BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD

RECORD 1987/1

FIRST ORDER REGIONAL MAGNETIC SURVEY

OF PAPUA NEW GUINEA

March/April 1985

by

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Port Moresby Geophysical Observatory, Papua New Guinea Geological Survey

SUMMARY

A first-order magnetic survey was made by BMR and the Port Moresby Geophysical Observatory of the PNG Geological Survey throughout PNG in March and April 1985. Results suitable for the reliable definition of the Earth's vector field and its secular variation were obtained at 6 stations, and used for the production of regional charts at epoch 1985.0.

Travel was by commercial airline and at the stations hire cars were used.

At each station a three-component fluxgate variograph and a base station total-intensity magnetometer were operated for about three days; magnetograms were calibrated by frequent absolute observations; and sun observations were made to determine the true azimuth of reference marks used in determining declination. Earlier stations were connected to present stations to extend the time-series where possible.

The value of magnetic elements observed, preliminary mean hourly values for declination, horizontal intensity, total intensity and vertical intensity, and adopted station values at the epoch of occupation are given.

CONTENTS

1. INTRODUCTION

The BMR publishes geomagnetic epoch charts of the seven vector components of the magnetic field in the Australian region. These are updated approximately five yearly. The reoccupation of six first order stations in Papua New Guinea between March 12 and April 7 1985 collected data for the current update. The values of the Earths main field are needed to an accuracy of better than 5nT (0.5') overall, to provide reliable estimates of the secular variation.

The stations visited were (Fig 1) Wewak, Momote, Kavieng, Aropa, Daru and Gurney, all of which were last occupied in 1981.

At each station a three component EDA fluxgate variometer, proton precession magnetometer, and ancilliary equipment were set up and a minimum of two nights magnetically quiet magnetograms obtained.

Absolute observations to calibrate the magnetograms were made throughout the occupation, together with sunshots at all stations.

Travel between stations was by commerical airlines, and hire cars were used for local transport. The itinerary for the survey is in Appendix 1.

The survey was organized in cooperation with the Port Moresby Geophysical Observatory and the two-man field party consisted of Luke Bibot, a geophysicist from the Observatory and the author, from the Geomagnetism Section, Division of Geophysics, BMR.

2. PREPARATIONS

The survey was planned for April/June which is the best time weather-wise. In PNG the wet season is between January and March/April, with NW monsoonals blowing, May is less windy, and in June the SE Trade winds begin.

Ian Ripper, OIC PMGO, arranged the local logistics, starting six months in advance.
These included

* customs clearance - a letter to the Controller of Customs in Port Moresby informing him of our arrival and a list of equipment and it's value itemized by box.

* accommodation - booked in advance at all stations. This may be inconvenient if there are any delays during the survey, but is necessary since few hotels/motels service most of the stations and last minute accommodation is sometimes not available.

* hire cars - booked in advance at all stations. These are most often obtained from the major companies, but also from local business people at some smaller stations. Advance booking is necessary since cars are at a premium.

* Provincial Government contacts - courtesy is the main reason for informing the provincial governments of our activities, though it is useful to have a contact if any problems arise.

* Permission to access stations - permission was received from the Civil Aviation Authority HQ to work at each airport.

* flights - it was necessary to inform Air Nuigini of movements and

baggage excess so the 200 kg of equipment could be accommodated on flights.

Preparations in Canberra through the BMR travel clerk involved

* organizing travel to and within PNG.

* obtaining an official passport and entry visa (takes about 3 weeks).

* arranging miscellaneous charges orders to cover freight/excess baggage costs (AUD6000). The 1985 costs are set out in Appendix 2.

Other preparations included

* approval from the Secretary of PNG Department of Minerals and Energy for direct cooperation of PMGO personnel on the survey.

* obtaining approval for the survey from the Secretary, Department of Resources and Energy. The forms 'Request for Approval of short-term Duty Overseas' are available from the BMR OIC General Services.

* obtaining a course of anti-malarials, and typhoid shots (from the Commonweath Medical Officer).

* preparing the equipment for the survey. Appendix 3 has a list of the equipment needed.

* arranging petty cash ($2000) for hire cars and incidental items.

3. EQUIPMENT

RECORDING EQUIPMENT

The variometers used on the survey were a portable three component (X,Y,Z) EDA FM-100B fluxgate magnetometer, and an Elsec proton precession magnetometer Model 595 with a toroidal head. The EDA recorded the field continuously and the PPM recorded once every minute on a Tigraph 100 chart recorder (6 channels). A Doric Trendicator monitored the temperature of the EDA sensors using a Thermilinear YSI series 700 thermistor mounted in the head. A BMR-built Dick Smith clock provided hourly timemarks on the chart. Figure 2 is a diagram of the equipment.

Details of the magnetograph recording at each station are in Table 1.

The variographs were housed in convenient buildings with access to 240 V AC power, with the sensors as far from sources of artificial disturbance as possible. These buildings were usually on airports and included, at different stations, hangars, workshops and Bureau of Meteorology facilities.

ABSOLUTE INSTRUMENTS

Absolute calibration of the magnetograms was by an Askania declinometer, La Cour quartz horizontal magnetometer (QHM), and Geometrics and Austral proton precession magnetometers. These instruments were compared before and after use in the field at Canberra Magnetic Observatory. A secondary QHM was taken and used once at each station to keep a check on instrument differences (Table 2).

The instruments used to calibrate the recording equipment were

H QHM 305, 173

D Dec 640506/Circle 508810
F PPM Geometrics 816 1025, Austral 528

Preliminary instrument corrections are in Table 2.

For sunshots and rounds of angles the Hilge & Watts theodolite No. 66006 was used.

4. STATION OCCUPATIONS

Appendix 4 contains descriptions of all stations visited. Latitude, longitude and local meridian times are in Table 3. The reference marks and their azimuths, which were used in declination observations, are collated in Table 4, and in Table 5 the value of magnetic elements obtained from absolute observations made at each station are tabulated (preliminary instrument corrections applied).

Wewak D (12-17/3/85)

The recording equipment was set up in the unused meteorological balloon-filling hut to the west(W) of the terminal. The key is available from the Met OIC. The hut is not secure and is close to a residential area and an infrequently used road. The EDA head was placed to the W of the shed. The Elsec base station could not be tuned. Replacing the oscillator improved the performance but did not solve the problem. No F recording was obtained for the station. The 1/100ths digit on the Doric was losing segments, making it occasionally difficult to read the temperature.

Station D has a brass marker and separate footpads. They are about 3 cm below ground level, covered with soil and grass, but easily located using the station discription. Permission to access it was given by the OIC General Services whose office is in the terminal building at the airport.

The mark used for declination observations was the RHS of an antenna to the NE. There are also two windsocks which could be used. In all cases the bases of the reference marks are obscured by scrub.

Absolutes (H,D,F), sunshots (AM,PM) and a round of angles were completed.

The Provincial Government contact was Phillip Kanora (Ph 862200 x 236). We paid him a courtesy call only.

The Sepik Motel (862422) cost K55 per night including breakfast. It is about 10km from the airport and probably the best motel available (others are the Wewak Hotel and the Windjammer).
The motel was also the Avis agent and provided a hire car which cost about K60 per day. A car is essential.

Momote D,E (17-21/3/85)

The recording equipment was set up in the office of the fuel depot. The depot is to the W of the terminal, next to a WWII shed. The office is secure with padlocked outside fence and locked door, and has plenty of room inside. During the occupation there were no commercial flights to or from the airport, so activity round the fuel depot was minimal. The keys were obtained from the depot supervisor through the Airport OIC. The sensors for the EDA and Elsec were set up to the W and SW of the office respectively. The Elsec was very noisy (unserviceable).

Station D was located. Measurements were made from the ARP which is an inconspicuous concrete block in the ground (brass plaque probably removed by

a slasher or grader). The Airport OIC knew exactly where it was. The station is above ground level inside the cone markers, tilted over, and has no footpads. A new station (E) was put in outside the cone line. It has separate marker and footpads, about 3 cm below ground level. Station E was used as the main station. The station differences measured were

	Stn D-E
D	6.0'
H	63 nT
Z	43 nT

Permission to work in the airport grounds was obtained from the Airport OIC.

The reference mark used was a windsock to the north. Two other windsocks to the W and SE are also suitable as marks.

Absolutes, AM sunshots and a round of angles were completed.

The Provincial Government was in turmoil at the time of the occupation, and no contact was made.

Accommodation was arranged at the Lorengau Hotel (409093). Lorengau is about 40 km from Momote airport, and the road is rough. It takes 35 minutes to travel from the airport to town. The hotel charged K33 per night (bed only), and the rooms were small and dark but tidy. There is another hotel in Lorengau that is apparently better but more expensive.

The hotel was the Avis agent and provided a car at about K60 per day. A car is essential.

There is a tavern (Momote Tavern) very close to the airport that sells cold drinks and snacks.

Kavieng C (21-25/3/85)

The Meteorological balloon-filling shed used to house the recording gear in 1981 was unsuitable because of visitors cars at the Met observers home and office nearby. A better site for the equipment was found in one of two huts at the unused Department of Civil Aviation transmitter at the southern end of the runway. The hut on the left (as seen from the road) was used for the equipment. It is the same hut that the PMGO seismograph is in, though this was not operational during the occupation. There was little interference from cars on the seldom used road nearby. This location proved to be quite good. The key to the hut is available from the Met observer.

The sensors for the EDA and Elsec were placed to the SE and NE of the hut. All of the equipment operated satisfactorily except that the F trace on the Tigraph ceased recording one night though the Elsec continued to give sensible numbers. After ventilating the PPM by removing the case and swapping the Tigraph lead to it, the original configuration worked again.

Permission to look for and work at the station was given by the supervisor of a Department of Works and Supply gang. Station C was located from the measurements. It has separate marker and footpads, at ground level.

The reference mark used was the base of a windsock to the SE. A windsock to the NE is also suitable as a mark.

Absolute observations, PM sunshots and a round of angles were completed on C.

The Provincial Government contact was Martin Benoa (942111 x 250). A courtesy contact only.

The Kavieng Hotel (942199) charged K47 per night for a spacious, air-conditioned, clean, well-lit room in the new wing. Rooms in the old section cost about K35. All meals are extra. The hotel was about 3 km from the airport.

The hire car was provided by Budget, the hotel is the agent. It cost about K40 per day. A car is essential.

Aropa C (25-29/3/85)

The Bougainville Copper Ltd (BCL) hangar at the Aropa airport was used to house the recording equipment and proved to be a reasonable site. The equipment was placed in the NE corner of the hangar (front left as seen from apron). This is probably the best location in the hangar so sensors can be placed at relatively quiet sites, however there is little protection from wind and driving rain. Each evening and morning generators supplying power to the hangar are switched over. This did not affect the equipment badly (ie clock, baselines) but caused the Tigraph to initiate its systems check (causing untidy records). The sensor location (Elsec and EDA heads placed to NE and E of hangar respectively) was quiet though the records were affected if the hangar doors were opened wide and by the fuel tractor driving past each time a flight came in (once or twice a day). The hangar is probably the best site at the airport for housing the recording gear. Permission to use it was obtained from Jack Dalby the hangar manager (BCL in Loloho 972152) and the key is available from him or from the Bougair hanger (next to the BCL hangar).

Station C near the Met enclosure was located. During the occupation footpads were added. The station is now a triangle of concrete incorporating the marker above ground level and footpads at ground level. Station B on the beach side of the runway has been washed away so was not occupied.

The mark used for declination was the centre base of a windsock to the N.

Absolutes and AM sunshots were completed on the station.

The contact at the Provincial Government (in Arawa) was Phil Lodge (971109). He was helpful and interested.

Accommodation was at the Davara Hotel (956175) at Toniva Beach about 15 km from the Aropa airport. The rooms were spacious and clean though poorly lit and cost K58 a night bed only. It is a very good hotel.

The Davara was also the agent for Avis and provided a car for K50 per day. A car is essential.

Daru C,D (30/3 - 2/4/85)

The Met observers office was used to house the recording equipment, with the sensors placed in his backyard. This location proved satisfactory though the observers transmitter caused full scale deflection of all traces for a minute or so each hour. An alternative (better) site is the Met balloon-filling hut (used in '81). If this is to be used it will be necessary to carry about 60 m of extension lead to get power from the Met office. It is also likely that the only site for the sensors will be very overgrown (thorny bushes about 1m high), though it should be possible to borrow some bush knives to clear space. One good night of recording was obtained (F was occasionally noisy) due to the Met dog disturbing the EDA head on the first night and effects of heavy rain on the last night.

Both stations were located (C and D). D has separate concrete marker and footpads, and was used as the primary station. It was about 2 cm below

ground level and in an area of thick scrub. This area is only cleared once a year. Station C has only a brass marker in concrete. It is 2 cm below ground level and situated just inside the cone line. No observations were made on C due to the malfunctioning recording equipment.

The mark used was the windsock to the S.

Observations completed on D were absolutes and AM and PM sunshots.

There was no Provincial Government contact.

Accommodation was at the Wyben Hotel (659055) near the wharf at the northern end of the island. Rooms are plain, spacious and well lit. The cost was K45 per night for bed only. There is no other accommodation available except the Daru Guest House close to the airport but it is not recommended.

The hotel also agreed to provide a car, however on our arrival it had been lent to another party instead. Transport during the occupation was by the hotel bus, the Talair pilot and by walking (30 mins airport to hotel). This was inconvenient though not impossible. Apparently a local company 'Daru Trading' will hire out cars (expensively).

Gurney F (3-7/4/85)

There is no continuous power at the airport. The recording equipment was set up in Alotau in the Provincial Government Information Office which is detached from the main office complex. The EDA head was positioned E of the office. This proved to be a quiet site. The Elsec did not operate properly and no F recording was made. The occupation was during the Easter weekend so the nearby car park (about 30 m away) was unused. Mr Levi George the Provincial Planner (611112) arranged for us to use the site, and keys are available from the Liason Officer (the Information Office OIC).

Station F at the airport has plaque and footpads in concrete, covered by 3 cm of grass/dirt. It is (was) painted orange.

A windsock to the SW was used for a mark. There is also a distant windsock to the W which is often obscured by the heat haze.

Absolutes and sunshots (AM and PM) were completed.

The provincial Government contact was Levi George, the Provincial Planner (611112).

Accommodation was at the Masurina Lodge in Alotau. The cost was K58 per night for an unselfcontained, fan cooled room and K72 for a s/c airconditioned room. Cost includes all meals. K58 rooms are reasonably lit and compact.

The hired car was obtained through a local company 'Bay Cabs' at reasonable rates. Apparently it is also possible to arrange a car through Avis in Port Moresby.

5. RECOMMENDATIONS

Since meteorological facilities are used at a number of stations preparation for future surveys should include a letter to Met HQ (in Port Moresby) to

i) inform HQ of our needs and make sure facilities are still available.

ii) ask permission to use them.

iii) ask HQ to inform outstations of our arrival.

Ideally contact should also be made with the observers at the outstations to ensure this information is passed to them. The following Met facilities are used to house the recording instruments

* Wewak - balloon filling hut.

* Kavieng - DCA transmitter hut, key from Met OIC.

* Daru - balloon filling hut, power from Met office.

At Momote housing for the equipment can best be arranged through the Department of Works and Supply Airport OIC. For this reason he should be forewarned of the survey.

The Bougainville Copper Ltd (BCL) people should also be given some prior warning about the survey since their hangar is the most suitable site at the Aropa Airport to set up the gear. This initial contact could also inquire about the possibility of running the BCL generator to supply power to the shed continuously during the occupation.

The Milne Bay Provincial Government in Alotau provided an office in which the recording equipment was set up since at Gurney airport there is no continuous power. They should also be contacted prior to arrival at Gurney.

It is necessary to book flights, hotels and cars in advance. Flights are infrequent to most stations (once or twice a week) and are often full, though this depends a lot on the time of year (school holidays, beginning/end of financial quarter). It is also very important that the airline be informed in advance of the survey itinerary so that arrangements can be made to accommodate the survey gear on each flight. To ensure the equipment accompanies the same flight as the survey party it is necessary to send it as excess baggage. This is very expensive but essential.

All excess baggage and freight costs were paid by Miscellaneous Charges Orders issued by QANTAS. A total of $4920 was needed to cover these costs. The MCOs were issued in Australian dollars (AUD). This was not a problem, however it was often inconvenient especially if exchange rates were not immediately available. It would be preferable for the MCOs to be issued in New Guinea Kina (NGK). Payment in AUD is necessary for costs from Canberra to Port Moresby ($1300 excess baggage in '85) but for the rest of the trip charges are in NGK (K2600 for excess baggage/freight in '85).

Hotels may be booked-out so it is preferable to book in advance as there is often only one or two suitable hotels/motels in each town.

If cars are hired pre-booking is necessary since they are in demand. Major companies (Avis/Budget) operate at Wewak, Lorengau (Momote), Kavieng and Kieta. A car at Alotau can be arranged through Avis in Port Moresby. No car rental companies operate at Daru though a car may be hired from the Wyben Hotel (only one is available) or from a local company, 'Daru Trading' (expensive). Payment was by cash, however if hire cars are used in future it may be possible to arrange payment to the major companies in some other form, perhaps using warrants.

The cars generally tended to be small and on one occasion there wasn't one available at all. This was an inconvenient though not impossible situation. It may be possible to use cars from the Government car pool at each station. It would be necessary to arrange this through the PMGO and it may be that only a PNG Government officer is allowed to drive them. This should not be a problem if someone from PMGO is on the survey. Payment, if not made by PMGO, would need to be worked out.

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6. DATA REDUCTION

Observations were vetted as they were made, to pick up obvious errors and inconsistencies. The observed data (absolute observations and azimuth determinations) were used with data scaled off the magnetograms to derive preliminary calculations of the baselines in three components (D,H,F) to assess the adequacy of the occupation before the station was closed.

On return to the BMR the magnetograms were digitized, all data recalculated and preliminary instrument corrections (Table 2) applied to the absolute observations. Data reduction then followed the same proceedure as was used to reduce data collected to produce the 1980.0 Epoch charts (McEwin 1984). Baselines and mean hourly values(MHV) tables (Tables 6,7,8,9) and plots were produced. The data reduction was checked by plotting the values of the magnetic elements(Table 5) derived from the absolute observations onto the MHV plots. If correct these values should exactly coincide with the MHV plot. Night time quiet station values were then derived:

> "The value of the geomagnetic field around local midnight most closely approximates the quiet level of the field, but to account for magnetic disturbance during station occupation the morphology of the of the mean hourly value plots were compared with plots of observatory data covering several months. The 'night time' quiet station value was adjusted to more accurately reflect the longer term quiet field level at the station, as indicated by the observatory data" (McEwin 1984).

Port Moresby Geomagnetic Observatory data was used for this comparison as the observatory is in similar magnetic latitudes.

7. REFERENCES

McEwin,A.J., 1984,First Order Magnetic Survey of Australia for Epoch 1980.0, March 1978 - July 1979 - Operations Reports. Bureau of Mineral Resources Australia Record, 1984/15.

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Appendix 1

Itinerary

Date	From	To	Dep	Arr	Flight
10/3/85	Canberra	Sydney	0700	0735	TN422
	Sydney	Port Moresby	0835	1350	QF95
12/3	Port Moresby	Wewak	1100	1305	Px126
17/3	Wewak	Manus Is	1700	1755	Px272
21/3	Manus Is	Kavieng	1820	1910	Px276
25/3	Kavieng	Rabaul	0730	0805	Px227
	Rabaul	Kieta	1430	1525	Px226
29/3	Kieta	Port Moresby	1550	1735	Px255
30/3	Port Moresby	Daru	1220	1345	Px185
2/4	Daru	Port Moresby	1740	1900	Px188
3/4	Port Moresby	Gurney	1445	1600	Px194
7/4	Gurney	Port Moresby	1625	1740	Px195
9/4	Port Moresby	Sydney	1530	2030	Px003
10/4	Sydney	Canberra	0835	0915	TN421

Airlines TN TAA
QF QANTAS
Px Air Nuigini

Appendix 2

Freight and Excess Baggage Costs

There was about 180 kg of equipment which was transported as excess baggage on each leg of the survey except the last (Port Moresby to Canberra) when it was freighted. Sending the equipment as excess baggage ensured that it always travelled on the same flight as the field party.

	NGK	AUD
Canberra - Port Moresby		1265
Port Moresby-Wewak	300	418
Wewak-Manus Is	219	310
Manus Is-Kavieng	208	300
Kavieng-Kieta	207	294
Kieta-Port Moresby	431	605
Port Moresby-Daru	209	293
Daru-Port Moresby	208	300
Port Moresby-Gurney	67	98
Gurney-Port Moresby	188	271
Port Moresby-Canberra (Freight)	526	765
		$4919

The round trip air ticket, from Canberra to Canberra, cost $2383.

At the time of the survey the exchange rate was about AUD 1.42 per Kina.

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Appendix 3

Survey Equipment

1. Recording Box 1

Tigraph chart recorder
EDA head
spikes short + long with banger
EDA/Doric cable
1 extension lead
tape measure

2. Recording Box 2

Elsec console
Doric
Elsec power supply and lead
Elsec head and cable
clock
distribution board
tool kit
EDA console and lead
Elsec head pole (3 pieces)
Fluke multimeter
jewellers screwdrivers

3. Esky

radio
calculator with handbook and cards
BMR manual
18 tent pegs
aluminium poles (8 pieces)
purple head fly
hammer
compass
stanley knife
spare Tigraph paper (1 roll)
hacksaw
soldering iron and flux
continuity tester
4 station markers
theodolite
5m nylon rope
masking tape
brass pipe (15 x 9 in)

4. Absolute Box

Askania circle 508810
QHMs 305,173
Dec 640506
Geometrics 816/1025 PPM
digital stopwatch
observing fly
absolute forms
pencilling boards (2)
brass screws (1 pair)
picker

5. Spares Box

circuit breaker
level
tissue paper
Rustrak recorder + lead
manual
adaptor lead
spare QHM thermometer
calculator paper (2 rolls)
Rustrak paper (2 rolls)
damping corks (2)
fly
brass screws (2 pairs)
Elsec cards + oscillator
extension lead
Tigraph paper (2 rolls)
masking tape (3 rolls)
D-cell batteries (24)
connectors
banana pin leads
brass rods (3)
Austral PPM 528
manual
analog stopwatch
envelope of copies
raincoat

6. Tripod Bag

theodolite tripod
Askania tripod
PPM head tripod
observing shelter poles

7. Stationery
lined A4 paper (2 pads)
graph paper (2 pads)
notebook
pencil sharpener
rubber bands
BMR ID card
envelopes (6)
manila folders (3)
station info folders (6)
survey admin folder
pencils (4)
biros (2)
marker pen
paper clips
erasers (2)
TA claim forms
petty cash forms
attendance records (4)
Nautical Almanac information

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Appendix 4

The following pages detail the location of each station and the reference marks used in making Declination observations.

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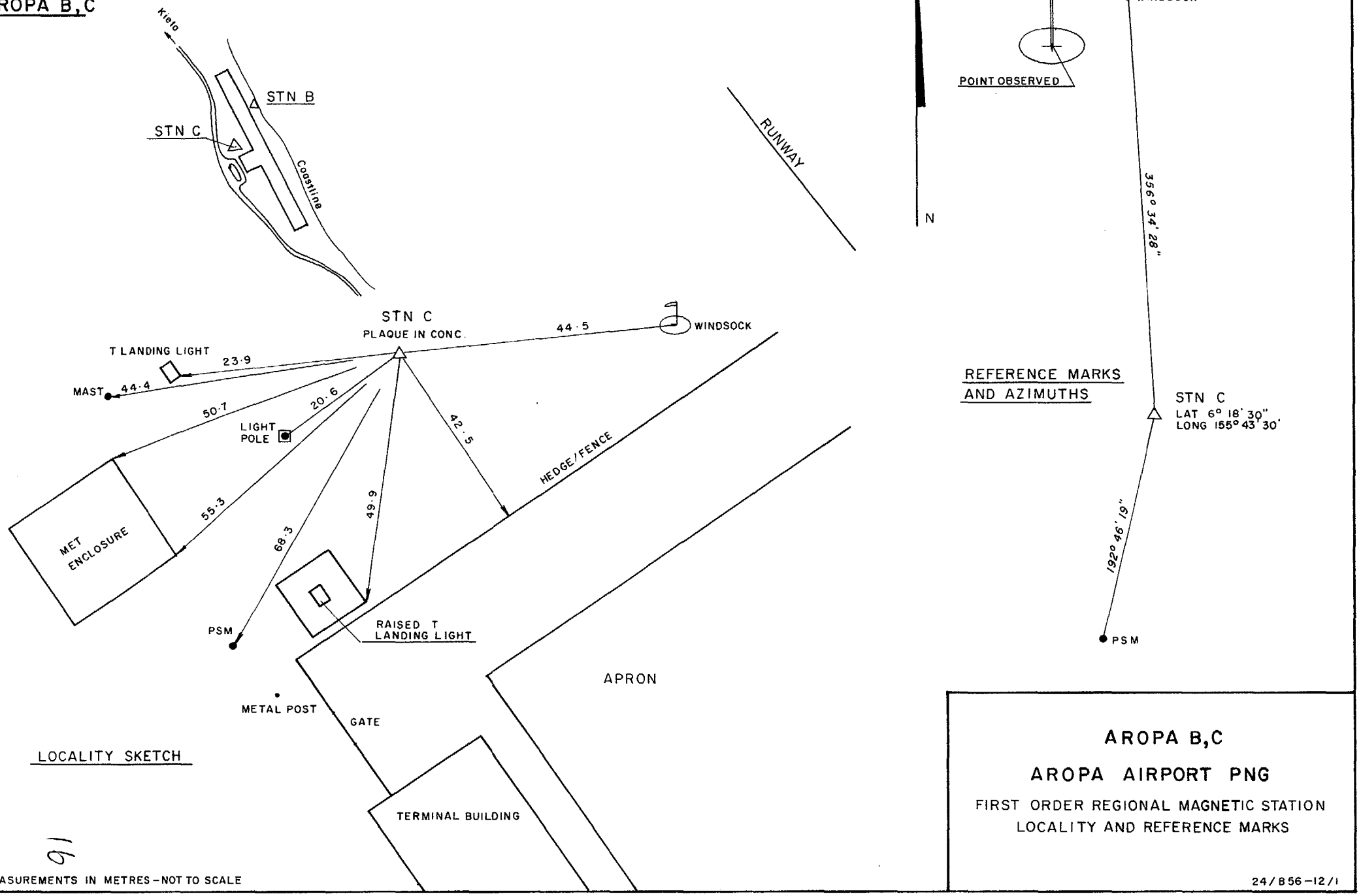
AROPA B,C



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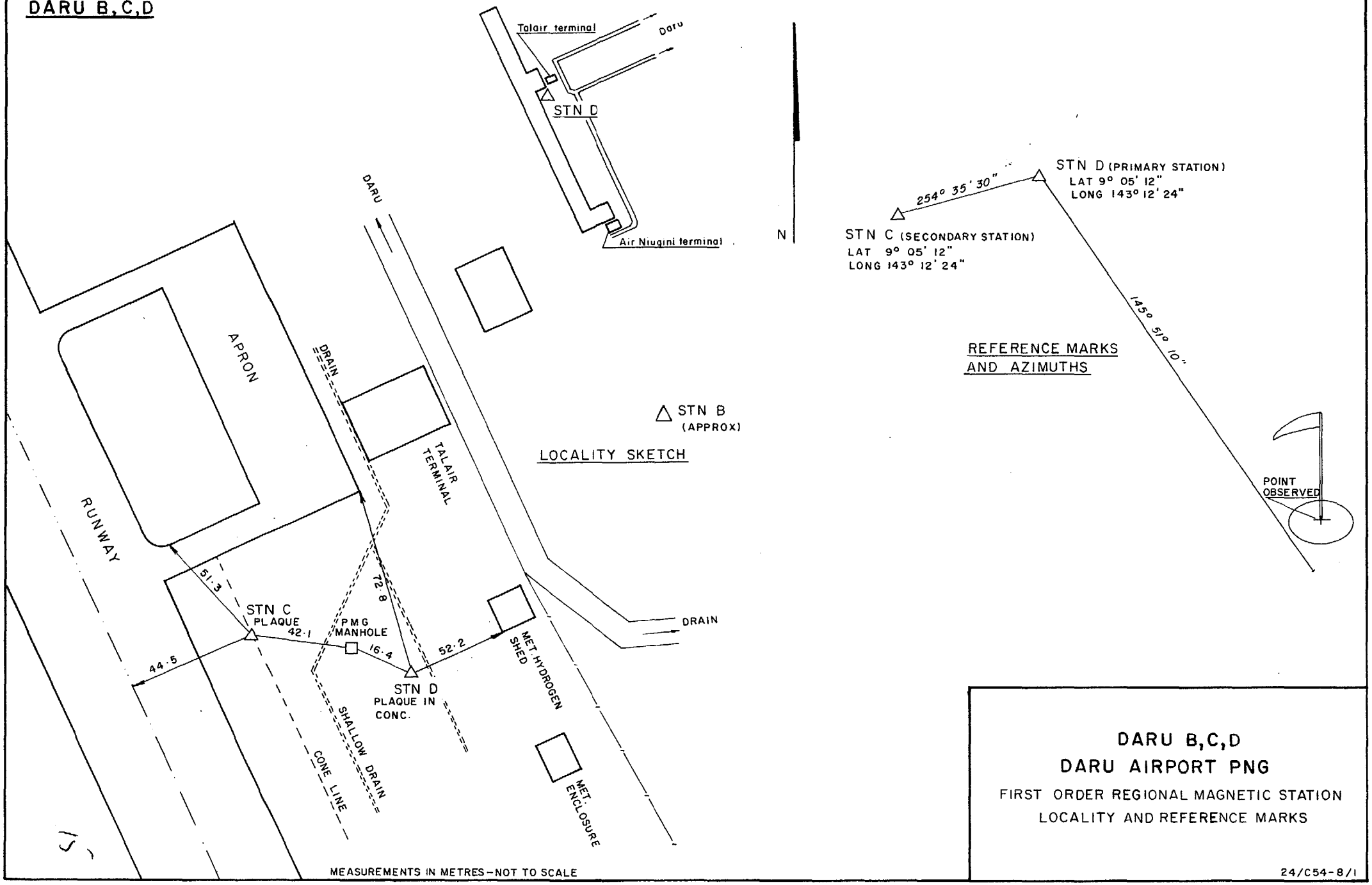
AROPA B,C

AROPA AIRPORT PNG

FIRST ORDER REGIONAL MAGNETIC STATION
LOCALITY AND REFERENCE MARKS

24/856–12/1

DARU B,C,D



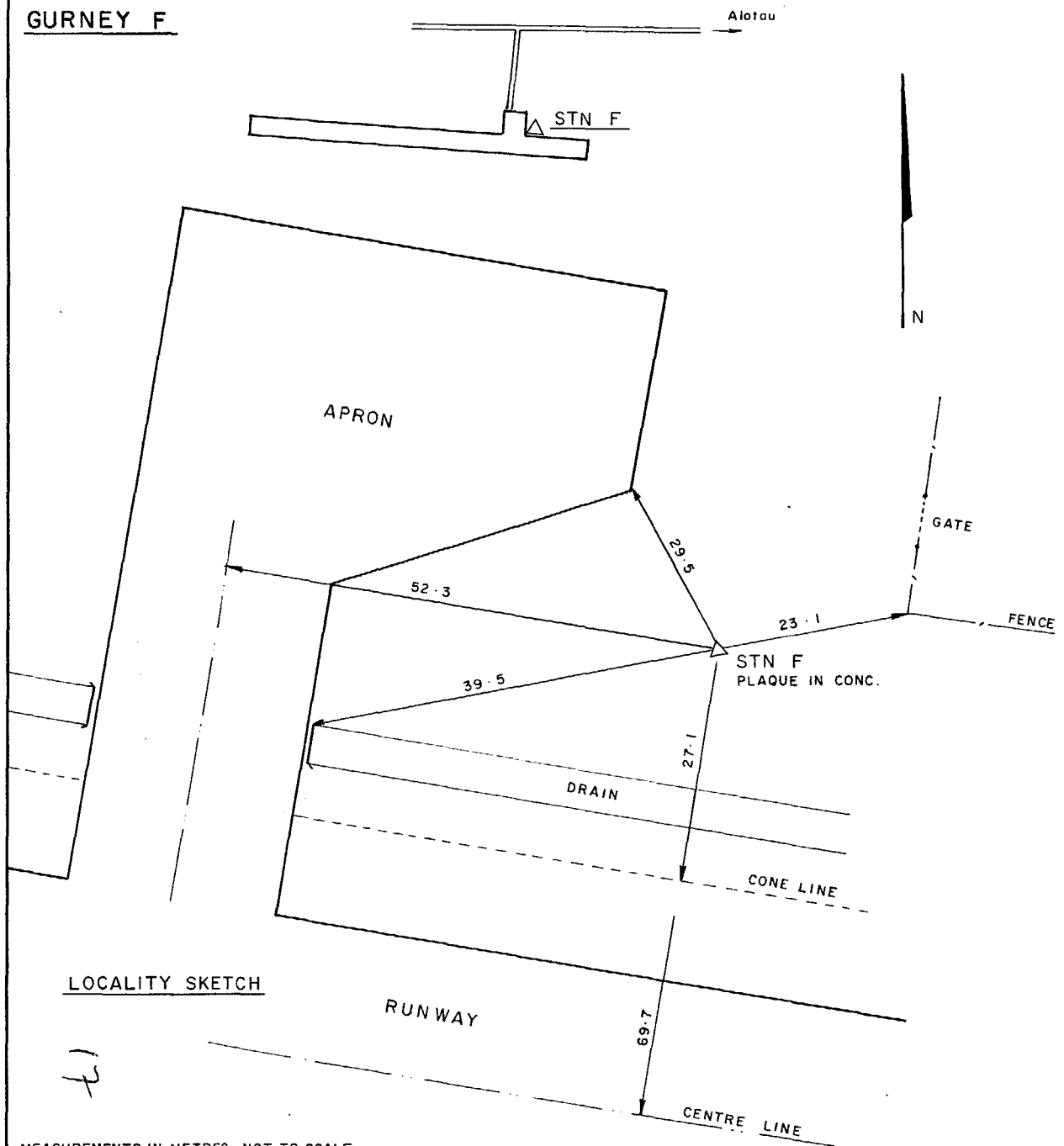
MEASUREMENTS IN METRES—NOT TO SCALE

DARU B,C,D
DARU AIRPORT PNG

FIRST ORDER REGIONAL MAGNETIC STATION
LOCALITY AND REFERENCE MARKS

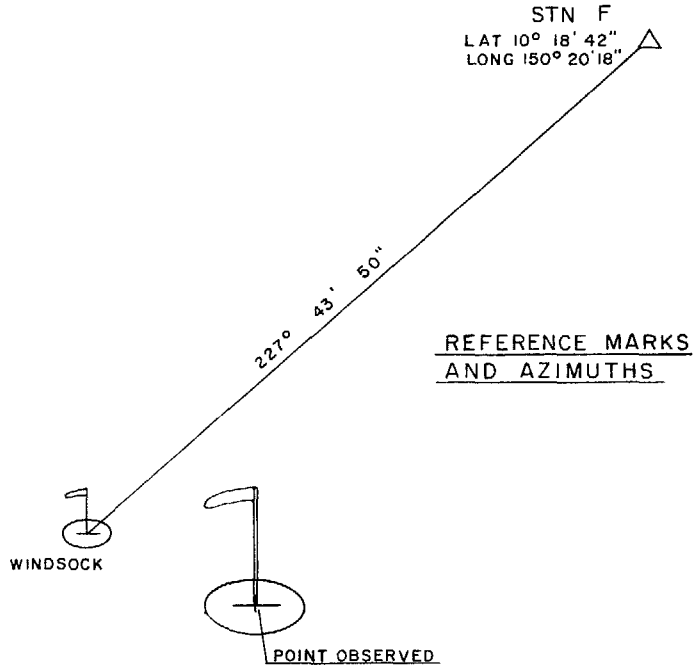
24/C54-8/1

GURNEY F



LOCALITY SKETCH

MEASUREMENTS IN METRES – NOT TO SCALE



REFERENCE MARKS AND AZIMUTHS

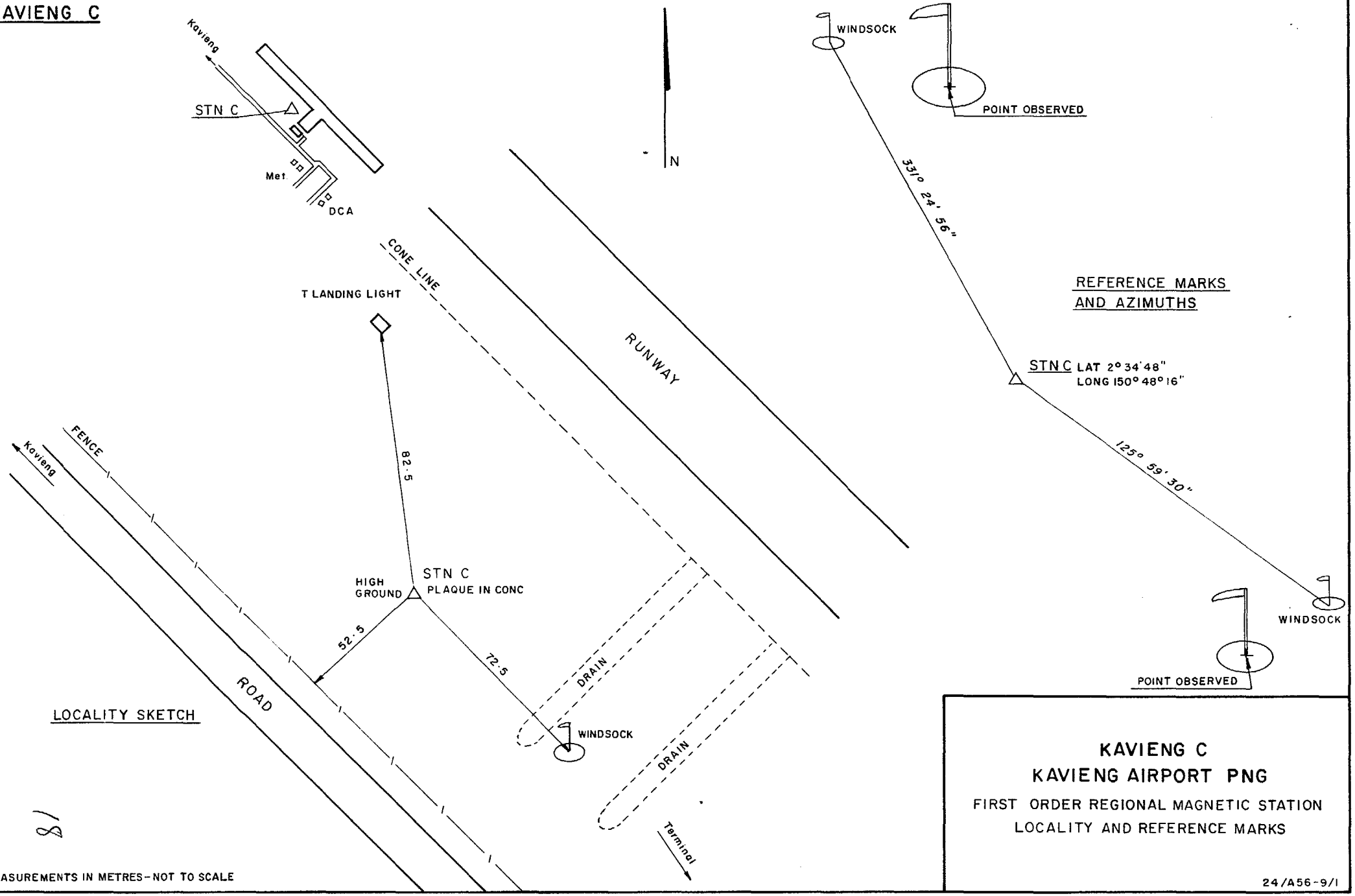
GURNEY F

GURNEY AIRPORT PNG

FIRST ORDER REGIONAL MAGNETIC STATION
LOCALITY AND REFERENCE MARKS

24/C56-9/1

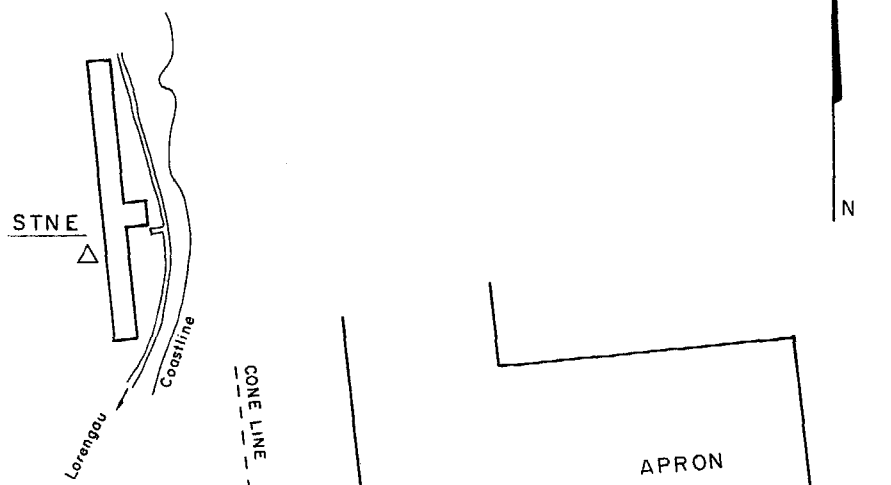
KAVIENG C

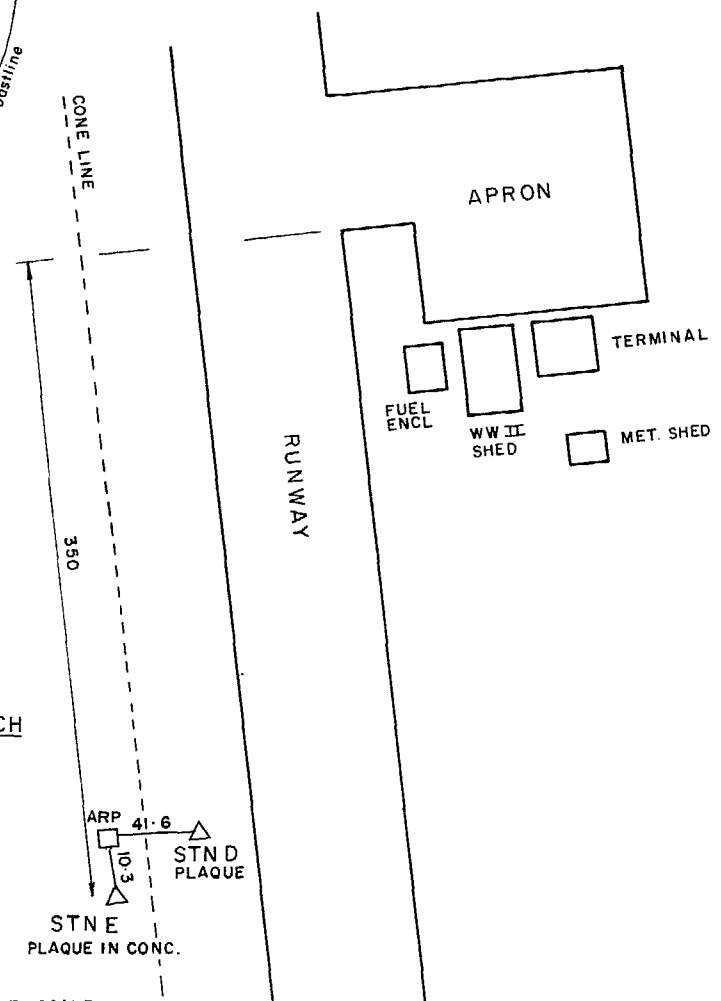


KAVIENG C
KAVIENG AIRPORT PNG
FIRST ORDER REGIONAL MAGNETIC STATION
LOCALITY AND REFERENCE MARKS

24/A56-9/1

MOMOTE D, E





LOCALITY SKETCH

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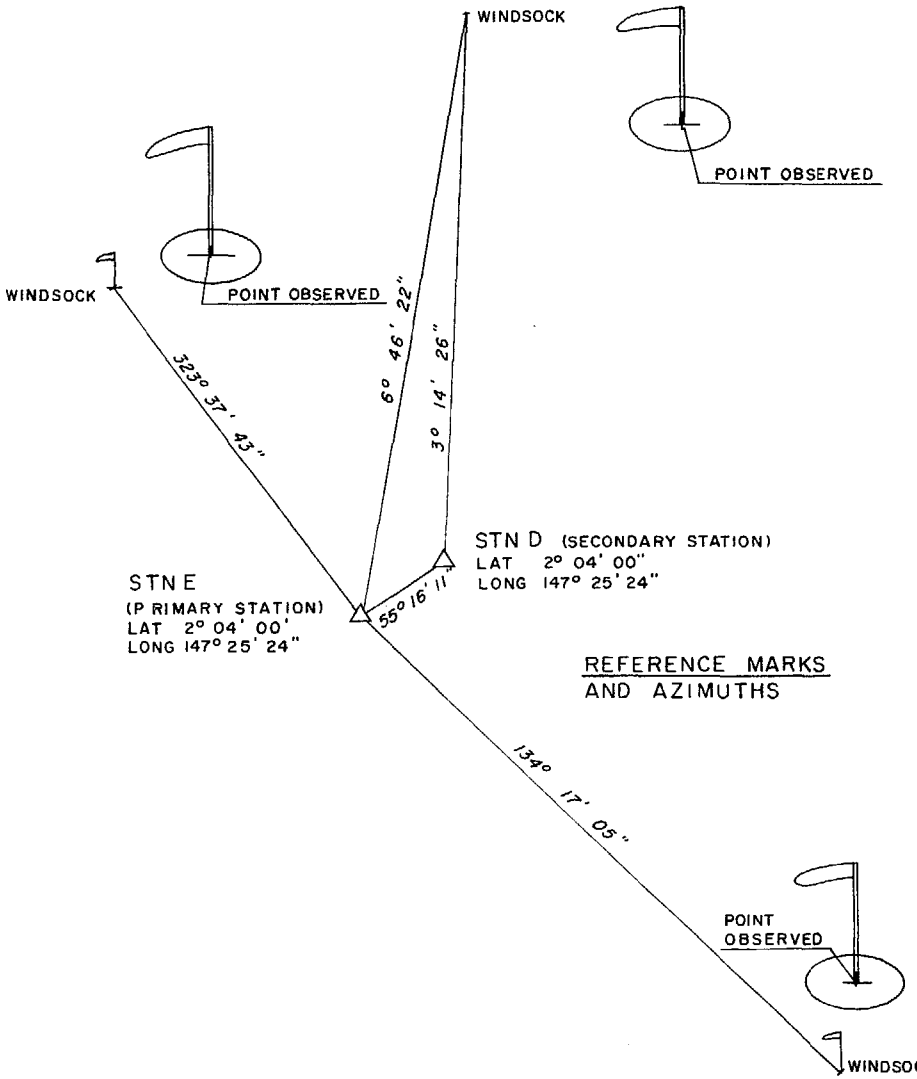
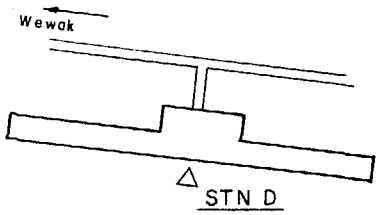
MEASUREMENTS IN METRES - NOT TO SCALE



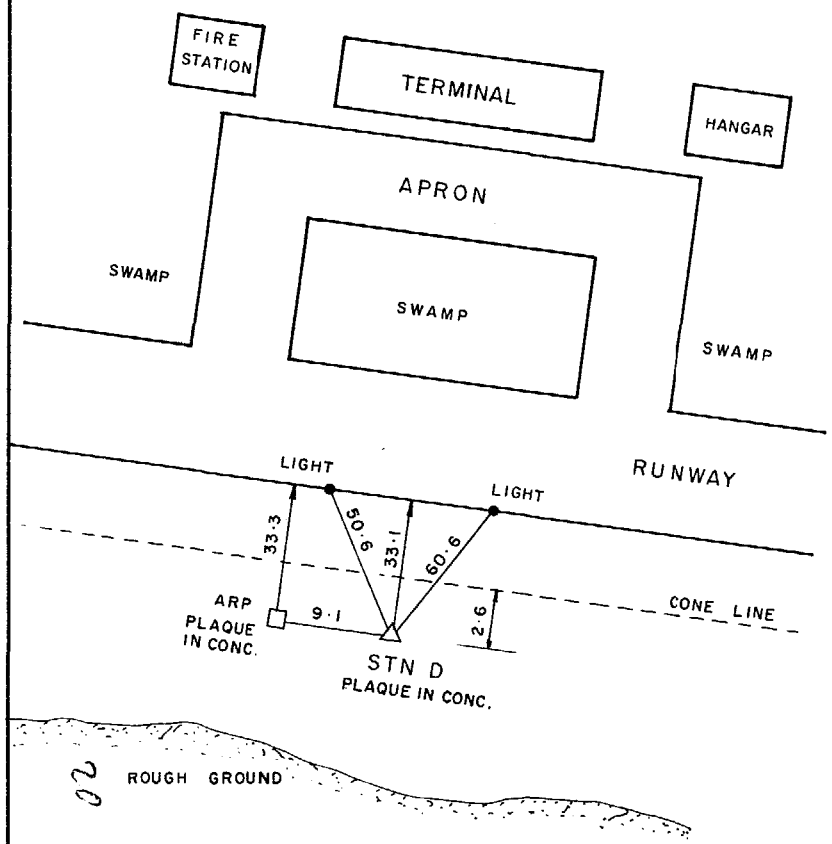
MOMOTE D, E
MOMOTE AIRPORT PNG
FIRST ORDER REGIONAL MAGNETIC STATION
LOCALITY AND REFERENCE MARKS

24/A55-11/1

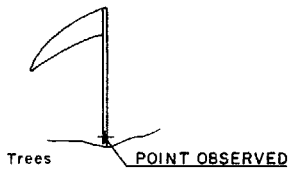
WEWAK D

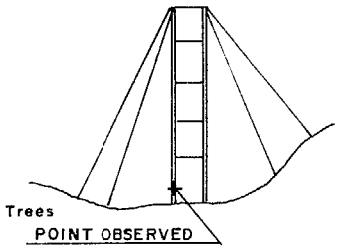


LOCALITY SKETCH



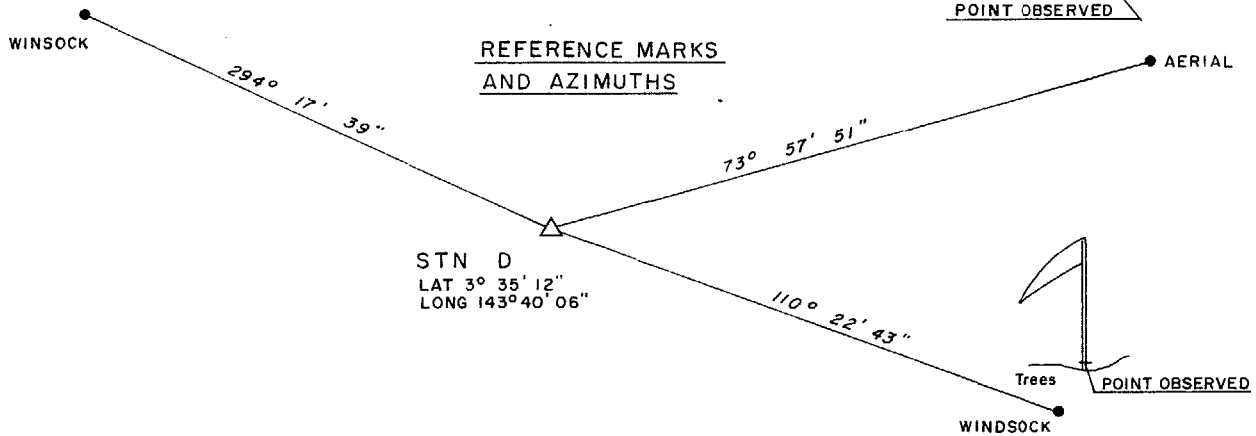
MEASUREMENTS IN METRES—NOT TO SCALE





AERIAL

REFERENCE MARKS AND AZIMUTHS



WEWAK D

WEWAK AIRPORT PNG

FIRST ORDER REGIONAL MAGNETIC STATION
LOCALITY AND REFERENCE MARKS

24/A54-16/1

Table 1

Magnetograph recording - 1985

	Start		End		Remarks
Wewak	0009	13 Mar	0026	15 Mar	Good record (X,Y,Z,T)
Momote	0419	18 Mar	0121	20 Mar	Good record (X,Y,Z,T)
Kavieng	2342	21 Mar	0310	24 Mar	Good record (X,Y,Z,F,T) lost 14 hrs on F trace
Aropa	0232	26 Mar	0212	28 Mar	Good record (X,Y,Z,F,T)
Daru	0108	31 Mar	0700	01 Apr	Record affected by radio lost 6 hrs on F trace (X,Y,Z,F,T)
Gurney	0348	04 Apr	2105	05 Apr	Good record (X,Y,Z,T)

Table 2

Instrument comparisons and preliminary corrections

Station	Date	Instrument A	Instrument B	Difference A-B nT	nT/H*10exp5
		QUARTZ HORIZONTAL MAGNETOMETER			
Canberra	4-3-85	460	305	-24.8	105
		461	305	-23.9	101
		462	305	-28.1	119
		462	173	-3.3	14
Wewak	14-3-85	305	173	42	113
Momote	20-3-85	305	173	39	106
Kavieng	23-3-85	305	173	38	104
Aropa	27-3-85	305	173	39	107
Daru	1-4-85	305	173	42	116
Gurney	5-4-85	305	173	38	107
Canberra	13-5-85	461	305	-22.2	94
		461	173	-4.2	18
		DECLINOMETER		Minute of Arc	
Canberra	6-3-85	Ruska 4813	640506	-0.8	
	18-4-85	Ruska 4813	640506	-2.0	
		PROTON PRECESSION MAGNETOMETER			
Canberra	6-3-85	MNS2.3	Geom 1025	-6 nT	
		MNS2.3	Aust 528	-8 nT	
	18-4-85	MNS2.3	Geom 1025	-3 nT	

CORRECTIONS ADOPTED

HS= QHM 305 - 0.00103 H
HS= QHM 173 - 0.00016 H
DS= Dec 640506 - 1.4'
FS= Geom 816/1025 - 4 nT
FS= Austral 528 - 8 nT

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Table 3

Station details

Station	Latitude ° '	Longitude ° '	Local Meridian Time Hour	Minute
Wewak D	-03 35.2	143 40.1	02	25
Momote D	-02 04.0	147 25.4	02	10
E	-02 04.0	147 25.4	02	10
Kavieng C	-02 34.8	150 48.3	01	57
Aropa C	-06 18.3	155 43.5	01	37
Daru C	-09 05.2	143 12.2	02	27
D	-09 05.2	143 12.2	02	27
Gurney F	-10 18.7	150 20.3	01	59

Table 4

Reference marks and azimuths

Aropa C		
PSM		192 46 19
Windsock to N	RM	356 34 28
Daru D		
Windsock to S	RM	145 51 10
Station C		254 35 30
Gurney A		
Windsock to SW	RM	227 43 50
Kavieng C		
Windsock to SE	RM	125 59 30
Windsock to NW		331 24 56
Momote D		
Windsock to N	RM	3 14 26
Station B		235 16 11
Momote E		
Windsock to N	RM	6 46 22
Station A		55 16 11
Windsock to SE		134 17 05
Windsock to W		323 37 43
Wewak D		
Antenna to NE	RM	73 57 51
Windsock to E		110 22 43
Windsock to W		294 17 39

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Table 5

Value of magnetic elements

	UT	D	UT	H	UT	F
Aropa C						
26 Mar 85	0611	08 34.1E	0623	36387	0600	40827
	0639	34.0	0631	36388	0643	40827
	0653	34.0	0702	36382	0645	40827
	2240	32.0	2304	36393	2221	40829
	2322	32.6	2313	36395	2328	40835
	2341	32.8	2350	36400	2330	40836
			2359	36398		
27 Mar 85	0008	32.8			0013	40841
	0252	34.0	0304	36398	0238	40837
	0320	34.3	0312	36394	0325	40831
	0340	33.5	0351	36384	0327	40832
	041	33.2	0411	36384	0423	40826
	0452	34.2	0503	36374	0444	40822
	0521	33.2	0512	36364	0527	40812
	0540	33.4	0551	36363	0530	40813
	0608	33.3	0558	36363	0613	40807
	2318	31.4	2331	36398	2308	40829
	2351	31.8	2342	36397	2355	40836
					2357	40836
28 Mar 85	0009	32.0	0017	36388		
	0031	33.2	0024	36393	0036	40823
Daru D						
31 Mar 85	0437	05 40.4E	0448	36181	0423	43512
	0506	41.0	0458	36179	0512	43507
	0536	39.4	0551	36180	0525	43509
	0610	40.3	0602	36177	0617	43508
	2254	37.8	2305	36166	2238	43498
	2332	38.4	2324	36167	2338	43503
					2352	43501
01 Apr 85	0008	37.5	0024	36180		
	0047	38.3	0036	36191	0055	43510
	0254	39.5	0322	36213	0239	43528
	0352	39.8	0344	36211	0357	43521
	0406	39.3	0418	36201	0359	43518
	0434	39.7	0425	36201	0440	43514
02 Apr 85	0041	38.9	0055	36162	0033	43486
	0111	39.4	0103	36160	0116	43496
Gurney A						
04 Apr 85	0616	07 11.3E	0631	35484	0602	43252
	0649	11.7	0639	35488	0654	43252
	0704	11.6	0714	35487	0656	43252
	0732	10.8	0723	35488	0737	43251
	2340	09.5	2350	35525	2328	43268
			2356	35528		
05 Apr 85	0004	10.0			0028	43278
	0040	10.7	0103	35541	0029	43278
	0125	10.6	0115	35536	0131	43279
	0150	10.5	0203	35536	0141	43287
	0240	10.5	0229	35533		
	0350	10.4	0358	35523	0341	43284
	0413	10.0	0405	35524	0417	43277
	0427	11.7	0438	35520	0419	43275
	0456	11.7	0447	35520	0500	43270

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Kavieng C							
22 Mar 85	0233	06	23.6E	0245	36566	0219	39139
	0321		24.0	0309	36566	0329	39133
	0558		23.1	0607	36536	0541	39110
	0630		22.7	0619	36532	0637	39104
	0648		23.1	0656	36531	0638	39104
	0710		23.2	0702	36526	0714	39099
	2303		22.8			2250	39120
23 Mar 85	0014		23.1	0027	36550	0002	39129
	0053		25.5	0038	36558	0059	39123
	0251		24.2	0302	36545	0236	39111
	0333		23.8	0324	36532	0338	39103
	0358		25.0	0416	36540	0340	39103
	0439		23.2	0428	36537	0446	39099
	0644		23.8	0652	36531	0631	39104
	0714		23.5	0701	36530	0719	39100
24 Mar 85	0050		23.4	0101	36564	0034	39126
	0116		23.7	0108	36662	0122	39130
	0137		23.5	0159	36570	0127	39127
	0217		25.2	0209	36559	0223	39127
Momote D							
18 Mar 85	0656	05	18.9E	0712	36871	0641	39320
	0733		19.8	0723	36876	0741	39309
19 Mar 85	0157		20.6	0208	36935	0139	39368
	0223		20.6	0216	36932	0227	39373
Momote E							
18 Mar 85						2349	39302
19 Mar 85	0001	05	11.7E	0011	36853		
	0037		12.7	0024	36854	0048	39312
	0440		12.3	0458	36852	0418	39317
	0520		11.5	0511	36855	0525	39303
	0710		11.9	0723	36830	0702	39287
	0739		11.7	0731	36831	0745	39280
						2358	39299
20 Mar 85	0013		11.4	0021	36849		
	0053		12.4	0042	36853	0059	39309
Wewak D							
13 Mar 85	0349	04	26.2E	0335	37168	0359	40662
	0527		24.8	0539	37146	0513	40648
	0559		25.5	0549	37140	0613	40639
	0633		26.1	0650	37138	0618	40638
	0719		26.0	0708	37137	0725	40638
	2245		23.8	2305	37170	2227	40664
	2326		23.6	2315	37168	2333	40670
14 Mar 85	0142		25.3	0131	37202	0149	40688
	0332		26.0	0322	37192	0338	40682
	0701		25.2	0713	37154	0647	40659
	0728		25.9	0720	37154	0734	40656
	2308		23.2	2323	37160	2251	40655
				2352	37158		
15 Mar 85	0005		24.8			0013	40673

DECLINATION EAST

MEAN HOURLY VALUES PRELIMINARY

1985 MARCH UT	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Mean
WEWAK										4 Deg + tabular values in 0.1 Min																
13 Q	246	258	263	261	262	260	256	256	255	254	253	251	250	249	248	247	247	248	246	247	247	244	236	235		251
14	242	250	257	259	260	260	258	257	260	258	256	254	251	250	251	249	250	248	248	249	250	247	239	235		252
MOMOTE										5 Deg + tabular values in 0.1 Min																
18					164	169	176	180	185	179	175	171	167	167	166	167	166	163	160	163	171	162	161	167		
19	189	214	225	211	183	177	182	177	183	175	165	158	154	157	161	168	168	163	163	164	167	160	154	169		174
20 Q	182																									
KAVIENG										6 Deg + tabular values in 0.1 Min																
22 Q	219	228	234	233	230	231	234	235	237	235	234	233	234	234	234	232	233	234	234	232	229	225	225	228		232
23	232	236	238	238	238	240	239	239	237	237	236	237	236	236	236	236	235	235	234	233	228	225	227	229		235
24	232	236	241																							
AROPA										8 Deg + tabular values in 0.1 Min																
26				337	331	345	347	337	330	322	324	332	330	330	335	335	333	331	331	336	329	320	315	319		
27	318	325	330	335	339	335	333	340	335	319	327	331	324	327	334	335	338	339	333	338	342	321	316	320		331
28	319	326																								
DARU										5 Deg + tabular values in 0.1 Min																
31		386	389	390	394	400	405	404	400	394	392	392	393	389	390	391	388	387	388	385	385	382	376	379		
1985 APRIL																										
1	395	404	408	409	411	411	406																			
GURNEY										7 Deg + tabular values in 0.1 Min																
4					110	113	114	113	114	112	110	106	106	104	105	104	104	105	102	100	100	97	95	96		
5	99	101	101	101	103	102	100	100	100	100	98	98	97	96	98	98	98	98	97	97	97					

Table 7

Horizontal Intensity - Preliminary Mean Hourly Values

HORIZONTAL INTENSITY

MEAN HOURLY VALUES PRELIMINARY

1985 MARCH UT		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Mean
WEWAK											37000. + tabular values in nT.																
13	Q	142	164	171	162	153	146	136	132	124	118	123	126	129	131	138	137	139	141	142	144	147	152	161	172		143
14		184	199	206	199	183	176	167	155	154	159	158	148	144	137	145	144	140	147	158	165	155	154	156	167		163
MOMOTE											36000. + tabular values in nT.																
18							909	896	884	875	876	877	879	881	881	882	883	885	886	888	888	888	891	895	898	906		
19		922	926	935	935	927	911	901	896	890	888	881	874	866	866	879	889	884	888	884	886	888	888	892	901		896
20	Q	916																									
KAVIENG											36000. + tabular values in nT.																
22	Q	560	564	568	563	548	539	531	529	527	527	529	527	527	531	525	526	530	535	536	535	534	541	548	560		539
23		562	560	549	539	529	529	532	529	528	526	523	521	518	516	518	518	520	522	523	527	533	535	543	555		531
24		563	568	560																							
AROPA											36000. + tabular values in nT.																
26					398	392	387	383	381	381	372	365	369	369	376	372	375	377	379	375	371	376	375	383	397		
27		405	406	400	390	377	364	357	358	361	357	355	361	363	366	368	380	376	374	374	374	377	383	384	390		375
28		379	384																								
DARU											36000. + tabular values in nT.																
31			195	202	196	182	174	173	167	129	107	124	135	142	139	143	148	150	148	151	156	151	153	162	171		
1985 APRIL																											
1		182	197	213	210	193	178	173																			
GURNEY											35000. + tabular values in nT.																
4							497	483	482	486	491	489	493	504	499	500	496	499	505	506	505	502	500	506	514	523		
5		532	533	534	527	517	514	511	510	507	507	504	505	499	511	508	511	512	514	518	517	521					

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Table 8

Total Intensity - Preliminary Mean Hourly Values

TOTAL INTENSITY

MEAN HOURLY VALUES

PRELIMINARY

1985 MARCH UT	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Mean
KAVIENG										39000. + tabular values in nT.																
22 Q	127	131	137	132	119	113	107	99	97	97	98	101														
23			112	104	103	104	104	99	94	94	91	90	88	87	88	88	90	92	94	96	100	104	110	119		
24	125	128	124																							
AROPA										40000. + tabular values in nT.																
26				840	837	830	826	826	827	821	816	817	818	824	821	824	826	827	823	820	822	821	828	835		
27	839	840	835	831	823	815	810	811	810	811	810	811	814	817	817	827	824	822	822	822	827	831	831	834		822
28	824	828																								
DARU										43000. + tabular values in nT.																
31		515	517	512	506	504	501					482	490	483	487	489	491	490	491			492	498	501		
1985 APRIL																										
1	504	512	522	522	512	500	495																			

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Table 9

Vertical Intensity - Preliminary Mean Hourly Values

VERTICAL INTENSITY

MEAN HOURLY VALUES PRELIMINARY

1985 MARCH UT		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	2	Mean
WEWAK											-16000. - tabular values in nT.																
F																											
13	Q	522	558	540	510	489	485	482	485	485	483	507	515	512	518	527	525	527	525	528	531	536	548	546	530		517
14		507	504	504	488	471	497	500	498	503	516	507	495	507	512	528	519	524	530	545	543	527	530	531	533		513
MOMOTE											-13000. - tabular values in nT.																
18						608	609	612	614	622	618	617	617	621	623	623	627	627	625	623	624	637	641	630	619		
19		630	635	639	633	630	626	632	627	631	618	616	605	607	618	632	635	636	640	631	640	639	636	633	637		629
20	Q	632																									
KAVIENG											-13000. - tabular values in nT.																
22	Q	827	840	863	876	885	883	874	858	860	869	887	892	892	894	885	880	905	916	919	919	894	896	872	854		881
23		845	838	822	827	860	863	874	872	867	878	889	883	885	892	903	903	905	912	916	919	916	898	887	880		881
24		856	845	854																							
AROPA											-18000. - tabular values in nT.																
26					450	442	432	439	443	450	445	447	453	459	466	466	471	471	467	466	464	463	466	459	451		
27		455	443	440	443	453	456	445	455	458	461	466	467	466	469	469	485	479	479	482	479	487	490	475	469		465
28		451	458																								
DARU											-24000. - tabular values in nT.																
31			90	96	93	79	96	90	115	82	65	110	147	152	152	155	158	152	155	164	161	132	141	138	107		
1985 APRIL																											
1		84	67	99	124	113	107	121																			
GURNEY											-24000. - tabular values in nT.																
4						727	729	729	727	727	726	724	722	722	722	721	720	721	724	724	724	724	723	719	713		
5		717	717	717	720	723	721	723	724	727	724	723	723	724	722	723	722	722	723	722	724	724					

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Table 10

Adopted station values at epoch of occupation

	Z	F	D	H
Wewak D	-16438	40621	4 25.1	37147
Momote D	-13636	39331	5 16.3	36892
Kavieng C		39105	6 23.3	36526
Aropa C		40834	8 35.0	36388
Daru D		43497	5 39.0	36163
Gurney F	-24723	43275	7 10.2	35518

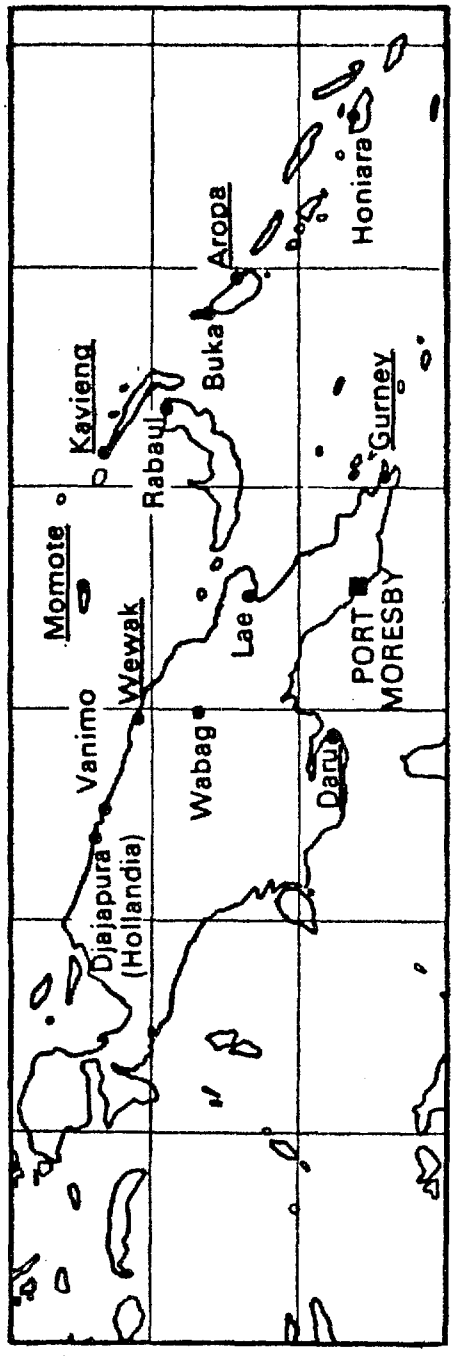

Figure 1. PNG First Order Stations
Stations underlined were occupied in 1985.

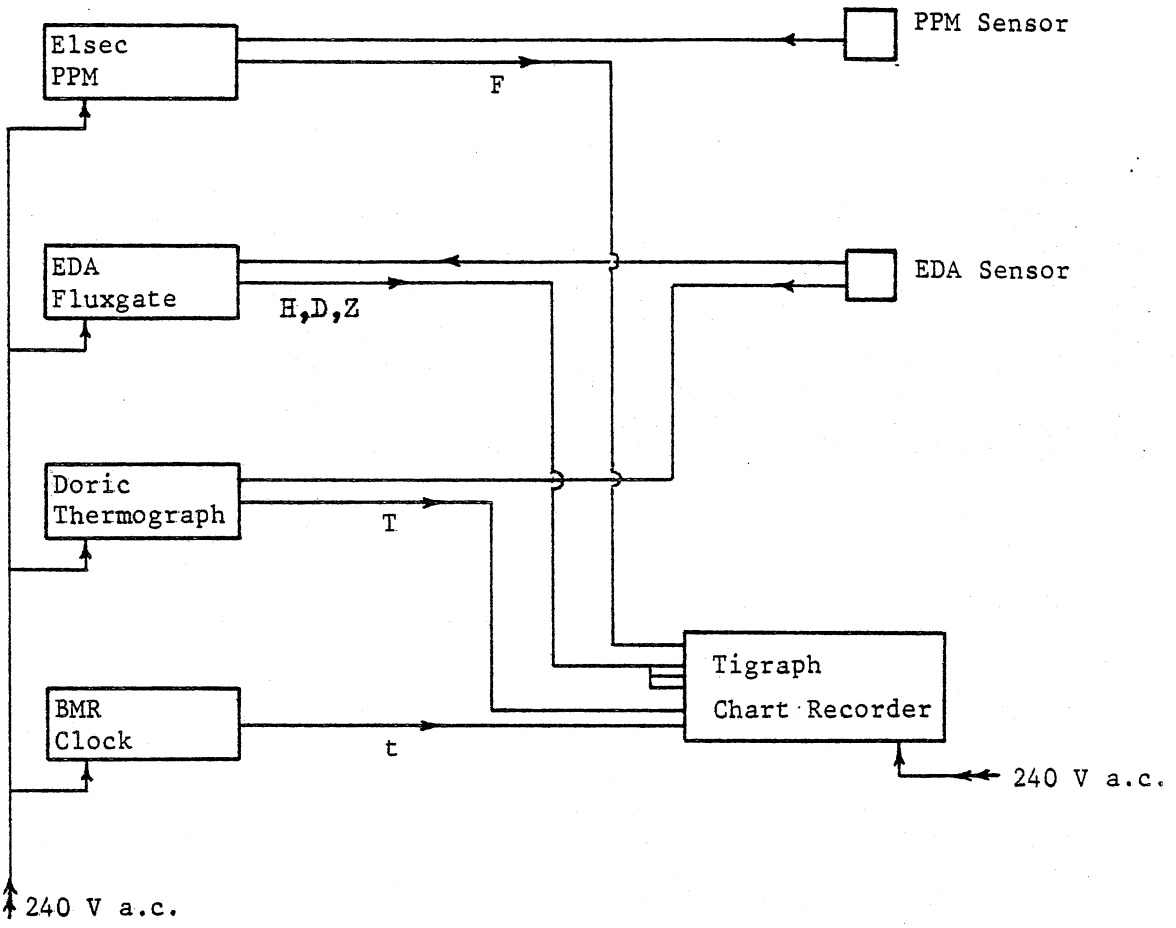

Figure 2. Diagram of survey equipment