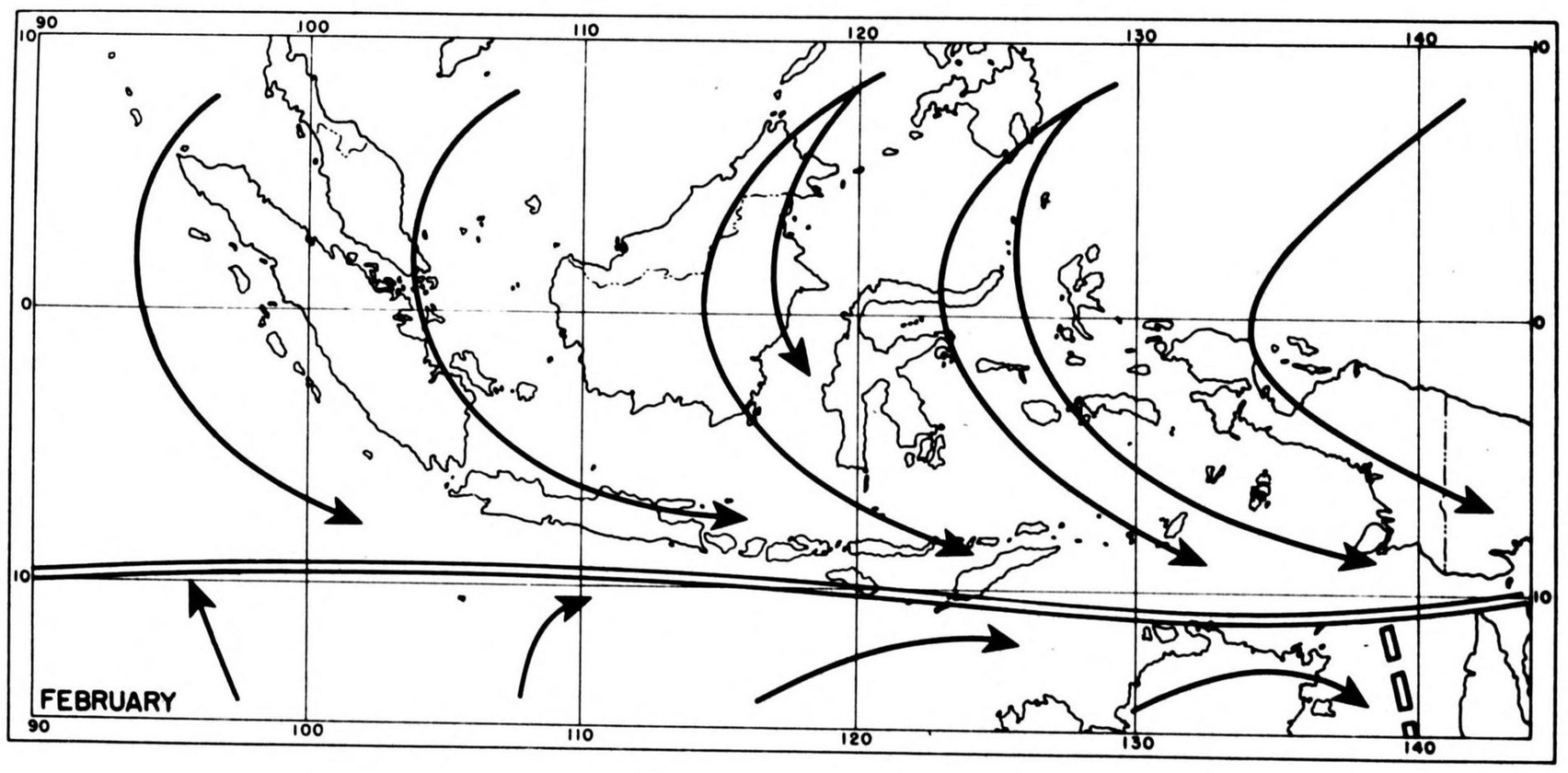
In the southernmost parts of the archipelago, the south monsoon brings a strong decrease in turbulence and cloud formation and a well-marked dry season. In the northern parts, there is less contrast between north and south monsoon air; turbulence and cloud formation are heavy and showers frequent throughout the year.

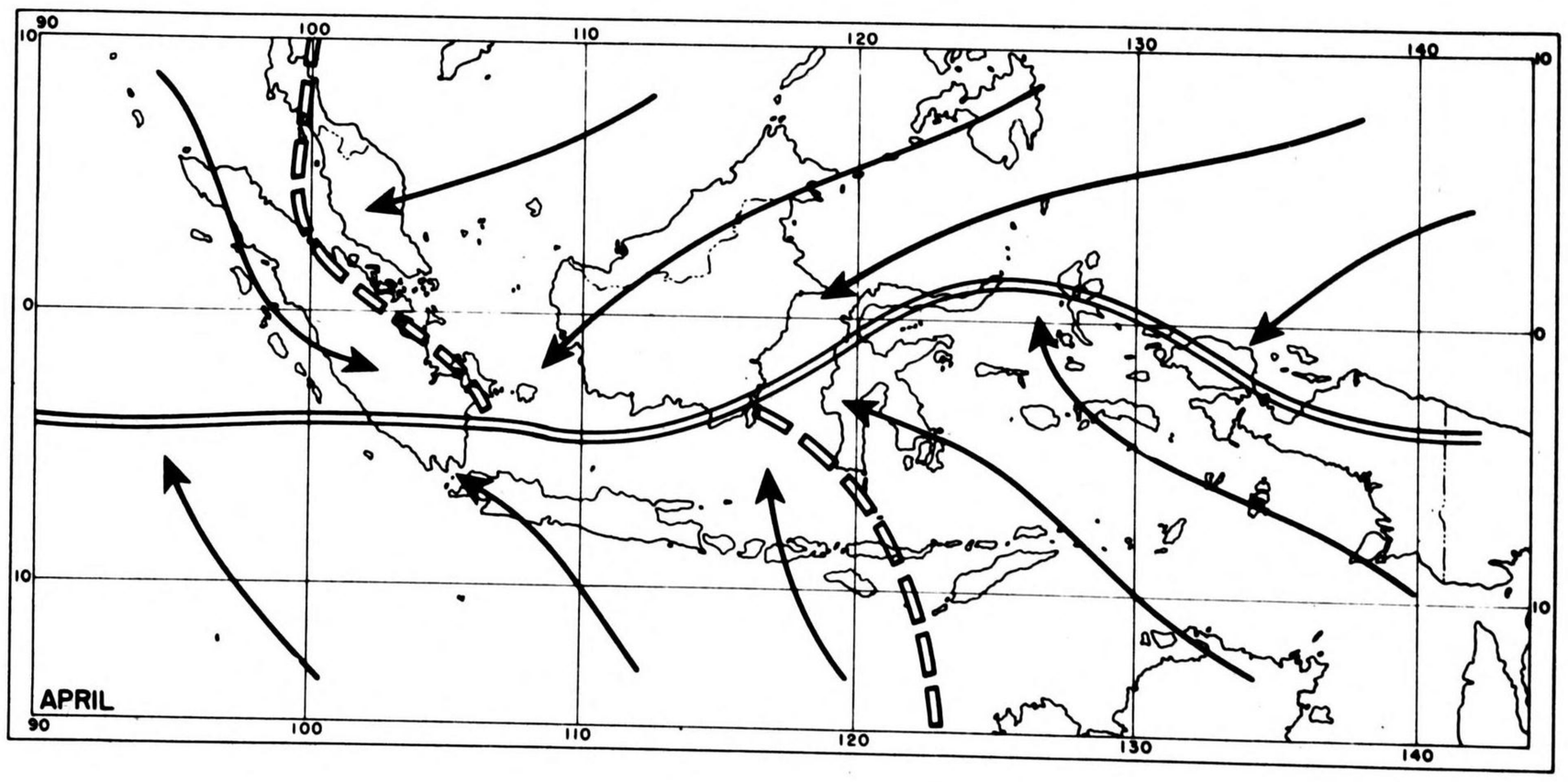
Daily Contrasts

Significant variation in most weather elements is produced by daily heating and cooling of the atmosphere and of ground and water surfaces. Wind direction, wind speed, temperature, relative humidity, visibility,

* Regional names refer to areas delimited on fig. 4.







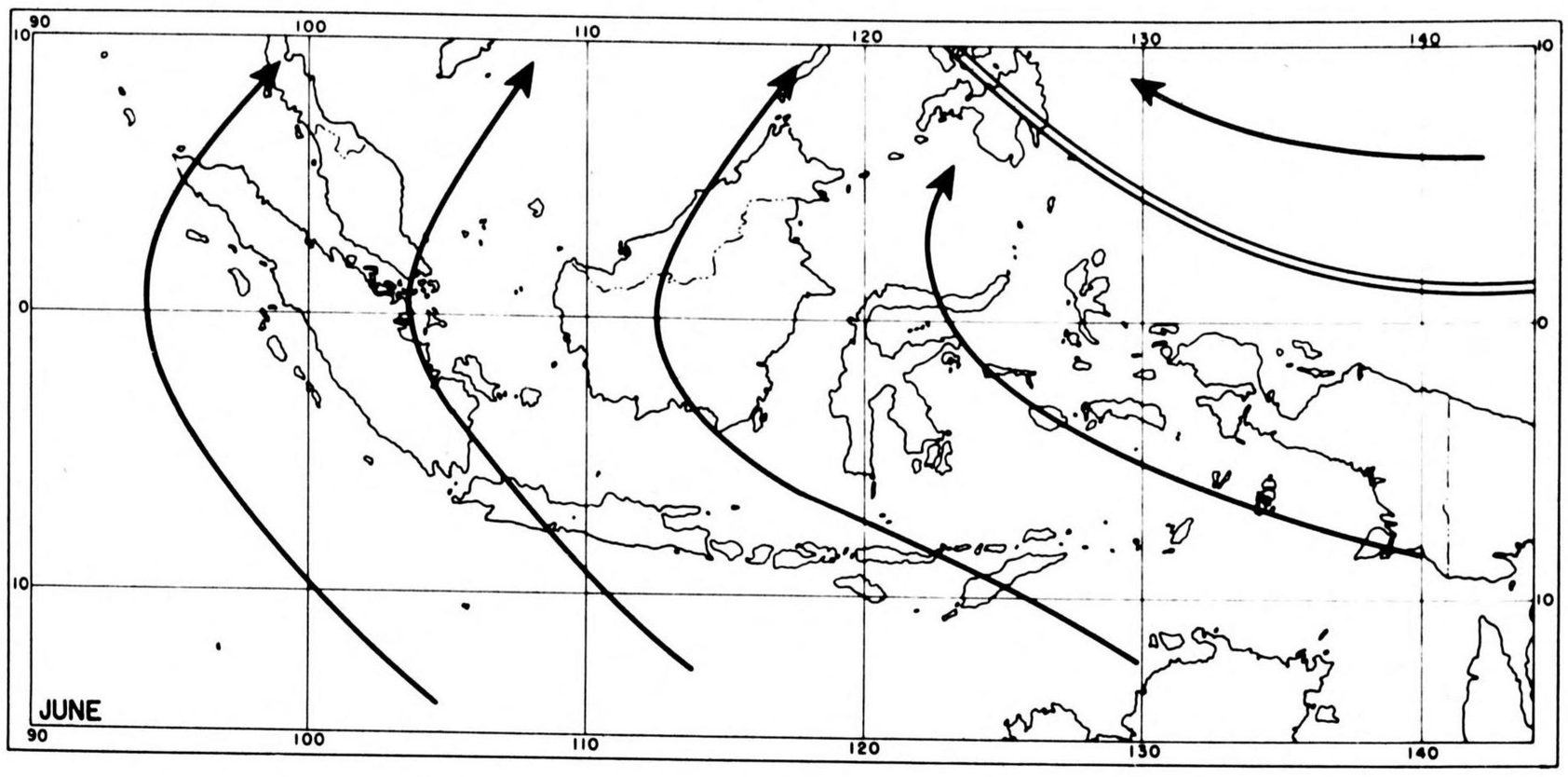
LEGEND

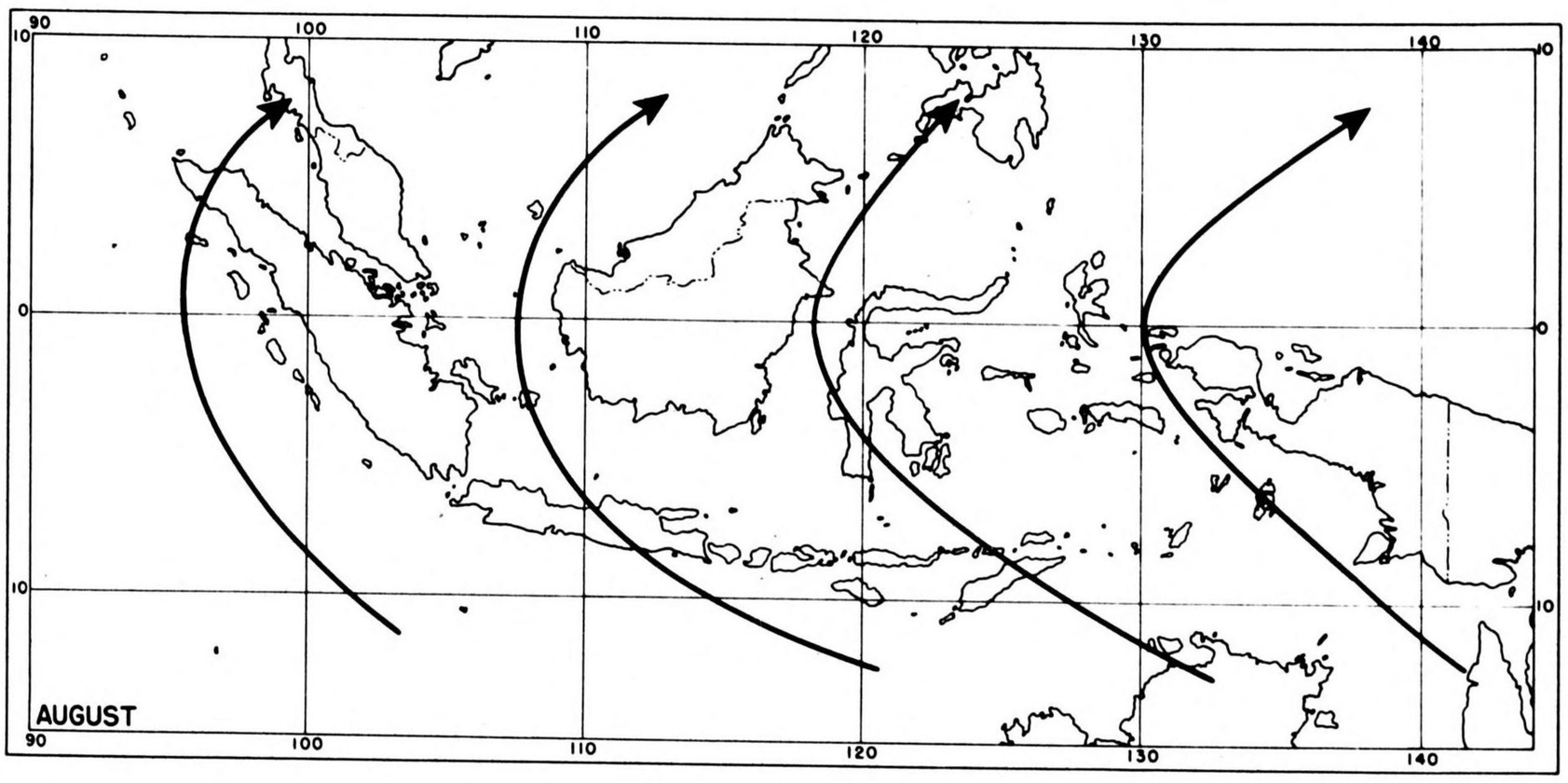
Equatorial Front

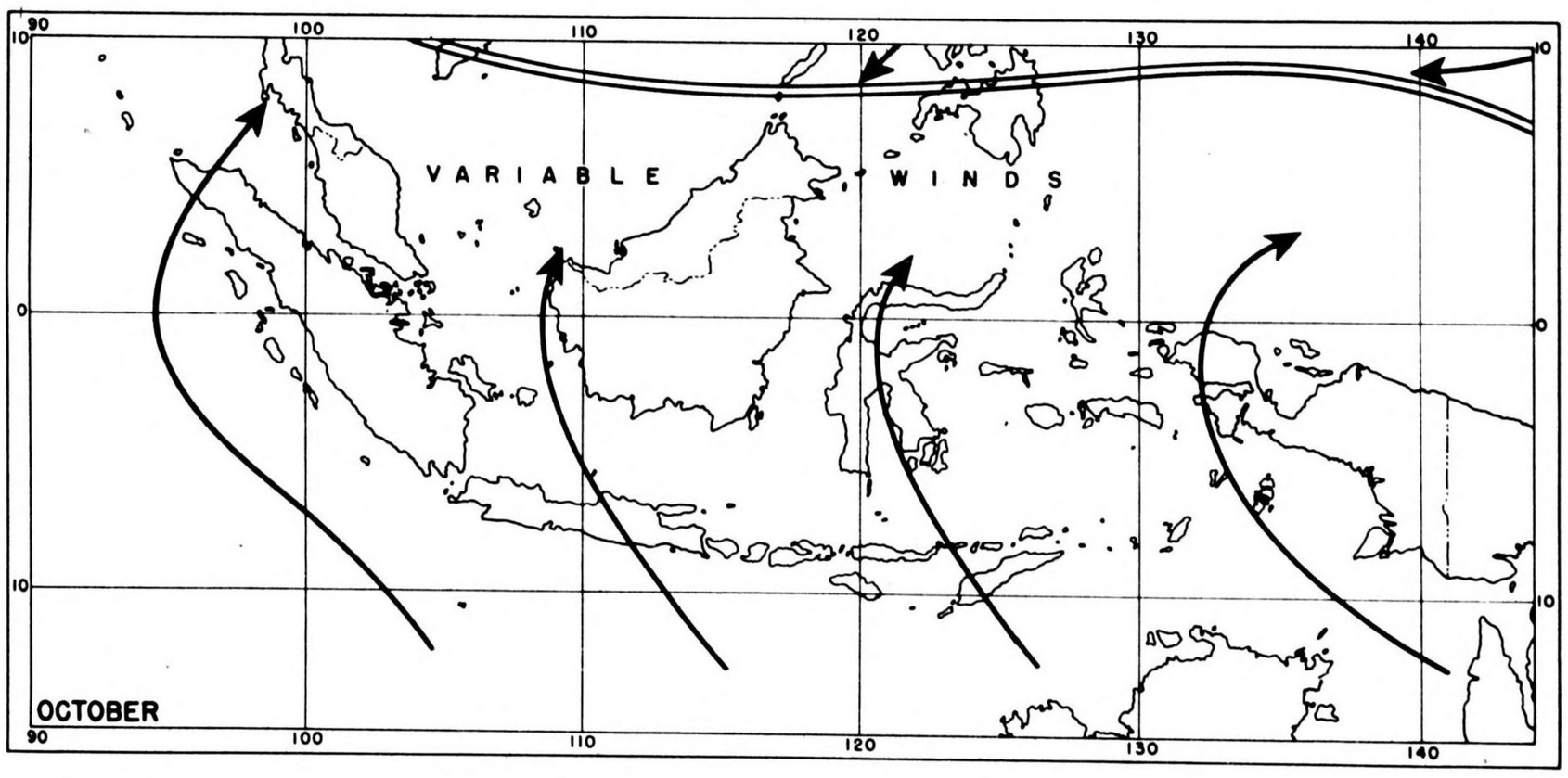
Secondary Fronts

Mean Wind Flow

Figure 1a.--Mean Surface Wind Flow and Fronts







LEGEND

Equatorial Front

Secondary Fronts

Mean Wind Flow

Figure 1b.--Mean Surface Wind Flow and Fronts

cloudiness, and rainfall are all subject to well-marked daily variation, which, in many cases, may exceed seasonal variation.

Areal Contrasts

There are significant climatic contrasts among different parts of the Netherlands Indies. Broad regional contrasts are associated with differences between land and sea surfaces, between windward and leeward slopes of the major mountain masses, and between contrasting latitudinal positions. In addition, topography causes extremely complex local variation in most weather elements. Even slight local differences in elevation, slope, or exposure commonly produce quite dissimilar weather at nearby places.

Day-to-Day Contrasts

Unlike the fairly regular climatic processes described above, day-to-day weather changes are quite irregular.

The monsoons, although remarkably steady in comparison to winds in most middle latitude regions, are subject to nonperiodic variation in speed and direction of flow. In like manner, the intertropic front undergoes erratic shifts in position and intensity. Moreover, moving pressure disturbances sometimes traverse this area. Such disturbances are generally quite weak and are reflected in the weather chiefly through intensifying or weakening local convective activity. Disturbances of sufficient intensity to cause widespread bad weather appear occasionally. Violent tropical cyclones--typhoons--are frequent both north and south of the Netherlands Indies, but they seldom penetrate within 10° of the Equator. At long intervals typhoons cut across the northernmost and southernmost margins of the Netherlands Indies. In most of the area they are unknown.

Day-to-day weather changes can be anticipated only by means of short-range forecasts. Because of the sparse network of synoptic stations in the western Pacific and the East Indies before the Japanese occupation, the nature of weather processes in this area is only incompletely understood.* Forecasting is not easy in this region, even if numerous synoptic reports are available from the East Indies and neighboring areas. With reports cut off by enemy occupation, accurate forecasting is extremely difficult.

WEATHER AND AIR OPERATIONS

Low-level Operations

The chief weather factors which may restrict low-level air operations over the Netherlands Indies are low ceilings, restricted visibi-

* For discussion of synoptic situations, reference should be made to:

Day, J.A.
c. 1942. SYNOPTIC ANALYSIS IN THE TROPICAL PACIFIC. Pan American Airways publication. Also as U.S. Navy reprint.

U.S. Army Air Forces.
1944. INTERPRETATION OF WEATHER OVER THE PACIFIC. Weather Division Publication No. 640. Washington. (Restricted.) (In press.)

lity, and turbulence. Surface winds and upper winds, although not necessarily restrictive, are of interest in planning operations.

Low ceilings.--Heavy cloud formation is frequent over the Netherlands Indies. However, stratus overcast is rare except over limited areas of the interior. Low clouds are predominantly cumulus, associated with local convective activity. The bases of the cumulus clouds usually lie at 2,000 or 3,000 feet above sea level, producing frequent low ceilings over upland areas. Over the sea and the lowlands, very low ceilings are rare, except in showers.

Seasonal contrasts in the frequency of low ceilings are greatest in the southern parts of the area, where the south monsoon season (May through October) has far less cloud and rain than the rest of the year. An exception is encountered over some highland areas, where stratus cloud decks develop in the south monsoon air. The contrast in cloudiness between the north and south monsoon air streams decreases northward. In the northern parts of the area, seasonal contrasts depend chiefly on local topography: slopes exposed to the south monsoon generally have more low ceilings from May through October; slopes exposed to the north monsoon have more low ceilings from December through February. The seasonal variation of rainfall at a given station is generally a reliable indication of the seasonal variation of low ceilings (tables 2 and 5)

Daily contrasts in the frequency of low ceilings depend largely on surface features. Over the sea, very low ceilings are most frequent in the early morning. Observations on the cruise of the *Snellius*, taken at distances of over 60 miles from land in various seas of the Netherlands Indies, give the following relative hourly frequencies of cumulonimbus cloud, the chief cause of unusually low ceilings:

Hour (L.C.T.)	0000	0200	0400	0600	0800	1000	1200	1400	1600	1800	2000	2200
Percentage frequency	6	11	12	13	12	9	9	9	8	5	4	5

Over the interior, very low ceilings are most frequent in the afternoon. The nights and early mornings are relatively clear. Cumulus formation begins soon after sunrise on mountain slopes facing the sun, and rapidly spreads over the plateaus and plains. Low cloud is normally heaviest during the afternoon, breaking up in the late evening This tendency toward an afternoon maximum in low ceilings extends to the coast in seasons when the wind is blowing offshore. When the wind is onshore, the daily variation resembles that over the sea. In the southern islands of the area, a special type of daily variation in ceilings occurs over interior plateaus and on mountain slopes in the south monsoon season. A temperature inversion is sometimes present in the south monsoon air at 5,000 to 10,000 feet elevation. Where the ground surface approaches that elevation, stratus overcast often forms in the evening or in the early morning hours. Such stratus decks are usually dissipated before midday, with the beginning of convective activity and cumulus formation. The daily variation of rainfall at a given station is generally a reliable indication of the variation of low ceilings (table 4).

Areal contrasts in low ceilings are great in this area. In addition to the general northward increase in cloudiness during the south monsoon, there is much local variation. Over the sea, the bases of the lower clouds generally lie about 2,000 feet above the surface. Over the lowlands, cloud formation is somewhat heavier, but cloud bases tend to be higher. At Batavia, the mean elevation of cumulus bases is about 3,000 feet. Over the sea and lowlands, very low ceilings occur occasionally in showers under cumulonimbus clouds, where cloud bases may lower to 500 feet or less. These showers are normally local and seldom exceed 10 miles in horizontal extent. Observations at the lowland station of Amboina (Celebes) give the following mean annual frequencies for the height of the base of the lower clouds:

Height (feet)	<600	<1,000	<2,000	<3,000	<6,500
Percentage frequency	2	16	54	75	96

Heavy low cumulus and zero ceilings are very prevalent on windward mountain slopes. In the mountains, cloudiness tends to become heavier with increasing elevation. An exception sometimes occurs over the southern islands during the south monsoon, where the vertical increase in cloudiness extends up to the level of the temperature inversion only; mountain peaks extending above about 6,000 feet are relatively free of cloud. Over mountain-ringed plateaus throughout the area, cloud bases are usually high above the ground.

Day-to-day variation in ceiling conditions is seldom great in this area. Weak cold fronts moving in from higher latitudes and weak phases of the equatorial front merely intensify local cumulus formation and do not cause widespread low ceilings. However, with strong convergence along the equatorial front, an unbroken belt of heavy low cumulonimbus clouds develops.

Restricted visibility.--Horizontal visibility is generally good in this area, but is occasionally reduced by fog, cloud, mist, haze, or rain. Observations on the cruise of the *Snellius* in various seas of the Netherlands Indies give the following mean annual frequencies for different degrees of visibility:

Visibility (miles)	<½	<2½	<6	<12	<35	>35
Percentage frequency	½	1	5	24	78	22

Fog, reducing visibility to less than ½ mile, is rare over the sea. Over the land, dense fogs form nearly every night over many swampy river valleys, lakes, and marshes. Fog often forms at night over sheltered plains or plateaus on which rain has fallen during the evening. Fog in this area is of the radiation type, produced by nocturnal cooling of the surface air, and is therefore most frequent on clear calm nights; it is dissipated rapidly after sunrise. In the southern islands, fog over lakes and persistently wet ground is most frequent in the dry south monsoon season, when nocturnal cooling is most intense. Likewise, fog is more frequent at high elevations, where nocturnal cooling is more intense than near sea level.

Clouds cause very bad visibility conditions on mountain slopes. Above the condensation level, which usually lies at 1,000 to 3,000 feet elevation on windward slopes, the frequent thick cloudbanks have the same effect as fog.

Mist and haze, reducing visibility to less than 6 miles, are encountered in all seasons. Haze occurs in stable air streams and is apparently the result of strong winds whipping condensation nuclei into the air. It is often intensified by dust, volcanic ash, and smoke. The air is haziest, particularly in the early morning, toward the end of the south monsoon season, in September and October. The upper limit of the haze layer is usually not sharply defined. However, when a strong temperature inversion is established in the south monsoon air, as sometimes happens in the southern islands, the haze ceases abruptly at the inversion. Above the inversion, usually at 5,000 to 10,000 feet, the air is extraordinarily clear. The upper boundary is best defined in the early morning before the daily convective activity has begun.

Toward the end of an abnormally dry south monsoon season, when dust storms and grass fires are numerous in drought-stricken parts of the East Indies and Australia, the haze sometimes becomes so dense that it has the same effect as fog. It is described as "dry fog," "milky fog," or "smoke fog." In extreme cases, this "dry fog" reduces visibility to a fraction of a mile over large parts of the archipelago. "Dry fog" ceases when the rains begin.

Rain often reduces visibility to a few miles. In torrential downpours, visibility may be practically nil. Observations on the cruise of the *Snellius* in various seas of the Netherlands Indies give the following mean annual frequencies for different degrees of visibility during rain:

Visibility (miles)	<½	<2½	<6	<12	<35	>35
Percentage frequency	5	18	41	81	99	1

Over the land, rainfall is more intense, with a corresponding reduction in visibility. However, rain occurs ordinarily in the form of brief local showers, which can generally be avoided by planes in flight. The rain associated with fronts or tropical cyclones is more continuous and must be approached with care. Data on daily and seasonal contrasts in rainfall are presented in tables 4 and 5.

Turbulence.--Turbulence is severe in cumulonimbus clouds and thunderstorms and is extremely violent in well-developed tropical cyclones. Cumulonimbus clouds often extend from below 1,000 feet to above 30,000 feet, and sometimes extend as high as 50,000 feet. Vertical air movements of over 2,000 feet per minute are commonly observed in these clouds. Cumulonimbus clouds are usually isolated, in which case they can be avoided by planes in flight; when this is impossible, the violent turbulence can best be avoided by either flying beneath the cloud base or by approaching the cloud at an altitude of more than 20,000 feet.

Seasonal contrasts in turbulence are complex. Over most of the area, severe turbulence is frequent in the north monsoon and transition seasons. In the southeastern part of the area, the frequency of severe

turbulence decreases during the south monsoon season. In the northern and western parts, this decrease is slight or entirely absent; at some places south monsoon air is more turbulent than north monsoon air. The seasonal variation of thunderstorms gives an indication of the seasonal variation of severe turbulence (table 10).

Daily contrasts in turbulence are different over the land and over the sea. Over the sea, turbulence is greatest at night and in the early morning. Over the land, turbulence is greatest in the afternoon. Following are the mean number of hours per year with thunder during different parts of the day:

Hours (L.C.T.)	0000-0400	0400-0800	0800-1200	1200-1600	1600-2000	2000-2400
SUMATRA						
Fort de Kock	--	--	6	239	245	--
Medan	--	--	12	183	311	--
Padang	--	--	5	22	32	--
Seriboedolok	1	2	17	240	251	44
JAVA						
Bandoeng	--	--	3	203	263	60
Batavia	52	20	13	116	120	49
Buitenzorg	26	0	30	373	848	116
Soerabaja	9	6	4	55	104	42
BORNEO						
Pontianak	--	--	1	50	72	--
CELEBES						
Amboina	6	19	23	23	35	18
Manado	--	--	7	36	4	--
TIMOR						
Koepang	--	--	38	103	52	--

-- indicates no data.

Areal contrasts in turbulence are very great, and are controlled chiefly by topography. Turbulence is generally much less severe over the sea than over land. The greatest turbulence prevails over rugged terrain, particularly over windward slopes, where the convective instability of the air masses is released by forced ascent. However, severe squalls and turbulence are possible also over leeward slopes.

Day-to-day contrasts in turbulence are seldom great. Local convection and turbulence are increased by the passage of weak fronts. When the equatorial front is unusually well developed, it is marked by a belt of cumulonimbus clouds and severe turbulence. Violent turbulence is encountered in tropical cyclones. These are almost unknown in the Netherlands Indies, except in the vicinity of the island of Timor, where a cyclone can be expected about once a year, almost invariably in April.

Surface winds.--Surface winds over the Netherlands Indies, although remarkably steady in comparison to winds of higher latitudes, are subject to important variations.

Seasonal contrasts in wind direction are primarily controlled by the great monsoon air streams (figs. 1a and 1b). During the north monsoon season, from December through February, northeast winds prevail north of the Equator, north winds near the Equator, and northwest winds south of the Equator. During the south monsoon season, from May through

October, southeast winds prevail south of the Equator, south winds near the Equator, and southwest winds north of the Equator. In the transition months, winds are more variable, but northeast winds prevail over the northern parts of the area, southeast winds over the southern parts.

Over the sea, the monsoons are extremely steady. Observations at the offshore lighthouse of Meaty Miarang (Timor) give the following mean frequencies for different wind directions at the height of the north monsoon (January) and south monsoon (July).

Direction	N	NE	E	SE	S	SW	W	NW
Percentage frequency								
January	1	1	1	0	2	9	26	60
July	0	0	22	65	12	0	0	0

Over the land, wind directions are more variable. In the mountains, winds are funneled through valleys and passes. Even minor topographic features produce local variations in the characteristically weak air flow.

Along the coasts and in interior valleys, there is a tendency toward regular daily variation in wind direction. On exposed portions of the coast, this tendency causes only a slight deflection of the prevailing monsoon. However, in sheltered bays, local breezes often completely obliterate the monsoons. The land (offshore) breeze sets in during the evening and usually abates at about 0900. The sea (onshore) breeze sets in before midday and abates after sunset. The land breeze normally occupies a shallow layer, which seldom exceeds 500 feet in depth. The sea breeze is generally deeper and often exceeds 3,000 feet in depth. The land breeze is perceptible only within a few miles of the coast; the sea breeze is sometimes perceptible for a distance of 50 miles or more on both sides of the coast line, but usually is strongly developed only within 20 miles of the coast. Many interior valleys experience a similar daily reversal of wind direction. Mountain (downslope) breezes are common at night, valley (upslope) breezes in the daytime.

Wind speeds are generally on the order of a gentle breeze (about 10 m.p.h.), but occasionally reach strong breeze force (25 m.p.h.). Gales are very rare, but are encountered in unusually violent thundersqualls and in tropical cyclones.

Upper winds.--In the lower levels, upper winds closely resemble the surface circulation. In the upper levels, there is a tendency for circulation to parallel the Equator, with westerly and easterly winds frequent, northerly and southerly winds less frequent. There are significant local and regional peculiarities (figs. 2a through 2d).

At all levels, wind speeds are normally moderate. Speeds greater than 30 knots are encountered only a small percentage of the time.

High-level Operations

High-level operations are affected by the same weather factors as those which affect low-level operations. In addition, high-level operations are restricted by cloudiness at intermediate and low levels and by icing.

Intermediate and low cloudiness.--Although very low ceilings are rare over the seas and lowlands of this area, cloud formation is sufficiently heavy to seriously restrict high-level operations. Cumuliform clouds, with bases at 2,000 to 3,000 feet, predominate. Observations on the cruise of the *Snellius* in various seas of the Netherlands Indies give the following mean annual frequencies of various cloud forms:

Cloud form	Ci Cicu Cist	Acu	Ast	Stcu	Nb	St	Cu	Cunb	No Cloud
Percentage frequency	25	6	12	2	3	½	40	11	1

Available cloudiness data refer to total sky cover by clouds at all levels. Such data include observations of cirrus clouds, sometimes so high that they do not affect even high-level operations.

Seasonal variation in cloudiness is greatest in the southeast of the area. Following are mean monthly cloudiness values, in percentage of sky covered:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
JAVA													
Batavia	76	76	67	60	53	51	47	45	49	57	68	74	60
CELEBES													
Tomohon	81	80	76	67	65	67	66	59	60	64	69	75	69
TIMOR													
Koepang	45	43	39	20	21	16	19	12	10	16	24	43	26

Seasonal variation in the frequency of cloudy days resembles variation in mean cloudiness. Following are the mean monthly number of clear days (less than 25 percent cloud cover) and cloudy days (more than 75 percent cloud cover):

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
JAVA													
Batavia													
Clear	0	0	½	½	1	2	3	2	2	2	0	0	12
Cloudy	17	16	12	7	5	4	2	3	4	8	11	16	103
BORNEO													
Sandakan													
Cloudy	15	12	16	9	7	11	14	8	14	15	16	16	153

Daily contrasts in cloudiness are complex. Different cloud types characteristically have dissimilar daily variation. However, in general cloudiness is heavier during the daylight hours than at night. Following are mean annual cloudiness values, in percentage of sky covered, at different hours of the day:

Hour (L.C.T.)	0000	0200	0400	0600	0800	1000	1200	1400	1600	1800	2000	2200
JAVA												
Batavia	59	55	52	61	53	58	66	62	61	68	66	63
VARIOUS SEAS												
Snellius	48	52	48	58	54	51	55	54	53	57	48	45

Areal contrasts in cloudiness are discussed above in the section on low ceilings.

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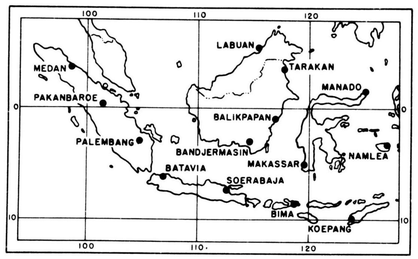
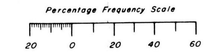


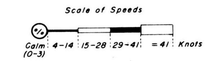
UPPER WINDS – DECEMBER, JANUARY, FEBRUARY

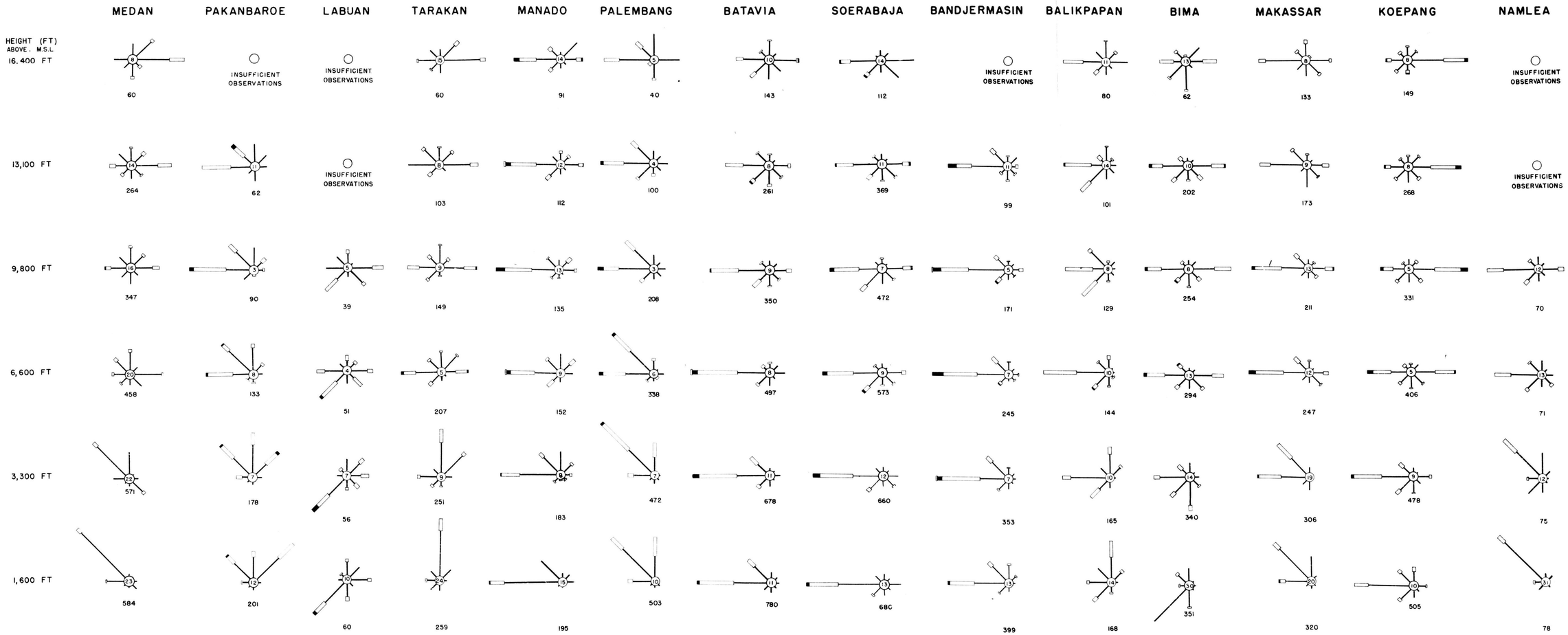
~~CONFIDENTIAL~~

MEAN PERCENTAGE FREQUENCY OF UPPER WINDS OF SPECIFIED DIRECTIONS AND SPEEDS AT VARIOUS ELEVATIONS

FIGURES BELOW THE ROSES INDICATE THE NUMBER OF OBSERVATIONS







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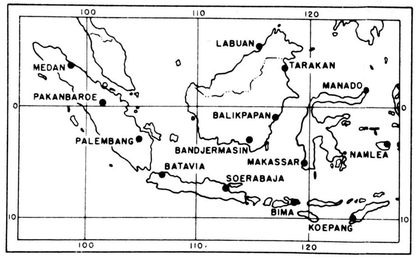
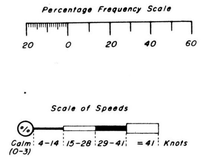


UPPER WINDS – MARCH, APRIL, MAY

CONFIDENTIAL

MEAN PERCENTAGE FREQUENCY OF UPPER WINDS OF SPECIFIED DIRECTIONS AND SPEEDS AT VARIOUS ELEVATIONS

FIGURES BELOW THE ROSES INDICATE THE NUMBER OF OBSERVATIONS



HEIGHT (FT) ABOVE M.S.L.	MEDAN	PAKANBAROE	LABUAN	TARAKAN	MANADO	PALEMBANG	BATAVIA	SOERABAJA	BANDJERMASIN	BALIKPAPAN	BIMA	MAKASSAR	KOEPANG	NAMLEA
16,400 FT	108	30	INSUFFICIENT OBSERVATIONS	80	142	95	184	75	INSUFFICIENT OBSERVATIONS	66	72	256	187	INSUFFICIENT OBSERVATIONS
13,100 FT	325	75	INSUFFICIENT OBSERVATIONS	107	158	190	327	322	171	84	166	313	315	INSUFFICIENT OBSERVATIONS
9,800 FT	419	97	65	139	184	321	452	481	230	103	203	369	422	66
6,600 FT	499	120	90	170	201	453	566	584	312	124	244	406	494	73
3,300 FT	543	155	105	206	223	542	710	675	410	136	309	443	555	73
1,600 FT	551	175	120	211	228	564	758	694	465	142	317	447	571	75

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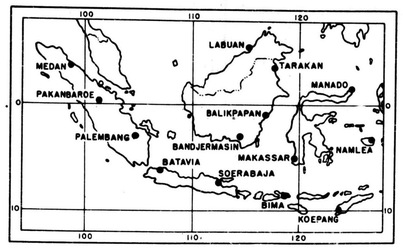
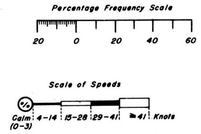


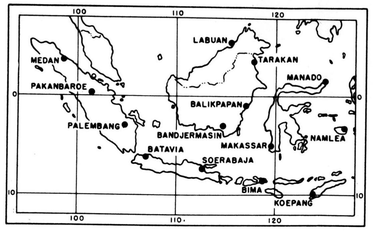
UPPER WINDS – SEPTEMBER, OCTOBER, NOVEMBER

MEAN PERCENTAGE FREQUENCY OF UPPER WINDS OF SPECIFIED DIRECTIONS AND SPEEDS AT VARIOUS ELEVATIONS

FIGURES BELOW THE ROSES INDICATE THE NUMBER OF OBSERVATIONS



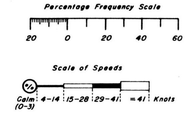
HEIGHT (FT) ABOVE M.S.L.	MEDAN	PAKANBAROE	LABUAN	TARAKAN	MANADO	PALEMBANG	BATAVIA	SOERABAJA	BANDJERMASIN	BALIKPAPAN	BIMA	MAKASSAR	KOEPANG	NAMLEA
16,400 FT	69	INSUFFICIENT OBSERVATIONS	INSUFFICIENT OBSERVATIONS	116	156	117	252	133	INSUFFICIENT OBSERVATIONS	67	77	300	229	INSUFFICIENT OBSERVATIONS
13,100 FT	403	77	INSUFFICIENT OBSERVATIONS	168	178	209	384	442	187	87	214	368	389	INSUFFICIENT OBSERVATIONS
9,800 FT	486	110	108	226	209	356	509	590	295	116	285	424	513	85
6,600 FT	560	150	147	295	223	498	631	692	400	140	347	452	573	90
3,300 FT	637	214	179	350	259	644	789	741	509	194	403	461	616	89
1,600 FT	652	243	180	355	265	678	845	745	538	224	411	462	626	86



UPPER WINDS - JUNE, JULY, AUGUST

MEAN PERCENTAGE FREQUENCY OF UPPER WINDS OF SPECIFIED DIRECTIONS AND SPEEDS AT VARIOUS ELEVATIONS

FIGURES BELOW THE ROSES INDICATE THE NUMBER OF OBSERVATIONS



HEIGHT (FT) ABOVE M.S.L.	MEDAN	PAKANBAROE	LABUAN	TARAKAN	MANADO	PALEMBANG	BATAVIA	SOERABAJA	BANDJERMASIN	BALIKPAPAN	BIMA	MAKASSAR	KOEPANG	NAMLEA
16,400 FT	74	INSUFFICIENT OBSERVATIONS	INSUFFICIENT OBSERVATIONS	129	173	177	209	61	INSUFFICIENT OBSERVATIONS	46	53	279	177	INSUFFICIENT OBSERVATIONS
13,100 FT	405	91	INSUFFICIENT OBSERVATIONS	182	211	279	397	332	221	67	216	351	354	INSUFFICIENT OBSERVATIONS
9,800 FT	496	131	86	239	255	400	507	511	297	85	263	420	455	27
6,600 FT	568	169	144	286	278	518	623	601	389	105	331	455	568	27
3,300 FT	619	218	174	327	309	611	762	704	469	139	429	470	650	28
1,600 FT	633	236	182	336	317	642	815	719	501	179	463	473	659	29

Icing.--The freezing level is normally close to 15,000 feet and rarely descends as low as 12,000 feet. Icing conditions can generally be avoided by descending to lower levels when clouds are encountered in which icing conditions exist. The greatest danger occurs when it is necessary to fly through cumulonimbus clouds at high levels.

Incendiary Bombing Operations

Incendiary bombing operations are affected by the same weather factors as those which affect high- and low-level operations. In addition, burning conditions are limited by wind speed, rainfall, and humidity.

Wind speed.--Throughout the archipelago, wind speeds are generally too low to produce satisfactory incendiary burning conditions; speeds of more than 30 m.p.h. are rare. Along the coasts, calms are frequent, and winds do not often exceed 10 m.p.h. except in the early afternoon, when the sea breeze is strongest.

Rainfall.--Burning would be seriously restricted in this area by frequent heavy rainshowers; over ½ inch of water falls on an average rainy day. From November through April, rain generally falls on 10 to 20 days a month over all the islands (table 5). However, from May through October, during the south monsoon, there is a well-marked dry season in the southernmost islands. The dry season becomes less intense northward, and is entirely lacking in the northernmost islands. Throughout the archipelago, abnormally wet or abnormally dry conditions are possible in any month (table 3).

Humidity.--Extremely high humidity is characteristic of all of this area. In the northern islands, relative humidity generally averages between 80 and 90 percent throughout the year. In the southern islands, humidity is equally high except at the height of the dry season, when it generally averages between 70 and 80 percent (table 8). Throughout the archipelago, abnormally high or abnormally low relative humidities are possible in any month (table 9)

Parachute Operations

Parachute operations are affected by the same weather factors as those which affect low-level operations. In addition, parachute landings are endangered by high surface wind speeds.

Surface wind speed.--Surface wind speeds are generally low, but dangerously high speeds are possible anywhere in any season.

Seasonal contrasts are slight (table 1).

Daily contrasts in wind speed are well marked near the coasts, where dangerous wind speeds are most probable at the height of the sea breeze in the early afternoon. Following are mean annual wind speeds, in miles per hour, at three coastal places during different parts of the day:

Hours (L.C.T.)	0000-0400	0400-0800	0800-1200	1200-1600	1600-2000	2000-2400
JAVA						
Batavia	½	1	4	6	2	1
Semarang	5	5	7	10	7	5
CELEBES						
Makassar	3	3	5	9	5	3

The afternoon increase in wind speed extends to most of the interior lowlands. However, this effect disappears at about 3,000 feet elevation; on the higher mountains and plateaus, wind speeds are highest at night.

Areal contrasts in wind speed are not great. Differences are due primarily to local topography, rather than to general contrasts between regions or altitude zones. Observations taken on numerous mountain tops give the following mean annual wind speeds, in miles per hour in different altitude zones:

Elevation (feet)	<1600	1600-3300	3300-6600	>6600
Sumatra	3	2	5	6
Java and Bali	9	6	6	9
Celebes	5	4	8	5

Day-to-day contrasts in wind speed are usually slight. However, the monsoon air flow occasionally develops abnormally high speed, especially where reinforced by the afternoon sea breeze or where funneled through mountain passes. Steady winds exceeding 30 m.p.h. occur at rare intervals at some exposed places. Throughout the area, gusts of great force accompany unusually violent thundersqualls.

Maintenance of Ground Installations

The chief weather factors which affect ground installations in this region are rainfall, temperature, humidity, and wind speed.

Rainfall.--The frequent heavy rainshowers of the Netherlands Indies cause serious problems of muddiness, flooding, and erosion of airports. Total annual rainfall exceeds 80 inches over most of the region, and exceeds 200 inches at a few places. Downpours of over 2 inches in a single day are frequent in most of the islands of the archipelago. Most places have had over 6 inches of rain in a single day, a few have had over 20 inches.

Rainfall is quite unevenly distributed over the archipelago (fig. 3 and table 2). There is a general contrast between the southern islands, which have a dry season, and the northern islands, which are wet in all seasons. In addition, local topography causes sharp contrasts between nearby places, as between Batavia and Buitenzorg or between Paloe (one of the very driest places in the Netherlands Indies) and Donggala.

Temperature.--Monotonous heat prevails over all the lowlands of the Netherlands Indies in all seasons. Lowland temperatures normally range from 70° or 75° in the cool of the morning, to 85° or 90° in the heat of the day (table 6). Temperatures below 65° or above 95° are rare (table 7). Cooler conditions can be expected in the highlands. The rate of decrease in average temperature with increasing elevation is generally 3° or 4° per 1,000 feet. Only the highest mountain peaks have frost. The lowest temperature experienced on Pangerango (9,900 feet elevation) during 7 years of record was 33°.

Humidity.--Extremely high humidity is characteristic of this region. In conjunction with the heavy rainfall and constant high temperatures, the high humidity produces difficult health problems and trouble with

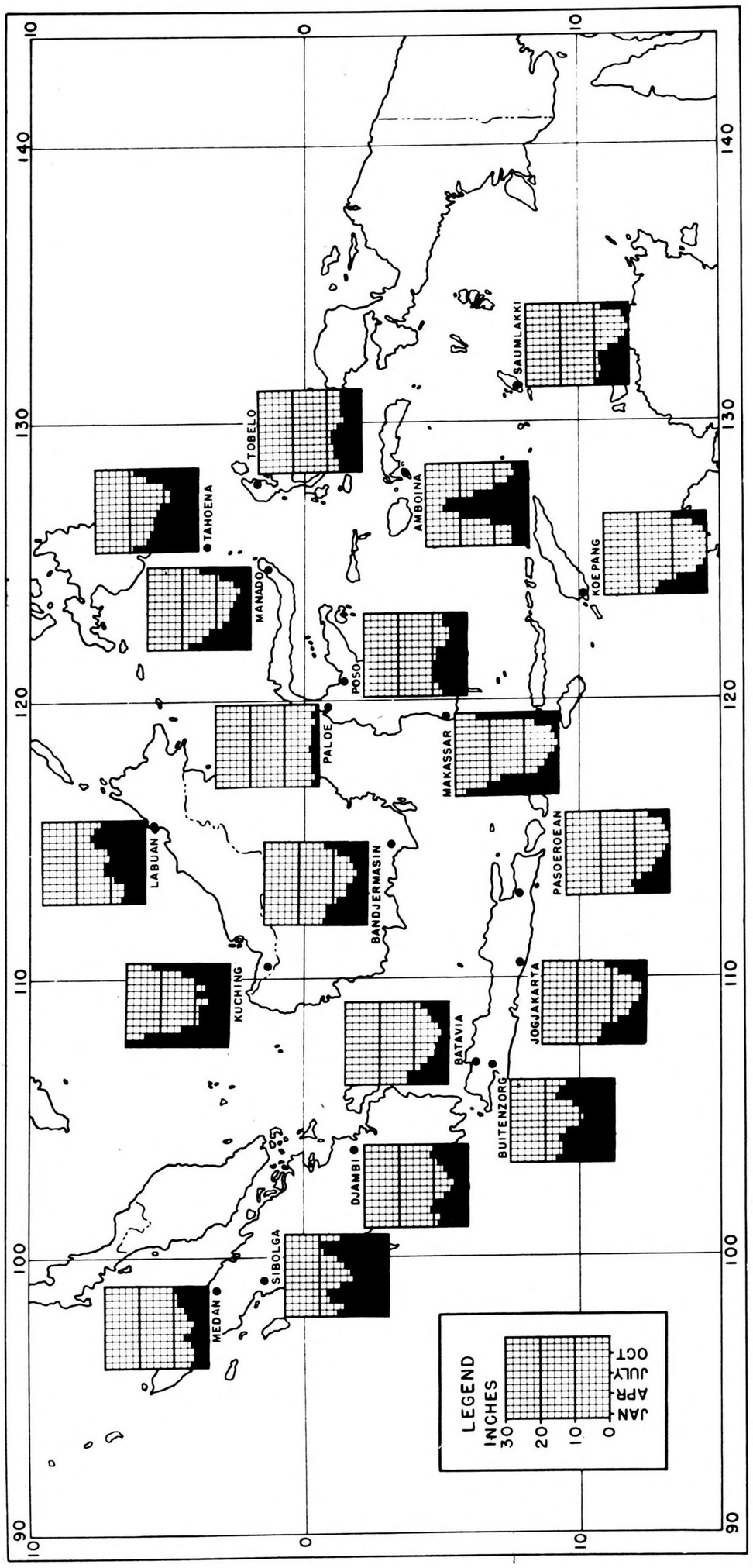


Figure 3.--Average Rainfall

rust and mold. Throughout the archipelago in all seasons, relative humidity normally exceeds 90 percent in the early morning (table 8). In the heat of the day, relative humidity is appreciably lower.

Wind speed.--Destructive winds sometimes accompany the tropical cyclones which occur on the extreme northern and southern fringes of the Netherlands Indies. Cyclones are most frequent in the vicinity of Timor, where they can be expected about once a year between the latter part of March and the first days of May. They are usually rather weak, but in a few instances have destroyed houses, uprooted trees, and caused loss of life. During one cyclone, wind speed exceeded 55 m.p.h. at Koepang.

Throughout the area, destructive gusts accompany unusually violent thundersqualls. It is possible that wind speeds may approach 45 m.p.h. in local squalls. However, the highest wind speed ever recorded at Batavia is 36 m.p.h.

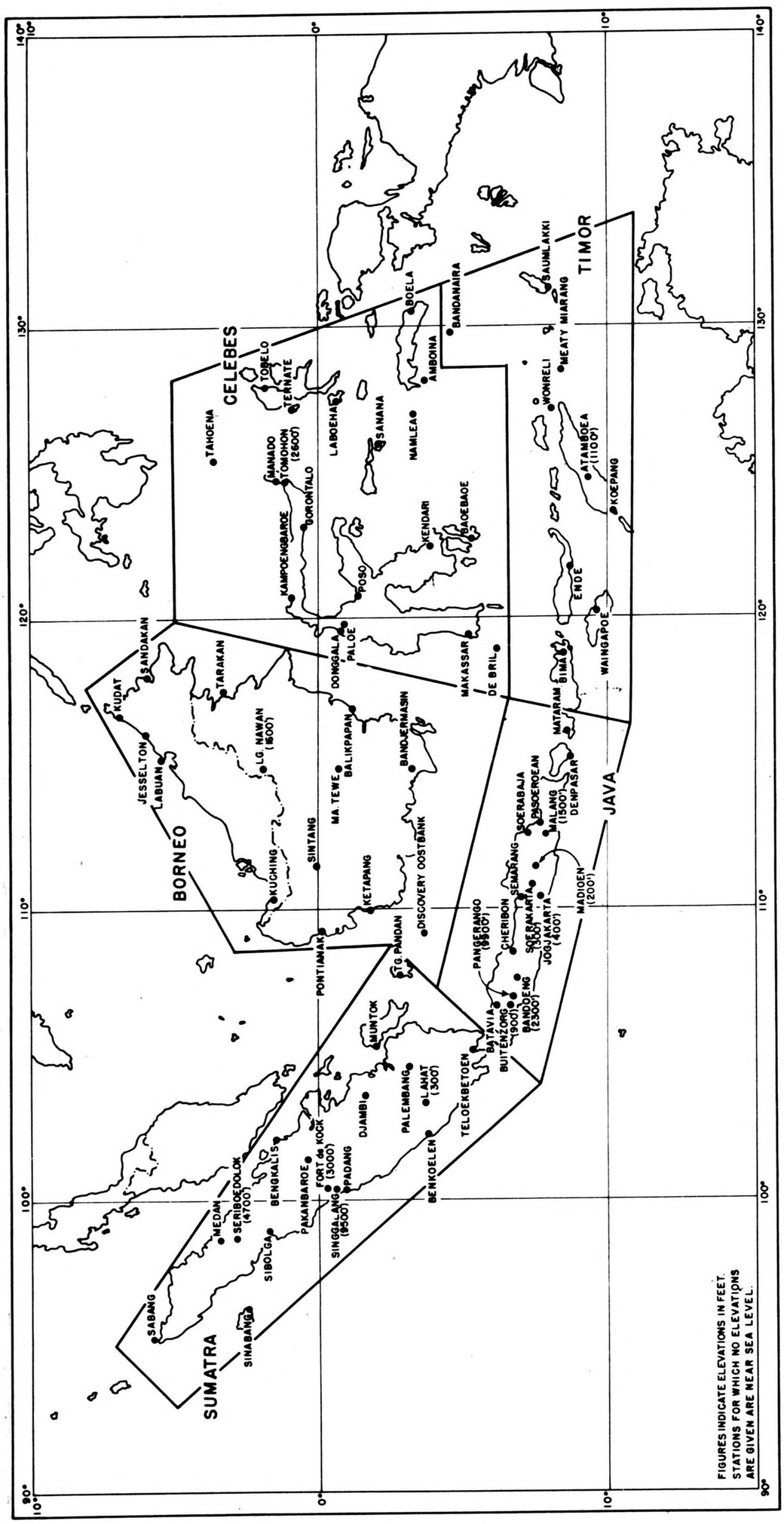


Figure 4.--Locations of Meteorological Stations.

Table 1
SURFACE WIND SPEED

Mean surface wind speed, in m.p.h. (Values based on 24 hours of observation per day.)

Station \ Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Years Record
SUMATRA														
Seriboedolok	5	4	5	5	5	5	6	7	6	6	5	5	5	5
JAVA														
Batavia	3	3	3	3	3	2	3	3	3	3	3	3	3	53
Pasoeroean	3	3	2	3	3	3	3	4	4	4	3	3	3	10
Semarang	7	8	7	6	7	7	7	7	8	7	7	6	7	3
BORNEO														
Discovery Oostbank	15	13	11	10	12	16	16	18	16	14	10	14	14	8
CELEBES														
De Bril	17	13	13	12	15	19	19	20	19	16	12	14	16	8
Makassar	6	5	4	4	4	4	4	5	5	5	5	5	5	5
TIMOR														
Koepang	8	7	6	7	7	8	8	7	7	7	7	7	7	5
Meaty Miarang	16	15	12	13	16	17	16	15	13	11	8	11	14	8

Table 2

AVERAGE RAINFALL

Mean total precipitation in inches.

Station \ Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Years Record
SUMATRA														
Bengkalis	7	5	8	10	7	5	5	7	10	11	13	11	98	50
Benkoelen	12	11	11	11	9	8	7	8	10	14	15	14	129	50
Djambi	9	8	11	10	7	5	4	6	7	9	11	10	98	50
Fort de Kock	9	7	8	10	7	5	4	6	7	9	9	10	89	50
Lahat	18	14	15	13	9	5	5	5	6	8	11	15	125	50
Medan	5	4	4	5	7	5	5	7	8	10	10	9	80	50
Muntok	17	11	12	10	7	5	4	4	4	8	12	20	115	50
Padang	14	10	12	14	12	12	11	14	16	20	20	19	174	50
Pakanbaroe	10	7	10	9	7	5	4	5	8	10	9	10	94	22
Palembang	12	10	12	11	7	5	4	4	5	8	11	13	101	50
Sabang	12	6	5	4	7	4	4	5	7	7	10	15	86	35
Seriboedolok	6	4	7	7	5	3	3	4	6	9	8	9	70	19
Sibolga	15	13	17	18	14	10	11	13	15	19	20	16	181	49
Sinabang	10	8	10	11	10	7	9	9	12	15	14	13	127	11
Singgalang	15	11	12	13	9	7	8	8	13	14	16	17	143	11
Tg. Pandan	11	7	8	11	10	7	7	6	7	11	11	17	114	50
Teloekbetoeng	11	11	10	7	5	5	4	5	5	5	6	10	83	50
JAVA														
Bandoeng	8	7	9	9	5	4	2	2	3	7	9	9	76	50
Batavia	12	12	8	6	4	4	3	2	3	5	6	8	71	57
Buitenzorg	17	15	15	16	14	10	9	10	12	17	16	14	166	50
Cheribon	18	14	13	8	6	4	2	1	2	3	6	13	89	39
Denpasar	13	10	8	3	3	2	2	3	2	5	6	12	69	22
Jogjakarta	11	13	13	8	5	4	2	1	1	4	9	14	88	50
Madioen	12	11	10	8	5	3	1	1	1	3	8	10	73	50
Malang	12	12	10	6	4	3	2	1	1	4	8	12	75	50
Mataram	10	10	9	5	4	3	2	2	3	8	9	12	75	25
Pangerango	18	19	16	12	7	4	2	4	5	10	15	18	130	17
Pasoeroean	10	11	8	5	4	2	1	T	T	1	2	6	52	50
Semarang	14	14	9	8	5	3	3	2	4	5	8	10	85	50
Soerabaja	12	12	10	7	4	3	2	1	1	2	5	10	69	50
Soerakarta	13	13	12	8	6	4	2	2	2	5	9	11	85	50
BORNEO														
Balikpapan	8	7	9	7	8	7	7	6	5	6	6	8	86	30
Bandjermasin	13	12	12	9	6	6	4	3	4	5	9	13	95	50
Discovery Oostbank	7	4	4	5	6	4	3	2	2	5	7	10	58	24
Jesselton	6	3	3	6	10	11	10	9	13	16	12	12	110	20
Ketapang	15	11	9	11	11	7	6	6	7	12	17	19	129	25
Kuching	30	25	14	9	9	9	6	10	7	10	14	23	166	9
Kudat	15	7	6	3	4	4	4	5	5	8	10	18	87	20
Labuan	7	6	6	9	12	12	10	11	15	16	15	13	131	22
Lg. Nawan	12	11	13	15	14	10	10	11	16	16	16	12	155	11
Ma. Tewe	12	12	13	12	10	8	5	6	7	9	12	13	120	46
Pontianak	11	8	10	11	11	9	7	9	9	15	16	13	128	50
Sandakan	19	11	9	5	6	7	7	8	9	10	15	19	124	46
Sintang	14	12	13	13	11	9	8	10	10	14	14	14	141	48
Tarakan	11	11	14	14	12	14	9	12	12	13	15	14	150	18
CELEBES														
Amboina	5	5	5	11	20	25	24	16	10	6	4	5	136	50
Baoebaoe	10	11	8	7	7	6	4	1	1	2	5	9	70	21
Boela	9	9	10	10	7	8	8	3	4	4	5	7	85	16
Donggala	8	6	6	4	4	5	4	3	3	2	4	6	55	35
Gorontalo	4	5	4	5	4	5	4	3	2	3	4	5	48	47
Kampoengbaroe	9	7	6	5	8	10	9	8	7	7	6	8	89	47
Kendari	8	8	8	7	8	7	5	3	1	1	3	7	66	20
Laboeha	7	6	6	7	6	6	6	5	4	4	5	7	69	42
Makassar	27	21	17	6	4	3	1	T	1	2	7	24	112	50
Manado	18	14	12	8	6	6	5	4	3	5	9	15	105	50
Namlea	7	8	8	4	5	4	4	2	1	2	2	5	52	14
Paloe	2	1	2	2	2	3	2	2	2	1	2	1	21	20
Poso	7	8	10	10	10	9	9	6	5	5	7	7	92	32
Sanana	5	5	6	9	12	8	7	3	3	2	3	5	69	11
Tahoena	19	15	14	13	13	12	11	8	8	10	15	19	157	33
Ternate	8	7	8	9	9	8	5	4	4	5	8	9	86	50
Tobelo	7	7	8	8	9	9	7	5	6	6	6	6	82	21
Tomohon	12	10	9	9	10	7	6	4	5	8	10	11	101	30
TIMOR														
Atamboea	12	10	10	3	1	1	1	T	T	2	6	9	55	9
Bandanaira	10	8	9	13	15	14	8	4	4	4	5	10	105	50
Bima	8	8	7	5	2	1	1	T	1	2	5	9	50	48
Ende	6	6	6	3	3	2	2	1	2	2	5	7	45	18
Koepang	15	14	9	3	1	T	T	T	T	1	4	10	57	50
Saumlakki	10	9	8	9	9	6	3	1	T	1	2	8	66	17
Waingapoe	7	6	6	3	1	1	T	T	T	T	1	5	31	22
Wonreli	4	4	7	5	7	4	2	T	T	T	2	4	40	10

T = less than ½ inch.

Table 3

EXTREMES OF RAINFALL

Maximum and minimum total precipitation, in inches.

Station \ Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Years Record
SUMATRA														
Medan														
Maximum	12	11	14	12	15	17	14	15	13	19	17	26	104	52
Minimum	0	T	0	T	2	2	T	1	1	4	2	2	58	52
Padang														
Maximum	26	23	26	28	24	28	27	29	30	41	33	33	219	52
Minimum	3	2	4	3	4	2	1	6	5	8	8	9	136	
JAVA														
Batavia														
Maximum	32	29	19	15	13	13	8	7	10	12	13	22	97	67
Minimum	3	4	2	1	T	0	0	0	0	0	1	2	46	
Pasoeroean														
Maximum	23	19	18	18	19	10	10	4	4	8	12	14	90	52
Minimum	2	4	3	0	0	0	0	0	0	0	0	2	25	
BORNEO														
Jesselton														
Maximum	16	10	14	10	16	18	24	26	22	27	18	22	141	26
Minimum	1	0	00	0	3	4	3	2	7	7	4	2	76	
Kudat														
Maximum	36	21	19	11	9	7	8	15	11	15	19	41	132	20
Minimum	5	0	0	0	0	1	0	0	1	3	5	7	57	
Labuan														
Maximum	18	30	15	23	21	21	25	24	26	29	22	26	186	22
Minimum	1	0	0	4	2	3	2	1	5	6	5	4	82	
Pontianak														
Maximum	23	23	23	22	26	18	19	18	20	34	25	31	67	52
Minimum	2	T	2	3	5	2	T	1	T	6	5	6	99	
Sandakan														
Maximum	61	35	25	11	17	17	12	18	20	18	31	44	278	43
Minimum	1	0	0	1	1	3	3	2	2	2	4	6	58	
CELEBES														
Amboina														
Maximum	12	11	10	30	55	62	68	72	38	14	11	11	243	60
Minimum	1	T	T	4	3	3	3	T	T	T	0	T	60	
Kendari														
Maximum	12	12	17	12	16	17	11	10	4	3	8	14	90	19
Minimum	3	2	4	4	3	1	T	0	0	0	0	1	40	
Makassar														
Maximum	56	46	26	16	9	7	5	1	2	2	45	38	135	19
Minimum	9	8	6	2	T	T	T	T	T	T	T	2	74	
Manado														
Maximum	47	27	34	19	15	15	15	10	10	16	30	45	159	52
Minimum	5	5	2	1	2	1	0	0	0	0	2	4	63	
Paloe														
Maximum	9	5	6	4	8	5	6	5	4	6	6	6	61	19
Minimum	T	0	0	1	1	T	T	T	T	T	0	T	15	
TIMOR														
Koepang														
Maximum	42	37	26	13	10	4	3	1	1	7	11	21	88	60
Minimum	2	1	1	0	0	0	0	0	0	0	T	1	17	
Waingapoe														
Maximum	14	10	9	5	5	5	4	3	1	1	4	12	38	19
Minimum	2	2	1	1	T	0	0	0	0	0	0	1	22	

T - less than ½ inch.

Table 4

DAIIY MARCH OF RAINFALL

Mean total precipitation per month, in inches, during different parts of the day. (Values for N Monsoon are based on January and February, for S Monsoon on July, August, and September, for transition seasons on March, April, October, and November.)

Hours (L.C.T.) / Station and Season	0000-0400	0400-0800	0800-1200	1200-1600	1600-2000	2000-2400	Years Record
SUMATRA							
Fort de Kock							6
N Monsoon	1.1	0.3	0.3	1.5	3.2	1.5	
S Monsoon	0.4	0.3	0.3	2.0	1.7	0.8	
Transition	0.8	0.4	0.4	2.6	3.0	1.9	
Medan							10
N Monsoon	0.9	0.5	0.4	1.1	0.7	1.0	
S Monsoon	0.7	0.4	0.2	0.8	3.0	2.1	
Transition	1.1	0.7	0.3	1.0	2.3	2.0	
Padang							13
N Monsoon	2.0	1.2	0.7	1.5	3.8	2.6	
S Monsoon	2.6	1.3	0.7	2.1	4.5	2.8	
Transition	2.6	1.8	1.0	2.1	5.3	3.9	
Singgalang							8
N Monsoon	1.7	1.4	1.2	3.3	3.0	2.1	
S Monsoon	1.1	0.6	1.2	2.7	2.2	1.4	
Transition	1.6	0.8	1.8	4.5	3.5	2.5	
JAVA							6
Bandoeng							
N Monsoon	0.5	0.5	0.3	2.2	3.1	0.9	
S Monsoon	0.1	0.1	0.1	0.7	1.3	0.4	
Transition	0.4	0.2	0.2	3.5	3.2	1.1	
Batavia							53
N Monsoon	2.8	2.3	1.6	1.8	2.1	2.2	
S Monsoon	0.3	0.2	0.1	0.5	0.8	0.4	
Transition	0.5	0.4	0.5	1.6	1.8	0.8	
Buitenzorg							14
N Monsoon	1.3	1.1	1.0	6.8	5.1	1.5	
S Monsoon	0.2	0.1	0.1	1.8	7.1	1.6	
Transition	0.5	0.3	0.3	5.4	7.8	1.6	
Pangerango							10
N Monsoon	2.4	2.6	2.0	5.2	4.7	2.2	
S Monsoon	0.2	0.2	0.4	1.5	1.4	0.7	
Transition	0.8	0.7	1.3	4.8	3.9	1.7	
Pasoeroean							14
N Monsoon	0.1	0.2	0.1	3.0	5.4	1.6	
S Monsoon	0.1	0.0	0.0	0.0	0.1	0.3	
Transition	0.2	0.1	0.2	0.9	1.9	0.8	
BORNEO							5
Discovery Oostbank							
N Monsoon	0.6	1.5	1.0	1.0	0.4	0.6	
S Monsoon	0.2	0.7	0.7	0.6	0.2	0.0	
Transition	0.8	1.1	1.7	1.1	0.2	0.4	
Pontianak							15
N Monsoon	0.9	0.8	0.5	2.7	2.9	1.5	
S Monsoon	0.6	0.5	0.2	2.2	2.8	1.4	
Transition	1.0	0.7	0.9	4.4	3.7	1.8	
CELEBES							14
Amboina							
N Monsoon	0.5	0.4	0.9	1.3	1.3	0.6	
S Monsoon	3.1	3.1	3.1	2.2	2.1	2.7	
Transition	0.8	0.7	1.0	1.8	1.4	0.9	
Manado							7
N Monsoon	3.3	2.2	2.3	4.0	2.2	2.4	
S Monsoon	0.5	0.5	0.3	2.0	0.5	0.2	
Transition	0.9	0.7	1.0	3.2	1.3	1.0	
TIMOR							7
Koepang							
N Monsoon	3.1	2.2	2.6	3.4	2.4	1.9	
S Monsoon	0.0	0.0	0.0	0.1	0.0	0.0	
Transition	3.3	0.5	0.6	1.4	0.7	0.4	

Table 5

RAINY DAYS

Mean number of days with over .04 inch of precipitation.

Station \ Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Years Record
SUMATRA														
Bengkalis	11	8	12	14	11	9	8	11	13	16	17	16	146	50
Benkoelen	17	14	16	15	12	10	10	11	12	16	18	19	169	50
Djambi	18	14	18	17	13	10	9	11	12	16	18	19	175	50
Fort de Kock	18	14	18	18	15	11	11	15	16	19	19	20	194	50
Lahat	22	18	19	17	13	9	8	9	10	14	16	19	173	50
Medan	11	7	8	10	12	9	9	13	14	17	17	15	142	50
Muntok	18	13	16	15	11	9	8	7	7	12	17	21	151	50
Padang	16	13	15	17	14	12	12	14	16	20	21	20	190	50
Pakanbaroe	13	10	13	13	10	7	7	8	11	15	14	14	135	22
Palembang	19	16	18	16	12	9	7	8	8	12	16	20	162	50
Sabang	16	10	9	9	12	10	10	10	12	14	16	18	145	35
Seriboedolok	16	11	16	15	12	7	8	10	13	18	16	17	159	19
Sibolga	18	15	19	19	16	12	14	16	17	21	21	20	208	49
Sinabang	17	13	17	19	16	14	15	16	18	21	21	19	206	17
Tg. Pandan	17	11	14	18	17	14	12	10	11	17	21	22	184	50
Teloekbetoeng	18	17	16	13	11	10	9	9	9	10	12	16	149	50
JAVA														
Bandoeng	17	15	17	16	10	8	5	5	7	12	17	17	145	50
Batavia	19	19	17	12	9	8	5	4	6	9	13	16	137	57
Buitenzorg	24	22	23	20	17	13	12	12	14	19	21	22	217	50
Cheribon	21	18	17	12	9	8	5	3	3	5	10	18	127	39
Denpasar	15	13	10	6	6	4	4	4	3	6	8	14	91	22
Jogjakarta	18	18	17	12	8	6	4	3	3	7	13	19	128	50
Madioen	17	16	16	12	8	5	3	2	2	5	12	16	112	50
Malang	20	18	17	11	8	6	4	3	3	7	15	18	129	50
Mataram	13	12	11	8	5	4	2	2	3	8	11	14	94	25
Pangerango	29	26	28	27	23	21	15	17	19	25	27	28	284	17
Pasoeroean	17	17	15	9	6	5	2	1	1	1	5	13	91	50
Semarang	20	18	16	13	10	7	5	5	6	10	14	18	142	50
Soerabaja	19	18	17	13	9	7	4	2	1	3	9	17	117	50
Soerakarta	18	18	18	12	8	6	3	3	4	8	13	16	128	50
BORNEO														
Balikpapan	14	12	15	13	12	12	11	10	9	10	11	15	142	30
Bandjermasin	22	19	19	15	13	12	9	9	8	12	16	21	176	50
Discovery Oostbank	13	7	8	9	10	7	6	4	4	8	12	16	104	24
Jesselton	12	7	9	11	14	15	13	13	17	19	17	16	163	20
Ketapang	16	13	13	15	13	10	8	7	9	16	20	21	160	25
Kuching	26	20	19	16	16	13	12	15	14	18	22	22	213	9
Kudat	18	11	11	8	8	11	10	10	12	17	18	21	155	20
Labuan	12	9	10	14	16	15	13	14	17	20	17	17	174	21
Lg. Nawan	21	18	23	22	23	18	17	17	22	22	24	21	248	11
Ma. Tewe	17	16	17	17	15	13	10	10	11	14	18	19	177	46
Pontianak	16	13	14	16	16	13	10	12	13	19	20	19	182	50
Sandakan	19	13	13	10	11	14	14	14	14	16	19	20	177	43
Sintang	19	16	19	18	16	14	12	13	14	19	21	22	203	48
Tarakan	18	16	19	18	17	18	15	16	16	18	19	19	209	18
CELEBES														
Amboina	13	12	15	18	22	24	23	20	15	13	11	13	200	50
Baoebaoe	18	17	16	13	14	11	7	3	2	4	10	17	133	21
Boela	14	13	14	16	11	11	8	5	6	7	8	12	123	16
Donggala	11	10	9	7	8	9	8	7	6	6	8	10	99	35
Gorontalo	10	9	9	11	11	10	8	7	5	6	9	12	107	47
Kampoengbaroe	14	12	9	10	12	15	12	12	11	12	10	12	141	48
Kendari	16	13	14	13	14	13	8	5	3	2	7	13	121	20
Laboeha	12	11	11	12	12	12	11	11	8	8	9	12	129	42
Makassar	25	20	18	10	8	6	4	2	2	5	11	22	134	50
Manado	21	18	16	13	13	13	9	9	8	10	14	19	163	50
Namlea	10	10	9	6	7	5	6	3	3	3	4	9	75	14
Paloe	7	7	7	6	8	8	8	7	8	5	6	6	82	20
Poso	13	12	13	14	15	15	13	10	9	9	10	11	144	32
Sanana	10	11	13	14	15	13	10	7	8	6	6	11	124	11
Tahoena	22	20	19	18	17	17	15	10	11	14	19	21	203	33
Ternate	14	12	13	15	15	14	10	9	9	10	14	15	150	50
Tobelo	12	13	12	13	15	15	12	10	10	11	12	12	148	21
Tomohon	21	18	18	18	18	15	12	9	10	14	18	19	190	30
TIMOR														
Atamboea	16	13	13	6	3	1	1	1	1	3	8	13	79	9
Bandanaira	17	15	17	18	21	19	16	11	9	9	11	17	179	50
Bima	15	15	13	8	5	3	1	1	2	5	10	15	92	48
Ende	13	12	12	6	6	5	5	3	3	6	7	13	90	18
Koepang	18	16	12	5	3	1	1	#	#	1	7	15	80	50
Saumlakki	16	15	14	12	12	10	6	2	1	2	4	12	107	17
Waingapoe	13	11	10	5	3	1	1	1	#	1	3	10	56	22
Wonreli	9	9	13	8	10	7	6	2	1	2	5	8	78	10

- less than ½ day.

Table 6

AVERAGE DAILY TEMPERATURE RANGE

Mean daily maximum and minimum temperature, °F.

Station \ Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Years Record
SUMATRA														
Fort de Kock														
Maximum	76	78	79	79	80	79	78	78	78	78	77	77	78	6
Minimum	64	63	64	65	65	63	63	63	64	64	65	64	64	
Medan														
Maximum	85	87	88	89	89	89	89	89	88	86	86	85	87	17
Minimum	71	71	72	73	73	72	72	72	72	72	72	72	72	
Padang														
Maximum	87	87	88	87	88	88	87	87	86	86	86	86	87	10
Minimum	74	74	74	75	75	74	74	73	74	74	74	74	74	
Seriboedolok														
Maximum	67	71	72	71	73	71	73	72	72	71	70	70	71	2
Minimum	57	57	58	58	59	58	58	59	59	58	59	58	58	
Singgalang														
Maximum	55	55	57	56	57	54	55	57	55	57	56	55	56	2
Minimum	41	42	46	45	46	45	45	46	46	46	45	46	45	
Tg. Pandan														
Maximum	83	83	84	86	86	86	87	87	88	87	84	83	85	7
Minimum	75	75	74	73	74	73	73	72	72	73	73	74	73	
JAVA														
Bandoeng														
Maximum	79	80	81	82	82	82	82	83	84	84	82	81	82	7
Minimum	67	66	66	66	66	64	62	62	63	64	66	66	65	
Batavia														
Maximum	84	84	85	86	87	86	86	87	88	88	87	85	86	70
Minimum	74	74	74	75	75	74	73	73	73	74	74	74	74	
Buitenzorg														
Maximum	81	83	84	86	87	86	87	87	88	88	86	85	86	9
Minimum	71	71	71	72	72	71	70	70	71	71	71	71	71	
Pangerango														
Maximum	52	54	54	54	56	57	57	57	57	56	55	53	55	7
Minimum	44	45	44	46	45	44	43	43	42	43	43	43	44	
Pasoeroean														
Maximum	88	88	88	88	88	87	87	87	89	90	90	88	88	17
Minimum	74	74	71	74	73	71	70	70	71	73	75	74	73	
BORNEO														
Balikpapan														
Maximum	85	85	85	85	85	83	83	83	84	85	85	85	84	6
Minimum	73	73	73	73	74	73	73	74	74	74	73	73	73	
Jesselton														
Maximum	86	86	87	88	89	88	88	89	88	87	87	86	87	20
Minimum	71	71	71	72	72	72	71	71	71	71	71	71	71	
Kudat														
Maximum	84	85	86	90	91	90	91	91	90	89	86	85	88	8
Minimum	73	73	74	75	74	74	74	75	76	76	75	74	74	
Labuan														
Maximum	86	86	87	89	89	88	88	88	87	87	86	86	87	21
Minimum	76	76	76	76	76	76	77	76	76	76	76	76	76	
Pontianak														
Maximum	86	87	87	88	88	88	88	88	88	88	88	87	85	877
Minimum	74	74	73	74	75	74	74	73	74	74	74	74	74	
Sandakan														
Maximum	85	86	87	89	89	89	89	89	89	88	87	86	88	45
Minimum	74	74	75	76	76	75	75	75	75	75	75	74	75	
Tarakan														
Maximum	85	86	86	86	87	87	87	87	87	87	86	86	86	7
Minimum	73	73	73	73	74	73	73	73	73	73	73	73	73	
CELEBES														
Amboina														
Maximum	88	88	88	86	84	82	81	81	83	85	87	88	85	21
Minimum	76	76	76	75	75	74	73	73	74	74	75	76	75	
Makassar														
Maximum	84	84	85	86	87	86	86	87	87	87	86	84	86	11
Minimum	75	75	74	74	74	72	70	69	70	72	74	74	73	
Manado														
Maximum	84	84	85	86	86	86	87	88	88	88	86	85	86	18
Minimum	73	73	72	73	73	73	73	72	72	71	72	73	72	
Tomonon														
Maximum	76	76	78	79	80	79	79	80	80	80	80	77	78	13
Minimum	65	65	65	64	65	65	65	64	63	64	64	65	65	
TIMOR														
Koepang														
Maximum	85	85	87	89	88	87	87	89	90	91	91	88	88	7
Minimum	75	74	74	72	72	70	69	69	70	72	74	75	72	

Table 7
EXTREME TEMPERATURE RANGE
Extreme maximum and minimum temperature, °F.

Station \ Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Years Record
SUMATRA														
Fort de Kock														
Maximum	85	84	85	85	85	84	85	84	85	84	82	83	85	6
Minimum	55	55	55	58	58	50	53	55	57	54	57	56	50	
Medan														
Maximum	93	94	95	95	96	95	96	95	96	93	93	94	96	16
Minimum	65	65	65	67	65	63	64	65	66	64	60	65	60	
Padang														
Maximum	93	94	93	91	93	91	92	92	91	91	90	91	94	10
Minimum	70	69	70	71	72	68	70	69	70	70	70	70	68	
Seriboedolok														
Maximum	71	73	74	74	76	77	77	78	78	75	75	75	78	2
Minimum	52	54	54	54	57	55	54	56	55	54	55	56	52	
Singgalang														
Maximum	60	62	61	61	62	58	60	61	61	62	63	62	63	2
Minimum	39	37	42	43	42	43	42	44	42	40	37	41	37	
Tg. Pandan														
Maximum	89	87	88	91	91	91	92	92	94	93	91	88	94	7
Minimum	72	71	71	71	71	69	67	66	65	66	68	69	65	
JAVA														
Bandoeng														
Maximum	83	87	87	86	86	86	86	88	90	94	91	87	94	7
Minimum	61	60	59	57	57	53	52	53	56	59	57	60	52	
Batavia														
Maximum	92	91	92	92	92	92	92	94	96	96	96	93	96	70
Minimum	69	69	69	69	70	67	67	67	66	69	68	67	66	
Buitenzorg														
Maximum	90	91	90	90	91	90	92	92	93	94	92	90	94	7
Minimum	67	66	66	68	66	65	65	64	66	68	65	66	64	
Pangerango														
Maximum	62	63	62	64	66	65	67	69	68	66	63	62	69	7
Minimum	37	37	36	38	39	38	38	34	33	35	35	34	33	
Pasoeroean														
Maximum	92	94	93	92	93	93	93	94	93	95	96	95	96	17
Minimum	70	70	69	65	62	60	58	61	62	64	67	68	58	
BORNEO														
Balikpapan														
Maximum	91	91	91	90	91	90	85	85	88	91	91	91	91	6
Minimum	70	70	70	70	71	71	68	69	67	69	70	70	67	
Jesselton														
Maximum	92	93	93	93	97	94	98	94	92	92	94	92	98	20
Minimum	64	62	64	64	65	65	63	61	62	67	65	64	61	
Kudat														
Maximum	90	90	93	96	96	95	96	95	96	94	92	94	96	5
Minimum	69	70	70	70	71	71	71	70	70	70	70	70	69	
Labuan														
Maximum	92	92	93	95	96	94	93	94	92	94	93	93	96	20
Minimum	68	68	63	60	59	60	68	68	64	63	69	69	59	
Pontianak														
Maximum	91	93	93	92	93	93	94	92	94	93	93	92	94	7
Minimum	69	69	68	71	71	70	68	69	69	71	70	70	68	
Sandakan														
Maximum	91	91	94	95	95	99	96	95	97	94	93	92	99	32
Minimum	70	70	71	70	72	71	70	71	70	70	71	71	70	
Tarakan														
Maximum	91	91	91	91	92	91	91	92	91	92	91	90	92	7
Minimum	68	67	68	69	71	67	69	68	69	69	70	67	67	
CELEBES														
Amboina														
Maximum	96	96	95	92	91	87	86	89	89	91	94	94	96	21
Minimum	71	71	70	71	70	67	67	67	66	66	68	68	66	
Makassar														
Maximum	88	89	89	91	92	91	92	94	95	92	91	89	95	11
Minimum	70	70	70	69	63	63	63	62	58	65	66	69	58	
Manado														
Maximum	91	92	92	92	92	93	93	95	96	97	94	92	97	21
Minimum	67	67	67	65	59	68	65	63	66	65	66	68	59	
Tomohon														
Maximum	82	85	87	86	88	85	87	85	88	86	86	87	88	13
Minimum	55	57	58	58	60	58	59	56	54	56	58	59	54	
TIMOR														
Koepang														
Maximum	89	91	92	95	94	93	91	94	96	96	96	96	96	7
Minimum	71	69	69	63	64	60	59	62	62	65	67	70	59	

Table 8

AVERAGE DAILY HUMIDITY RANGE

Mean daily maximum and minimum relative humidity, in percent.

Stations / Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Years Record
SUMATRA														
Fort de Kock														6
Maximum	98	99	99	98	99	99	99	99	98	98	98	98	99	
Minimum	66	63	63	65	62	60	62	61	63	63	65	65	63	
Medan														6
Maximum	98	98	97	96	97	97	97	97	97	97	97	97	97	
Minimum	69	60	59	62	62	60	61	61	62	66	69	69	63	
Padang														6
Maximum	94	94	94	94	93	93	92	92	94	94	95	94	93	
Minimum	61	60	62	64	62	61	60	60	62	63	64	62	62	
Seriboedolok														2
Maximum	99	98	98	97	99	98	98	97	97	98	98	96	98	
Minimum	73	67	67	69	66	64	59	65	66	67	72	71	68	
Singgalang														2
Maximum	100	99	100	100	99	100	100	98	100	99	100	99	99	
Minimum	78	70	73	78	68	82	74	72	84	82	80	87	80	
Tg. Pandan														6
Maximum	95	96	98	99	99	99	98	97	97	97	97	98	98	
Minimum	76	75	73	70	69	67	63	58	59	63	74	77	69	
JAVA														
Bandoeng														7
Maximum	96	96	96	96	96	96	96	95	95	96	96	96	96	
Minimum	66	67	63	59	58	56	51	48	48	51	57	62	57	
Batavia														53
Maximum	97	97	97	97	96	97	95	94	94	94	95	96	96	
Minimum	72	72	69	66	64	62	59	56	56	58	62	68	64	
Buitenzorg														6
Maximum	95	96	96	94	95	94	93	93	92	91	92	92	93	
Minimum	71	71	67	64	61	60	55	52	51	54	61	65	61	
Pangerango														7
Maximum	98	99	99	99	97	97	93	95	98	97	98	99	98	
Minimum	80	77	77	67	59	53	44	45	48	60	72	75	63	
BORNEO														
Balikpapan														6
Maximum	99	98	98	98	98	97	98	97	95	94	97	97	97	
Minimum	67	66	67	71	72	74	75	72	69	70	68	66	71	
Pontianak														7
Maximum	95	97	97	97	98	97	98	97	97	97	97	98	97	
Minimum	62	59	61	61	61	60	60	57	58	61	63	66	61	
Tarakan														6
Maximum	98	98	99	97	97	97	97	98	97	97	97	98	97	
Minimum	69	67	69	69	69	68	69	64	64	65	68	69	68	
CELEBES														
Amboina														7
Maximum	96	95	96	96	96	97	96	96	96	96	96	95	96	
Minimum	63	61	60	67	71	74	74	72	69	66	63	62	67	
Makassar														5
Maximum	94	93	94	93	93	93	91	91	88	91	92	93	92	
Minimum	77	76	76	69	69	65	61	56	57	60	67	74	67	
Manado														7
Maximum	98	97	97	97	97	96	91	91	91	94	97	98	95	
Minimum	75	72	71	72	71	68	62	58	59	62	69	74	68	
TIMOR														
Koepang														6
Maximum	97	97	97	96	94	93	93	91	89	92	94	95	91	
Minimum	72	72	67	53	53	50	48	44	42	50	54	65	56	

Table 9
EXTREME HUMIDITY RANGE

Extreme minimum relative humidity, in percent. (Extreme maximum relative 100 percent at all stations in all months.)

Station \ Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Years Record
SUMATRA														
Fort de Kock	39	38	40	52	41	38	43	42	41	32	42	42	32	6
Medan	51	46	41	39	42	39	34	42	44	48	53	50	34	6
Padang	35	37	39	47	42	42	46	42	48	46	48	42	35	6
Seriboedolok	58	46	56	59	38	46	38	37	36	37	35	46	35	2
Singgalang	48	26	55	62	44	63	50	49	72	55	58	60	26	2
Tg. Pandan	43	62	56	52	47	50	46	35	29	29	46	59	29	6
JAVA														
Bandoeng	41	45	37	36	33	39	27	24	23	24	33	34	23	7
Batavia	44	44	49	45	42	39	34	28	22	24	32	41	22	53
Buitenzorg	50	54	45	47	40	40	30	33	28	33	44	47	28	6
Pangerango	15	30	15	12	14	9	6	6	8	12	11	28	6	7
BORNEO														
Balikpapan	44	38	49	52	52	57	62	57	50	48	51	37	37	6
Pontianak	35	31	43	44	43	44	37	28	30	46	49	47	28	7
Tarakan	47	42	51	52	45	47	50	47	38	44	44	45	38	6
CELEBES														
Amboina	43	40	38	49	47	54	57	56	46	48	38	38	38	7
Makassar	59	61	56	55	43	41	46	41	32	23	43	55	23	5
Manado	54	43	51	46	47	45	43	37	33	34	48	48	33	7
TIMOR														
Koepang	54	38	35	28	30	32	24	14	20	25	28	38	14	6

Table 10
DAYS WITH THUNDER

Mean number of days with thunder heard. (Values based on observations between 0600 and 2100 L.C.T. only.)

Station \ Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Years Record
SUMATRA														
Fort de Kock	11	11	14	19	14	9	11	11	13	10	9	7	138	4
Medan	9	8	16	21	21	15	17	19	15	18	16	13	187	4
Padang	3	3	3	5	4	5	4	3	4	2	2	2	39	4
Palembang †	5	7	13	14	10	8	9	7	6	12	14	9	115	8
Seriboedolok	8	8	23	28	17	11	16	13	18	13	13	12	177	4
JAVA														
Bandoeng	24	24	23	22	20	10	5	12	11	21	22	24	218	4
Batavia	11	12	14	15	12	7	4	9	10	13	18	11	136	4
Buitenzorg	28	26	26	28	27	25	24	24	28	30	26	30	322	4
Soerabaja	13	5	9	6	4	4	#	#	1	12	8	12	73	3
BORNEO														
Bandjermasin †	5	4	4	4	6	3	2	2	3	5	7	7	54	9
Labuan †	4	3	3	5	4	4	5	8	8	5	5	4	58	7
Pontianak	5	5	9	9	7	6	4	5	7	8	6	2	73	4
Sandakan †	1	1	1	1	2	3	3	3	6	5	4	2	31	5
CELEBES														
Amboina	7	6	7	6	2	3	2	2	3	4	9	7	57	4
Manado	3	5	1	4	5	2	#	3	2	4	4	2	35	4
TIMOR														
Koepang	10	8	6	2	1	#	#	1	#	5	11	23	67	4

† Hours of observation not known
# Less than ½ day

Table 11

LOCAL NUMES OF WEATHER ELEMENTS

Name	Region	Meaning
Aloegoe Bolon	Seriboedolok (Sumatra)	Strong W wind, S monsoon season.
Aloegoe Dahatoe	Seriboedolok (Sumatra)	Weak N wind, N monsoon season.
Aloegoe Laoet	Seriboedolok (Sumatra)	Fairly strong E wind, N monsoon season.
Aloegoe Loebis	Seriboedolok (Sumatra)	Strong W wind, S monsoon season.
Aloegoe Si Giring	Seriboedolok (Sumatra)	Weak NW wind, April.
Aloegoe Siroeng	Seriboedolok (Sumatra)	Strong SW wind, S monsoon season.
Aloegoe Tamboen	Seriboedolok (Sumatra)	Weak SE wind, S monsoon season.
Barat	Manado (Celebes)	Strong W wind, N monsoon season.
Bohorok	Medan (Sumatra)	Dry SW wind, S monsoon season.
Broebroe	Makassar (Celebes)	Strong dry E wind, S monsoon season.
Dongi	Poso (Celebes)	N wind, N monsoon season.
Gending	Pasoeroean (Java)	Dry SE wind, S monsoon season.
Koema Koema	Saumlakki (Timor)	"Dry fog," S monsoon season.
Koembang	Cheribon (Java)	Dry SE wind, S monsoon season.
Langkisau	Fort de Kock (Sumatra)	Strong W wind, S monsoon season.
Slatan	Manado (Celebes)	Strong S wind, S monsoon season.
Sumatra	Medan (Sumatra)	Severe nocturnal SW squall, S monsoon season.
Tandongkasa	Poso (Celebes)	S wind, S monsoon season.
Timoer	Makassar (Celebes)	SE wind, S monsoon season.
Tongara	Makassar (Celebes)	Dry hazy SE wind, S monsoon season.