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OPERATION ARIGHT 1991 (CONTROL)

OPERATION REPORT

GPS CONTROL SURVEY OF CAPE YORK AND TORRES STRAIT

4th FIELD SURVEY SQUADRON

OPERATION ARIGHT 91

(CONTROL)

OPERATION REPORT

A CONTROL SURVEY CONDUCTED

IN THE CAPE YORK AND

TORRES STRAIT REGION

OF QUEENSLAND

JULY - SEPTEMBER 1991

4TH FIELD SURVEY SQUADRON

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EXECUTIVE SUMMARY

Operation Aright 91 (Control) was a control survey operation conducted by Det 4 Fd Svy Sqn in the Cape York - Torres Strait region of Queensland during the period 8 Jul - 5 Sep 91.

The aim of the Operation was to establish control for future 1:50 000 scale mapping between 9 and 12 degrees South latitude, and between 141 and 145 degrees East longitude. This region includes part of the Southern Papua New Guinea mainland.

The Operation was supported from bases on Horn Island and Yorke Island. Organic to the operational force were two AAAvn Iroquois RW aircraft, one AAAvn Pilatus Porter FW aircraft (fitted with RC10 camera) and personnel from RASvy, RASigs, RAEME, AAAvn, RAAMC, AACC and RAE. In addition, support was provided by 51 Far North Queensland Regiment and the Naval Reserve unit on Thursday Island. Insertion, extraction and resupply of the force was by a combination of RAAF C130 and CC08 aircraft, civilian sea freight and domestic airline flights.

Survey operations in the region were brought forward to FY 91/92 as a result of a review of mapping priorities conducted in August 1990. As a consequence, standard lead times for resource planning were not available. This, combined with the uncertainty which surrounded the command status of 4 Fd Svy Sqn, had significant impact on the logistics of the Operation.

OPERATION REPORT

OPERATION ARIGHT 91 (CONTROL)

JUL - SEP 91

References: A. DGOP-A Tasking Directive 1/90 - Survey Operation A86-575 dated 29 Aug 90

B. Land Headquarters Operation Order 8/91 - LHQ AUST OPS 083/91 310130ZMAY91

C. DSVY-A Technical Directive AS474-5-123 SVY 000219 dated 25 Mar 91

D. DEFARM CAMPBELL Z2Y/JQD SVY 3516 232330ZJUN91

E. 1 Topo Svy Sqn R611-1-1 dated 10 Apr 91

F. 4 Fd Svy Sqn 851-91-1 dated 14 Aug 91

G. 4 Fd Svy Sqn 696-91/92-1 dated 10 Sep 90

H. 4 Fd Svy Sqn 851-91/92-1 dated 30 Jan 91 - November 90 Reconnaissance Report

I. 4 Fd Svy Sqn 851-91-1 dated 11 Jun 91 - June 91 Reconnaissance Report

INTRODUCTION

1. Operation Aright 91 (Control) was a control survey conducted in the Cape York / Torres Strait region of Queensland. Reference A was the tasking authority, with Land Headquarters (LHQ) being responsible for mounting the operation. Reference B was the LHQ Operation Order.

2. The Operation was conducted during the period 8 July - 5 September 1991 and was supported from a main base on Horn Is, and a forward base on Yorke Is.

MISSION

3. Reference C (as amended by Reference D) directed 4 Fd Svy Sqn to:

a. Establish and coordinate horizontal control stations using TI4100 GPS receivers in relative positioning mode. Points were to be established to 3rd Order or higher.

b. Ground mark control stations in accordance with the standards outlined.

c. Target existing and new control stations.

d. Positively identify all targeted control stations on identification photography.

e. Carry out additional control acquisition involving both GPS relative positioning and Doppler point positioning. The purpose of this was to strengthen the Australian geodetic network in the Torres Strait region, as well as connecting the PNG and Australian geodetic networks.

4. The requirement to establish control points in PNG was notified subsequent to the issue of Reference B. This aspect was not finalised until shortly before deploying on the Operation.

5. A task given separately by LHQ was the acquisition of data needed to compile Vital Asset Protection (VAP) products. Details are given in Reference E.

6. Although not stated in Reference C, a task routinely undertaken when operating in a 'new'Area of Operations (AO) is to collect data to enable compilation of photographic interpretation guides (PIGs).

AREA OF OPERATIONS

7. The AO is bounded by 9 and 12 degrees South latitude, and longitudes 141 and 145 degrees East. The control points requiring establishment were contained on mainland Cape York, Great Barrier Reef islands to the East of the Cape, a fairly even distribution over the Torres Strait islands and some points on the Southern portion of Papua New Guinea's Western Province.

8. The AO (shown at Annex A) comprises the following 1:250 000 map areas:

a. SC54-7 BOIGU;

b. SC54-8 DARU;

c. SC54-11 THURSDAY ISLAND;

d. SC54-12 CAPE YORK;

e. SC54-15 JARDINE RIVER; and

f. SC54-11 ORFORD BAY.

OPERATION RESULTS

9. All objectives stated in the Mission were achieved, with the exception of some aspects of the VAP mapping photography. Photography in the final two weeks of the Operation was severely hindered by unseasonal cloudy periods. Even with the allocation of an additional 20 task hours the photography aircraft had to return to Oakey for major servicing with some tasks still outstanding. These tasks were the identification photography of five control points as well as some VAP mapping photography.

10. In the weeks immediately following the Operation the photography of the outstanding control points was achieved by the Australian Survey and Land Information Group (AUSLIG) aircraft. This aircraft was, at the time, under contract to RASvy for mapping photography tasks in Cape York. Repanelling tasks during this period were conducted by personnel from C Coy 51 FNQR using a chartered helicopter.

11. Technical aspects are covered in detail at Annexes B and C.

CONDUCT OF OPERATIONS

12. The following sections cover the major parts of the conduct of the Operation. A detailed sequence of events is given at Annex D.

Deployment of the Force

13. Deployment comprised four major steps:

a. Line Haul of Bulk Stores. On 1 Jul 91 a semi-trailer loaded with a LR 110, 1/2 tonne trailer and stores left Adelaide for Cairns. These items were onforwarded to Horn Is by civilian sea freight vessel (Cape Trader).

b. Advance Party. On 8 Jul 91 an advance party of seven personnel and containerised stores flew from RAAF Edinburgh to Cairns on two C130 aircraft. The next day two members accompanied the stores on the Cape Trader, two members flew civil air to Weipa to carry out preliminary technical tasks and three personnel flew civil air to Horn/Thursday Is. All seven personnel established the main base facility in the

Horn Is Army compound during the period 12 - 14 Jul 91. Stores were delivered to the compound by the civilian sea freight company (Torres Island Trading). The base camp, once established, was capable of accommodating 60 personnel.

c. Main Body. On 15 Jul 91 the main body of 26 personnel and technical stores were flown by RAAF C130 from Adelaide to Weipa. That afternoon and the next day four Caribou sorties were flown to transport personnel and stores from Weipa to Horn Is.

d. AAAvn Element. The AAAvn element deployed in their own aircraft. All aircraft were due to arrive on 16 Jul 91. One Iroquois arrived one day early, one arrived four days late and the Porter arrived one day late. All aircraft and AAAvn/RAEME support personnel were changed over at various times during the Operation.

Station Reconnaissance, Clearing and Marking.

14. A two man reconnaissance party commenced their tasks on 15 Jul 91. They kept only a few days in front of the field survey parties. Their task was to find/establish, clear and mark each point to be coordinated by the survey parties.

15. During the first half of the Operation Iroquois aircraft were used in support of this task. Later a charter Bell Jetranger was used. Reasons for this change are explained in paragraph 30.

GPS Operations (Relative Positioning)

16. GPS operations were conducted using relative positioning techniques. Field parties were deployed primarily using Iroquois aircraft. On a few occasions road and sea transport were used. Operations were divided into three phases:

a. Phase 1 (18-30 Jul). During this Phase control points to the South and South-East of Horn Is were occupied, commencing in the South and moving in a Northerly direction.

b. Phase 2 (31 Jul - 15 Aug). This Phase commenced with points in the vicinity of Horn and Thursday Islands. The initial plan was to move the field parties to the North and West up to and including the

first points in PNG. However, as Diplomatic Clearances for aircraft to enter PNG had not been arranged, a redeployment of parties to the East was necessary. This was done to fill in the time until clearances were obtained. This Phase included the establishment of the forward operating base on Yorke Is. Stores for this camp were inserted using a RAAF Caribou aircraft. During the Phase all points to the West and South-West of Yorke Is were occupied.

c. Phase 3 (16-22 Aug). Firstly points to the North and East of Yorke Is were completed. Parties were then moved generally Westward to eventually occupy those points to the North and West of Horn Is not completed because of the change in direction during Phase 2. This Phase also included points in PNG. Towards the end of the Phase forward base was withdrawn to Horn Is, again using RAAF Caribou. The last three days of operations were again based out of Horn Is.

Doppler Operations (Point Positioning)

17. Concurrent with GPS operations Doppler point positioning observations were caried out on six of the control points. This was achieved by a combination of Doppler equipment being issued to selected GPS parties, as well as an additional two man party being formed using personnel from base camp.

GPS Post Processing Operations

18. One senior NCO with assistance from an NCO was required throughout the Operation for GPS post processing and record keeping. This is a very time consuming task, and selection of personnel and the computing environment are extremely important. More detail is given in Appendix 4 to Annex B.

Photography Operations

19. An AAAvn Pilatus Porter aircraft, fitted with an RC10 aerial camera, was used for photographic tasks detailed in the Mission. This aircraft was based out of Horn Is for the entire Operation so as to have ready access to the darkroom on Horn Island. Although based on Horn Island , this aircraft remained at Yorke Island Forward Base whenever savings in air hours could be achieved by this. The darkroom used was a purpose built facility which was part of the James Cook University

Research Unit. The darkroom was loaned to the Detachment for the duration of the Operation. A nominal fee for electricity was the only charge.

Withdrawal of the Force

20. Withdrawal of the Operational Force was completed in accordance with Reference F. The main elements were:

a. 23 - 24 Aug 91. Field operations ceased and survey field parties returned to main base, Horn Island.

b. 25 Aug 91. Iroquois aircraft, aircrew and RAEME personnel released.

c. 25 - 26 Aug 91. Extraction of main body and technical stores from Horn Island to Weipa using four Caribou sorties.

d. 26 Aug 91. Main body and technical stores from Weipa to RAAF Edinburgh via C130.

e. 29 Aug 91. Photograpic operations ceased.

f. 30 Aug 91. Porter aircraft, pilot and All Trades released. Civilian sea freight vessel (Cape Trader) loaded.

g. 2 - 3 Sep 91. Cape Trader arrives Cairns and unloaded.

h. 4 Sep 91. Stores in Cairns prepared for C130 and line haul movement to Adelaide.

i. 5 Sep 91. Rear party and three pallets of stores returned to RAAF Edinburgh from Cairns on C130.

j. 30 Sep 91. BMSS containers, vehicle and trailer loaded on line haul trucks arrives at 4 Fd Svy Sqn.

ADMINISTRATION AND LOGISTICS

Resource Forecasting

21. Preliminary resource estimates for the Operation were contained in this Unit's Forecast of Activities and Planning Estimates (FAPE) submission to LHQ (Reference G), submitted, as required through HQ 4 MD in Sep 90. These bids were at best 'guesstimates' because at that stage there had been no reconnaissance conducted, and the tasks involved in the Operation had

not been defined. This was the case because, at the time of submission, it had only just been decided to include Cape York control survey operations in FY 91/92 tasking. Unfortunately, for reasons unknown, the FAPE document was not received by LHQ. The first resources bid staffed by LHQ were those submitted at Reference H, after the initial reconnaissance in November 90. The result of the above circumstances was that bids for resources were 'supplementary' in nature, and therefore were largely constrained to what was available rather than what was ideally required.

Manning

22. Annex E details personnel and their dates of attachment to the Operational Force. Although not formally attached to the Operation, mention needs to be made of personnel from C Coy 51 FNQR who provided much needed support both on Horn and Yorke Islands.

23. Difficulty was experienced in obtaining timely advice on the availability of non-organic support personnel. Most arrangements to obtain this support were done by this unit using direct liaison.

Movements

24. Initially it was planned to insert and extract the Force using RAAF C130 into Horn Is. This was based on the knowledge that a few months prior to the initial reconnaissance such an aircraft used the airstrip, apparently with no damage caused. Unfortunately, clearance for C130 was not given for either Horn Is or Bamaga airstrips. As a result, the movement of stores and personnel was carried out as described in paragraphs 13 and 20.

25. The deployment/redeployment involved the coordination of civil and military road, sea and air transport. Such a complex plan was time consuming to organize and had the potential to breakdown due to failure of any one of it's elements. Fortunately, through the dedicated efforts of all agencies involved, the plan went quite well. One major error was the costing of sea freight. This is explained under the Finance section of this report (paragraph 60). Comments on how movements could have been simplified are made under the Conclusions section (paragraph 83).

Accommodation

26. Main Base - Horn Is. On Horn Is a compound administered by DSG North Queensland was available for use. It was built in 1989 as a base for troops exercising in the area. It is about 60 metres x 60

metres in size and is enclosed by a cyclone wire perimeter fence. Within this is a bare concerte slab (16m x 9m) upon which kitchen, messing and canteen tents were erected. There is an ablution block with eight showers (cold), toilets and wash basins as well as sufficient room for washing machines to be housed. There is also a large water tank with pressure provided by an electric pump. The tank was of sufficient capacity to supply all water requirements. With the exception of the ablution block, the entire camp was under tentage. 240 volt power was available from one end of the ablution block. As the Detachment was the first group to use the facility some teething problems occurred. Firstly, the water in the tank was too saline for drinking. A fibreglass tank was borrowed from the Water Resources Commission camp on the Island and was filled with potable water from a tanker. About two-thirds through the Operation the main tank was connected to a new water supply and all water could then be drawn from it. Secondly, the power outlets originally available were inadequate. Several additional outlets were installed by arrangement through the Australian Construction Services' representative on Thursday Is. A telephone line was connected to the compound by Telecom for the duration of the Operation only.

27. Forward Base - Yorke Island. This base consisted of tentage set up in a cleared area about 50 metres to one side of the Northern end of the airstrip. Water was provided from a borrowed fibreglass tank which was filled daily by members of the Yorke Is community. Shower facilities were constructed and 'porta-potties' were used for latrines. This is further explained in Annex F. The Yorke Is community provided enormous support in the form of access to refrigeration and freezer facilities as well as transport using a tractor and low loading trailer. The latter was particularly useful for loading/unloading aircraft. In addition, by arrangement with C Coy 51 FNQR, two members of Yorke Is ARes patrol were provided for general duties around the camp.

Aircraft Support

28. The following aircraft were used in support of the operation:

a. Two UH1H Iroquois from 171 Comd and Liaison Sqn. A total of four aircraft were used during the Op as they were swapped over upon arrival of new air and ground crews. The entire 240 task hours allocated to the Operation were flown.

b. One Pilatus Porter from 173 Gen Spt Sqn. One aircraft, three pilots and two All Trades ground crew were involved at

different times during the Operation. A total of 90 task hours were flown. This consisted of the original allocation of 70 hours with 20 additional hours allocated after being requested late in the Operation.

Aircraft usage and availability is shown at Annex G.

29. As outlined in the AAAvn Det Commander's report (Annex H) UH1H availability was of concern. The nature of helicopter mounted GPS operations involving five field parties is such that two aircraft must be on-line each day in order to achieve the rate of movement required. A third UH1H allocated to the Operation would have enabled this to be achieved. On many days air crew flew extended hours in order to achieve the moves required.

30. Use of the UH1H as a reconnaissance aircraft proved to be a costly use of the resource. Midway during the Operation a civilian Jetranger was hired from Reef Helicopters operating out of Thursday Is. The Jetranger proved ideally suited to reconaissance operations. The 20 hours flown were fundamental to UH1H usage remaining within allocated limits. Recommendations are made later on this aspect.

31. The Pilatus Porter proved to be very reliable and flexible in its tasking. Although primarily used for photography operations, several resupply and transport sorties were required. This, together with unseasonal cloudy conditions, necessitated an extra 20 task hours to be requested.

Sea Support

32. Sea Freight. Insertion and extraction of bulk stores and equipment was achieved using civilian sea freight between Cairns and Horn Is. The Torres Island Trading Company (TITC) vessel Cape Trader was used. Their contact details are shown at Annex I. This firm was most helpful in their service to the Operation. Their rates were slightly cheaper than competitors, with the added attraction that they delivered all stores to the Horn Is compound at no extra cost. Other shipping companies servicing the AO were Seaswift and Jardine Shipping. Both these companies were used during the Operation for transport of rations from Cairns to Horn Is. The choice of company to freight rations was determined by which ship left Cairns soonest after supplies were ordered.

33. Travel between Thursday and Horn Is. The ferry service between Thursday and Horn Is runs only each hour and is costly ($5 a return trip per person). Arrangements were therefore made to obtain the support of a qualified Army smallcraft operator as well as the loan

of a powered dinghy. The boat operator was provided by 18 Fd Sqn, Townsville and the dinghy supplied by C Coy 51 FNQR. This arrangement proved very successful. On most days it was necessary to cross the 2km of water on several occassions. Having the ability to do this at short notice with quick turnaround times was often essential to operations proceeding to schedule. On several occasions it was necessary to carry bulk stores between the two islands. On these occasions the QLD Police Shark Cat was kindly made available by SGT Greg Edwards, who lived on Horn Is. This was particularly helpful during the insertion of field parties onto Thursday Is.

34. Operational Sea Support. Several operational tasks were performed using support from C Coy 51 FNQR and the Naval Reserve Unit vessel (HMAS Argus). These included the establishment of a GPS station on White Rocks, that station's subsequent repanelling and the repanelling of a point on Booby Is. These tasks could not have been carried out by any other means. Execution was, by necessity, at short notice due to the rapidly changing weather conditions. Excellent cooperation existed between all concerned parties with the result that these difficult tasks were successfully completed.

Vehicles

35. Vehicles used on the operation were:

a. 1 x LR110 FFR from Unit resources,

b. 1 x LR110 RFSU type on loan from C Coy 51 FNQR,

c. 1 x Tlr 1/2 ton from Unit resources, and

d. 1 x tractor with trailer on loan from Yorke Is community.

36. The Land Rover and trailer from this Unit were sent by line haul to Cairns, then on the Cape Trader to Horn Is. The C Coy Land Rover was transferred to Horn Is early in the Operation by barge. The purpose of the vehicles was twofold. Firstly, to shuttle ground crew, passengers and stores to and from the airport to base camp - approximately one kilometre. Secondly, to carry personnel and stores the five kilometres to Horn Is wharf.

37. This Unit's vehicle showed definate signs of suspension wear as the Operation progressed. The many trips along the rough Horn Is road appeared to take their toll. The vehicle had been fully checked prior to the Operation and had only travelled a total of 46,000 km since new. Interestingly, no such wear was apparent in the C Coy vehicle, which shared tasking equally. The

RAEME mechanic attached to the Operation was able to make temporary repairs to the vehicle so that it could remain taskworthy.

Other Stores and Equipment

38. Generally stores and equipment taken on the operation were sufficient. Serviceability of equipment remained quite high. Annex C discusses the need for an increase in technical equipment by an amount equal to that required for a field survey party. Therefore for five parties, seven sets of equipment should be taken.

39. Radios. The acquisition of sufficient serviceable F1/F3 radios was a difficult task. This Unit holds 18 such sets of which only three are serviceable. It would appear that, because Raven radios are soon to be introduced, repair/replacement of old stocks has been cut back significantly. The 14 sets required for the Operation were obtained from Moorebank Log Bn, Army Svy Regt, 144 Sig Sqn and Adelaide Log Bn.

40. Field Party Generators. Approval was gained to purchase lightweight generators (1KVA) for use by field parties. Five Yamaha E1000 have been purchased. They proved to be extremely reliable, quiet and economical on fuel. Only one breakdown occurred, and this was caused by contaminated fuel. The generators were complemented by purpose built battery charging kits. These kits consisted of Arlec chargers and Gel Cell batteries housed in wooden wet cell battery boxes. These proved very convenient and were ideal for the highly mobile teams. Some work still needs to be done to optimize the charging of batteries to power the TI4100 equipment. These modifications are minor however, and once effected will constitute a significant advance in equipping field parties. More details are given in the Equipment section of Annex B.

41. Base Camp Generators. Forward base camp power was generated using 3.2KVA and 4KVA generators. Although both operated without fault, it was found that this configuration was only just sufficient. The intensive resupply requirement dictated a greater than anticipated refrigeration/freezing requirement. This combined with the conditioned power required for computing meant the generators were often operating close to their limits. In future a 10KVA generator should be used, with back up generators of the type used.

42. Lightweight Tents. After successful trial of an igloo style tent on Op Mizmaze 90, several more were purchased for this Operation. The tents were reasonably successful, however were found to be insufficiently robust for the combined effects of strong winds (35 knots) and sandy ground which were often encountered in the AO. Remedial action is being taken on this matter.

43. High Resolution Film. Experimentation was conducted into the use of Kodak 2412 film under field conditions. A full range of exposure and development parameters were tried - without much success. It is thought that different chemicals may be required, however this could not be confirmed.

44. Technical Equipment. GPS and Magnavox equipments performed very well, with only minor problems occurring. Barometers and psychrometers held by this Unit are showing definate signs of performance deterioration. These two items are now included on the RASvy equipment replacement programme.

Resupply

45. Rations. All rations were purchased using Survey Party Ration Allowance (SPRA). Although sufficient supplies were generally available from Thursday Is outlets, most rations were obtained from suppliers in Cairns. Enormous savings were made by doing this, even after freight costs were added. Arrangements made during the reconnaissance enabled suppliers to be sent orders on pre-prepared fax forms. Items were sent by ship to Horn Is where they were either picked up from the wharf or delivered to the base camp. These arrangements worked quite smoothly, however close management was required to operate with the 4-7 day lead times involved. Achieving this would not have been possible without telephone and fax facilities in the base camp on Horn Is. The flexibility afforded by SPRA was well appreciated by members of the Det. Catering staff were able to purchase the required mix of tinned food (used largely by field parties) and high quality fresh rations.

46. Urgent Replacement/Repair Items. All repair/replacement items required urgently had to be sent using the single civil air freight company servicing the AO. The success rate of items arriving on time was disappointing. Constant checking and enquiries were required during the ongoing struggle to locate items that had not been delivered within the quoted timeframes. This experience was considered 'normal' by local inhabitants. Unfortunately there was no alternative.

47. Bulk Fuel. Bulk aviation fuels were available at Horn Is airport. At times the supply of AVTUR was unreliable, both in terms of availability and access to fuel outlets. On several occasions fuel pumping equipment broke down. Difficulty was also experienced in locating the contractor so as to access pumps. Further, at times of busy civil aviation traffic, service to Army aircraft took lower priority. In addition, the amount of AVTUR available became critical at one stage due to the

collapse of the Horn Is wharf precluding the ship-to-shore movement of bulk fuel containers.

48. Drummed Fuel/LPG. Drummed fuel was supplied by arrangement through 2 Fd Sup Coy, located in Townsville. Civilian contractors were engaged to position drums at Heathlands Ranger Station (Cape York), Yorke Is and Boigu Is. Fuel dump sites are shown at Annex A. Two months lead time is the standard requirement for fuel positioning in the AO. As the Operation progressed it became obvious that UH1H usage rates were far exceeding those used when planning the drummed AVTUR requirement. Additional drums were arranged to be positioned at Yorke Is, at short notice. The rapid response by 2 Fd Sup Coy to this request meant no time was lost on the Operation. Drummed MSP, ULP, Dieso and LPG were obtained from a supplier (Rebel Marine) on Thursday Is. 200 litre drummed fuel usage for the Operation was:

a. AVTUR - 220,

b. AVGAS - nil,

c. MSP/ULP - 5, and

d. Dieso - 9

Return of empty and unused drums was arranged through SO2 POL HQ 1 MD. It is understood that separate contracts were let to retrieve drums. The current policy of drum retrieval using unit organic resources was waived for this Operation, as it was not possible given the nature of the AO.

Communications

49. A Net Control Station was established by the 3-man detachment from 2 Sig Regt. HF radios were used, field parties using F1/F3 and base camps AN/GRC 106. Communications were also maintained with aircraft supporting the Operation. Rear link to headquarters and supporting elements was by STD telephone and facsimilie.

50. The quality of communications between field parties and operations base was barely adequate. The signallers attached to the Operation did all they could with the equipment available. The Sig Det IC concluded that Raven HF radios should provide an improvement in communications quality. More detail is given at Annexes B and J.

51. The availability of STD telephone and facsimilie facilities at operating bases proved to be a critical factor in the success of the Operation. On several occasions immediate communication with operational and administrative elements were instrumental in avoiding lengthy delays. The facsimilie machine was

used much more than originally anticipated. Apart from the passage of Sitreps, it was found that most businesses/authorities in the AO preferred to send a fax rather than other forms of communication. In addition, AAAvn personnel made frequent use of this facility for daily weather forecasts as well as technical communications with their Unit HQ.

Land Clearances - Australian Territories

52. Land tenure in the AO included private property, pastoral leases, Aboriginal and Torres Strait Islander communities, National Parks and mining leases. Land clearance organisation therefore involved correspondence with numerous addressees.

53. Responsibility for land clearances in Far North Queensland lies with 51 FNQR. Initial liaison with that Unit was helpful in identifying the various owners/authorities needing to be contacted, however this Unit still needed to take up liaison with many of the interested parties in order to confirm details of our requirements.

54. The majority of arrangements were made with the following authorities:

a. National Parks and Wildlife Dept - for the use of Heathlands airstrip;

b. Great Barrier Reef Marine Park Authority - for access to Reef islands;

c. Torres Strait Island Coordinating Council (ICC) - for all matters relating to Torres Strait islands; and

d. Individual Torres Strait communities (once clearance had been gained through the ICC).

Contact details are given at Annex I.

Aspects Related to Operations in PNG

55. Customs and Quarantine. Due largely to the late inclusion of survey points in PNG in the technical plan, arrangements for Customs and Quarantine were left to be organised in the AO. A potentially significant problem was that standard practise requires all entry and exit to be via Horn Is, where the respective authorities are normally based. Because operations in PNG were to be based out of Yorke Is, these standard requirements placed an unacceptable burden on air hour and fuel resources. Fortunately, under special arrangements allowed by both authorities, entry/exit from Yorke Is was possible. It

is stressed that these concessions were achieved only after considerable dialogue between the Officer Commanding and Customs and Quarantine officials as well as formal briefings by these officials to all members of the Operation. It should not be assumed that similar arrangements will be allowed during future survey operations. It is worthy of note that these concessions would not have been possible without a facsimilie machine being available at the Yorke Is base camp.

56. Diplomatic Clearances. It became apparent during the Operation that the staff work required to gain Diplomatic Clearances for Army aircraft to operate in PNG had not been initiated. There is a mandatory 14 day between application and approval of such clearances. Fortunately there was sufficient flexibility in the Operation technical plan to enable a redeployment of field parties so as to 'fill in' the time until clearances were forthcoming.

57. Land Clearances and Local Liaison. Permission to enter PNG and carry out survey work was obtained by 8 Fd Svy Sqn on this Unit's behalf. A smooth commencement of operations in PNG was also facilitated by a two man detachment from 8 Fd Svy Sqn to Daru. They arranged such aspects as refuelling, PNG customs and quarantine and accommodation. Support on both these issues was both timely and thorough.

Finance

58. Accurate and timely financial estimates were not able to be made due to the relatively short lead times available when planning the Operation. This situation was further compounded by the complex / uncertain command and control status of 4 Fd Svy Sqn as well as the lack of any formal financial instructions. Consequently, there was considerable uncertainty regarding financial aspects when the Operation was mounted.

59. Expenditure was as follows:

a. Travel and Subsistence (T and S) - $9885.75;

b. Freight and Cartage (F and C) - $19263.65;

c. Petty Cash - $948.57;

d. Survey Party Ration Allowance (SPRA) - $18976.76; and

e. Civilian Air Charter - $15819.00.

60. The funds expended under F and C were considerably more than forecast requirements. The cause

of this was a misunderstanding of the civilian sea freight charge rates. Prices quoted were thought to be per tonne, however it turned out to be per tonne or per cubic metre, whichever is the greater.

61. SPRA expenditure was well below the forecast figure of $35000. As explained in paragraph 45, significant savings were made by purchasing rations through suppliers in Cairns. The estimate of SPRA required was based on Thursday Is prices. Another contributing factor was that the Operation was completed seven days earlier than planned.

Pay

62. Prior to deployment members were advised that the National Australia Bank (NAB) facilities on Thursday and Yorke Islands were the only banking outlets in the Torres Strait. Members who needed access to funds were required to open a Passbook Account at a NAB branch prior to deployment. No problems with this arrangement were encountered.

Allowances

63. The following allowances were paid:

a. Travelling Allowance. Advance party members received full TA for the first day of the Operation when civilian accommodation in Cairns was required. During the remainder of insertion and extraction activities incidental and meal elements of TA were paid where applicable.

b. District Allowance. District allowance was paid in retrospect in accordance with INDMAN Vol 1, Chap 3, using Thursday Island rates (DIS14), $108.16 per fortnight.

c. Field Allowance. Field allowance was paid at a rate of $13.44 per day.

d. Separation Allowance. After a 14 day qualifying period, Separation Allowance was paid to Category M members at a rate of $4.10 per day.

e. Flying Allowance (AAAvn aircrew). Flying allowance was paid to AAAvn aircrew at the applicable rate depending on rank.

Medical

64. Health of members was generally quite good throughout the Operation. The only exception was the incidence of heavy colds which effected several members early in the Operation. Details of medical aspects are given in Annex F.

65. Malaria. Whilst in the AO the topic of malaria prevention was discussed with many of the local inhabitants. It would seem that the malaria protection and eradication measures used for members of the Operation is somewhat different to common practise in the AO. Annex K is a copy of a letter written by the Superintendant of the Thursday Is Hospital on this matter.

Dress

66. Due to the hot and humid conditions dress around base camps was :

a. Squadron T-Shirt;

b. Black Shorts (all one brand);

c. GP Boots with khaki socks; and

d. Hat KFF.

Discipline

67. There were no incidents requiring disciplinary action. The good conduct of the troops was the subject of many compliments passed by local inhabitants.

Morale

68. Morale remained high throughout the Operation.

Rest

69. It is important to note that on an operation such as this, where field parties are under considerable pressure due to the their high degree of mobility, a rest day about every 10 days must be programmed. Three such rest days were given to field party members during the Operation. These were most welcome.

70. Members on the Operation accrued rest days in accordance with the Operation's Administrative Instruction. These days were taken immediately upon return to home Units.

Visitors

71. The following personnel visited, or were temporarily attached to, the Operation:

a. Mr David Trail
Bureau of Mineral Resources
18Jul - 25Jul91;

b. Mr Bob Byrne
Bureau of Mineral Resources
8 - 20Aug 91;

c. MAJ K. Boehme, WO2 Buckley, SGT Mason and Ms L. Keen.
Defence PR
24 - 30Jul91;

d. LTCOL P.H. Cates
DSVY-A
31Jul - 2Aug91;

e. LTCOL R. van den Tol, MAJ M. Perry and MAJ W. Smith.
Army Svy Regt
9 - 12Aug91;

f. GEN P.C. Gration AC, OBE
CDF
24Jul91; and

g. Rt Hon E.V. Lindsay, Rt Hon I.M. Sinclair, Rt Hon R.G. Halverson OBE, Sen D.J. Macgibbon and Ms J. Gould.
Members of the Defence Subcommittee of the Joint Committee on Foreign Affairs, Defence and Trade.
6 - 7Aug91.

Public Relations

72. Public relations played an important part in the Operation. There are numerous government and semi-government authorities which need to be consulted and kept informed when operating in the Cape York / Torres Strait region. Staff of C Coy 51 FNQR were instrumental in providing direction and support in this aspect.

73. The ADF is held in high regard in the AO, and all efforts were made to ensure this good relationship continued. There were many occasions when members of the Operation cooperated with, or became involved in, local events.

74. The Operation was covered by the local media. Early in the Operation an article appeared in the local

newspaper (Torres News). A radio interview with the Officer Commanding was broadcast several times during the Operation.

75. A Defence PR Team stayed at the Horn Is base during the period 24 - 30 Jul 91. The purpose of their visit was to obtain source data (video, interviews etc) from which a number of products could be made. Possible products include a short television documentary, Army training video or short stories for newspapers (including Army). At the time of writing it is understood that the video documentary is well under way.

Amenities

76. 4MD Amenities Fund provided a colour television for use on the Operation. This proved to be a valuable asset, with members appreciating being able to keep informed of news, current affairs and , of course, sport.

77. Canteen. A canteen account was opened by members contributing $50 in advance. 4 Fd Svy Sqn canteen supplemented this so that sufficient funds were available to purchse initial stocks. This was necessary as resupply required 7 days lead time. Resupply was from suppliers in Cairns, as for the rations. Costs for canteen items on Thursday Is were extremely high.

78. Mail. Several problems were experienced with mail deliveries. Best results were obtained by civilian mail service direct from the point of origin to Thursday Is Post Office. A member of the Det collected mail from the Post Office daily.

Contact Information

79. Listed at Annex I are the details of military HQ and units, civil authorities, commercial enterprises and individuals commonly contacted during the planning and conduct of the Operation.

CONCLUSIONS

80. Despite the difficulties arising from short lead times and command and control problems, Op Aright 91 (Control) was undoubtedly a successful survey operation. This is due mainly to the dedicated professional performance by members of the Operation.

81. Planning Lead Times. The planning of the Operation was severely hindered by the lack of appropriate lead times. The main problems arose in obtaining the major resources by late request (eg: personnel, aircraft, air hours, finance).

82. Command and Control. The complex command and control status of 4 Fd Svy Sqn had significant impact during planning and preparation for the Operation. Briefly, the official status of the Unit is that it is under command Army Survey Regiment, under command HQ 4 MD for administration, under technical control of DSVY-A and placed under operational control of LHQ whilst conducting field survey operations. In addition, DSVY-A are responsible for financial delegations used to mount field operations. Clearly, when trying to organise an Operation such as this, a multitude of command channels is far from ideal. There were two particular areas of concern with respect to command and control:

a. The lack of and lateness in the issue of formal orders and instructions. Land Headquarters Operation Order 8/91 (Reference B) was received on 3 Jun 91, some four weeks prior to deployment. At that stage the order was confirmation only of previously known information. There was no mounting instruction issued. Mounting details were disseminated in a piecemeal fashion direct by this Unit to units supporting the Operation.

b. Staff work in preparation for operations in PNG was inadequate. The main issues were the lack of timely arrangement of diplomatic clearances and that customs and quarantine arrangements were left to be sorted out in the AO. The late treatment of these issues meant there was enormous potential for operations to be significantly disrupted. Fortunately, good luck prevailed.

83. Deployment / Extraction. The deployment / extraction of the Operational force was complex and had to be conducted over an extended period. This could have been significantly simplified had clearance been gained to land C130 aircraft at the Horn Is airstrip. These aircraft have landed at this airstrip in the past. It would be geatly beneficial to all military operations in the AO if this matter could be resolved. A less attractive alternative would be clearance for C130 operations into Bamaga airstrip.

84. Conduct of Operations. In general the routine conduct of operations went very smoothly. This was due mainly to the dedicated effort put in by all members of the Operational team. All elements worked long hours over extended periods in order to achieve their individual objectives. There were several significant shortcomings in resources available to conduct the operation. Recommendations to rectify these are contained in the next section.

85. Supporting Elements. All supporting elements worked well as part of the Operational team. Special mention needs to be made of the support provided by 51 FNQR. Both Bravo and Charlie Companies provided much needed support, many times at short notice. Their understanding of the AO and established links with the local authorities and inhabitants proved to be invaluable.

RECOMMENDATIONS

86. Recommendations are drawn both from previous sections of this report as well as the attached annexes. It is recommended that:

a. 4 Fd Svy Sqn be placed under command LHQ in order to overcome the complications associated with its current command status.

b. Every effort be made to conform with lead times required for resource allocation when rescheduling RASvy field operations. These resources should be determined by a detailed technical and logistic reconnaissance.

c. Future operations be preceeded by timely mounting orders and instructions. These must cover, in detail, matters such as major resources, financial allocations, non-organic personnel and logistic support and administrative mounting details.

d. Arrangements concerning operations in overseas countries be formalised prior to deployment to the AO (ie: Customs, Quarantine and Diplomatic Clearances)

e. Aircraft support for future GPS operations of this type and magnitude consist of the following:

(1) 3 x UH1H for survey party movement,

(2) 1 x LOH for reconnaissance and UH1H back up, and

(3) 1 x Nomad for aerial photography and movement of personnel and stores.

f. 51 FNQR staff be consulted in detail when developing operational plans for this AO.

g. Where drummed fuel is required for UH1H operations, two drums of fuel per flying hour plus 20% be planned for.

h. For future operations consideration be given to positioning spare drummed fuel at Horn Is to supplement the currently unreliable bulk fuel supply.

i. Organic means of water transport between Horn and Thursday Is is essential for operations based on Horn Is.

j. Raven radios be made available for use on field survey operations as soon as possible.

k. A 10 KVA generator be used for the power requirements of forward operating bases of the type in this Operation. Back up of two 3-4 KVA generator sets is required.

l. Two complete sets of field party stores be deployed as spares on future operations.

m. Telephone facilities be made available in GPS operations base camps.

n. GPS data processing and associated records maintenance be conducted by two appropriately trained technicians.

o. An air conditioned / low dust room be made available for GPS post processing where possible.

p. Dust covers for disc drive openings on the TI PPCs be acquired.

q. Two part continuous feed A4 computer paper be purchased for printing base line reports.

r. Porta pottis be used on future ops where environmental considerations preclude the use of standard field latrines.

s. Further investigation into the malaria prevention issue be conducted prior to the next operation in the AO.

t. The following technical issues be addressed:

(1) Further investigation be conducted into computing baselines less than 30 km using GEOMARK double differencing.

(2) Investigations continue into the effects of selective availability on GPS positioniing.

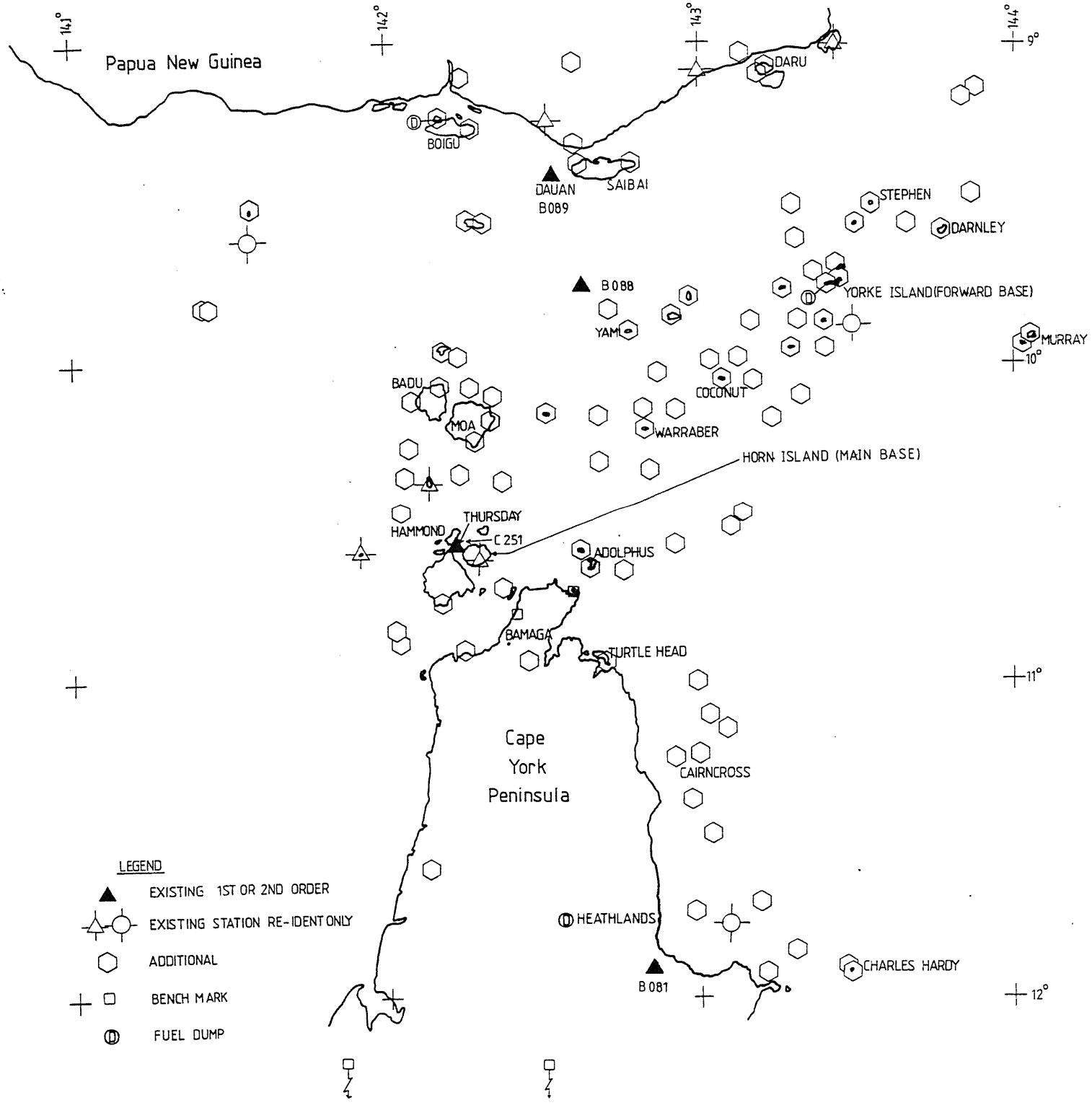
(3) If Doppler observations are required for future operations, then appropriate training be conducted at 4 Fd Svy Sqn immediately prior to deployment.

5 December 1991

L.A. NEWTON
Major
Officer Commanding

ANNEX A TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

AREA OF OPERATIONS



ANNEX B TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

TECHNICAL REPORT

References: A. DSVY-A Technical Directive AS474-5-123, dated 25 Mar 91.

B. DEFARM CAMPBELL Z2Y/JQD SVY 3516 232330ZJUN91, Amendment to DSVY-A Technical Directive.

C. Army Svy Regt Control/Photography Proposal - Cape York and Torres Strait, dated 18 Dec 90.

D. DEFARM CAMPBELL Z2Y/JQC SVY 3950, 080110ZJUL91, Amendment to DSVY-A Technical Directive.

E. 1 Topo Svy Sqn 611-1-1, Dated 10 Apr 91, Vital Asset Protection Product Requirements

F. RASVY SOP for GPS Equipment, dated Mar 88.

G. RASVY SOP for Transit Doppler, dated 10 Dec 84.

H. DSVY-A TI302, GPS Standards and Specifications for Control Surveys, dated Jul 91.

I. DSVY-A TI307, Transit Doppler Standards and Specifications, dated Mar 88.

J. DSVY-A TI305, Targeting and Identification Photography, dated 11 Jul 91.

INTRODUCTION

1. Operation Aright 91 (Control) was a GPS control survey operation conducted by Detachment 4 Fd Svy Sqn in the Cape York / Torres Strait region of Queensland during the period 8 Jul - 5 Sep 91.

2. The aim of the Operation was to establish survey control for future 1:50 000 scale topographic mapping of the region. The Area of Operations, which is illustrated at Annex A, includes part of the southern Papua New Guinea mainland and comprises the following 1:250 000 map sheets:

a. SC 54-7 BOIGU,

b. SC 54-8 DARU,

c. SC 54-11 THURSDAY ISLAND,

d. SC 54-12 CAPE YORK,

e. SC 54-15 JARDINE RIVER, and

f. SC 54-11 ORFORD BAY.

3. As well as the requirements stated in Para 2, Det 4 Fd Svy Sqn was also tasked to collect data suitable for the production of large scale Vital Asset Protection (VAP) products.

SPECIFIC TASKS

4. In accordance with References A to E, Det 4 Fd Svy Sqn was tasked to carryout the following specific tasks:

a. Establish and coordinate horizontal control stations as required by Reference C, using TI4100 GPS receivers in relative positioning mode. Points were to be established to 3rd Order or higher.

b. Carry out additional control acquisition involving both GPS relative positioning and Doppler Point Positioning. The purpose of this was to strengthen the Australian geodetic network in the Torres Strait region, as well as connecting the PNG geodetic network to the Australian network.

c. Post process GPS data to determine all baselines and provisional coordinates whilst in the AO. Network misclosures were not to exceed 30 ppm. The WGS84 datum was to be used for all computations.

d. Ground mark control stations in accordance with the standards outlined in Reference A.

e. Target existing and new control stations required by Reference C.

f. Positively identify all targeted control stations on identification photography.

g. Connect stations to sea level wherever possible.

h. VAP Mapping. The following data was required for VAP mapping:

(1) aerial photography of Horn Is, QLD at various altitudes, vertical and oblique;

(2) Schematic diagrams, plans and charts of the Horn Is wharf and airport; and

(3) identification of key areas/points.

5. All technical requirements were to be in accordance with References F to J.

6. Although not stated in Reference A, a task routinely undertaken when operating in a 'new' AO is to collect data to enable compilation of photographic interpretation guides (PIGs).

OPERATIONAL RESULTS

GPS Observations

7. All GPS Observations were successfully completed with better than expected results. The average precision of all GPS sessions was 5.36 ppm, well under the maximum allowable 30ppm. Reference C identified 111 control points to be either observed (GPS) and photographed or simply photographed. A breakdown of the final outcome is as follows:

a. New stns with GPS Obs and Photo Ident 69;

b. New stn with GPS Obs only 1;

c. Existing stns with GPS Obs and Photo Ident 31;

d. Existing Stns, re-ident only 6;

e. Stns deemed to be unsuitable as they were below Mean High Water ..3; and

f. Stn unable to be occupied .....1.

Total	111

8. The new station with GPS only and no photo ident was C539 (S10°04' E143°10'). Following the GPS observations

it was discovered that the station was well below Mean High Water.

9. The three stations that were deemed unsuitable, as they were below mean high water, were:

a. C338, S09°28' E143°52',

b. C510, S09°11' E143°50', and

c. C507, S09°32' E143°18',

These stations were discarded from the network.

10. The stn that was unable to be occupied was C288 S10°18' E142°40'. The stn was situated on Harvey Rocks and due to the continual inclement weather it was impossible to insert a GPS party onto the rocks.

11. 'Work around' solutions for the situations outlined in Paragraphs 8, 9 and 10 have already been submitted to Army Svy Regt.

12. The Station Listing, the Network Diagram and the GPS Observations Report are attached at Appendices 1 to 3 respectively.

GPS Computations

13. Whilst in the AO all baselines were computed and provisional coordinates determined for all stations. Even though the final results were very good, problems were encountered when processing baselines less than 30 km. Three major issues that became apparent during the Operation were:

a. At least two personnel are required to man the computations section for an operation of this type and size.

b. An air conditioned computer room is needed in the AO.

c. Further investigations are needed into the problem of computing baselines less than 30km long using Geomark Double Differencing.

14. The GPS Computations Report is contained at Appendix 4.

Additional Control Acquisition

15. All additional control requirements were satisfied including six Doppler stations which were observed to

Doppler 1 specifications. Doppler observations were carried out on the following stations:

a. C251, S10°35' E142°13',

b. C528, S10°12' E142°49',

c. EE Yorke, S09°45' E143°24',

d. C246, S09°09' E143°52',

e. C507, S09°31' E143°17', and

f. B089, S09°25' E142°32',

16. The planned locations of some of the Doppler Stations were changed as follows:

a. C251 - no change,

b. from C493 to C528,

c. from C542 to EE Yorke,

d. C246 - no change,

e. from C500 to C507, and

f. B089 - no change.

17. These changes were initiated so that the Doppler Stns were located on a GPS pivot stns.

18. The Doppler Observations Report is attached at Appendix 5.

Ground marking

19. Ground marking was carried out IAW Reference A. A high percentage of stns were located in sand and required deep penetration rods.

Targeting

20. All stations were targeted IAW Reference J. It is recommended that the following plastic types be used for future operations:

a. On Sand. Matt black plastic.

b. On sand covered with grass. White plastic with black bunting surrounds.

c. All other locations. White plastic.

21. 4 Fd Svy Sqn has already submitted, to DSVY-A, a proposed amendment to Reference J, as a result of the findings on Op Aright 91 (Control).

Sea Level Connections

22. IAW Reference A sea level connections were carried out where practicable. A summary of sea level connections is contained in Appendix 1. As a follow up to the Operation a request has been sent, via DSVY-A, to the Hydrographer RAN seeking tidal information.

Aerial Photography

23. Whilst in the AO all but five photo idents were obtained by Det 4 Fd Svy Sqn. The remaining five were subsequently obtained by AUSLIG during the period 5 Sep to 5 Oct 91. The last stn to be photographed was C502 on Buru Is. C Coy 51 FNQR repanelled this stn on Saturday 5 Oct 91 and it was immediately photographed by AUSLIG. C Coy also photographed the stn using a 35 mm camera at 2,000ft, 5,000ft and 10,000ft.

24. The Aerial Photography Report is contained in Annex C.

VAP Mapping Requirements

25. All requirements were satisfied except for the following:

a. high altitude (20 000 ft) and oblique aerial photographs of Horn Is due to insufficient acft hr, and

b. schematic diagrams, plans and charts of the Horn Is wharf and airport.

26. The VAP Report is Appendix 2 to the Aerial Photography Report at Annex C.

EQUIPMENT

27. Very few equipment problems were encountered apart from the need to replace a GPS antenna, and at times, a shortage of technical equipment caused by the deployment of six GPS parties. However, the following observations were

made:

a. GPS Party Stores. Sufficient technical stores were taken to deploy six GPS parties. When the need arose to deploy all six parties no spares were available if required. It is recommended that at least two complete sets of GPS party stores are deployed for an operation of this nature, this will allow more flexibility in op planning and will provide the necessary spares if required.

b. Power supply boxes. Prior to deployment three power supply boxes, which consisted of two 12v gel cell batteries and two Arlec battery chargers housed in a wooded battery box, were built by Sydney Workshop Coy. Two more power supplies were built in the AO. These power supplies worked effectively however the power required to run the GPS exceeded the charge rate of the power supply. As a consequence many hours of battery charging were required to keep the gel cells fully charged. In the event of a generator failure the power supplies would quickly became inadequate. The power supplies need to be modified so that they can be recharged at a higher rate than the output required by the GPS receiver. This problem can be overcome by using a higher amperage ARLEC charger in the power supplies. 4 Fd Svy Sqn and Sydney Wksp coy are currently working on this problem.

c. Baromecs. Although the baromecs were calibrated prior to deployment, some doubt exists as to their accuracy. 4 Fd Svy Sqn, in conjunction with SO2 Equip, DSVY-A, are currently looking at a suitable replacement item.

d. Radios. Being able to acquire sufficient F1 radios prior to deployment was a real headache. This was caused by an overall lack of serviceable radios being available throughout the Army. With the introduction of RAVEN radios it is anticipated that this situation will further deteriorate. 4 Fd Svy Sqn's priority for being issued RAVEN radios is such that we are on the borderline between being issued RAVEN radios or being issued a civilian equivalent. Good radio communications are essential for GPS surveying and during the Operation the

communications could only be described as barely adequate. Considering these factors it is felt that the situation needs to be resolved prior to the next operation in 1992.

e. Towers. The following towers were used during the operation:

(1) 2 x Pneumatic Towers. No problems were encountered with the pneumatic towers. The towers were through loaded in the UH1H helicopters eliminating the requirement for sling loading.

(2) 2 x Bush Towers (Extended Tripods). These towers were a valuable asset and were used on a number of stations. They have a maximum height of approximately four metres and consist of a T2 theodolite tripod (non extendable), tent poles, knuckles and guy ropes.

(3) 1 x Zippo Tower (Polytech Industries). 4 Fd Svy Sqn was approached by Polytech Industries to trial their Zippo Tower which is still in the development stage. Members of 4 Fd Svy Sqn were trained in the use of the tower prior to deployment by members of Polytech. Unfortuately, due to gear box failure, the tower was only used once during the operation. Polytech are currently developing a new gearbox which should overcome the problems encountered with the prototype. The suitability of this tower for survey operations is yet to be determined. Further trials are needed once the new gear box has been manufactured.

COMMUNICATIONS

28. Communications over long distances (250km), were at times, very poor. Further deterioration occurred when the GPS equipment was operating, especially when the tape drive was recording. Radios needed to be positioned as far as possible away from the GPS receivers.

29. The NCS maintained a listening watch during the following hours:

a. from 0730hr to approx 1800hr,

b. a 24hr listening watch if the location of the survey parties was considered inhospitable, and

c. whenever acft were flying.

30. Routine radio schedules were maintained with the survey parties as follows:

a. 0800hr, morning sched;

b. when arriving at new location;

c. 10 mins before start of scenario to confirm navigating;

d. 10 mins before end of scenario in case an extension to the scenario was needed;

e. 10 mins after scenario to confirm successful session;

f. 1600hr - sitrep; and

g. approx 1800hr - shut down.

CONCLUSION

31. Op Aright 91 (Control), technically, was a very successful operation. This success, to a large extent, can be attributed to the professionalism and dedication of the GPS parties.

RECOMMENDATIONS

32. Listed below is a summary of the recommendations from this Annex and the attached Appendices:

a. Equipment. It is recommended that:

(1) At least two complete sets of spare GPS party stores be deployed,

(2) the power supply boxes be modified to allow the gel cell batteries to be recharged at a higher rate than the output required by the GPS receiver,

(3) a suitable replacement item be procured for the existing baromecs, and

(4) 4 Fd Svy Sqn be issued with RAVEN radios or a civilian equivalent prior to the next survey operation in 1992.

b. GPS Observations. It is recommended that:

(1) further investigations be conducted into the problem of computing baselines, less that 30km, using Geomark Double Differencing;

(2) further investigations be conducted into the effects of Selective Availability on Relative Positioning and Gesar Point Positioning;

c. GPS Computations. It is recommended that:

(1) The data processing section for GPS operations consist of two people employed full time on GPS computations and associated records maintenance. Both the operators need to be fully conversant with all aspects of post processing. Pre operation training should include GPS post processing for the members identified.

(2) Air-conditioned computing facilities be made available for future field based GPS post processing.

(3) A suitable replacement to the CFC based tape head cleaning fluid be identified and introduced into service as soon as possible.

(4) The addition of dust covers over the disk drive openings on the TIPPCs be investigated to minimise dust build up in less than favourable working conditions.

(5) Connections to MEMTEC tape drives be checked for serviceability.

(6) Further investigations be instigated into the problem of computing baselines using Double Differencing.

(7) Two part continuous feed A4 computer paper be purchased for printing baseline reports and associated input records.

d. Doppler Observations. It is recommended that if doppler observations are required for future ops, Magnavox trg be conducted at 4 Fd Svy Sqn prior to deployment.

N.J. STONE
Captain
OPS OFFR

Oct 91

Appendices:

1. Station Listing
2. Network Diagram
3. GPS Observations Report
4. GPS Computations Report
5. Doppler Observations Report

APPENDIX 1 TO
ANNEX B TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

STATION LISTING

Tabulated below is the station listing for Op Aright 91 (Control):

Serial	Stn No	Geographicals	GPS Obs	SL Conn	Remarks
(a)	(b)	(c)	(d)	(e)	(f)
1.	C251	S10°35' E142°13'	yes	no	Existing stn, Doppler Observations
2.	C275	S10°22' E142°21'	yes	no	Existing stn
3.	C274	S10°21' E142°13'	yes	no	Existing stn
4.	C497	S10°21' E142°07'	yes	yes	New stn
5.	C514	S10°21' E142°03'	yes	no	New stn
6.	C492	S11°34' E142°09'	yes	no	New stn
7.	C512	S12°40' E141°50'	yes	no	New stn, levelled to NMVB304A
8.	C513	S12°40' E142°41'	yes	no	New stn, levelled to EK58
9.	B081	S11°55' E142°51'	yes	no	Existing stn
10.	C485	S11°44' E142°58'	yes	yes	New stn
11.	C178	S11°56' E143°12'	yes	no	Existing stn
12.	Bird Is	S11°46' E143°05'	no	no	Existing stn, re-ident only
13.	C484	S11°42' E143°11'	yes	yes	New stn
14.	C483	S11°51' E143°17'	yes	yes	New stn
15.	C481	S11°55' E143°29'	yes	no	New stn
16.	C482	S11°54' E143°28'	yes	no	New stn
17.	C486	S11°29' E143°01'	yes	yes	New stn
18.	C487	S11°23' E142°58'	yes	yes	New stn
19.	C488	S11°14' E143°00'	yes	yes	New stn
20.	C517	S11°15' E142°55'	yes	yes	New stn
21.	C489	S11°09' E143°05'	yes	yes	New stn
22.	C490	S11°06' E143°01'	yes	yes	New stn
23.	C491	S11°00' E142°59'	yes	yes	New stn
24.	C283	S10°57' E142°43'	yes	no	Existing stn
25.	B648	S10°40' E142°40'	yes	no	Existing stn
26.	C515	S10°40' E142°45'	yes	yes	New stn
27.	C493	S10°35' E142°56'	yes	yes	New stn
28.	B649	S10°36' E142°37'	yes	no	Existing stn
29.	C519	S10°44' E142°35'	yes	no	New stn, levelled to NMVB467
30.	C516	S10°57' E142°25'	yes	no	New stn
31.	NMVB460	S10°48' E142°24'	yes	no	Existing BM
32.	C518	S10°42' E142°25'	yes	yes	New stn
33.	C132	S10°55' E142°15'	yes	no	Existing stn

APPENDIX 1

Serial	Stn No	Geographicals	GPS Obs	SL Conn	Remarks
(a)	(b)	(c)	(d)	(e)	(f)
34.	C135	S10°45' E142°11'	yes	no	Existing stn
35.	C262	S10°50' E142°01'	yes	no	Existing stn
36.	C261	S10°53' E142°02'	yes	no	Existing stn
37.	C277	S10°27' E142°03'	yes	no	Existing stn
38.	NMB368	S10°37' E142°18'	no	no	Existing stn, re-ident only
39.	NMB367 (Booby Island)	S10°35' E141°55'	no	no	Existing stn, re-ident only
40.	C271	S10°06' E142°04'	yes	no	Existing stn
41.	C498	S10°15' E142°17'	yes	no	New stn
42.	C521	S10°03' E142°10'	yes	no	New stn
43.	C520	S10°16' E142°04'	yes	no	New stn
44.	C526	S09°57' E142°10'	yes	yes	New stn
45.	C525	S09°57' E142°13'	yes	no	New stn
46.	C267	S10°06' E142°21'	yes	no	Existing stn
47.	C522	S10°04' E142°16'	yes	no	New stn
48.	C523	S10°10' E142°20'	yes	no	New stn
49.	C524	S10°09' E142°30'	yes	yes	New stn
50.	C527	S10°10' E142°40'	yes	yes	New stn
51.	C241	S10°09' E142°49'	yes	yes	Existing stn
52.	C528	S10°12' E142°49'	yes	no	New stn, Doppler Observations
53.	C529	S10°20' E142°50'	yes	yes	New stn
54.	C494	S10°31' E143°05'	yes	yes	New stn
55.	C292	S10°10' E142°56'	yes	yes	Existing stn
56.	C495	S10°28' E143°08'	yes	yes	New stn
57.	C531	S10°03' E143°04'	yes	yes	New stn
58.	C322	S09°58' E143°07'	yes	yes	Existing stn
59.	T Dove	S09°59' E143°02'	yes	yes	Existing stn
60.	C537	S10°02' E142°52'	yes	yes	New stn
61.	C534	S09°51' E142°43'	yes	no	New stn
62.	C305	S09°50' E142°43'	yes	yes	Existing stn
63.	B088	S09°46' E142°38'	yes	no	Existing stn
64.	C533	S09°48' E142°58'	yes	yes	New stn
65.	C535	S09°51' E142°54'	yes	no	new stn
66.	C320	S09°52' E143°11'	yes	yes	Existing stn
67.	C536	S09°46' E143°15'	yes	yes	New stn
68.	C539	S10°04' E143°10'	yes	yes	New stn, no photo ident, stn below MHW
69.	C496	S10°10' E143°14'	yes	yes	New stn
70.	C323	S09°58' E143°18'	yes	yes	Existing stn
71.	C540	S10°06' E143°19'	yes	yes	New stn
72.	C538	S09°52' E143°18'	yes	yes	New stn
73.	C541	S09°57' E143°24'	yes	yes	New stn
74.	C509	S09°53' E143°29'	yes	yes	New stn
75.	C543	S09°52' E143°24'	yes	yes	New stn
76.	C553	S09°55' E144°03'	yes	no	new stn
77.	C511	S09°57' E144°02'	yes	no	New stn
78.	C542	S09°44' E143°27'	yes	yes	New stn

APPENDIX 1

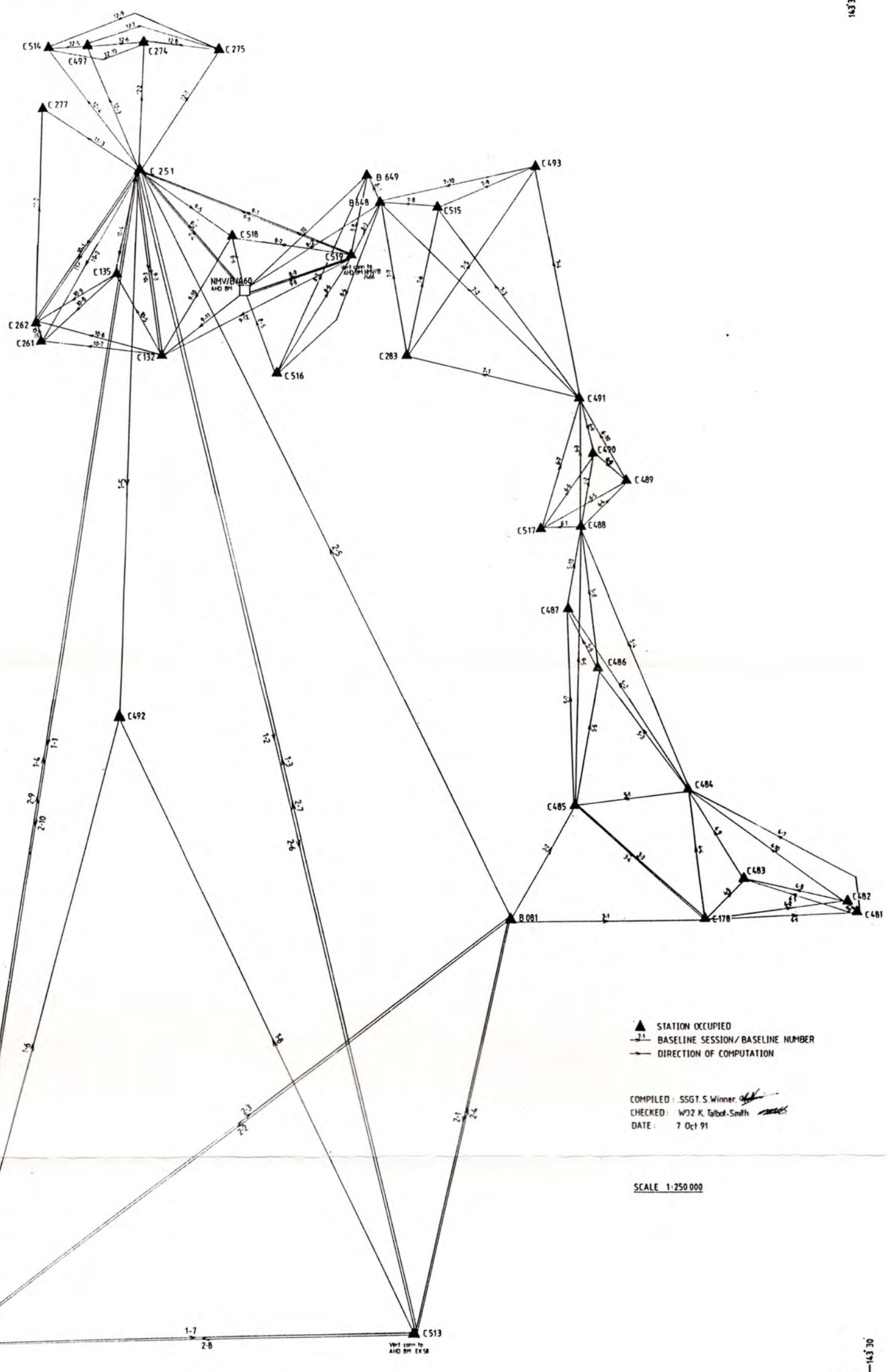
Serial	Stn No	Geographicals	GPS Obs	SL Conn	Remarks
(a)	(b)	(c)	(d)	(e)	(f)
79.	C545	S09°35' E143°46'	yes	no	New stn
80.	EE Yorke	S09°45' E143°24'	yes	yes	Existing stn, Doppler Observations
81.	C499	S09°41' E143°25'	yes	yes	New stn
82.	G.G. Marsden	S09°42' E143°21'	yes	yes	Existing stn
83.	C508	S09°37' E143°18'	yes	yes	New stn
84.	C547	S09°30' E143°33'	yes	no	New stn
85.	C334	S09°34' E143°29'	yes	yes	Existing stn
86.	C546	S09°34' E143°39'	yes	yes	New stn
87.	C548	S09°23' E142°37'	yes	yes	New stn
88.	C506	S09°23' E142°46'	yes	no	New stn
89.	AA859	S09°03' E143°06'	yes	no	New PNG stn
90.	AA440	S09°05' E143°12'	yes	no	Existing PNG stn
91.	C246	S09°09' E143°52'	yes	no	Existing stn, Doppler Observations
92.	C532	S09°08' E143°52'	yes	yes	New stn
93.	AA858	S09°18' E142°35'	yes	no	New PNG stn
94.	AA857	S09°04' E142°36'	yes	no	New PNG stn
95.	PCP110	S09°00' E143°25'	no	no	Existing PNG stn, re-ident only
96.	AA469	S09°05' E143°00'	no	no	Existing PNG stn, re-ident only
97.	AA477	S09°15' E142°31'	yes	no	Existing PNG stn
98.	C504	S09°14' E142°10'	yes	no	New stn
99.	C505	S09°16' E142°16'	yes	no	New stn
100.	B089	S09°25' E142°32'	yes	no	Existing stn, Doppler Observations
101.	AA860	S09°06' E142°14'	yes	no	New PNG stn
102.	C502	S09°33' E142°16'	yes	no	New stn
103.	C503	S09°33' E142°19'	yes	no	New stn
104.	C507	S09°31' E143°17'	yes	yes	New stn, Doppler Observations
105.	C500	S09°50' E141°25'	yes	yes	New stn
106.	C501	S09°50' E141°26'	yes	yes	New stn
107.	C340	S09°37' E141°34'	no	no	Existing stn, re-ident only

OPERATION ARIGHT 91
GPS NETWORK DIAGRAM

SESSION 1-12

10° 15'
14° 30'

10° 15'
14° 30'



COMPILED : SSGT. S. Winner.
CHECKED : WO2 K. Talbot-Smith
DATE : 7 Oct 91

SCALE 1:250 000

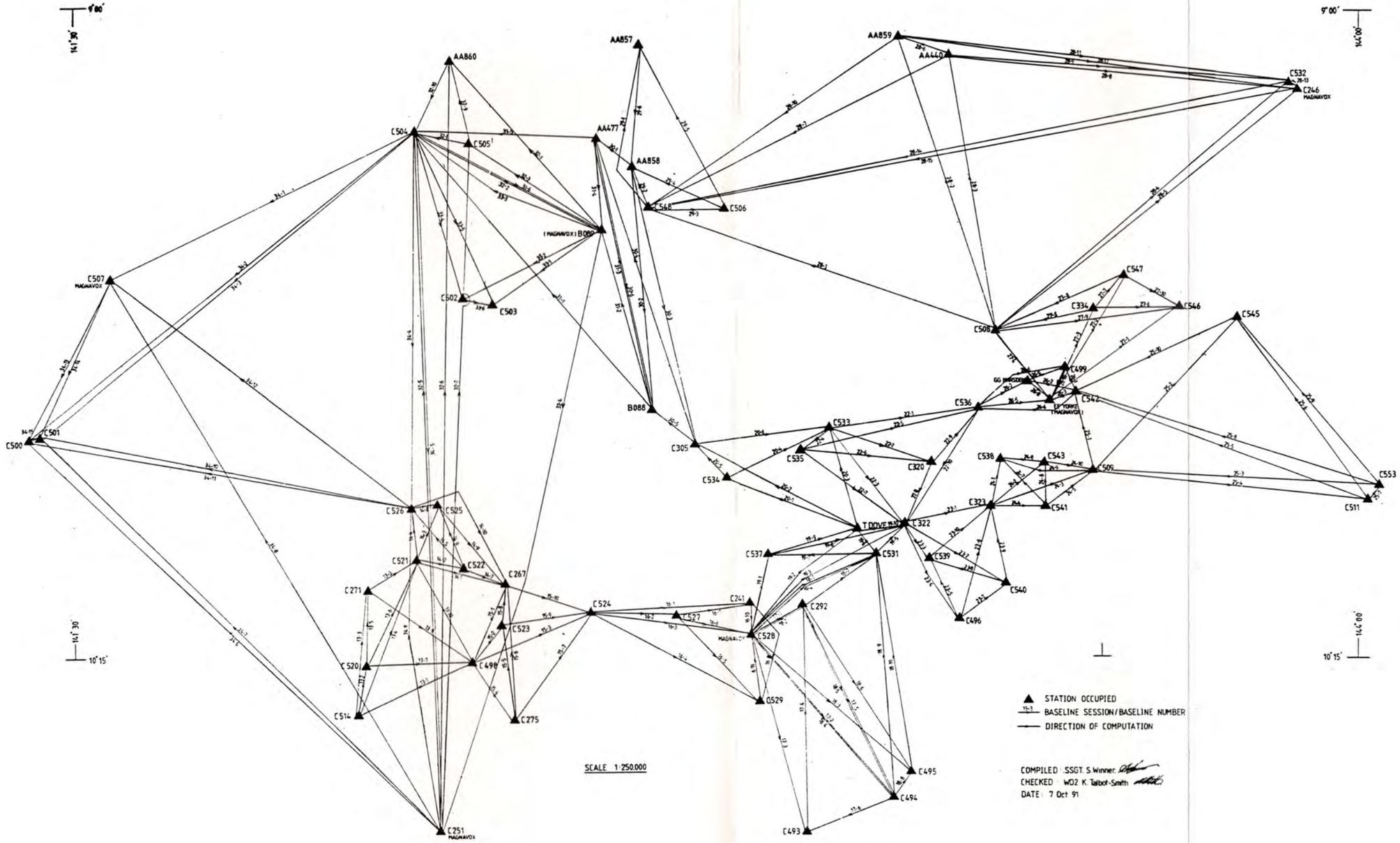
145° 30'
12° 45'

145° 30'
12° 45'

APPENDIX 2 TO
ANNEX B TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

OPERATION ARIGHT 91
GPS NETWORK DIAGRAM

SESSION 13-34



SCALE 1:250,000

COMPILED : SSGT. S Winner
CHECKED : WO2 K. Talbot-Smith
DATE : 7 Oct 91

APPENDIX 3 TO
ANNEX B TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

GPS OBSERVATIONS REPORT

Introduction

1. GPS Observations were conducted during the period 18 Jul to 22 Aug 91. Apart from four sessions, five GPS parties were deployed throughout the Operation. 34 GPS sessions were observed using Relative Positioning techniques, thus providing provisional coordinates for 101 survey stations. 302 baselines were measured and subsequently computed. Baseline lengths ranged from 0.2 km to 235.0 km.

Technical Preparation

2. Control requirements, including observing windows, were received from the Army Svy Regt in Dec 90. GPS sessions were subsequently planned in accordance with the Technical Directive and then submitted to the Army Svy Regt for approval. The GPS network was designed to ensure that most adjacent stations were observed in the same session and that the shape of the session would be suitable for post operation network adjustment using NUGAN.

3. Prior to deployment there were concerns over the accuracies that were obtained using Relative Positioning techniques on previous GPS surveys ie. Melville Island, Albury/Wodonga, P&EE and pre-op trg at 4 Fd Svy Sqn. Problems were being experienced with the inability to successfully compute baselines less that 30km using Geomark Double Differencing. As a result it was decided to increase the observing period from 50min to 75min to ensure the required accuracies could be obtained. It was considered at the time that Selective Availability was the cause of the problems.

4. Along with the concerns over Relative Positioning computations, it was identified that any results obtained by Gesar Point Positioning would not satisfy the technical requirement. It was then decided that the proposed Gesar stations would be observed using Doppler (Magnavox MX 1502). The impact was significant in that the observation time would increase from four hours to approximately three days. Limited operator expertise also caused concern.

Pre-Operation Training

5. To ensure all GPS parties were properly prepared, two weeks of full time pre-op trg was conducted at 4 Fd Svy Sqn. The trg programme covered all tasks required of a GPS party.

6. The trg conducted on the Magnavox MX1502 was only familiarization as at that time the Magnavox was only going to be used as a back up. It was only just prior to deployment that the decision to substitute GPS Gesar for Doppler was made. Unfortunately only two GPS parties had sufficient knowledge/expertise to operate the Magnavox. This placed additional constraints on op planning.

Detailed Technical Briefing

7. Two days before deployment all members of the Detachment, apart from the advance party, were given a detailed technical briefing. This was essential due to the number of changes in the technical requirements that occurred in the previous fortnight. Members of the main body left for the AO with no doubts as to the technical requirements.

Station Reconnaissance, Clearing and Marking

8. Recon and clearing was commenced on 16 Jul 91, two days prior to the deployment of the GPS parties. The recon/clearing team was deployed using UH1H acft, which proved to be an expensive option for carrying out this type of activity. A LOH would have been far more suitable.

9. The recon/clearing team was able to keep ahead of the GPS parties, however this was only possible due to the use of a civilian Jet Ranger (Reef Helicopters) which was hired for approx 20 hours. Without the use of this acft there would have been insufficient UH1H hours to complete the Operation.

GPS Sessions

10. As mentioned before, the observing time was increased from 50 min to 75 min due to the uncertainty of the effects of Selective Availability. Results obtained were more than acceptable with an average precision accuracy of 5.36ppm. The 75 min session allowed for some flexibility if any of the parties started navigating late. The timings for the sessions were selected to allow for an extension if required.

11. GPS almanacs were gathered every two weeks thus giving up-to-date information for generating SATPLANS and hence GPS scenarios. The RAEME GPS technician was normally tasked to gather the almanac data using the spare GPS receiver.

GPS Operations

12. GPS operations were conducted using relative positioning techniques. Field parties were deployed using mainly Iroquois aircraft. On a few occasions road and sea transport were used. Operations were divided into three phases.

a. Phase 1 (18 - 30 Jul). During this Phase control points to the South and South-East of the Horn Is base camp were occupied, commencing in the South and moving generally in a Northerly direction. Phase 1 involved sessions 1 to 12. Following Phase 1 the GPS parties were returned to main base for a day's rest. During the rest day the parties refurbished their tech and accommodation stores and discussions were held concerning technical and resupply aspects.

b. Phase 2 (31 Jul - 15 Aug). This phase commenced with points in the vicinity of Horn and Thursday Islands. The initial plan was to move the field parties to the North and West up to and including the first points in PNG. However, due to the fact that no diplomatic clearances had been arranged for AAAvn acft entry into PNG, a redeployment of parties to the East was necessary. This was done to fill in the time until clearances were obtained. This phase included the establishment of the forward operating base on Yorke Is. Stores for this camp were inserted using a RAAF Caribou aircraft. During this phase all points generally to the West and South-West of Yorke Island were occupied. Phase 2 involved sessions 13 to 27. Two days rest were granted at the end of Phase 2 and, once again, the GPS parties took the opportunity to refurbish their stores. The RAEME GPS technicians and the generator mechanic thoroughly checked all equipment and carried out servicing where necessary. During the two rest days the recon of the PNG stations was conducted.

c. Phase 3 (16 - 22 Aug). After completing the points to the North and East of Yorke Is parties moved generally Westward to occupy those points to the North and West of Horn Is not completed because of the change in direction during Phase 2. This phase included the points located in PNG. Towards the end of this phase forward base was extracted, again using RAAF Caribou aircraft. The last three days of operations were again mounted out of Horn Is. Phase 3 included sessions 28 to 34.

13. Many stations in the AO were located on islands that were less than hospitable due to the inclement weather, wild life (including crocodiles) and tides that nearly submerged the station. It was necessary on a number of occasions not to leave the GPS party on the particular island overnight. This placed further constraints on the op planning as well as placing additional pressure on the GPS party to complete their requirements in a much shorter time span.

Conclusion

14. GPS observations generally ran smoothly even though a significant change in the plan of attack was required due to a delay in acquiring Diplomatic Clearances for entry into PNG and the inhospitable conditions that existed on some stations. Very few problems with the equipment also contributed to the success of the Operation.

15. The dedication and professionalism of all personnel involved ensured the success of an operation that was technically, administratively and logistically demanding.

Recommendations

16. It is recommended that:

a. further investigations be conducted into the problem of computing baselines, less that 30km, using Geomark Double Differencing;

b. further investigations be conducted into the effects of Selective Availability on Relative Positioning and Gesar Point Positioning; and

c. LOH acft be used for recon/clearing instead of UH1H.

N.J. STONE
Captain
OPS OFFR

Oct 91

APPENDIX 4 TO
ANNEX B TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

GPS COMPUTATION REPORT

General

1. Data processing was carried out at both the Main Base on Horn Island and at the Forward Base on Yorke Island. Daily resupply and movement of GPS field parties meant that the Computations Section had a steady, continuous workload. Data cassettes from the previous days observations would arrive by mid afternoon allowing cassette translation to floppy disk and subsequent baseline determinations to be performed during the early evening and the following morning. All computations/observations and session results would then be independently checked by the OPSO before progressing to the next session's computations.

Section Manning

2. The computations section was generally manned by only one SNCO for the duration of the Operation. The responsibilities of the computations SNCO were:

a. allocation of processing numbers;

b. collection of the GPS Satellite Almanac using TI4100;

c. compilation and issue of predictions using SATPLAN;

d. receiving and checking GPS and Magnavox 1502 data and station records;

e. performing cassette translations and baseline determinations using GEOMARK;

f. determining the precision of each GPS network session;

g. computing provisional coordinates;

h. preparation of data for Army Survey Regiment; and

i. computer maintenance.

3. The computations SNCO worked an average of 15 hours per day. For an operation of this type two people should be employed for GPS computing and associated records maintenance. 'Fill-in' or opportunity basis assistance in the computations section is not suitable. Both section members will need to be fully conversant with all aspects of post processing.

Working Conditions

4. The post processing / computations section was located with the OPS Section in a 33'x 11' tent and power was obtained through 240V mains electricity on Horn Island and 240V generator power on Yorke Island. Neither location was air conditioned although an unsuccessful attempt was made to cool down the computations area using a refrigerated airconditioner. Because of the location of the computations section in both main and forward bases, keeping the working environment dust free was a continual problem.

5. RAAF cargo palates were used as flooring to minimise dust in the computations area on Horn Island and vinyl flooring was used on Yorke Island. Whenever computers/printers/MEMTECS were not in use, plastic covers were used to minimise dust build up.

6. Overall the working conditions were barely adequate and this could have led to serious equipment problems. It is recommended that the use of an air-conditioned, low dust, computer room be obtained for future operations.

Equipment Used

7. The following pieces of equipment were used in the computations/records section:

a. 2 x TIPPCs, c/w CES and EPSON Printers;

b. 2 x power conditioners;

c. 2 x transformers (240v to 120v);

d. 6 x spare Memtecs; and

e. 1 x IBM PC.

Equipment Performance.

8. Even though the working conditions were barely adequate there were very few equipment problems. The

lack of a suitable cleaning agent to clean tape drive heads in the early stages warranted the use of RAP supplied Alcohol wipes which proved effective. Methylated spirits were used later in the Operation on the advice from the RAEME technicians. It is recommended that a suitable replacement to the CFC based tape head cleaning fluid be identified and introduced into service as soon as possible.

9. Both 5.25" disk drive heads on the TIPPCs had to be continuously cleaned using a commercially available product because of the dust build up. A good idea for the disk drives is for the addition of a dust cover over the disk slot to minimise dust and grime build up.

10. The newly purchased EPSON LQ550 printers worked admirably and no difficulties were encountered.

11. Few problems were encountered with the MEMTEC tape drives. It is suggested that the connection leads be checked for serviceability as two of the leads had missing screws which are used to hold the lead to the back of the computer. Two additional MEMTECs were configured to read/copy data cassettes recorded using the MAGNAVOX MX1502 and no problems were encountered using either of these drives.

12. Both TIPPCs performed well and no problems were encountered with the GEOMARK software.

13. It is recommended that two part continuous A4 computer paper be purchased to eliminate the need to photocopy baseline reports and associated input records upon return to the unit.

Satellite Predictions.

14. The computations SNCO was responsible for the compilation of satellite predictions using SATPLAN. New almanac data was collected every two weeks throughout the Operation using a TI4100 receiver. It was found that satellites 6, 9, 22 and 24 were unhealthy or not recommended for use for the duration of the Operation leaving a 14 satellite constellation on which to predict GPS scenarios.

15. Regular GPS notices by facsimile transmission from DSVY-A were invaluable in planning of observation sessions. Having access to a facsimilie machine in the AO is a must for GPS operations.

16. Generally, the two 75 minute `windows' occurred early afternoon and early evening. Satellites available

for these scenarios were:

a. Early afternoon. 14,15,18,19; and

b. Early evening. 2,13,16,19.

17. Hard copies of the satellite almanac and field prediction sheets were able to be duplicated using the photo copy facility on the facsimilie machine. These copies were then supplied to the GPS parties in their normal resupply prior to the daily observing session. Any changes were relayed by radio during scheduled communications.

Introduction of horizontal and vertical control

18. The following control points were used to introduce horizontal and vertical control into the network:

a. C251, Horizontal, 2nd Order;

b. B081, Horizontal, 1st Order;

c. NMVB460, Vertical, AHD;

d. NMVB466, Vertical, AHD;

e. NMVB304A, Vertical, AHD;

f. EK58, Vertical, AHD.

Carrying forward of coordinates

19. Provisional coordinates were carried throughout the network. Wherever possible the provisional coordinates were compared with the coordinates of existing control points as a gross error check. These existing control points included C251 (2nd Order), B088 (1st Order) and B089 (1st Order). The difference between the provisional coordinates and the actual coordinates was always less than one metre.

Integrity check

20. Integrity checks were carried out between the existing control. The results (difference between actual and computed coordinates) were as follows:

a. B081 to C251, Session 2, Difference in Latitude 0.258m, Longitude 0.418m;

b. EK58 to NMVB304A, Session 2, Height difference 0.872m;

c. NMVB304A to EK58, Session 1, Height difference 1.189m; and

d. NMVB466 to NMVB460, Session 9, Height difference 0.323m.

21. Results obtained from the integrity checks were considered acceptable.

Results.

22. All GPS computations were carried out using the WGS84 reference spheroid. Initial computations involved the conversion of several 1st and 2nd Order Horizontal control points, firstly to Geographical coordinates from supplied grid coordinates then a 7 Parameter Transformation from AGD84 to WGS84 Geographical coordinates.

23. 34 GPS sessions were observed to produce a total of 302 baselines. The breakdown of Baseline Determinations was as follows:

a. 134 baselines were over 30km and were computed using Triple Differencing.

b. 168 baselines were under 30km and were computed as follows:

(1) 63 baselines were "forced" Triple Differenced (Average length 21.7km);

(2) 59 baselines were computed using Double Differencing, however substantial editing was needed (Average length 16.9km)

(3) 46 baselines were computed using Double Differencing and required no editing (Average length 12.4km).

24. Where a baseline was unable to be computed using Double Differencing, it was found that the solution would be lost at regular intervals after many receiver measurement discrepancies. For instance, in a 75 mins period available for processing, the solution would be lost and Carrier Phase processing restarted every 4-7 mins up to the end, subsequently not isolating a solution. It was found that baselines with vector lengths between 20-25km were more susceptible to this

problem with very few lines over 25km being able to be Double Differenced.

25. A complete analysis of all baseline determinations was conducted in an attempt to identify why 37% of all baselines under 30km could not be computed using Double Differencing. No conclusive pattern or answer emerged from the analysis, however it does appear, to be dependent on the length of the baseline; the mystery remains unsolved. This problem requires further investigation.

26. The GPSCLOSE program for the IBM PC was used to perform the misclose computations and precision checks, saving hours of long hand computations. In a five station session, several five sided figures were computed and the results meaned.

27. The results produced acceptable miscloses with a maximum 3D vector misclose of 1.21 metres (12.40 ppm precision) occurring in Session 13. The average precision for all sessions was 5.36 ppm.

28. Output for the Baseline Report was WGS84 Lat and Long with a MSL elevation. All baselines in the network have been computed using the default geoid separation.

Adjustment Package.

29. The following information has been prepared for forwarding to Army Survey Regiment for adjustment by NUGAN:

a. GPS Network Diagrams.

b. Session Diagrams showing all successfully observed baselines.

c. Baseline computation reports. Baselines are numbered to agree with the Network diagram supplied. Each baseline report is accompanied by printouts of:

(1) Baseline determination status,

(2) Weather data input,

(3) Antenna offset input, and

(4) Report parameters showing geoid separation.

d. Provisional coordinate listing.

e. Horizontal/vertical control coordinate listings.

f. Copies of conversions to WGS84 geographical coords.

g. Copies of field observation sheets.

h. Copies of relevant station documentation.

Conclusion.

30. No real difficulties were encountered with either the computing equipment or operating software. All sessions were computed to the precision required. Keeping the computing environment dust free was an ongoing problem but luckily it did not hamper the operation of the equipment.

Recommendations.

31. It is recommended that:

a. The data processing section for GPS operations consist of two people employed full time on GPS computations and associated records maintenance. Both the operators need to be fully conversant with all aspects of post processing. Pre operation training should include GPS post processing for the members identified.

b. An air-conditioned computer room (eg ATCO hut) be used on future GPS operations.

c. A suitable replacement to the CFC based tape head cleaning fluid be identified and introduced into service as soon as possible.

d. The addition of dust covers over the disk drive openings on the TIPPCs be investigated to minimise dust build up in less than favourable working conditions.

e. Connections to MEMTEC tape drives be checked for serviceability.

f. A facsimilie machine be available in the AO.

g. Further investigations be instigated into the problem of computing baselines using Double Differencing.

h. Two part continuous feed A4 computer paper be purchased for printing baseline reports and associated input records.

S.E.Winner
SSGT
Computations SNCO

Oct 91

APPENDIX 5 TO
ANNEX B TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

DOPPLER OBSERVATIONS REPORT

Reference: A. DSVY-A SIC Z2Y SVY 4329 of 282342ZJUL91, Op Aright Doppler Observations.

Introduction

1. Prior to deployment it was identified that Selective Availability would seriously effect any results obtained from GPS Point Positioning. As a result the Technical Directive was amended to replace GPS Point Positioning with Transit Doppler Point Positioning, using the Magnavox MX 1502.

Specific Tasks

2. Det 4 Fd Svy Sqn was tasked to carryout Doppler One Observations at the following locations:

a. C251, S10°35' E142°13',

b. C493, S10°35' E142°56',

c. C542, S09°44' E143°27',

d. C246, S09°09' E143°52',

e. C500, S09°50' E141°25', and

f. B089, S09°25' E142°32',

3. Due to operational requirements the location of some of the Doppler Stations were subsequently changed as follows:

a. C251 - no change,

b. from C493 to C528 - S10°12' E142°49',

c. from C542 to EE Yorke - S09°45' E143°24',

d. C246 - no change,

e. from C500 to C507 - S09°31' E143°17', and

f. B089 - no change.

Changes to Technical Requirements

4. To test the serviceability of the Magnavox equipment and to produce Alert Data Tapes, tests were conducted at 4 Fd Svy Sqn, prior to deployment. The tests were conducted in accordance with Technical Instruction (TI) 307 - Transit Doppler Standards and Specifications, dated Mar 88. The acquisition rate of 3D passes during the testing indicated that an observing period of up to 5 days may be required to satisfy the requirements of TI 307. The acquisition rate did not improve whilst conducting further testing in the AO prior to observing the first doppler stn. DSVY-A and the Army Svy Regt were consulted over this matter with the following observing concessions being granted (Reference A):

a. increase Residual Limit from 0.25m to 0.40m; and

b. if 3D pass requirement cannot be achieved (ie 25 3D passes), observe 25% more acceptable 2D passes (ie. at least 44 2D passes).

5. An anomaly currently exists between TI 307 and the SOP for Transit Doppler in respect to the Residual Limit setting that is required during initialisation of the receiver. TI 307 states 0.25m where as the SOP states 0.40m. An amendment proposal has already been submitted by 4 Fd Svy Sqn to DSVY-A to change TI 307 to 0.40m.

Results

6. Acceptable results were obtained at all six doppler stations. Apart from the concessions granted, all observations were in accordance with TI 307 and the SOP for Transit Doppler. A brief summary of the observations is given below:

Serial	Station	2D Passes	3D Passes	Distribution of 2D Passes (NW,NE,SW,SE)	Distribution of 3D Passes (NW,NE,SW,SE)
(a)	(b)	(c)	(d)	(e)	(f)
1.	C251	38	29	10, 10, 9, 9	10, 7, 5, 7
2.	C507	46	25	11, 11, 11, 13	3, 7, 7, 8
3.	B089	69	34	14, 18, 18, 19	10, 13, 6, 5
4.	EE Yorke	44	31	12, 10, 11, 11	9, 8, 6, 8
5.	C246	43	19	13, 8, 12, 10	7, 3, 5, 4
6.	C528	39	32	10, 12, 8, 9	9, 10, 6, 7

Pre-Operation Training

7. Pre-Op Magnavox training was conducted at 4 Fd Svy Sqn during Jun 91. The trg was only familiarisation as at that time the use of Magnavox, on Op Aright 91 (Control), was not planned. It wasn't until one week prior to deployment that the Technical Directive was amended to include doppler observations. Unfortunately this meant that limited expertise was available with only two out of the five field parties being capable of operating the Magnavox. This placed additional constraints on op planning.

Doppler Team

8. As the Operation progressed it became obvious that the doppler observations would seriously restrict progress. A doppler team was subsequently formed which operated independently of the GPS teams. Two members of the detachment were trained in the AO and then deployed. This proved to be very successful and allowed the GPS teams to progress unhindered.

In-House Magnavox Training

9. There is an obvious lack of Magnavox expertise at 4 Fd Svy Sqn. As this subject is no longer taught at the School of Military Survey, it is recommended that 4 Fd Svy Sqn conduct its own in-house training prior to any future field survey operations where Magnavox is to be used.

Equipment

10. Very few equipment problems were encountered. The repairs that were carried out in the AO are detailed in the RAEME Tech Report at Annex L.

Conclusion

11. Even though there was a lack of expertise with Magnavox operation all doppler requirements were fulfilled without any major disruptions to the overall conduct of the Operation. The option of deploying a dedicated doppler team proved very successful and is recommended for any future operations requiring both GPS and Doppler observations.

Recommendations

12. It is recommended that 4 Fd Svy Sqn conduct its own in-house Magnavox training prior to any future field survey operations where doppler observations are required.

N.J. STONE
CAPT
OPS OFFR

Nov 91

ANNEX C TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

AERIAL PHOTOGRAPHY REPORT

General

1. Identification photographs of control stations were acquired during the period 16 Jul to 2 Sep 91. Photography was acquired using a WILD RC10 Camera, Number 1466, with a SWA lens (No 2044, f=88.15mm) mounted in Pilatus Porter aircraft, No. A14-705.

Tasking

2. The following tasks were undertaken.

a. Identification Photography. A total of 107 stations were photographed during the operation. Five exposures were taken of each station at an altitude of 10,000 feet. A listing of all stations is contained at Appendix 1. Registers were kept of the A36 Reports, flight reports and proven idents. Bromides were made and marked up in situ as per TI 305.

b. Vital Asset Protection (VAP) Photography. A request was made by 11 BDE for support in producing VAP mapping of Horn Island, North Queensland. In response Horn Island was photographed from 10,000 ft with 90% forward and 50% side overlap. Unfortunately, the request for airport and wharf coverage at 5,000 ft and oblique photography over the airport were not met. This was due to an unseasonal cloudy period covering the last 10 days that the acft was in the AO. It was during this period that the wharf and oblique VAP photography was planned to be obtained.

Personnel

3. The following personnel were involved:

a. SGT Purdey, 4 Fd Svy Sqn, Air Cam Op;

b. CPL Willis, 4 Fd Svy Sqn, Air Cam Op;

c. CPL Hogan, 4 Fd Svy Sqn, Air Cam Op;

d. LT Wallace, 173 Gen Sup Sqn, Pilot;

e. LT Stewart, 173 Gen Sup Sqn, Pilot;

f. LT McClure, 173 Gen Sup Sqn; Pilot;

g. CPL Hopwood, 173 Gen Sup Sqn, All Trades; and

h. CPL Thomas, 173 Gen Sup Sqn, All Trades.

Processing

4. Processing was performed in an air conditioned darkroom belonging to the James Cook University Of Northern Queensland situated 400 m from main base on Horn Is. It was fortunate to have the use of this excellent facility. The Zeiss FE 120 film developing unit and Zeiss KG 30 contact printer were used. A nominal fee was paid from petty cash for electricity usage.

Problems Encountered

5. The following problems were encountered:

a. Kodak 2412 Film. The use of the 2412 film was unsuccessful. A full experimentation with varying exposure times and aperture settings failed to rectify the problem. Further investigation into processing methods is needed. During the Op processing times and methods for the rewinding spool were not readily available.

b. The pilot became ill and was medically unfit to fly for four days. An emergency replacement was requested, however he did not arrive in time to prevent the loss of four days.

c. The drive unit on the Zeiss FE 120 broke down resulting in the film having to be turned by hand. The faulty part was quickly repaired with no loss in production.

d. The AO was susceptible to large cloud build-up which prevented the taking of photography These conditions, together with the location of many control points in low-lying areas, led to several points having to be re-panelled.

Conclusions

6. The photographic phase of the operation was carried out in a professional manner leading to excellent results on both film, and subsequently, on bromide. The use of an air conditioned dark-room was instrumental in this success.

7. Further information on the processing of 2412 film on a rewinding spool is needed. It is suggested that trials using 2412 be undertaken as soon as possible.

8. A total of 106 targets were identified, all within specifications.

Recommendations

9. It is recommended that further investigation be conducted into the processing of Kodak 2412 film.

T. PURDEY
SGT
Camera Operator

Oct 91

Appendices: 1. Ident Photography Summary

2. VAP Mapping

APPENDIX 1 TO
ANNEX C TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

IDENTIFICATION PHOTOGRAPHY SUMMARY

Serial	Point	Date	No	Time (Z)	Altitude	Shape
(a)	(b)	(c)	(d)	(e)	(f)	(g)
1.	C275	19 Jul	395	0611	10 000 ft	
2.	C274	20 Jul	396	0044	10 000 ft	
3.	C497	20 Jul	396	0049	10 000 ft	
4.	NMB 368	21 Jul	397	0200	10 000 ft	
5.	C251	21 Jul	397	0214	10 000 ft	
6.	C178	21 Jul	397	0314	10 000 ft	
7.	C481	21 Jul	397	0325	10 000 ft	
8.	C484	21 Jul	397	0347	10 000 ft	
9.	C485	21 Jul	397	0355	10 000 ft	
10.	Bird Island	21 Jul	397	0400	10 000 ft	
11.	C492	23 Jul	398	0036	10 000 ft	
12.	C512	23 Jul	398	0308	10 000 ft	
13.	C513	23 Jul	398	0340	10 000 ft	
14.	B081	23 Jul	398	0418	10 000 ft	

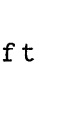
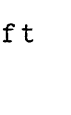
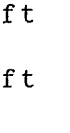
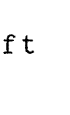
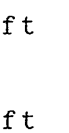
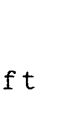
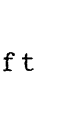
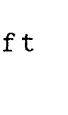
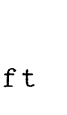
APPENDIX 1

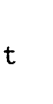
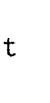
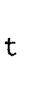
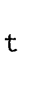
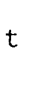
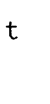
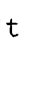
Serial	Point	Date	No	Time (Z)	Altitude	Shape
(a)	(b)	(c)	(d)	(e)	(f)	(g)
15.	C483	23 Jul	398	0434	10 000 ft	- -
16.	C482	23 Jul	398	0437	10 000 ft	- -
17.	C488	23 Jul	398	0513	10 000 ft	- -
18.	C489	25 Jul	399	0400	10 000 ft	- -
19.	C283	25 Jul	399	0424	10 000 ft	- -
20.	C486	25 Jul	400	2322	10 000 ft	- -
21.	C487	25 Jul	400	2332	10 000 ft	- -
22.	C517	25 Jul	400	2340	10 000 ft	- -
23.	C490	25 Jul	400	2355	10 000 ft	- -
24.	C491	25 Jul	400	2357	10 000 ft	- -
25.	C516	29 Jul	400	0020	10 000 ft	/ \
26.	C132	29 Jul	400	0034	10 000 ft	- -
27.	NMVB 460	29 Jul	400	0040	10 000 ft	- -
28.	C519	29 Jul	400	0103	10 000 ft	/ \
29.	B648	29 Jul	400	0107	10 000 ft	- -
30.	C493	29 Jul	401	0124	10 000 ft	- -

Serial	Point	Date	No	Time (Z)	Altitude	Shape
(a)	(b)	(c)	(d)	(e)	(f)	(g)
31.	C515	29 Jul	401	0134	10 000 ft	- -
32.	B649	29 Jul	401	0143	10 000 ft	- -
33.	C262	30 Jul	402	0329	10 000 ft	- -
34.	C261	30 Jul	402	0331	10 000 ft	- -
35.	C135	30 Jul	402	0338	10 000 ft	- -
36.	C518	30 Jul	402	0345	10 000 ft	- -
37.	C520	03 Aug	403	2344	10 000 ft	- -
38.	C271	03 Aug	403	2349	10 000 ft	- -
39.	C521	03 Aug	403	2355	10 000 ft	- -
40.	C526	03 Aug	403	0006	10 000 ft	- -
41.	C525	03 Aug	403	0012	10 000 ft	- -
42.	C522	03 Aug	403	0020	10 000 ft	- -
43.	C267	03 Aug	403	0025	10 000 ft	/ \
44.	C498	03 Aug	403	0035	10 000 ft	- -
45.	C523	03 Aug	403	0042	10 000 ft	- -
46.	C524	03 Aug	403	0051	10 000 ft	- -

Serial	Point	Date	No	Time (Z)	Altitude	Shape
(a)	(b)	(c)	(d)	(e)	(f)	(g)
47.	C514	04 Aug	404	0428	10 000 ft	
48.	C527	04 Aug	404	0454	10 000 ft	
49.	C528	04 Aug	404	0505	10 000 ft	
50.	C241	04 Aug	404	0509	10 000 ft	
51.	C292	04 Aug	404	0514	10 000 ft	
52.	C529	04 Aug	404	0554	10 000 ft	
53.	C494	04 Aug	404	0615	10 000 ft	
54.	C495	07 Aug	405	0346	10 000 ft	
55.	C534	11 Aug	406	0500	10 000 ft	
56.	C305	11 Aug	406	0505	10 000 ft	
57.	B088	11 Aug	406	0519	10 000 ft	
58.	C533	11 Aug	406	0538	10 000 ft	
59.	T Dove	11 Aug	406	0547	10 000 ft	
60.	C322	11 Aug	406	0553	10 000 ft	
61.	C496	11 Aug	406	0602	10 000 ft	
62.	C540	11 Aug	406	0610	10 000 ft	

Serial	Point	Date	No	Time (Z)	Altitude	Shape
(a)	(b)	(c)	(d)	(e)	(f)	(g)
63.	C323	11 Aug	406	0616	10 000 ft	
64.	C509	11 Aug	406	0623	10 000 ft	
65.	C538	11 Aug	406	0631	10 000 ft	
66.	C542	11 Aug	406	0654	10 000 ft	
67.	C553	15 Aug	407	0122	10 000 ft	
68.	C511	15 Aug	407	0129	10 000 ft	
69.	C543	15 Aug	407	0205	10 000 ft	
70.	C531	15 Aug	407	0226	10 000 ft	
71.	C320	15 Aug	407	0433	10 000 ft	
72.	EE Yorke	15 Aug	407	0514	10 000 ft	
73.	AA469	16 Aug	408	0350	10 000 ft	
74.	PCP 110	16 Aug	408	0411	10 000 ft	
75.	C545	16 Aug	408	0453	10 000 ft	
76.	C546	16 Aug	408	0500	10 000 ft	
77.	C547	16 Aug	408	0504	10 000 ft	
78.	C334	16 Aug	408	0508	10 000 ft	

Serial	Point	Date	No	Time (Z)	Altitude	Shape
(a)	(b)	(c)	(d)	(e)	(f)	(g)
79.	G G Marsden	16 Aug	408	0517	10 000 ft	
80.	C532	17 Aug	409	0356	10 000 ft	
81.	C246	17 Aug	409	0356	10 000 ft	
82.	C535	17 Aug	409	0546	10 000 ft	
83.	C537	18 Aug	409	0020	10 000 ft	
84.	C541	18 Aug	409	0040	10 000 ft	
85.	C536	18 Aug	409	0052	10 000 ft	
86.	C508	18 Aug	409	0059	10 000 ft	
87.	C499	18 Aug	409	0120	10 000 ft	
88.	AA440	21 Aug	410	0017	10 000 ft	
89.	C506	22 Aug	411	0016	10 000 ft	
90.	AA858	22 Aug	411	0024	10 000 ft	
91.	AA477	22 Aug	411	0034	10 000 ft	
92.	AA857	22 Aug	411	0040	10 000 ft	
93.	AA860	22 Aug	411	0057	10 000 ft	
94.	C505	22 Aug	411	0114	10 000 ft	

Serial	Point	Date	No	Time (Z)	Altitude	Shape
(a)	(b)	(c)	(d)	(e)	(f)	(g)
95.	C504	22 Aug	411	0126	10 000 ft	
96.	C277	28 Aug	411	0205	5 000 ft	
97.	C277	28 Aug	412	0217	3 000 ft	
98.	C277	28 Aug	412	0229	7 500 ft	
99.	C277	28 Aug	412	0237	10 000 ft	
100.	C500	28 Aug	412	0329	10 000 ft	
101.	C501	28 Aug	412	0329	10 000 ft	
102.	C340	28 Aug	412	0342	10 000 ft	
103.	C507	28 Aug	412	0356	10 000 ft	
104.	NMB367 Booby Island	28 Aug	412	0520	10 000 ft	
105.	AA859	3 Sep	AUS 20	2343	12 000	
106.	C503	4 Sep	AUS 20	0010	12 000	
107.	B089	3 Sep	AUS 20	2330	12 000	
108.	C548	16 Sep	-	-	15 000	
109.	C502	5 Sep	AUS 20	1830	10 000	

APPENDIX 2 TO
ANNEX C TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

VAP MAPPING

Reference: A. 1 Topo Svy Sqn 611-1-1 dated 10 Apr 91

General

1. A request was made by 11 BDE for support in producing VAP (Vital Asset Protection) mapping of Horn Island, North Queensland. Reference A is a letter from 1 Topo Svy Sqn outlining the requirements.

Tasking

2. The following tasks were requested:

a. Aerial Photography:

(1) high altitude - 20 000 feet over lapping photography of Horn Island;

(2) low altitude - 5 000 feet, of airport and wharf areas; and

(3) oblique photography centred from Airport Terminal to the four cardinal points.

b. Obtain available maps/charts of the wharf and airport.

c. Obtain 35mm photography of the wharf and airport.

Achievement of Requirement

3. An altitude of 20 000 feet was not attainable due to the lack of oxygen equipment in the photography acft. Unseasonal heavy cloud towards the end of the Operation hampered the taking of photography. Consequently no available aircraft hours remained for low altitude and oblique photography. There were no maps/charts available of the wharf and airport areas.

4. Photography was flown at 10 000 feet over Horn Island when initially testing the 2402 film. Test photography was also flown at 1000 feet. This photography was inspected and bromide copies of suitable photography were produced, then despatched to 1 Topo Svy Sqn in early Nov 91.

Recommendations

5. For future VAP mapping support the following is recommended:

a. VAP photography be given dedicated flying hours.

b. There is a need for the acquiring agency to be more aware of the uses and presentation of VAP mapping data.

c. Enquiries be made to the relevant state and federal authorities within the capital cities, for copies of maps and charts relating to Crown Lands.

A.CHAMBERLAYNE
2LT

Dec 91

ANNEX D TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

SEQUENCE OF EVENTS

Tabulated below is the Sequence Of Events for Op Aright 91 (Control), commencing with the initial planning through to post op records finalisation and report writing:

Serial	Date	Event
(a)	(b)	(c)
1.	29 Aug 90	Army Office Tasking Directive issued.
2.	10 Sep 90	4 Fd Svy Sqn Forecast Activity Plans and Estimates (FAPE) for TY 91/92 sent to SO2 OPS HQ 4MD, 2IC Army Svy Regt.
3.	4 Oct 90	4 Fd Svy Sqn FAPE TY 91/92 sent to SO2 OPS, DSVY-A.
4.	5 Nov 90	Letters of introduction sent to Army Units/HQ and various Govt Dept in the AO.
5.	20-23 Nov 90	Reconnaissance conducted by SO1 Svy LHQ, SO1 OPS DSVY-A and OC 4 Fd Svy Sqn.
6.	17 Dec 90	Resource requirements sent to DSVY-A.
7.	30 Jan 91	Recon Report distributed.
8.	Feb 91	Op Aright Conferences commenced at 4 Fd Svy Sqn.
9.	7 Feb 91	Request to use Army Compound on Horn Is sent to DSG NQ.
10.	20 Feb 91	Request for support sent to C Coy 51 FNQR on Thursday Is.
11.	26 Feb 91	Request for AAAvn spt sent to 1 Avn Regt by LHQ.
12.	6 Mar 91	1 Avn Regt approves spt to Op.
13.	7 Mar 91	4 Fd Svy Sqn requests Tech Directive from DSVY-A.

Serial	Date	Event
(a)	(b)	(c)
14.	20 Mar 91	4 Fd Svy Sqn commences proceedings to obtain spt pers for Op.
15.	25 Mar 91	4 Fd Svy Sqn receives Tech Directive from DSVY-A.
16.	3 Apr 91	Approval received from DSVY-A to conduct second recon.
17.	9 Apr 91	4 Fd Svy Sqn informed that a member of the Bureau of Mineral Resources (BMR) will be attached to the Op.
18.	10 Apr 91	Technical requirements for the Vital Asset Protection Mapping received from 1 Topo Svy Sqn.
19.	11 Apr 91	4 Fd Svy Sqn commences arrangements to obtain Survey Party Ration Allowance (SPRA).
20.	11 Apr 91	4 Fd Svy Sqn insertion/extraction proposal submitted to LHQ and DSVY-A for approval.
21.	15 Apr 91	Insertion/extraction plan approved by LHQ.
22.	16 Apr 91	Negotiations commenced with the Torres Island Trading Company (TITC) reference the movement of stores by sea vessel from Cairns to Horn Is.
23.	17 Apr 91	4 Fd Svy Sqn requests Land Clearances.
24.	30 Apr 91	Request to Log Comd Melbourne for four BMSS A Class containers.
25.	2 May 91	Signal sent to various Army Units/HQ to announce forth coming recon.
26.	9 May 91	TRANSREQ's for C130 and CC08 sent to 1 GL Gp, Richmond, NSW.
27.	28 May 91	POL request sent to HQ 4 MD, info copy to DSG Townsville.
28.	3 Jun 91	LHQ OPORD 8/91 received by 4 Fd Svy Sqn.

Serial	Date	Event
(a)	(b)	(c)
29.	3-7 Jun 91	Final recon conducted by OC, 2IC and SQMS 4 Fd Svy Sqn.
30.	11 Jun 91	Recon Report distributed.
31.	11-21 Jun 91	Pre-Op Trg conducted at 4 Fd Svy Sqn.
32.	17 Jun 91	Proposed GPS session diagram submitted to Army Svy Regt.
33.	17 Jun 91	Further Land Clearance requests sent to DSG NQ.
34.	18 Jun 91	Draft Mounting Instruction sent to LHQ.
35.	19 Jun 91	RAAF "Greens" start to arrive at 4 Fd Svy Sqn.
36.	20 Jun 91	Approval received from LHQ to carry civilian passengers on Service Acft.
37.	21 Jun 91	Further request for POL sent to Mildist Brisbane.
38.	23 Jun 91	Amendment to Tech Directive received from DSVY-A.
39.	24 Jun 91	Petty Cash request sent to RFO, HQ 4MD.
40.	8 Jul 91	Amendment to Tech Directive received from DSVY-A, 6 x GESAR Points replaced by Doppler.
41.	8 Jul 91	Advanced Pty and accommodation stores deployed to AO to establish Main Base in the Army Compound on Horn Is.
42.	9 Jul 91	TITC transports stores from Cairns to Horn Is.
43.	15 Jul 91	Main Bdy and tech stores deployed to AO.
44.	15 Jul 91	1 x UH1H arrives in AO.
45.	16 Jul 91	Recon/clearing pty deployed, Pilatus Porter arrives in AO.

Serial	Date	Event
46.	18 Jul 91	Second UH1H arrives in AO. Svy parties deployed, GPS observations began. Mr D. Trail, BMR, arrived at main base.
47.	23 Jul 91	Defence Public Relations Team arrived at main base.
48.	24 Jul 91	OC flies to Yorke Is to conduct recon for forward base. CDF visits Det at main base.
49.	25 Jul 91	Mr D. Trail, BMR, departed.
50.	29 Jul 91	Det received notification from LHQ that Dip clearances for entry into PNG would not be available until 14 Aug 91. This necessitated a significant change in the Op plan.
51.	30 Jul 91	All GPS parties returned to main base for a rest day. An extra 60 drums of Avtur Jet A1 were requested for forward base on Yorke Is. LTCOL P. Cates, SO1 OPS, DSVY-A arrived at main base on a liaison visit. Defence Public relations Team departed.
52.	31 Jul 91	GPS parties re-deployed, observations recommenced. FAX sent to LHQ reference concern over UH1H availability.
53.	3 Aug 91	Forward base established on Yorke Is. Reef Helicopter's Jetranger hired for recon/clearing.
54.	4 Aug 91	Changeover of UH1H crews.
55.	7 Aug 91	Defence Sub Committee visits Det on Yorke Is. Reef Helicopter's Jetranger hired.
56.	8 Aug 91	Reef Helicopter's Jetranger hired.
57.	9 Aug 91	LTCOL van den Tol (CO Army Svy Regt), MAJ Smith (US Exchange) and MAJ Perry (UK Exchange) arrived on liaison visit. Mr B. Byrne, BMR, arrived at forward base.

Serial	Date	Event
58.	11 Aug 91	Changeover of AAAvn crew. LTCOL R. van den Tol, MAJ Smith and MAJ Perry departed.
59.	14 Aug 91	All GPS parties arrived at forward base for two days rest. Recon of PNG stations commenced.
60.	15 Aug 91	Recon of PNG stations completed.
61.	16 Aug 91	GPS parties redeployed and observations recommenced, including two stations in PNG.
62.	20 Aug 91	Mr B. Byrne, BMR, departed.
63.	21 Aug 91	PNG stations complete.
64.	22 Aug 91	Forward base on Yorke Is disbanded, OPS returned to Horn Is.
65.	23 Aug 91	GPS OPS completed. 11 Photo idents outstanding.
66.	24 Aug 91	Social function at the Wangai Hotel on Horn Is.
67.	25 Aug 91	AAAvn UHIH acft and crews released.
68.	25-26 Aug 91	Main body and tech stores extracted from Horn Is to Weipa by RAAF CC08.
69.	26 Aug 91	Main body and tech stores extracted from Weipa to Adelaide by RAAF C130.
70.	27-29 Aug 91	Rear party packed up remainder of main base as well as obtaining 6 of the remaining 11 photo idents.
71.	29 Aug 91	Photo ops ceased (5 idents still outstanding).
72.	30 Aug 91	AAAvn Porter and crew released. TITC sea vessel (Cape Trader), loaded with remaining stores and rear party, departed Horn Is for Cairns.
73.	3 Sep 91	Cape Trader arrives in Cairns, stores unloaded.

Serial	Date	Event
74.	4 Sep 91	Stores prepared for C130 and line haul movement to Adelaide.
75.	5 Sep 91	Rear party and three pallets of loose stores arrive in Adelaide by C130. BMSS containers, veh and trailer loaded on line haul trucks in Cairns.
76.	5 Sep-5 Oct 91	AUSLIG obtains photo idents of the remaining 5 stations.
77.	19 Sep 91	Post Operation Report sent to LHQ.
78.	30 Sep 91	Line haul arrives at 4 Fd Svy Sqn.
79.	Sep-Dec 91	Post Op records finalisation and report writing.

ANNEX E TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

OPERATION MANNING

Tabulated below are all personnel who were involved in Op Aright 91 (Control):

Regt No	Rank	Name	Appoint	Unit	Dates
(a)	(b)	(c)	(d)	(e)	(f)
225759	MAJ	L.A. Newton	OC	4FD SVY SQN	8JUL-26AUG91
46319	CAPT	N.J. Stone	OPS OFFR	4FD SVY SQN	15JUL-26AUG91
455989	2LT	A.P. Chamberlayne	ADMIN OFFR	4FD SVY SQN	15JUL-26AUG91
45423	WO1	S. Hinic	DET SSM	4FD SVY SQN	8JUL- 5SEP91
211893	WO2	V.A. Applebee	SQMS	4FD SVY SQN	8JUL-26AUG91
45892	WO2	K.G. Talbot-Smith	OPS WO/RECON	4FD SVY SQN	15JUL- 5SEP91
321834	SSGT	S.E. Winner	GPS POST PROC	4FD SVY SQN	8JUL-26AUG91
324051	CPL	B. Hogan	GPS POST PROC	4FD SVY SQN	15JUL-26AUG91
47834	SSGT	M.R. Paterson	GPS PARTY IC	4FD SVY SQN	15JUL-26AUG91
46735	SGT	P.J. Elverd	GPS PARTY IC	4FD SVY SQN	15JUL-26AUG91
46710	SGT	E.L. Jacobs	GPS PARTY IC	4FD SVY SQN	15JUL-26AUG91
321968	SGT	S.E. McGuinness	GPS PARTY MBR	4FD SVY SQN	15JUL-26AUG91
234855	CPL	P.J. Austine	GPS PARTY IC	4FD SVY SQN	15JUL-26AUG91
454834	CPL	R.P. Crawford	GPS PARTY MBR	4FD SVY SQN	15JUL- 5SEP91
556094	CPL	A.P. Love	GPS PARTY MBR	4FD SVY SQN	15JUL- 5SEP91
321355	CPL	S.A. Nokes	GPS PARTY IC	4FD SVY SQN	15JUL-26AUG91
555960	CPL	D.T. Scott	GPS PARTY MBR	4FD SVY SQN	15JUL-26AUG91
454117	CPL	T.P. Tran	GPS PARTY MBR	4FD SVY SQN	15JUL-26AUG91
4401748	SGT	T.M. Purdey	AIR CAM OP	4FD SVY SQN	15JUL- 5SEP91
555573	CPL	D.J. Willis	AIR CAM OP	4FD SVY SQN	15JUL-26AUG91
7338	CPL	I.R. Brown	RECON/CLEARING	4FD SVY SQN	8JUL-26AUG91

Regt No	Rank	Name	Appoint	Unit	Dates
(a)	(b)	(c)	(d)	(e)	(f)
184348	LT	M.C. Jackson	SVY ATTACH	ARMY SVY REGT	15JUL- 4AUG91
327308	LT	S. Buckpitt	SVY ATTACH	ARMY SVY REGT	3AUG-26AUG91
326561	CPL	D.P. Dumble	RADAR TECH	4FD SVY SQN	15JUL-26AUG91
184291	CFN	M.D. Harper	RADAR TECH	SYD WKSP COY	15JUL-26AUG91
325512	LCPL	I.D. Baker	VEH/GEN MECH	ADEL LOG BN	15JUL-26AUG91
47911	SGT	D.A. Daykin	MEDICAL ASST	DSU ADEL	15JUL-26AUG91
48804	CPL	G.A. Messner	COOK	HQ 4MD	15JUL-26AUG91
320036	CPL	R. Perry	COOK	DSU ADEL	8JUL-26AUG91
226186	CPL	K.M. Stockton	SIG	2 SIG REGT	15JUL-26AUG91
455090	SIG	A.S. Connolly	SIG	2 SIG REGT	15JUL-26AUG91
238247	SIG	P.G. Furlong	SIG	2 SIG REGT	15JUL-26AUG91
329704	SPR	J.S. Dash	S/CFT HANDLER	18 FD SQN	8JUL- 2SEP91
237126	CAPT	G.R. McGlone	PILOT (UH1H)	171 C&L SQN	15JUL- 4AUG91
2141611	CAPT	M.A. Priddin	PILOT (UH1H)	171 C&L SQN	4AUG-25AUG91
34303	LT	N.L. Beckett	PILOT (UH1H)	171 C&L SQN	14JUL-19AUG91
612175	LT	B.A. Carlson	PILOT (UH1H)	171 C&L SQN	18JUL-11AUG91
899376	LT	S. Onno	PILOT (UH1H)	171 C&L SQN	14JUL-11AUG91
117220	LT	G.A Newton	PILOT (UH1H)	171 C&L SQN	11AUG-25AUG91
89916	2LT	J. Imaka	PILOT (UH1H)	171 C&L SQN	4AUG-25AUG91
556641	LT	P.G. Wallace	PILOT (PORTER)	173 GEN SPT SQN	16JUL-14AUG91
185446	LT	S.D. Stewart	PILOT (PORTER)	173 GEN SPT SQN	3AUG- 4AUG91
3203479	LT	N.B. McClure	PILOT (PORTER)	173 GEN SPT SQN	14AUG-30AUG91
2302460	CPL	T.P. Shaw	LOAD MASTER	171 C&L SQN	17JUL- 4AUG91
181098	CPL	R.J. Ball	LOAD MASTER	171 C&L SQN	11AUG-25AUG91
228542	BDR	D.C. Stannard	LOAD MASTER	171 C&L SQN	3AUG-25AUG91
185372	PTE	H.J. Storey	LOAD MASTER	171 C&L SQN	18JUL-11AUG91
317834	SGT	C.W. Sanders	MECHANIC(UH1H)	171 C&L SQN	18JUL- 4AUG91
232793	SGT	R.J. Ford	MECHANIC(UH1H)	171 C&L SQN	4AUG-25AUG91
180596	CPL	I.D. McKay	MECHANIC(UH1H)	171 C&L SQN	18JUL-25AUG91

Regt No	Rank	Name	Appoint	Unit	Dates
(a)	(b)	(c)	(d)	(e)	(f)
453442	CPL	A.J. Panter	MECHANIC(UH1H)	171 C&L SQN	18JUL-11AUG91
47730	CPL	M.D. Winter	MECHANIC(UH1H)	171 C&L SQN	11AUG-25AUG91
183759	CFN	R.B. Biddle	MECHANIC(UH1H)	171 C&L SQN	4AUG-25AUG91
182439	CFN	S.G. King	MECHANIC(UH1H)	171 C&L SQN	16JUL- 4AUG91
237934	CFN	D.J. Murray	MECHANIC(UH1H)	171 C&L SQN	16JUL-11AUG91
329670	CFN	S.P. Nilon	MECHANIC(UH1H)	171 C&L SQN	4AUG-25AUG91
235913	PTE	G.S. Ryder	MECHANIC(UH1H)	171 C&L SQN	16JUL- 4AUG91
2141473	CPL	K. Hopwood	MECHANIC(PORT)	173 GEN SPT SQN	16JUL-14AUG91
212194	CPL	W.K. McPherson	MECHANIC(PORT)	173 GEN SPT SQN	6AUG91
161745	CPL	M.R. Thomas	MECHANIC(PORT)	173 GEN SPT SQN	16AUG-30AUG91
0125099	FLTLT	P. Ward	CARIBOU PILOT	35 SQN (RAAF)	3AUG- 4AUG91
0324514	FLTLT	C.A. Sambell	CARIBOU PILOT	35 SQN (RAAF)	3AUG- 4AUG91
0129737	FLTLT	G.J. Fichera	CARIBOU PILOT	35 SQN (RAAF)	21AUG-25AUG91
0410475	FLTLT	A.J. Roberts	CARIBOU PILOT	35 SQN (RAAF)	21AUG-25AUG91
0236131	FLGOF	G.M.Foster	CARIBOU PILOT	35 SQN (RAAF)	17JUL91
0131150	FLGOF	C.R.Snedden	CARIBOU PILOT	35 SQN (RAAF)	17JUL91
A224551	WO1	M. Monckton	LOADMASTER	35 SQN (RAAF)	17JUL91,21-25AUG91
A232832	SGT	A.D. Batic	LOADMASTER	35 SQN (RAAF)	3AUG- 4AUG91
217041	LCPL	A.J. McPhee	ACFT MAINT	35 SQN (RAAF)	21AUG-25AUG91

ANNEX F TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

MEDICAL REPORT

General

1. The Area of Operations (AO) covered a large area taking in parts of Cape York, the Torres Strait and the southern section of PNG. The coverage of such a large area was in itself a problem with diseases, animals, insects and other conditions peculiar to each area.

2. Transport throughout the AO was primarily by rotary wing aircraft which often required LZ to be cut from thick scrub, jungle and mangrove swamps. This was a constant concern with personnel using axes and chainsaws to fell large trees and scrub in confined areas. Once this was completed a GPS party would be placed in location for periods from one to three days, and the problems encountered varied greatly depending on location.

3. Main Base. Main base was situated on Horn Is within an Army Compound, approx five km from the coast and about one and a half km from the airport. Medium scrub surrounded the compound with the scrub approx 20m from the fence. There was a small dry creek just outside the fence line. The major problems encountered here were mosquitos, blow flies and drainage from the shower point.

4. Forward Base. Forward base, which was situated on Yorke Is, was approx 100m from the coast and approx 100 m from the airstrip. This was an ideal location but lacked all amenities until the camp was set up. The major problems here were the sewerage and ants, both of which are discussed later.

Tasks Performed

5. Whilst on Op Aright 91 (Control) I was tasked with the following duties:

a. full medical and dental treatment for 50 personnel,

b. hygiene for both main and forward bases,

c. pest control,

d. malaria prevention and eradication,

e. water collection whilst on Yorke Is,

f. construction and maintenance of toilets and showers on Yorke Is, and

g. other duties as directed.

Civilian Medical Support

6. Thursday Is. Thursday Is has a hospital with a casualty and outpatient department and is the major medical facility in the AO. Dr Muscio was the acting hospital administrator. Only three det pers were treated by Dr Muscio and these were only minor complaints.

7. Yorke Is. Yorke Is has a small Medical Aid Post (MAP). It is manned by a local islander and is supplemented by a nursing sister who visits for two weeks on a monthly basis. A Doctor, from Thursday Is hospital, visits once a month for one day. The MAP was well set up with a good pharmacy and treatment section. This centre also has direct contact with the Thursday Is hospital and the Flying Doctor Service. There was no requirement to use this facility.

Health Problems

8. Mosquitos (Anopheles). Mosquitos, which are the vector for malaria, were in plague proportions on Horn Is. The council was approached and contact made with the Health Officer, Mr Chris Towner, for advice and assistance in solving the problem. Mr Towner was able to supply a back-pack sprayer and pesticide to help control the problem.

9. Flies. Flies were a constant problem where there was food preparation and sullage. This problem was controlled, in part, by covering the drains and sullage pits with hessian wherever possible, but constant monitoring was necessary with occasional pesticide spraying.

10. Ants. Ants were always present and although not a health problem, were certainly a nuisance. The ants were controlled using pesticide.

11. Worms. Although nobody complained of a problem in this area it was felt prudent for all members to be "wormed", especially after finding large worms inside certain insect species.

12. Cuts and Abrasions. Cuts and abrasions were common and required little treatment, but lots of attention. All members with minor cuts were instructed on how to keep the wounds clean in an effort to prevent tropical ulcers. Only one member required treatment for

a local cut and after removing several small pieces of coral, the member was returned to the field with no further treatment required.

13. Common Colds. Several members were affected with the common cold and all were treated with antibiotics and rest. Some members were seen by Dr Muscio at the hospital and he was happy with the treatment they were receiving. This problem caused the only bed rest patients.

14. Malaria. Malaria is endemic to parts of the AO. It was decided that all members operating North of latitude, 10 degrees South, would require malaria prophylaxis, and on return to the Australian mainland, an eradication course. No cases of malaria have been reported.

Porta Potti's

15. Porta potti's were used at Forward Base on Yorke Is and required close supervision until all Det members became familiar with their operation. The porta potti proved far better than the "thunder box". The porta potti's required emptying daily and this was done by emptying the contents into a hole dug in the beach between low and high tide. Although this practice does not appear to be the most hygienic way of disposing of human waste, the method was recommended by the local inhabitants. The island relies on bore water and any deep pit latrines would have contaminated the only reliable water supply.

Conclusion

16. Preparations for the Operation were extensive with all members being brought up to full DPI condition (Medical Boards, Dental, Inoculations, Spectacles) before departing to the AO. A large quantity of stores, not normally used in 4 MD, were brought in. These included large quantities of prickly heat powder, insect repellant and anti malarials. The insect repellant was greatly appreciated on Horn Is.

17. Although not needed during Op Aright 91, I feel an oxy-viva should have been taken and each of the shipping boxes used for medical stores should have locks fitted for security of restricted drugs.

18. During the Operation it was necessary to request a resupply of anti-malarials from DSU Adelaide. They took seven days to arrive. I do not consider the delivery time to be excessive.

19. Other drugs could have been obtained on a service script filled out by any Doctor or from the MAP on Yorke Is, neither were used.

Recommendations

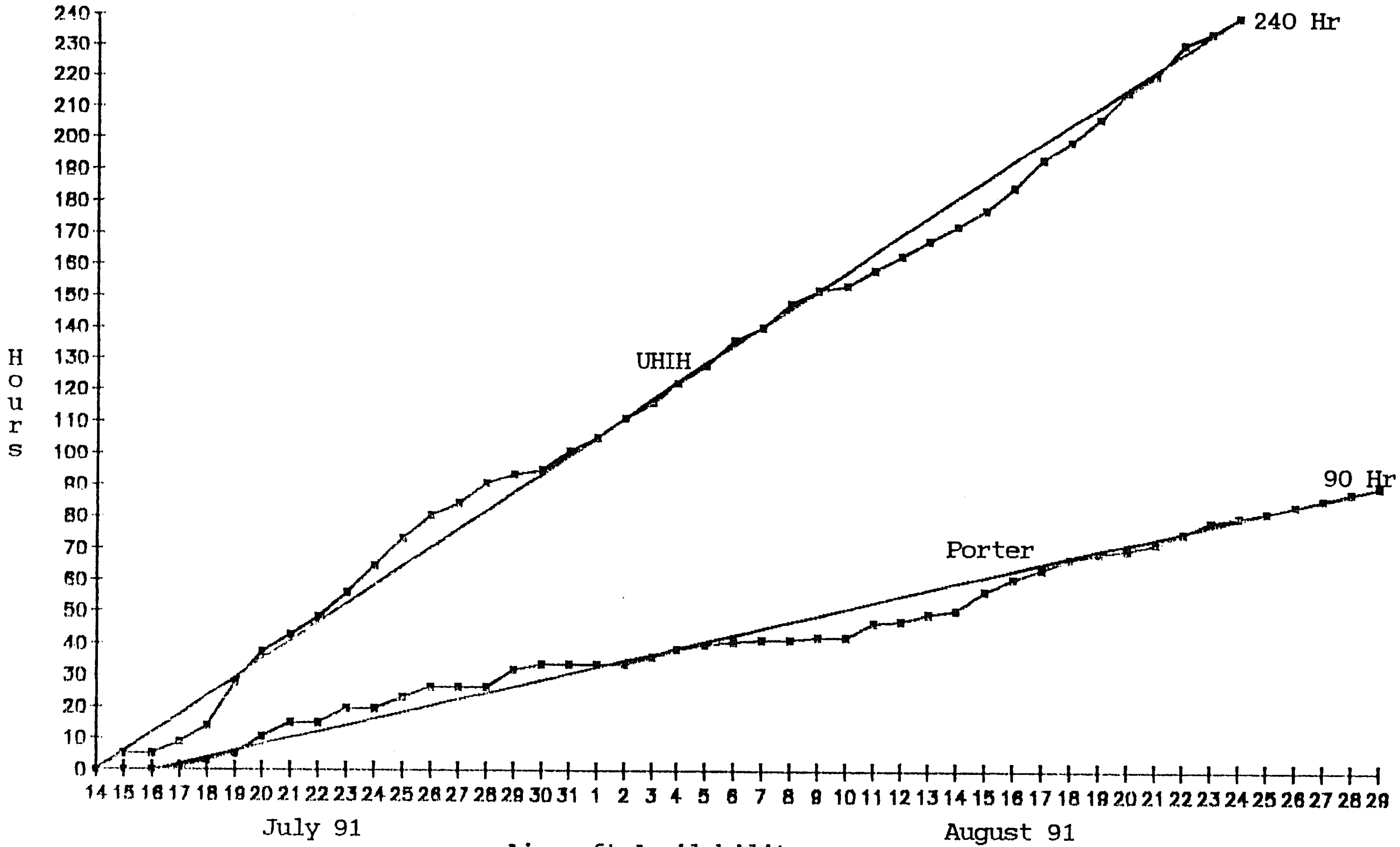
20. Although at times I was under-employed, I feel a Senior Med Assist ECN031 is a necessity on such an operation especially when operating in such remote localities and the potential dangers that may be encountered.

21. The Operation was a distinct learning process and I would have changed only a few minor points as mentioned earlier.

D.A. DAYKIN
SGT
Med Assist

27 Sep 91

AIRCRAFT USAGE/AVAILABILITY



Aircraft Availability

UHIH	1	0	1	1	2	1	1	1	2	2	2	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	2	2	2	2	2	-	-	-	-
PORTER	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

ANNEX G TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

ANNEX H TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

ARMY AVIATION REPORT
UH1H IROQUOIS/PILATUS PORTER

Introduction

1. OP ARIGHT 91 (CONTROL) was a late spt aviation bid for field survey FY 91/92. The spt bid was submitted to the Aviation Support Committee at the annual tasking conference at Greenbank in Feb 91. The task bid did not appear on the annual AAAvn Spt Schedule for FY 91/92

2. The bid was accepted for the following aircraft types and hours:

   a. UH1H x 2 (240 task hours), and

   b. Pilatus Porter x 1 (70 task hours). An additional 20 hours was allocated during the Operation.

3. The following tasking was undertaken by the aircraft types:

   a. UH1H. GPS team insertion/extraction, party resupply, site recon; and

   b. Porter. Photographic ops, GPS team insertion/extraction, party resupply, movement of supplies and personnel.

Deployment and change over

4. For both aircraft types and total of two sets of crews and aircraft were used for the survey - i.e. aircraft and crews changed over mid operation.

5. The break down of aircraft aircrew, and dates are at Appendix 1.

6. The change over of aircrew was considered essential due to high work load and hours to be flown on task.

7. Aircraft were changed over due to major servicing requirements ie. R2 and R3. Aircraft servicing will be further covered later.

Execution of Tasks

8. Orderly execution of tasking was made easier by ops briefings mid afternoon for next days operations and nightly ops conferences.

9. A flexible approach to tasking is the only tact to adopt with the uncertain nature of GPS, Relative Positioning, observations.

10. Specific tasking. The following specific tasking was undertaken and comments noted:

a. Recon Tasking. The UH1H was used to move recon parties (two to three pers and limited equipment) from operating bases to panelling locations for recon tasks. The loads involved were not beyond the capability of a AAAVN LOH and a civilian jet ranger helicopter was also used for this task. The hours flown for recon were not an effective use of a utility asset given the tight hours schedule for UH1H operational involvement. An LOH would have been task effective /cost effective for operational use. This could have reduced UH1H task hours for the task i.e. 200 hours v's 240 hours.

b. Resupply/Party Movement. Both UH1H, and to a lesser extend Porter, were used to move and resupply the GPS parties. Both aircraft types were effective in this task given the heavy weights/bulk of equipment to be moved each time (1300 - 1400 pounds, 2 pers and approximately 2 cubic metres of equipment). Resupplies normally were flown in conjunction with movement of parties (normally party moved each 24 hours). Further UH1H hours could have been saved if an LOH allocated to operation was used to supplement the resupply effort.

c. Photographic Ops. Normally survey photographic ops were flown by the Porter. Ops were conducted routinely and only hampered by weather and disjointed repanelling caused by tidal activity.

11. PNG OPS. Ops into PNG were flown by UH1H and Porter. Entry and exit for recon/resupply/movement and photography was conducted with minimal problems. Once diplomatic clearances were obtained, 4 Fd Svy Sqn ensured that customs and quarantine were handled, thus minimal delays and nil operational/paperwork problems ensued.

12. Flying Rate. The average flying rate and geographical spread of operations dictated that two aircraft operations (UH1H) per day was the optimum for a successful steady flow of survey operations. Only two UH1H were tasked by UH4 AUST for Operation ARIGHT 91. Given that necessary servicing and problems associated with unserviceabilities, with only two acft allocated, it is not reasonable to expect that both acft will be available for tasking each day. For an operation of this size, complexity and considering the number of hours allocated, it is considered advisable to have three UH1H acft allocated. If this is not available, then considering earlier comments, have the two UH1H supplemented with an LOH for the period.

13. The flying rate for Porter operations was acceptable.

Logistical aspects

14. Fuel. Some problems were experienced due to fuel shortages during the operation. The following are some guides to alleviate problems:

a. Operations from airfields with inground refueling should be backed up with some drumstock on hand. For instance 20 drums held at Horn Island would give 10 hours flying (UH1H) for one day.

b. Only detailed planning before an operation can foresee fuel requirements for drumstock dumping prior to the operation. Operations were lucky that the quality of fuel provided meant no drum wastage. As a guide for UH1H ops for each flying hour it is two drums consumed. Add 20% of total drums then for fuel wastage (this then adds some fat for ops). For LOH ops it is 1.5 flying hours/drum.

15. The quality of fuel provided was very good.

16. Repair parts for early stages of the op (ie. skids) were supplied after an excessive period of delay. This was compounded by AAAvn RAEME advice and lack of urgency at Oakey MCO. This problem led to operational concerns and was not repeated on a late unserviceability.

17. Field repair including routine R1 UH1H servicing presents no problems. The provision of tentage for acft stores was helpful.

Aircraft performance

18. Porter or Nomad acft would be adequate for the range of tasking conducted on OP ARIGHT 91 for FW acft.

19. UH1H acft were ideal for the movement of GPS parties. An LOH would require almost triple the hours to accomplish the same mission. The use of role equipment i.e. hook and hoist, to accomplish some tasking made the UH1H a very acceptable acft.

20. Resupplies without party movement and recon of sites would be much more suited to the LOH for reasons discussed.

Administration

21. All aspects of pre task administration were well handled. Any queries or questions were quickly answered. One item that in hind site would have made planning a little easier would have been the provision of an operational map with AO marked.

22. All camp administration on task was a credit to 4 Fd Svy Sqn.

Conclusion

23. Both 171 and 173 Sqns found OP ARIGHT 91 to be a worthwhile operation that extended many flying opportunities to the aircrew.

Recommendations

24. The following is recommended:

a. For future survey ops of this scope and magnitude, involving a large number of UH1H hours, that three UH1H acft, not two, be obtained for the operation.

b. For an operation of this nature an LOH be obtained to supplement the UH1H operations.

c. For operations of this nature a Nomad can cope as well as a Porter.

M. PRIDDIN
CAPT
AAAvn DET COMD

Sep 91

Appendix: 1. Aircraft dates, Aircrew and RAEME Pers

APPENDIX 1 TO
ANNEX H TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

AIRCRAFT DATES, AIRCREW AND RAEME PERSONNEL

Listed below are the aircraft dates, aircrews and RAEME personnel:

a. Aircraft dates.

(1) A2-376 15 Jul to 4 Aug 91,
(2) A2-490 11 Aug to 25 Aug 91,
(3) A2-508 4 Aug to 25 Aug 91, and
(4) A2-649 15 Jul to 11 Aug 91.

b. Aircrew.

(1) CAPT McGlone 15 Jul to 3 Aug 91 (Det Comd Phase 1),
(2) CAPT Priddin 4 Aug to 25 Aug 91 (Det Comd Phase 2),
(3) LT Carlson 19 Jul to 11 Aug 91,
(4) LT Beckett 15 Jul to 19 Aug 91,
(5) LT Onno 15 Jul to 11 Aug 91,
(6) LT Newton 11 Aug to 25 Aug 91,
(7) CPL Ball 11 Aug to 25 Aug 91 (Loadmaster),
(8) CPL Shaw 15 Jul to 3 Aug 91 (Loadmaster),
(9) BDR Stannard 4 Aug to 25 Aug 91 (Loadmaster assistant), and
(10) PTE Storey 15 Jul to 11 Aug 91 (Loadmaster assistant)

c. RAEME Personnel.

(1) SGT Sanders 15 Jul to 4 Aug 91,
(2) SGT Ford 4 Aug to 25 Aug 91,
(3) CPL McKay 15 Jul to 25 Aug 91,
(4) CPL Winter 11 Aug to 25 Aug 91,
(5) CPL Panter 15 Jul to 11 Aug 91,
(6) CFN Biddle 4 Aug to 25 Aug 91,
(7) CFN Nilon 4 Aug to 25 Aug 91,
(8) CFN Murray 15 Jul to 11 Aug 91, and
(9) CFN King 15 Jul to 4 Aug 91.

ANNEX I TO
OP ARIGHT 91 (CONTROL)
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CONTACT INFORMATION FOR THE AO

Military

1.	HQ 51 FNQR CAIRNS	Ops Offr	(070)543633	
2.	B Coy 51 FNQR Weipa	OC	(070)699320	
3.	C Coy 51 FNQR Thursday Is PO Box 384 4875	OC	(070)691736 FAX 867	
4.	DSG Nth Qld Lavarack Bks Townsville	SO2(OPS)	(077)717418	
5.	SO2(POL) HQ 1 MD	Ms L. Stockman	(07)2334559	Fuel drum retrieval
6.	2 Fd Sup Bn Lavarack Bks Townsville	POL Sect	(077)717983	Drum fuel position
7.	MCO Townsville	Movt Offr	(077)717778	Stores loading in Cairns

Government

8.	Torres Strait Island Coord Council PO Box 264 Thursday Is	Mr Getano Lui Chairman	(070)691446	
9.	Nth Penninsula Area Council Adidi St Bamaga	Mr Joseph Elu Chairman	(070)693133	

10.	Customs Thursday Is	Mr Greg Burke	(070)691554	
11.	Quarantine Services Thursday Is	Mr Steve Goener	(070)691121	
12.	Island Board of Industry and Services (IBIS) Victoria Pde Thursday Is	Mr B. Pearson	(070)691121	Variuos retail outlets in Torres Strait
13.	Police Thursday Is	SGT Greg Spencer	(070)691520	
14.	James Cook Uni Research Stn Horn Is	Mr Jim vanderCam		Darkroom facility

Civilian Companies

15.	Jardine Shipping PO Box 1867 Cairns	Mr F. Markert	(070)351299	Sea freight company
16.	Seaswift 52 Tingara St Cairns	Ms C. Saddler	(070)351234	Sea freight company
17.	Torres Is Trading Coy PO Box 5758 Cairns	Mr D. Duggan	(070)511044	Sea freight company
18.	Cape York Enterprises Horn Is	Mr G. Campbell	(070)691573	Range of spt facy Horn Is
19.	Peddel Boat Charter Thursday Is	Ms Nancy Ellis	(070)691551	Ferry svcs Bamaga- Thurs Is- Horn Is
20.	Flightwest Airlines Thursday Is		(070)691325	Inter- island air services
21.	Torres News	Ms J. Gothard Manager	(070)691531	Torres Strait newspaper
22.	Reef Helicopters		(070)691102	

ANNEX J TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

COMMUNICATIONS REPORT

Introduction

1. 2 Sig Regt were tasked to supply a Det consisting of 1 x CPL and 2 x SIG to provide the Net Control Station (NCS) for 4 Fd Svy Sqn in the Torres Strait and Cape York Peninsula for the period 15 Jul to 6 Sep 91.

Background

2. The main base was located in an Army Compound on Horn Is. The forward base was located on Yorke Is which was a sandy, windy island. There were doubts as to whether the 27ft masts would stay erect, however no problems were encountered.

Execution

3. The network consisted of a NCS and up to eight svy parties. A net diagram is attached at Appendix 1. The parties were to deploy throughout Far North Queensland and Torres Strait. The NCS was originally located on Horn Is. The NCS was able to maintain control of the net, if not directly, indirectly via the 'relay through' procedure. On 3 Aug 91 the main body moved forward to Yorke Is and an identical radio station was established. The Det was required to communicate in all directions. On 22 Aug 91 the forward base element returned to Horn Is and assumed control of the net for the final stage of the operation.

Manning

4. The Det consisted of the following members:

a. CPL Stockton - Det Comd,

b. SIG Connolly, and

c. SIG Furlong.

5. The manning was sufficient in that it gave the operator a reasonable break between radio shifts. For the deployment to Yorke Is, two operators were used while

one operator remained on Horn Is where the workload was less.

Equipment

6. The main pieces of equipment used were:

a. AN/GRC 106 set,

b. RT-F1/PRC,

c. AN/PRC-77 Set,

d. 27ft mast, and

e. various antennas.

Equipment problems

7. The first equipment problem encountered was the failure of the power supply. This was replaced by the Survey supplied PPF-2 battery charger. The existing RAVEN cables had to be modified to accommodate the different power supply.

8. The batteries taken on the Op were not used because at the completion of the Op there would have been a requirement to drain them and there was no facility available to do this. Smaller 12v batteries were purchased and used for the Op.

9. The AN/GRC 106 Set located at Horn Is began to fail so to overcome this problem an RT-F1/PRC was setup as a backup.

10. The microphone for the AN/GRC-106 failed. This was replaced immediately after determining the fault.

11. The PPF-2 failed at Yorke Is. It was replaced by two ARLEC battery chargers.

Communication Problems

12. Initial problems occurred due to the survey party radios being too close to their GPS receivers. When the radios were moved away communications improved.

13. The generators on Yorke Island being placed under the antennas caused 'generator noise' over the radio. Both were relocated, alleviating the problem.

14. Radio equipment needed to earth radios was not carried by the svy parties. This caused a few problems.

15. Frequency allocation and changing of frequencies was a problem initially. The Det was advised by the AAAvn pers that the 6 MHZ frequency was the best for the area, the signallers had deemed the 9 MHZ was the best for the area. Initially, the 6 MHZ frequency was used however communications were poor. The frequency was subsequently changed to 9 MHZ which was far more successful. Difficulty was encountered in informing all parties about the change in frequency. The 6 MHZ frequency was used after 1800hr for the duration of the operation.

Administration

16. There were no administrative problems encountered.

Conclusion

17. It appears that there was a communication breakdown between 2 Sig Regt and 4 Fd Svy Sqn. The Det was told that only the main base on Horn Is would require an AN/GRC-106 Set. On arrival in the AO the Det was informed that an AN/GRC-106 Set would also be required at forward base. This necessitated the modification of some cables as insufficient cables were available for the PPF-2 power supply.

18. Communications were maintained throughout the Operation at various levels. At most times the svy parties received the radio transmissions loud and clear. This was largely due to the power output of the AN/GRC-106 Set and the antennas erected. The most efficient and effective antenna was the horizontal dipole.

Recommendations

19. It is recommended that:

a. Prior to an operation of this magnitude a Tech Signaller be detached to 4 Fd Svy Sqn to assist in training surveyors in fault finding and antenna erection.

b. RAVEN radios be used for all future svy operations as they are more efficient,

quiet and reliable.

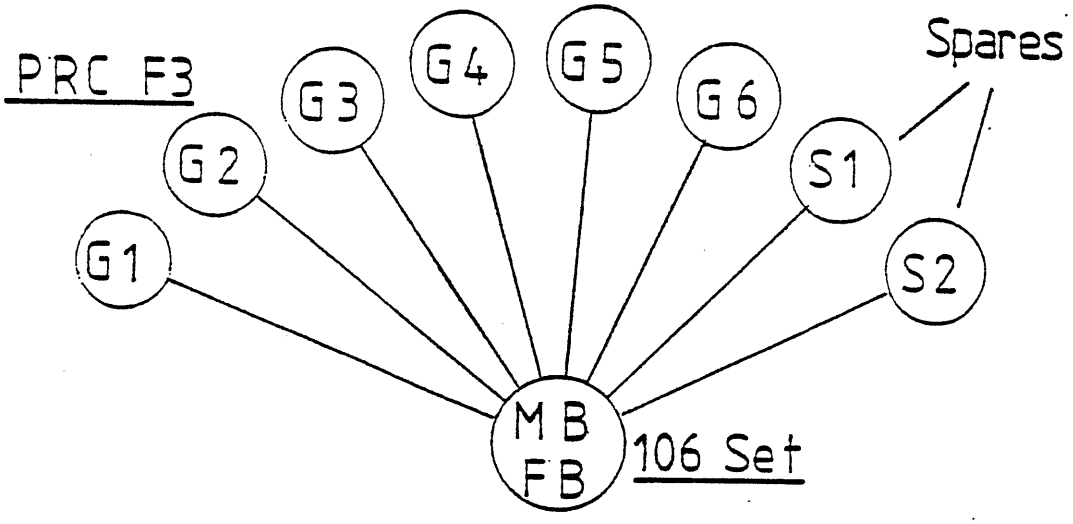
K. STOCKTON
CPL
IC SIG DET

Aug 91

Appendix: 1. Radio Net Diagram.

APPENDIX 1 TO
ANNEX J TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

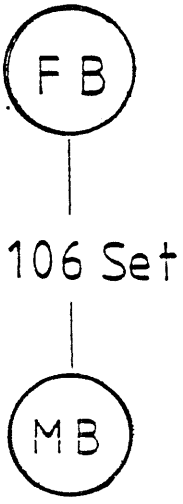
RADIO NETWORK DIAGRAM



Callsigns:

GPS Party 1	Golf one (G1)
GPS Party 2	Golf two (G2)
GPS Party 3	Golf three (G3)
GPS Party 4	Golf four (G4)
GPS Party 5	Golf five (G5)
Recon / clearing pty	Golf six (G6)
Det OC	Sierra one (S1)
Det OPSO	Sierra two (S2)
Fwd Base	Fox Bravo (FB)
Main Base	Mike Bravo (MB)

Radio Link - Fwd Base to Main Base



FREQUENCIES FOR OP ARIGHT 91

HF FREQUENCIES

HF 1	3236
HF 2	4490
HF 3	6692
HF 4	9947
HF 5	10220
HF 6	11150

VHF FREQUENCIES (IF REQUIRED)

VHF PRI	31.50
ALT	41.95
ALT1	49.45
ALT2	50.50

ANNEX K TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

MALARIA PREVENTION AND TREATMENT IN THE TORRES STRAIT

Attached is a self explanatory letter written by the Superintendent of the Thursday Island Hospital. It addresses the approach taken to Malaria in the Torres Strait.

Hospitals Board
THURSDAY ISLAND.
P.O. Box 391,
Thursday Island. Qld., 4875
Telephone: (070) 69 1109
Facsimile: (070) 69 1603

All Communications to be addressed to The Manager.

In reply please quote this Number:

13/06/91

MALARIA GUIDELINES & INFORMATIE

for Torres Straits ..

The malaria season is from Decemb January until April/May each year.

Most malaria cases in the Torres Stra are imported from Papua New Guinea.

Once or twice every other year an imported case triggers a locally transmitte epidemic which we are aware of within days and take action to control in the form of a "task force".

The islands most at risk are Saiba Boigu, Darnley & Zadu where the largest movements of PNG visitors occur. Coral atolls to date have never had a locally transmitted case or epidemic.

If you are not visiting PNG and use common sense measures such as long sleeves, trousers, repellants, nets, coil particularly at dawn & dusk, then the risk of catching malaria even on Sai

is in fact very low.

Local councils regularly spray & monitor mosquitoes.

In view of the low risk it is not the policy of this hospital to recommend malaria prophylaxis medications as they can all be associated with serious side effects be they rare

Lastly early symptoms of malaria are booming headache, nausea, chills and rigors. Anybody with these symptoms should present to the local island health clinic and see the health worker who is experienced and familiar with malaria symptoms, signs, diagnosis and management.

Dare I say far more experienced than health professionals working outside malaria belts, in the management of malaria

Peter McKENNA
Relieving Medical Superintendant

ANNEX L TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

RAEME (GPS TECH) TECHNICAL REPORT

Introduction

1. During OP ARIGHT 91 (CONTROL) various equipments requiring RAEME support were deployed. A detailed list of all equipment is included in Appendix 1.

2. In the weeks prior to deployment to the AO, all the equipment was tested and the operators were given instruction on operation and user maintenance of each equipment.

3. A total of four Yamaha ED1000 generators were purchased prior to deployment to supplement the existing stock of two Suzuki SE700 generators. One more Yamaha was purchased on Thursday Island after deployment to the AO.

4. Sydney Workshop Company was tasked to build three combined battery charger/power supply boxes. These were delivered one week before deployment to the AO. Two more boxes were built in the AO before deployment of the GPS parties.

Equipment serviceability

5. A detailed listing of all faults and the action taken to repair is available in Appendix 2.

6. Overall all GPS equipment worked very well with few problems. The problems encountered were relatively simple to overcome.

7. The computing equipment worked well considering the harsh environment it was required to operate in. The major difficulties were associated with the Memtec/MFE tape readers. Three of these were unserviceable upon reaching the AO. The new printers (EPSON LQ-550) worked flawlessly throughout the operation.

8. The Magnavox Doppler Receivers worked well considering their age and the lack of experienced operators.

9. The generators worked well.

10. The battery boxes proved to be successful with only two breakdowns early in the Operation.

11. The PRC-F3 radios proved electrically reliable with only four of the 14 unserviceable by the end of the operation. The main problem was the PPF1 battery chargers. The cables CXF7 and CXF8 proved totally inadequate for field use due to the connections on either end continually working loose.

Conclusions

12. Down time on most equipment was kept to a minimum by having working spares available at all times. It was found that the equipment for which there were no spares, ie PPF1 cables, proved to be the biggest headache. This particular example could have crippled communications if there were insufficient charged batteries for the field parties.

13. Equipment maintenance by the operators on the whole was good, however it could have been better with more extensive training in this area. The nature of survey operations requires the field party to be relatively self sufficient and a higher degree of user skills is required to prevent minor faults from developing into major problems. Also, the lack of cleaning fluid and electrical degreaser complicated field maintenance somewhat.

14. Many problems, especially with the Magnavox, developed from lack of current operator training. Most of the operators had not used the MX 1502 in years and some of the operators had to be trained in location. This lack of current experience could have led to problems had serious faults occurred.

15. Although the computing equipment performed well on this trip, the lack of a controlled environment could well have led to major problems.

Recommendations

16. It is recommended that:

a. Working spares are again taken to keep downtime to a minimum.

b. An entire GPS kit be kept in reserve, as part of the RAEME spares kit.

c. A spare MX 1502 be included in the RAEME spares kit when Magnavox is being used.

d. Two spare generators be taken to minimize down-time.

e. The PPFI cables CXF7 and CXF8 be subject to RODUM action and an alternative be found before the next operation.

f. Equipment maintenance be part of the unit training schedule throughout the year. Operators should be taught the theory behind maintenance as well as the practical side of it.

g. Operators have hands on experience with the equipment more than once a year. It is recommended that unit training exercises be carried out with the equipment to keep the operators familiar and competent with the equipment.

h. On future operations, as with this one, a minimum of two GPS technicians and one small engine mechanic be taken to provide the best possible maintenance support.

i. The feasibility of a purpose built, portable computing room be studied and if possible, built before the next operation.

j. A suitable electronic cleaner and degreaser, not containing CFC's, be purchased.

k. If RASvy continue to have doubts about GPS point positioning, and still wish to have effective use of the MX 1502, operator courses should either be run at Corps or unit level to maintain user competence.

l. All equipment should go to SWC for servicing upon return from an operation prior to the unit going on standdown.

m. The following pers be on the distribution list for this report:

(1) WO2 Nicholson, SWC; and

(2) WO2 Thompson, MEA.

D.P. Dumble
Corporal
RAEME GPS Technician

Oct 91

Appendices:

1. Equipment requiring RAEME support.

2. Equipment faults/repairs

APPENDIX 1 TO
ANNEX L TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

EQUIPMENT REQUIRING RAEME SUPPORT

The following pieces of equipment required RAEME support:

a. 6 x GPS TI4100 receivers (01, 02, 04, 05, 06, 07);

b. 2 x MX1502 receivers (003, 004);

c. 7 x generators (1 kva, 240 volts):

(1) 5 x Yamaha ED1000, and

(2) 2 x Suzuki SE700.

d. 14 x PRC F3 radios;

e. 6 x PPF1 battery chargers;

f. 2 x TIPPC (A and B, includes 4 x Memtec tape readers);

g. 2 x Epson printers LQ550;

h. 4 x Memtec tape readers;

i. 2 x Honda generators (3.5 kva and 4.5 kva);

j. 2 x PPF3 battery chargers;

k. 1 x IBM PC;

l. 1 x NEC facsimile machine; and

m. 5 x GPS power supplies.

APPENDIX 2 TO
ANNEX L TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

EQUIPMENT FAULTS/REPAIRS

1. GPS:

a. Fault: GPS 01 failed to track SV's.
Action: Reseated boards and checked all cables and connections.
Outcome: GPS serviceable.

b. Fault: GPS 02 failed to track SV's.
Action: Reseated boards,checked all connections, checked 12v line on antenna preamp (3.5v).
Outcome: Antenna preamp unserviceable. Back loaded antenna, new antenna sent from SWC, GPS serviceable.

c. Fault: GPS 07 showing "chinese figures" on CDU.
Action: Suspect short circuit antenna lead. Test antenna lead.
Outcome: Antenna lead has intermittent short circuit. Lead changed, GPS serviceable.

2. MX1502:

a. Fault: Rx 003 failed to track predicted SV's.
Action: Suspect antenna/antenna lead. Check antenna preamp.
Outcome: Antenna preamp has intermittent connection problem. Change preamp, equipment serviceable.

b. Fault: Rx 003 failed to track predicted SV's.
Action: Check antenna/antenna lead.
Outcome: Antenna hit by bird during the night. Makeshift repairs effected. Antenna was changed on return to forward base. Equipment serviceable.

3. Generators. All generator faults/repairs are contained in the Generator Mechanic's report at Annex F.

4. GPS Power Supplies:

a. Fault: Power supply started to smoke.
Action: Check power supply for short circuit.
Outcome: Changed connecting wires for wires with higher current rating. Equipment serviceable.

5. Memtec Tape Readers. A total of three Memtecs were found to be unserviceable upon arrival in the AO. These were put aside and kept for emergency. They were sent to SWC upon return to Adelaide.

6. PRC F3 Radios. Four radios were declared unserviceable whilst in the AO. All exhibited "no transmit" faults. All 14 radios will be sent to ALB for inspection upon return to Adelaide.

7. PPF1 Battery Chargers. Almost all the cable assemblies CXF7 and CXF8 are unserviceable due to connectors being pulled off. These cables will be sent to ALB upon return to Adelaide. The charges themselves will be sent to ALB for inspection and repair.

ANNEX M TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

RAEME (GENERATOR MECHANIC) TECHNICAL REPORT

Introduction

1. During OP Aright 91 (Control) various equipments requiring RAEME support were deployed. A detailed list of all equipment is included in Appendix 1.

2. As well as being responsible for all equipment listed in Appendix 1, I also acted as Assistant Q Storeman.

3. In preparation for the operation I liaised with WO2 Applebee to ensure I was adequately prepared as far as tools and equipment were concerned.

Equipment Serviceability

4. A detailed listing of all faults and the action taken to repair is contained in Appendix 2.

5. Overall the generators worked well with very little down time.

6. The M2A Burner (cooks Equipment) was plagued with fuel and pressure faults from the start of the operation. The Burner had not been serviced correctly prior to being issued to 4 Fd Svy Sqn.

7. The use of landrover 110s, even in a limited area of operation, proved a very strong argument for the use of the long range type of landrovers for all Survey Operations. The stiffer suspension provided a safer ride considering the consistent heavy loads and the rough tracks used by these vehicles.

8. The outboard motor proved very reliable considering its age and length of service.

9. The fridges worked well, however they are starting to show effects of fatigue and transportation.

10. The rifles, taken as protection against wild animals, were not used. Rust was a problem due to the climatic conditions in the AO.

11. The Zippo Tower was a very good idea but lacked a more sturdy and operator friendly gearbox which eventually lead to its downfall (not literally).

Conclusions

12. Both the forward base and survey parties generators worked extremely well. The generators used by the survey parties were very reliable. Apart from one survey party generator being written off due to sand being drawn into the engine, the equipment suffered no damage and very little down time. There was however a requirement for a small stock of minor repair parts to be readily available.

13. There is a requirement that for future operations the rifles be carried in individual rifle boxes to help prevent rust.

14. The M2A burner was issued to the unit well out of date of its two major safety checks. These factors are not controlled by the receiving unit, the issuing depot failed to check its equipment before issue. This equipment was rendered R\XX\B for safety reasons, not having the correct equipment to perform the required tests.

15. Operator knowledge of the small generators was of a good standard. A short lecture, prior to deployment, on the theory of mechanical maintenance would further improve their knowledge.

16. At times during the operation a generator was required by the RAEME element to enable the use of certain repair equipment both on the mechanical and electronics side.

Recommendations

17. It is recommended that:

a. Whilst using generators (survey parties) the battery box lid should be removed and used as a stand for the generator. This would decrease the likelihood of foreign matter entering the engine.

b. Operators keep a constant watch on the quality of fuel they receive.

c. A stock or minor spares eg; spark plugs, housing screws, should accompany each svy party as well as a small bottle of Loctite 222 (screw lock). Other spares such as Carby kits, Head Gaskets, should be held by the Q store This will become more important as the equipment ages.

d. The following modifications be carried out to the Zippo tower before being used on future survey Ops:

(1) the lid of the gearbox to be removable;

(2) all metal parts to be stainless steel, especially the screws;

(3) timing marks on the gears for easy maintenance checks;

(4) the gearbox to be transported in either a box or a bag to minimise the amount of dirt entering the gearbox;

(5) the gears to be made of a more resilient material;

(6) the gears to be easily removable without any protruding shaft; the use of a 1/2" socket drive is recommended; and

(7) the dividing plate needs to be redesigned to allow more efficient separation\joining of the links.

e. A small 240V power source, such as the Yamaha EV 1000 generator, be provided to the RAEME element to operate their equipment. This would allow all other generators to be distributed to the parties as required without hindering the repair capability of the support element.

f. Even though the landrovers were only used in a restricted area it became obvious the huge advantages the longrange type had over its counterpart. If future survey Ops are to continue in the remote Northern areas of Australia this type of vehicle should be used. The modifications on the longrange type are essential to operating in this environment. The compressor and split rims ensure one man tyre changes while the stiffer suspension and four wheel disc brakes provide greater safety while operating under extreme loads and

poor road conditions.

I. BAKER
Lance Corporal
RAEME Generator Mechanic

Sep 91

Appendices:

1. Equipment requiring RAEME Generator Mechanic Support

2. Repairs to the equipment

APPENDIX 1 TO
ANNEX M TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

EQUIPMENT REQUIRING RAEME GENERATOR MECHANIC SUPPORT

The following pieces of equipment required RAEME Generator Mechanic support:

Serial	Item	Model	Qty
(a)	(b)	(c)	(d)
1.	Generator	Yamaha EV1000	5
2.	Generator	Suzuki SE700A	2
3.	Generator	Honda E4500	1
4.	Generator	Honda EB3000X	1
5.	Generator	Winsconsion 500 Watt	2
6.	Outboard motor	Johnson 40HP	1
7.	110 Landrover	Survey Variant	1
8.	110 Landrover	LongRange	1
9.	Refrigerator	Tuomatic Gas/Electric	1
10.	Cooking Burner	M2A	1
11.	Rifle	L1A1 7.62mm SLR	6
12.	Chainsaw	Echo	3
13.	Washing machine	Lightburn	2
14.	Trailer	1/2 Ton	1

APPENDIX 2 TO
ANNEX M TO
OP ARIGHT 91 (CONTROL)
OPERATION REPORT
DATED 5 DEC 91

REPAIRS TO THE EQUIPMENT

The following repairs were effected by the RAEME Generator Mechanic:

a. Item: Burner M2A.
Problem: PRV not operating.
Action: Reset PRV and test.

b. Item: Rifle 7.62mm SLR.
Problem: Not Applicable.
Action: Tech Inspect and sight before issue to parties.

c. Item: Suzuki Generator G1.
Problem: Fuel Leak.
Action: Revove perished end of fuel line, seal fuel tap with Teflon.

d. Item: Suzuki Generator G2.
Problem: Wouldn't shut down.
Action: Straighten and readjust fuel cut of Linkage.

e. Item: Burner M2A.
Problem: PRV sticking, excessive pressure.
Action: Strip, clean and lube PRV, test.

f. Item: Suzuki Generator G1.
Problem: Engine won't run correctly.
Action: Generator written off. Intake of sand so much it has bent the crankshaft, camshaft, unseated the valves, cracked the housing and destroyed the oil seal and bearing. NFW declared.

g. Item: 110 Landrover L/Range.
Problem: Breaking uneven.
Action: Inspect brakes lefthand rear disc flanking, new part ordered.

h. Item: Chainsaw.
Problem: Out of tune.
Action: Tune and adjust carby.

i. Item: 110 Landrover L/Range.
Problem: Rodum from MEA.
Action: Inspect steering as per rodum, vehicle is O.K., details passed on.

j. Item: Washing machine.
Problem: Water leak.
Action: Fabricated overflow plug.

k. Item: Burner M2A.
Problem: Pours raw fuel into mixing chamber.
Action: Replace generator and test burn.

l. Item: Generators x 5.
Problem: Minor various.
Action: Tighten and tune.

m. Item: Burner M2A.
Problem: Raw fuel leak, pressure too low.
Action: Rendered repairable for annual tests.

n. Item: Outboard motor.
Problem: Lack of power.
Action: Replace spark plugs, adjust bearings.

o. Item: Trailer.
Problem: Loose wheel bearings.
Action: Strip Hubcaps and adjust bearings.

p. Item: Honda 3 KVA and 4.5 KVA.
Problem: Service.
Action: Change oil, readjust plug gap and tune carby.

q. Item: Suzuki Generator.
Problem: Won't start.
Action: Readjust and straighten fuel cut off linkage, lubricate seized solenoid switch.

r. Item: Yamaha Generator.
Problem: Won't start.
Action: Replace shark plug, drain bad fuel.

s. Item: Zippo Tower.
Problem: Links won't feed.
Action: Strip gearbox. Four gear teeth are stripped and 3 gear shafts are bent. Several modifications attempted. Equipment deemed R/XX/E.

t. Item: Suzuki Generator.
Problem: Won't start.
Action: Replaced bad fuel.

u. Item: Generators x 6.
Problem: Services Required.
Action: Loctite all housing screws, change oil, load test.

v. Item: Honda 4.5 KVA.
Problem: Fuel pouring out of intake.
Action: Overhaul carby, tune carby, clean filter and readjust governor.

w. Item: Generators x 6 (party).
Problem: Inspection prior to airlift.
Action: Drain all fluids after run test.