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4th Field Survey Squadron

# Operation KUMUL 93

## *Operation Report*

An aerial photography operation  
conducted in  
Papua New Guinea

July - August 1993



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OPERATION REPORT  
OPERATION KUMUL 93  
JULY TO AUGUST 1993

- References:
- A. HQADF Tasking Directive 1/1993 dated 21 Apr 93
  - B. LHQ OPORD 40/93 of 170635Z JUN 93
  - C. LHQ Op KUMUL 93 Mounting Instruction dated 18 Jun 93
  - \* D. DSVY-A Op KUMUL 93 Technical Directive dated 5 Jul 93
  - « E. 8 Fd Svy Sqn minute 147-1-4 dated 8 Jul 93
  - \* F. 8 Fd Svy Sqn Facsimile dated 9 Jul 93
  - G. Conversation SO1 Ops DSvy-A/LT Gray dated 28 Jul 93
  - H. DSvy-A Specifications for Vertical Aerial Mapping Photography (draft)
  - I. Op Instruction 1/93 - Responsibility of Aerial Photographic Operators
  - J. Aircraft Contract-Standing Offer:PN8260 dated 1 Oct 91
  - K. Survey Adelaide SIC Z2Y DTG 030720Z JUN 93
  - L. Survey Adelaide SIC Z2Y DTG 070530Z JUN 93
  - M. 4 Fd Svy Sqn 696-93-1 dated Mar 93
  - N. Defarm Campbell SIC Z2Y/JQK DTG 080600Z MAR 93
  - O. Army Svy Regt Facsimile 851-17-36 dated 12 Aug 93
  - P. IATA - Dangerous Goods Regulations; 34th Edition, effective 1 Jan 93

INTRODUCTION

1. Operation KUMUL 93 was an aerial photography operation conducted in Papua New Guinea between 8 Jul 93 and 27 Aug 93. The operation was conducted in response to References A, B and C.

MISSION

2. 4 Fd Svy Sqn's mission was to acquire mapping photography at a scale of 1: 80 000 in accordance with Reference D.

3. In addition to the mapping photography, the following lower priority and opportunity tasks were also attempted:

- a. Priority 2. Photography of selected natural resource areas for the PNGDF to be used for photo mosaics and small scale mapping as defined in Reference D.
- b. Priority 3. Colour photography in accordance with Reference D, in the Cape York area for assessment of the application of colour photography for plotting 1:50 000 mapping.
- c. Field Verification. On an opportunity basis, update the Madang urban orthophotomap (UOPM) in accordance with Reference E.
- d. Evaluation. All Technical Instructions (TI) and SOPs used during the operation were evaluated as stated in Reference D.

#### AREA OF OPERATIONS

4. Mapping Photography. The AO for mapping photography (illustrated at Annex A) covers:

- a. Western Border Area. A strip of one degree of longitude, extending from the PNG/Irian Jaya border at 141° E to 142° E and from 2° 30' S to 8° S covering part of the following 1:250 000 map sheets:
  - (1) SA 54-11 Aitape,
  - (2) SA 54-15 Vanimo,
  - (3) SB 54-03 Mianmin,
  - (4) SB 54-07 Ok Tedi,
  - (5) SB 54-11 Kiunga, and
  - (6) SB 54-15 Lake Murray.
- b. SW Coastal Area. This area was part of the following 1:250 000 map sheets:
  - (1) SC 54-3 Fly River,
  - (2) SC 54-4 Kiwai,
  - (3) SC 54-7 Boigu, and
  - (4) SC 54-8 Daru.

5. Resource mapping tasks are depicted at Annex B.

6. The AO for opportunity tasks extended over the greater part of PNG and is illustrated at Annex C.
7. The AO for the Madang UOPM was bounded by 5° 15' S, 145° 46' E and 5° 12' S, 145° 49' E. The scale for this map is 1:10 000.

## CONDUCT OF OPERATIONS

### Outline of Technical Plan

8. To achieve the technical tasks it was necessary to obtain aerial photography from a variety of flying heights ranging from 25 000 feet above sea level (ASL) to 36 500 feet ASL. With the different requirements for each of the tasks it was also necessary to alter the combination of lens sizes, filters and film types. Processing and assessment of the monochromatic aerial film was conducted in the AO. Colour film was dispatched to Australia where it was developed and prints produced by United Photographics in Melbourne.
9. The field verification of the Madang UOPM was carried out by a combination of physical inspection and consultation with local authorities.

### Conduct

10. The operation was conducted according to the sequence of events shown at Annex D. Significant events are discussed in the following paragraphs.

### Reconnaissance

11. A full reconnaissance of the AO was not conducted prior to deployment. A similar operation, Op KUMUL 92, had taken place during the period Jun to Sep 92, and facilities utilised on that operation had proven satisfactory. WO1 A. Glanville, of 8 Fd Svy Sqn, visited the Smugglers Inn Motel, Madang, in Jun 93 and established that those same facilities were once again available. On this advice bookings were made.

### Issue of Orders and Instructions

12. The Operation Order and Mounting Instruction were issued on 17 and 18 Jun 93 respectively. At least two months lead time would be more appropriate for an operation of this type.
13. The Technical Directive did not arrive at 4 Fd Svy Sqn with amendments until 5 Jul 93, leaving little time to thoroughly examine the document prior to deployment.

### Insertion of Force

14. The advance party consisting of three members and approximately 300kg of stores deployed from 4 Fd Svy Sqn on 6 Jul 93 to RAAF Base Richmond. 7 Jul 93 was spent repacking these stores along with the WAINCO aerial film processor and dangerous cargo totalling 1000kg on one C130 pallet. Insertion of the advance party into Madang was by C130 on 8 Jul 93.

15. The chartered camera aircraft (a Learjet) arrived in Adelaide on 9 Jul 93 but due to a variety of problems did not arrive in Madang until 14 Jul 93 with the other two detachment members.

### Establishment of Base

16. Upon arrival in Madang the advance party established the work and office areas. Much of the darkroom was still intact from the previous year and the main task was the set up and testing of equipment. One detachment member had deployed previously on Op KUMUL 92 and this was of great advantage with respect to liaison with the local community.

### Aerial Photography

17. On 15 Jul 93 operational photographic sorties commenced.

18. Camera, lenses, film types, processing and assessment of photography are all covered within the Technical Report at Annex E. Most of the information within this annex is applicable to aerial mapping photography in general and not peculiar to this operation. All activities were carried out in accordance with References H and I.

### Weather Conditions

19. Weather conditions in PNG are rarely ideal for the acquisition of aerial photography. Due to the mountainous terrain and tropical location, large cloud formations usually build up very quickly.

20. Satellite pictures of the AO were obtained through the Flight Services at Madang airport, however these did not prove particularly reliable due to the dynamic nature of the local weather conditions as well as the fact that low level cloud is not portrayed.

### Extraction of Force

21. Extraction of the operational force was not finalised until 19 Aug 93 due to the uncertainties surrounding the subsequent deployment on Op BELAMA 93. It was not until Jun 93 that Op BELAMA 93 was approved to follow directly after Op KUMUL 93. The implications of this were:

- a. Op KUMUL personnel had to be extracted from Madang;
- b. Op BELAMA personnel had to be inserted into Honiara (Solomon Is); and

- c. the majority of equipment used in Op KUMUL and required for Op BELAMA had to be transported from Madang to Honiara. A minimum of delay was necessary due to the contract daily hire rates of the Learjet as specified in Reference J.

22. Due to the size and weight of the WAINCO film processor a C-130 was the only aircraft capable of such a task. The extraction was achieved by:

- a. Op BELAMA 93 personnel and equipment deployed to Townsville by civil means on 25 Aug 93 to meet a RAAF C-130.
- b. On 27 Aug 93, the C-130 took Op BELAMA personnel and equipment from Australia to Madang and then moved the personnel and equipment for both operations from Madang to insert Op BELAMA into Honiara.
- c. Op KUMUL personnel returned to RAAF Richmond on 28 Aug 93.
- d. Op KUMUL personnel returned to their units by civil air on 29 Aug 93.

#### Problems Encountered

23. Learjet. The Learjet was to arrive in Adelaide on 8 Jul 93 and after fitting of the camera and flying the Bourke Test Range, arrive in Madang on 11 Jul 93. Problems encountered with the Learjet upon insertion and throughout the operation are detailed at Annex E.

### OPERATIONAL RESULTS

#### Mapping Photography

24. Annex F details the individual lines, and their classifications (in accordance with Reference H) that were achieved during the operation. Annex F also details outstanding photography. Mapping photography achieved during Op KUMUL 93 is depicted at Annex F and Annex G shows all available mapping photography achieved to date. A summary of mapping photography achieved is:

- a. X Class - 292 km;
- b. Y Class - 523 km; and
- c. Z Class - 965 km.

#### PNGDF Resource Photography

25. Of the areas tasked, photography was achieved of the following areas:

- a. Hides - all three runs were completed and acceptable;

- b. Tolukuma - one run acceptable and complete;
- c. Lihir - colour photography;
- d. Kutubu; and
- e. Misima.

26. Annex C contains details of achieved and outstanding photography as requested in Reference D.

#### Opportunity Tasking

27. Opportunity photography that was achieved in accordance with References E and F included Port Moresby (full coverage in B&W), and colour photography of Lihir Island, Daugo Island and the Rabaul area. Colour photography of Cape York was planned to be obtained whilst in transit from Brisbane to Madang during insertion. However, this was not achieved due to the delays caused with the Learjet insertion. Details of opportunity photography are shown at Annex C.

28. The field verification of the Madang UOPM was completed and despatched to DSvy-A on 20 Aug 93.

#### TI and SOP Evaluation

29. A separate report concerning the evaluation of TIs and SOPs was forwarded to DSvy-A on 10 Oct 93.

#### Problems Encountered

30. Problems that were encountered with the equipment and changes that were made to certain procedures are covered in Annex E.

### ADMINISTRATION AND LOGISTICS

#### Operation Manning

31. All personnel who participated in Op KUMUL 93 are listed at Annex I.

#### Support

32. Army.

- a. Army Svy Regt:

- (1) provided a camera operator for the duration of the operation,
  - (2) prepared flight lines for PNGDF resource mapping areas,
  - (3) assessed Bourke Test Range film in accordance with Reference I, and
  - (4) provided technical advice during the operation.
- b. 8 Fd Svy Sqn:
- (1) conducted a reconnaissance to Madang to liaise with local authorities and accommodation;
  - (2) booked accommodation and hire vehicle;
  - (3) through the Australian High Commission in Port Moresby, organised a CARNET card for the purchase of aircraft fuel, and accepted weekly invoices for payment;
  - (4) made arrangements with a local company (J.B. Security) for aircraft security whilst in Madang, and accepted invoices for payment;
  - (5) accepted invoices for telephone accounts; and
  - (6) arranged diplomatic and customs clearances for personnel and stores arriving in the Learjet.
- c. 1 Topo Svy Sqn. Arrangements were made for 1 Topo Svy Sqn to collect and store the box of the NF2 sight that was installed at Pacific Aviation, Brisbane.
- d. 15 GL Sect. 15 GL Sect at RAAF Richmond coordinated the tasking of the C-130 for the insertion advance party, stores, equipment and dangerous cargo.
- e. 68 GL Sect. 68 GL Sect at RAAF Richmond were very helpful when it was found that stores had not been shipped by civilian means as requested. There was legitimate concern expressed by GL staff that 1000kg and three passengers did not justify a dedicated C-130. (Unfortunately the size and weight of the WAINCO made it difficult to transport by any other means; dangerous cargo is a continuing problem and commercial shipping had proven to be totally unreliable.)

33. RAAF.

- a. 36 Sqn. RAAF support for the insertion and extraction phases of Op KUMUL 93 was by 36 Sqn in the form of C130 transport of personnel, stores equipment and dangerous cargo.
- b. Central Photographic Establishment (CPE). CPE was utilised for the processing of the Bourke Test Range film for proving the camera system in accordance with Reference G. Due to delays with the Learjet, this meant having operators on stand by over the weekend.

### Civilian

34. Reference J requires Airscan Pty Ltd to supply a camera platform and pilots. They achieve this by subcontracting Tipperary Aviation to provide a Learjet. This arrangement is most satisfactory, despite Army being unable to provide the six month's lead time required in the contract (due to the lack of notice for deployment).

### PNG Government

35. For the field verification of the Madang UOPM, assistance was sought from Mr Ivan Kitchen, Engineer with the PNG Department of Works. He and his staff were of tremendous assistance by providing local knowledge and town plans.

### Border Clearances

36. At Reference N it was requested that clearance be sought from Indonesia for a Commonwealth contracted aircraft to overfly the Papua New Guinea/Irian Jaya border for the purposes of obtaining mapping photography. The overflight clearance was not obtained.

37. Failure to obtain clearance caused East-West runs of photography to be aborted short of the planned western finish point. This is detrimental to the planned aerotriangulation solution of each mapping block.

38. An extra run, parallel to the Western Tie Run on each block is required to tie in shortened East-West runs. This run is along the longitudinal line of E141°09'. All east west runs must extend at least 2 models into this tie. This was confirmed by Reference O.

39. On several occasions when flying on the PNG side of the border, there were large areas of Irian Jaya observed to be cloud free and ideal for mapping photography. These areas will be part of the tasking for Op CENDERAWASIH and the opportunity to obtain the photography was lost.

### POL

40. AVTUR. Fuel for Learjet was purchased by the Commonwealth in accordance with Reference J. This was done by using a CARNET card issued by Australian High Commission, Port Moresby. Fuel invoices were forwarded to Australian High Commission weekly. Funds for the payment of these accounts were forwarded by IP Div to Australian High Commission.

41. Prist. Prist is a fuel additive which prevents freezing of condensing water at high altitudes and bacterial growth in tropical climates. This is not generally available in PNG and had to be imported from Australia. It is classified in accordance with Reference P as dangerous cargo and therefore there is some difficulty in transport arrangements. For this reason requirements must be forecast well in advance.

42. Vehicle Fuel. Fuel for hire vehicles was purchased through local service stations using petty cash as none of them would accept AGCC. It should be noted for future operations that unleaded fuel is not currently available in PNG.

### Vehicle Support

43. Hire Vehicles. One vehicle was hired from Budget Hire Cars in Madang for transport to and from the airport. With the additional task of UOPM field checking it became necessary to hire a second vehicle. With both of these vehicles the option of insurance for personal accident was exercised.

44. Landrover 110. Initial enquires regarding the use of an Australian Army 110 Landrover in and around the local Madang area have proven positive. There is little local mechanical knowledge of the Landrover specifically but sufficient regarding four wheel drive vehicles in general. Spare parts are not readily available in Madang and minor spares such as fan belts and tyres would need to be deployed with the vehicle. The deployment of such a vehicle would save the cost of a hire car and provide good public relations through the visible presence of the Australian Army in Madang. If a Landrover were to be deployed on future operations some modifications (including steering lock, keyed ignition, and removal of pioneer tools from bonnet) would be necessary for security of the vehicle.

### Stores and Equipment

45. Stores and equipment deployed with the operational force were sufficient. Only a few minor items were required to be purchased locally. Everything taken was in good working order and operated well. The WAINCO film processor required some modifications to both the machine and operating techniques. These are discussed in the Technical Report at Annex E.

### Shipment of Stores

46. Shipment of stores and equipment was planned to be by commercial surface shipping means. However, difficulties were again experienced with shipping agents who continue to off-load stores without any notification or reason. Since no satisfactory agent can be found, it has become necessary to rely on RAAF C-130 transport. On 5 Jul 93 a UEO from 4 Fd Svy Sqn flew to Sydney to retrieve the cargo from a transport company, deliver it to RAAF Richmond and pack it in accordance with Reference P.

47. Delays were also experienced with priority air freight from Adelaide to Madang with small items taking seven days to be delivered. Much of this time appears to have been a delay in Customs Department at Port Moresby. Air freight was also addressed to 8 Fd Svy Sqn in an attempt to expedite customs delays. However, delivery still took six working days.

48. Throughout the operation there was a constant flow of RAAF aircraft at Madang airport. This may be an avenue of achieving delivery of urgent freight.

### Accommodation

49. Accommodation for all operation personnel was at Smugglers Inn Resort, Madang. Each member had a single room and this was paid for weekly using AGCC. The rooms were of a good standard.

### Messing

50. Meals were available from the motel and several restaurants within the town. Payment for these were by individual members using Overseas Travelling Allowance issued prior to departure. These meals and selection were consistently of a good standard.

### Medical

51. Madang has both General Practitioners and a modern hospital with most facilities available. Madang is in a malarial zone. In accordance with Reference C, the Keswick Medical Centre supplied all military personnel with the prescribed anti-malarial treatment appropriate for the area and duration of deployment. Anti-malarial precautions for the pilots were their own responsibility.

52. Prior to deployment, first aid kits were prepared by Keswick Medical Centre. Since some medication (particularly antibiotics) is not always available from local sources some S3 and S4 drugs were included in the kits; a letter stating the contents and purpose was provided by the RMO.

53. The health of operational personnel in general was good. The only illness requiring medical attention was Mr M. Juelg being diagnosed and treated for malaria on 8 Aug 93 by the local doctor. Payment for this treatment is the responsibility of the Commonwealth Government in accordance with Reference J. Payment was made from the petty cash account.

### Finance

54. Aerial photography operations require long lead times to enable aircraft to be hired and stores to be bought

55. Australian Government Credit Cards (AGCC). The Detachment OC and 2IC both carried an AGCC with a monthly limit of \$30 000. This amount proved adequate but should be considered the minimum. Although every opportunity was taken to use the AGCC there are few businesses in the Madang area which will accept any form of credit cards.

56. Petty Cash. Because of the lack of acceptance of credit cards in Madang a petty cash advance of \$1000 was issued to OC Det in Adelaide prior to deployment. This was converted to travellers cheques which, in turn, were converted to Kina in PNG.

57. Cheque book. Few local businesses will accept credit cards, although most will accept cheques. A cheque book was not held by the detachment but it would have been advantageous for local purchases.

58. Cost Codes. The cost codes for Op KUMUL 93 were not issued until after 1 Jul 93 due to the new financial year. With an operation of this nature, stores must be ordered and allowances organised well in advance.

59. The Cost Codes used in accordance with Reference B were:

Req No: 3309017CP  
Cost Centre: 541806  
Account Code: 64732  
SLID/SLAC: G999.

60. Total costing. The total cost of Op KUMUL 93 was approximately \$ 445 000.<sup>1</sup> A break down of the costings is as follows:

|                            |                    |
|----------------------------|--------------------|
| Aircraft hire              |                    |
| Flying hours               | \$A 205 500        |
| Standing                   | 60 000             |
| Admin                      | 4 500              |
| Security                   | 1 900              |
| Maintenance                | 4 100              |
| Fuel                       | 45 930             |
| Accommodation <sup>2</sup> | 31 283             |
| Allowances                 |                    |
| Military pers              | 31 000             |
| Pilots <sup>3</sup>        | 20 000             |
| Hire vehicles              | 6 470              |
| Civil Air                  | 1 700              |
| Phone/Fax                  | 1 900              |
| Freight and Cartage        | 500                |
| Stores                     | 17 700             |
| Equip service              | 11 100             |
| Petty Cash                 | 950                |
| <u>TOTAL</u>               | <u>\$A 444 533</u> |

- Notes: 1 Some costs have been converted from Kina to \$A and are therefore only approximations.  
2 Accommodation element is for military personnel only.  
3 Pilots allowances contain both their meal and accommodation elements.

#### Total Expenditure

61. The cost estimate for Op KUMUL 93 in the Mounting Instruction (Reference C) was \$400 000. The reasons for this extra expenditure may be attributed to:

- a. added and hidden costs accounted against Op KUMUL 93 of which 4 Fd Svy Sqn was unaware, such as the servicing of the WAINCO film processor and T&S charges for visitors;
- b. changes to the cost of aviation fuel;
- c. unavailability of RAAF C130 for extraction on the requested date, the operational deployment was extended by four days; and
- d. decrease in value of Australian dollar.

## Allowances

62. Allowances for military operation personnel were:
- a. Overseas Travelling Allowance. This allowance was paid in advance in accordance with INDMAN 1, Volume 4, Instruction 3601 at the rate of:
    - (1) 77.30 Kina per day for the first 28 days, and
    - (2) 66.40 Kina per day after 29 days.
  - b. Overseas Outfit Allowance. An overseas outfit allowance was paid in advance to eligible members in accordance with INDMAN 1, Volume 4, Instruction 3602 at the rate of:
    - (1) Overseas - \$ 200.00; and
    - (2) Tropical - \$ 185.00.
  - c. Difficult Post Allowance. This allowance was paid to eligible members at a rate of \$ 205.23 per fortnight in accordance with INDMAN 1 Volume 4, Instruction 3719.
  - d. Flight Duties Allowance. Flight duties allowance entitlement was paid in accordance with INDMAN 1, Volume 1, Instruction 0107 (from the hours shown in Annex J).
63. Pilots employed under Reference J were entitled to meal and accommodation allowance of \$210.00 per day. An advance of \$19 740.00 was made to Airscan Pty Ltd prior to deployment. Pilots individual payments were then the responsibility of Airscan Pty Ltd. The extended period of the operation increased the payable amount and this was paid upon return to unit.

## Leave Entitlements

64. Remote Locality Leave. As stated in INDMAN 1, Volume 3, Instruction 2601, operation personnel are entitled to remote locality leave accumulated at the rate of 10/12 of a day per month whilst in the AO.
65. Flying Leave. Flying leave is accrued as stated in INDMAN 1, Volume 3, Instruction 2601, and is to be calculated retrospectively according to the hours flown by individual members (shown in Annex J).

## Passports and Visas

66. Official passports were issued to all military members of the detachment.
67. Visas for entry into PNG are required. As part of the Memorandum of Understanding (MOU) between Australia and PNG there is provision under the Status of Forces Agreement

(SOFA) for military personnel to enter the country. A copy of the form used is at Annex K. Pilots' visas were arranged by 4MU.

### Banking

68. Banking facilities in Madang are provided by:

- a. ANZ,
- b. Westpac (PNG), and
- c. PNG Banking Corporation (Commonwealth).

69. Each of these banks has affiliations with their Australian counterparts, however, Australian passbooks or accounts cannot be used. Personal credit cards can be used to obtain cash advances although this requires a telephone call (charged to the customer) to be made to Australia each time an advance is made.

70. Travellers cheques proved to be the best form of converting currency with a fee of three kina on each transaction.

### Mail

71. Mail rates to Australia were comparable to Australian overseas rates. Time for an item to reach Australia varied between seven and ten days. All mail to the detachment was addressed care of the motel and there did not appear to be any problems with that arrangement.

### Visits

72. Visits were made during the period 26-28 Jul 93 by LTCOL P. Cates (SO1 Ops, DSvy-A) and MAJ J. Gregs (OC 8 Fd Svy Sqn).

### Contact Information

73. Contacts made within the AO which may be useful in the mounting of further operations in the area are contained at Annex L.

## COMMAND AND SIGNAL

### Command

74. Command arrangements specified in Reference C were both suitable and functional.

## Communications

75. Telephone/Facsimile. Arrangements were made for the Post and Telecommunications Corporation to connect a direct telephone line to the room in the motel which was used as an office. The connection took four days and cost K65. The configuration of phone/fax used for this operation is ideal and worked very efficiently. Phone calls and facsimiles could be made to any unit with relative ease. This meant that operation communications could all be channelled through one line and only one bill resulted. The final phone bill was forwarded to 8 Fd Svy Sqn for payment.

76. Facsimiles sent to the Detachment from Adelaide were relayed through the gateway, RNCC-SA at RAAF Edinburgh.

77. Personal telephone and facsimile facilities were available through the motel. Although not always convenient it was considerably cheaper to arrange for expected calls to be made from Australia on a weekend.

## SITREPs

78. Weekly SITREPs were sent by facsimile to 4 Fd Svy Sqn and 8 Fd Svy Sqn. To decrease the expense of overseas calls, 4 Fd Svy Sqn then retransmitted the SITREP to Australian addressees.

## CONCLUSIONS

79. General. Op KUMUL 93 was a moderately successful aerial photography operation. The limited success can be attributed almost entirely to adverse weather conditions. On a task that requires perfect weather conditions, and in a country which is not conducive to such conditions, acquisition of acceptable aerial photography for mapping becomes more a fact of being in the right place at the right time.

80. Timings. The timing of this, and other overseas photography operations were confirmed only weeks prior to deployment. This left little time for planning, reconnaissance, stores acquisition, issue of orders and instructions, and forecast of RAAF support.

81. Learjet. Due to pressurisation problems, the fitting of the NF2 navigation sight to the Learjet must be carried out in Brisbane and supervised by RA Svy air camera operator.

82. Manning. Manning for the operation was satisfactory.

83. Border Clearances. For the second successive year, the failure to gain overflight clearance across the PNG/Irian Jaya border had a significant impact on the ability to achieve the desired results.

84. Vehicles. The deployment of a Unit vehicle could save on hire vehicle expenses.

85. Dangerous Cargo. Due to the nature of chemicals used in all aerial photographic operations and restrictions placed upon their air movement a UEO would be an advantage in the AO.

86. Shipment of Stores. The commercial shipping of stores, particularly dangerous cargo, continues to be shown to be unreliable. The frequent number of RAAF flights into Madang may provide a means to rapidly resupply future detachments.
87. RAAF Transport. A reliance upon RAAF transport now exists because of the unreliability of commercial shipping, the late notice provided for overseas operations, and the consecutive nature of overseas operations.
88. Finance.
- a. With the operation due to commence on 6 Jul 93 and no cost codes issued until 1 Jul 93 it was difficult to order stores and make payments for allowances. This situation is totally unacceptable, but is consistent with Defence Cooperation funded operations in recent years.
  - b. A large component of the overspend can be attributed to 4 Fd Svy Sqn not being notified of commitment being made against the Operation by other sources.
89. Aerial Camera. The age of aerial cameras currently owned by RA Svy and the unavailability of parts may create difficulties in the near future.

### RECOMMENDATIONS

90. As a result of the observations made throughout Op KUMUL 93 and the conclusions detailed in this report the following recommendations are made with respect to both PNG and future aerial photography operations.

| Recommendation  | Recommended Action by: |
|---|------------------------|
| 91. <u>Timings.</u> Sufficient lead time must be provided to enable operations to be properly planned and mounted.  | IP Div, LHQ<br>DSvy-A  |
| 92. <u>Finance.</u> As with timings, financial approval to undertake operations must be given early. Many arrangements need to be made which require funding months in advance. | IP Div, LHQ<br>DSvy-A  |
| 93. <u>Dangerous Cargo.</u> One member to be deployed on each operation should be a qualified UEO.  | 4 Fd Svy Sqn           |
| 94. <u>Border Clearances.</u> To ensure the technical success of this border mapping programme, permission to overfly the PNG/Indonesian border is essential.                   | LHQ                    |
| 95. <u>Vehicles.</u> The possibility of deploying a Unit Landrover with each overseas operation should be investigated.   | 4 Fd Svy Sqn           |
| 96. <u>Shipment of Stores.</u> Commercial surface shipping should not be used for delivery of stores to an overseas AO.   | 4 Fd Svy Sqn           |

| Recommendation  | Recommended<br>Action by: |
|---|---------------------------|
| 97. <u>Urgent Stores.</u> The possibility of shipping urgent stores direct to Madang by RAAF should be investigated.                                      | LHQ                       |
| 98. <u>Total Expenditure.</u> Expenditure made by any unit against an operation's cost codes should be notified to 4 Fd Svy Sqn within five working days. | DSvy-A                    |
| 99. <u>Aerial Camera.</u> The replacement of RC-10 aerial cameras should be investigated.   | LHQ<br>DSvy-A             |

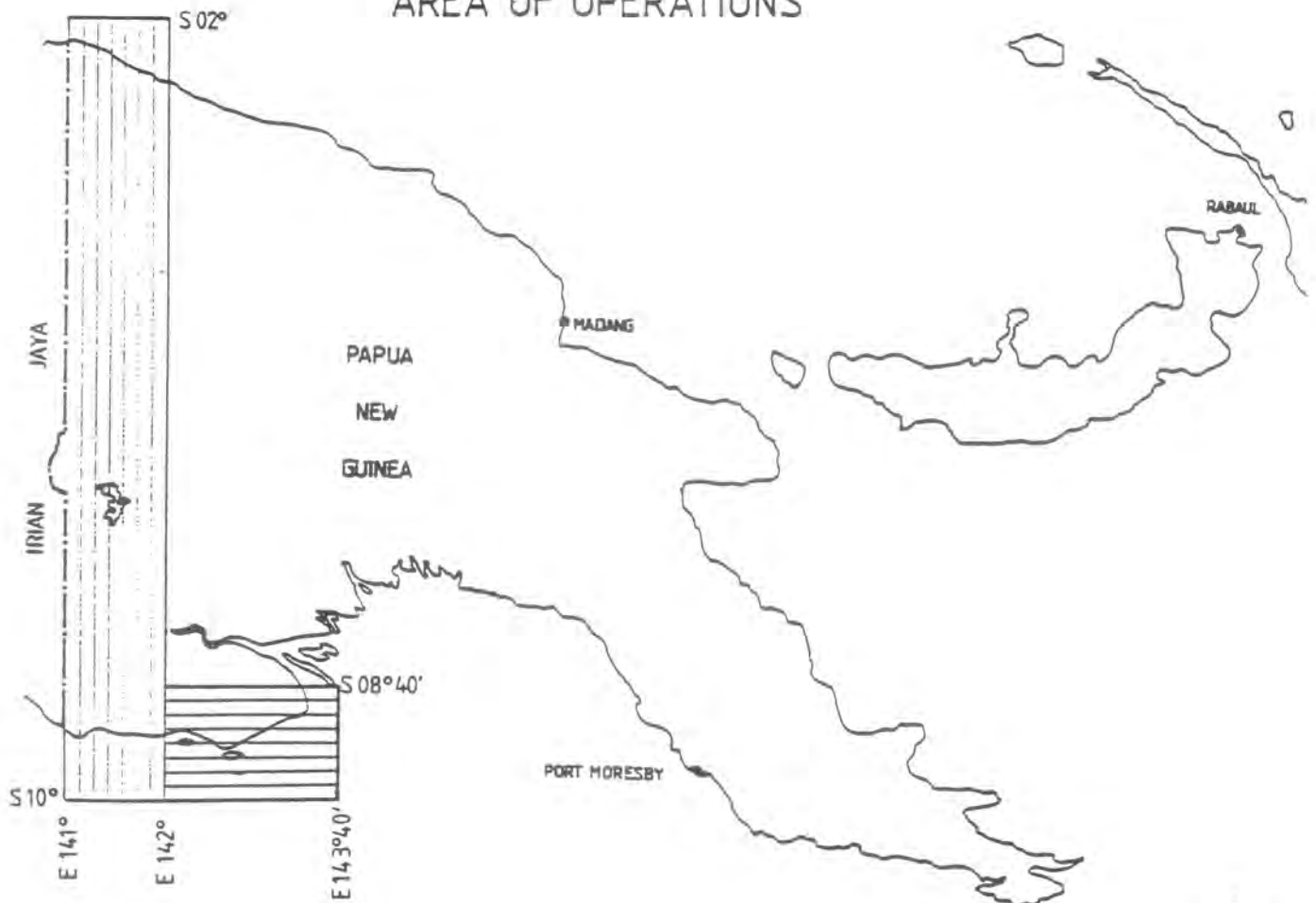


for

A.B. McLeod  
Major  
Officer Commanding

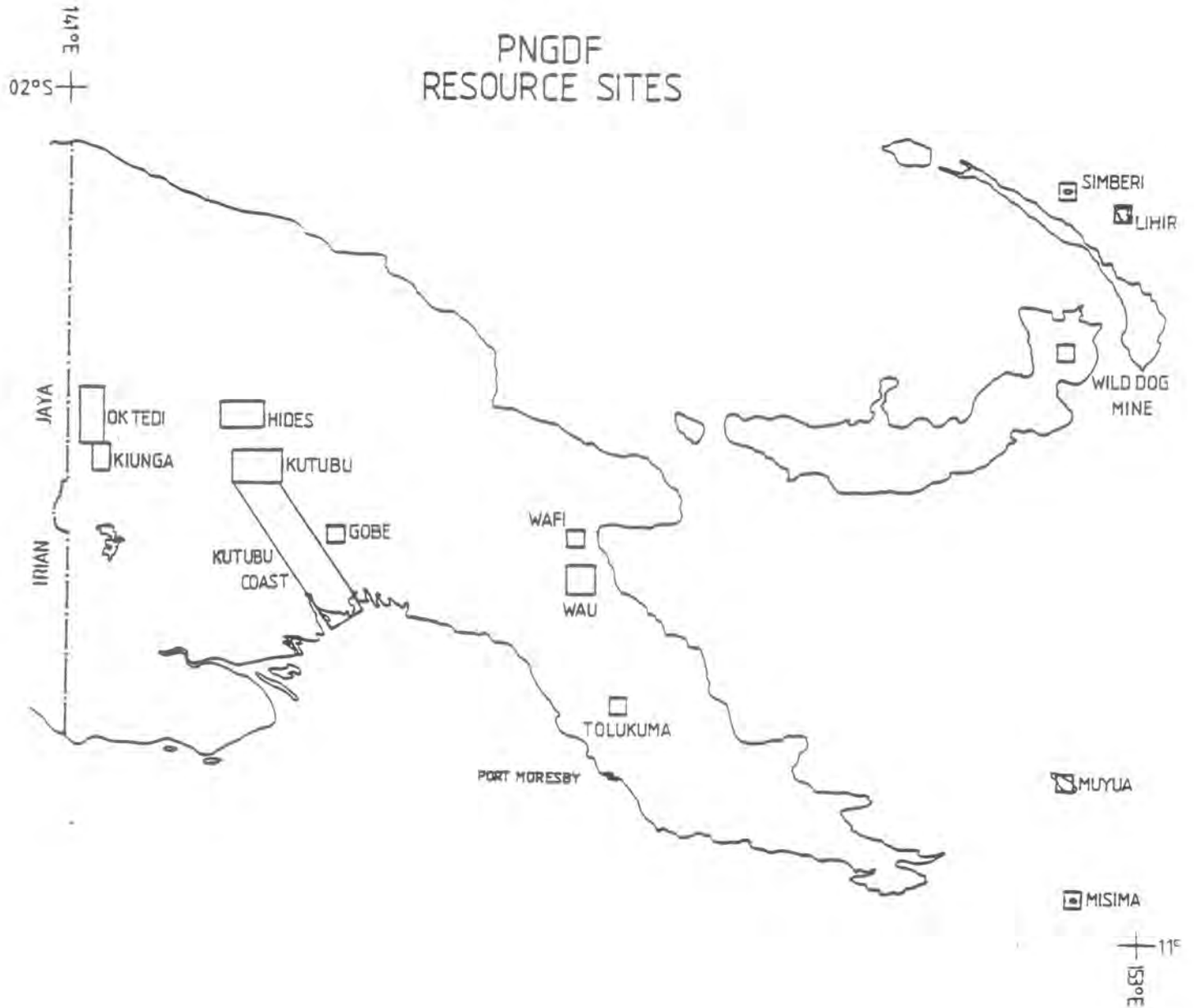
10 December 1993

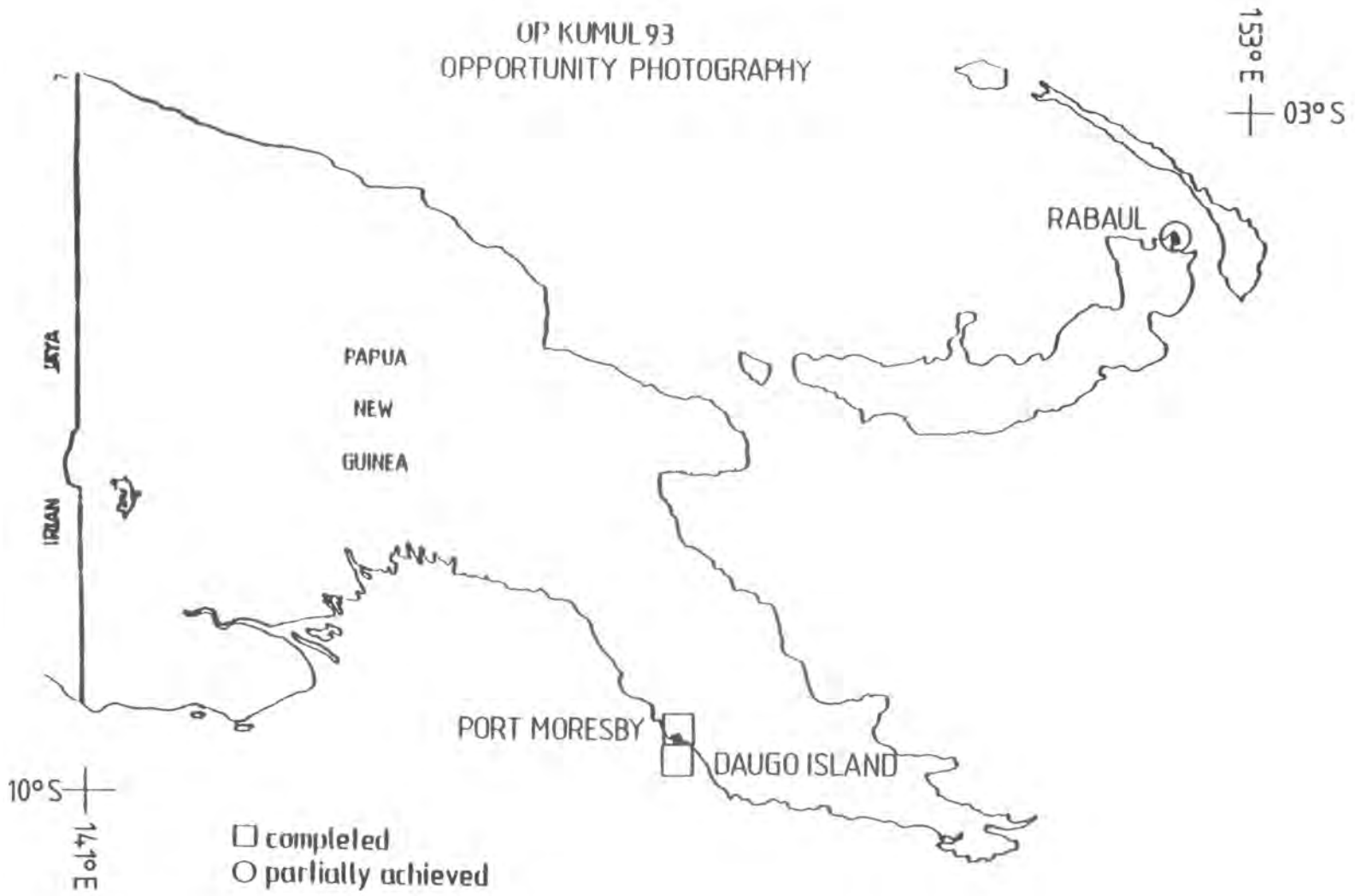
### MAPPING PHOTOGRAPHY AREA OF OPERATIONS



▨ WESTERN BORDER AREA

▨ SOUTH WESTERN COASTAL AREA





ANNEX C TO  
4 FD SVY SON  
OP KUMUL 93  
OPERATION REPORT  
DATED 10 DEC 93

OP KUMUL 93  
 SEQUENCE OF EVENTS

| Serial | Date        | Event  |
|--------|-------------|--|
| (a)    | (b)         | (c)  |
| 1      | 19 Aug 91   | DGOP-A Tasking Directive Issued  |
| 2      | 7 May 93    | Concept Of Operations Issued   |
| 3      | May 93      | Stores ordered   |
| 4      | 4-5 Jun 93  | Recon conducted by WO1 Glanville<br>(8 Fd Svy Sqn)   |
| 5      | 7 Jun 93    | Dangerous Cargo, WAINCO and associated stores delivered to<br>Shipping Agent   |
| 6      | 17 Jun 93   | Operation Order Issued   |
| 7      | 18 Jun 93   | Mounting Instruction Issued  |
| 8      | 2 Jul 93    | Additional stores delivered to Edinburgh   |
| 9      | 4 Jul 93    | SGT Gloster traveled Bendigo-Adelaide  |
| 10     | 5 Jul 93    | Technical directive Issued   |
| 11     | 5 Jul 93    | WO2 Clarke Adelaide-Richmond<br>Arranged for DC to be transported on C130  |
| 12     | 6 Jul 93    | Advance Party transit Edinburgh-Richmond by RAAF   |
| 13     | 8 Jul 93    | Advance Party with all stores transit Richmond-Madang by C130  |
| 14     | 9 Jul 93    | Learjet arrives Adelaide<br>RC10 fitted<br>Flew Adelaide-Brisbane for aircraft repairs   |
| 15     | 9-10 Jul 93 | Advance party establish work and Admin areas   |
| 16     | 10 Jul 93   | Learjet repairs carried out  |
| 17     | 11 Jul 93   | Learjet flew Bourke Test Range<br>Film Processed at CPE and despatched to<br>Army Svy Regt for analysis<br>Learjet Melbourne to Adelaide to replace faulty NF2 |
| 18     | 12 Jul 93   | Learjet Adelaide-Brisbane for rectification of aircraft pressurisation<br>problems   |
| 19     | 13 Jul 93   | Learjet repairs<br>Brisbane-Port Moresby   |
| 20     | 14 Jul 93   | Learjet Port Moresby-Madang  |

| Serial | Date         | Event   |
|--------|--------------|---|
| 21     | 15 Jul 93    | Commence Aerial Photography sorties   |
| 22     | 18 Jul 93    | Pilots rest day   |
| 23     | 19-24 Jul 93 | Sorties flown to border and resource mapping areas. Cloud cover varied from one to four layers of 8/8 cloud.    |
| 24     | 21-23 Jul 93 | Mr Pat Watt Aircraft Engineer repairs to lear pressurisation and fuel controller                                |
| 25     | 25 Jul 93    | Pilots rest day   |
| 26     | 26-31 Jul 93 | Sorties flown to border and resource mapping areas. Cloud cover varied from one to four layers of 8/8 cloud.    |
| 27     | 28-30 Jul 93 | Visit by LTCOL Cates and MAJ Greggs   |
| 28     | 1 Aug 93     | Pilots rest day   |
| 29     | 2-7 Aug 93   | Sorties flown to border and resource mapping areas. Field verification of Madang UOPM.                          |
| 30     | 8 Aug 93     | Pilots rest day   |
| 31     | 9 Aug 93     | Nil flying, Mr M. Juelg ill with Malaria.   |
| 32     | 10 Aug 93    | Sortie flown to border and resource mapping areas. Field verification of Madang UOPM.                           |
| 33     | 11-12 Aug 93 | Sortie to Port Moresby, overnight Port Moresby. Resource and opportunity tasking Misima and Port Moresby areas. |
| 34     | 13-14 Aug 93 | Sorties flown to border and resource mapping areas.   |
| 35     | 15 Aug 93    | Pilots rest day   |
| 36     | 16 Aug 93    | Sorties flown to border and resource mapping areas.   |
| 37     | 17 Aug 93    | Sorties flown to border and resource mapping areas.   |
| 38     | 18 Aug 93    | Sorties flown to border and resource mapping areas.   |
| 39     | 19 Aug 93    | Sorties flown to border and resource mapping areas.   |
| 40     | 20 Aug 93    | Sortie to Port Moresby via Lake Murray and Tokuluma. Collect and install new camera control unit                |
| 41     | 21 Aug 93    | Sorties flown to border and resource mapping areas.   |
| 42     | 22 Aug 93    | Pilots rest day   |
| 43     | 23 Aug 93    | Sorties flown to border and resource mapping areas.   |
| 44     | 24 Aug 93    | Sorties flown to border and resource mapping areas.   |
| 45     | 25 Aug 93    | Sorties flown to border and resource mapping areas. Clean and pack stores                                       |
| 46     | 26 Aug 93    | Sorties flown to border and resource mapping areas. Learjet transit to Port Moresby.                            |
| 47     | 27 Aug 93    | C130 Townsville-Port Moresby-Madang-Port Moresby-Honiara.   |
| 48     | 28 Aug 93    | C130 Honiara-Richmond   |
| 49     | 29 Aug 93    | Op pers RTU by Civilian Air   |

TECHNICAL AND EQUIPMENT REPORT  
OPERATION KUMUL 93  
JULY TO AUGUST 1993

INTRODUCTION

1. Operation KUMUL 93 was an aerial photography operation conducted in Papua New Guinea (PNG) between 8 Jul 93 and 28 Aug 93.
2. The aim of the Operation was to acquire:
  - a. suitable mapping photography for the production of 1:50 000 maps in the Western and SW regions of PNG;
  - b. wide angle photography of selected resource sites for the production of 1:5 000 and 1:10 000 photomaps; and
  - c. colour photography of selected Cape York and PNG runs for mapping suitability assessment.
3. The Areas of Operations (AO) are shown at Annex A and consist of:
  - a. Western Border 1:250 000 Areas.
    - (1) SA 54-11 VANIMO,
    - (2) SA 54-15 AITAPE,
    - (3) SB 54-03 MIANMIN,
    - (4) SB 54-07 OK TEDI,
    - (5) SB 54-11 KIUNGA, and
    - (6) SB 54-15 LAKE MURRAY.
  - b. SW Coastal Area.
    - (1) Block 1B (DARU-MAER), and
    - (2) Block 1C (NORTHERN BOIGU-DARU).

## c. PNGDF Resource Sites (Annex B)

Specific Tasking

4. Det 4 Fd Svy Sqn's mission was to acquire photography in the following priorities:
- a. Priority One. Mapping photography.
  - b. Priority Two. PNGDF Resource sites.
  - c. Priority Three. Colour trial photography.
  - d. Opportunity Tasks.

OPERATIONAL RESULTSPriority One Tasks

5. A total of 1780 line km were photographed on priority one tasking. Classification of photography is as follows:
- a. X class photography 292 line km.
  - b. Y class photography 523 line km.
  - c. Z class photography 965 line km.
6. Line km of X and Y photography achieved for block areas are:
- a. Western Border Area.
    - (1) AITAPE/VANIMO Nil
    - (2) MIANMIN Nil
    - (3) OK TEDI Nil
    - (4) KIUNGA Y Class - 60 km
    - (5) LAKE MURRAY X Class - 260 km; Y Class - 414 km.
  - b. SW Coastal Area.
    - (1) DARU-MAER (1B) X Class - 32 km; Y Class - 49 km.
    - (2) BOIGU-DARU (1C) included in above.

7. As clearance to overfly the PNG/Irian Jaya border was not approved, planned East-West flight lines could not be completed. To satisfy block geometry for aerotriangulation purposes, an extra Tie Run along longitudinal line 141° 09'E (Tie 4) was included to strengthen the LAKE MURRAY block.
8. LAKE MURRAY is now 96% complete to X and Y class specifications. Useable Z class photography obtained this year and in 1992 could possibly be used to bridge existing gaps.
9. Msn 4FDP 458 Runs 4 and 6 were flown in the SW Coastal Area on 1 Aug 93. The 112 km of photography was taken under cloud and classified as 'Z' due to 100% cloud shadow, as detail is not obscured this photography may be useable.
10. Annex F shows the useable mapping photography acquired during OP KUMUL 93.
11. Annex G shows the current status of useable photographic coverage as at Sep 93.

#### Priority Two Tasks

12. Resource area photography was prioritised and grouped for aircraft visitation. Of the 16 prioritised areas, four were partially photographed and one was completed.
13. Photography achieved is as follows:
  - a. KUTABU (PRIORITY TASK 2). Run 3 was achieved on 2 Aug 93. Msn No 4FDP 457 using Wide Angle lens 1006 with KODAK 2402 film. As complete coverage was not achieved the run may only be suitable for updating cultural detail.
  - b. MISIMA (PRIORITY TASK 5). Msn No 4FDP 464 Runs 1, 2 and 3 was flown on 12 Aug 93 using KODAK 2402 film with Wide Angle lens 1006. This resulted in part coverage of Misima mine and air strip due to large amounts of light cloud in the target area. Coverage would only be useable for updating cultural detail.
  - c. LIHIR (PRIORITY TASK 7). Msn No 455 Run 1 was flown on the 29 Jul 93 using Wide Angle lens 1006 with 2445 Aerocolor Film. Only part coverage was achieved due to cloud. Suitable for cultural update only.
  - d. HIDES (PRIORITY TASK 8). Msn No 4FDP 457 Runs 1, 2 and 3 were flown on 3 Aug 93 using Wide Angle lens 1006 with KODAK 2402 film, providing full coverage of planned area. All negatives are of a quality to produce a 4 times enlargement for use up to 1:5 000 (uncontrolled) photomap product.
  - e. TOLUKUMA (PRIORITY TASK 13). Msn No 4FDP 467 Run 1 was flown on 19 Aug 93 using Super Wide Angle lens 2090. Full coverage was achieved of the planned target area from an altitude of 16,000 feet using high contrast 2412 film, however the target was not confirmed. The negatives have high contrast with large amounts of relief shadow but may be suitable for 4 times enlargement for photo products. The super wide angle lens was used as the target presented itself briefly between cloud banks, not allowing time for lens change.

14. Each target area except TOLUKUMA was confirmed by 8 Fd Svy Sqn.
15. Achievements are represented at Annex G.

#### Priority Three Tasks

16. No colour trial photography was achieved.

#### Opportunity Tasks

17. Colour photography.
  - a. RABAUL - one low level run over township was achieved; and
  - b. DAUGO ISLAND - flown but results unknown at 16 Nov 93.
18. Panchromatic photography, PORT MORESBY - total coverage at 1:20 000 scale.
19. A graphical representation of all opportunity tasking is at Annex H.
20. MADANG Urban Orthophoto Map (UOPM). An update of the MADANG 1:10 000 UOPM was requested by 8 Fd Svy Sqn for completion by Det 4 Fd Svy Sqn whilst based in Madang. Field verification was conducted on an opportunity basis by vehicle and from contacting local services. Tasking was achieved and a correction overlay was delivered to 8 Fd Svy Sqn on 20 Aug 93.

### PROCESSING AND PRINTING

21. All Panchromatic processing and printing was carried out in the AO by Det personnel utilising the WAINCO film processor and Metaform print processor.
22. Colour film was despatched to United Photographics in Melbourne for processing and printing.

### ASSESSMENT

23. Assessing of photography was carried out by Det personnel in the AO in accordance with Reference H of this Report.

### EQUIPMENT

24. General. WILD RC10 aerial camera number 2611 was employed with:

- a. SAGII lens 2090 with calibrated focal length of 88.04mm (calibration date 5 Apr 93), and
  - b. UAG lens 1006 with calibrated focal length of 151.77mm.
25. The camera system also included Differential Height Evaluation and Logging System (DHELs) airborne unit 1.
26. The camera platform used was contracted Gates 35A Lear VH-TPR equipped with GARMIN GPS-100 Global Positioning System (GPS) for navigational purposes.

### Camera Platform

27. VH-TPR performed exceptionally well after initial pressurisation and fuel supply problems. The speed, range and stability of the aircraft allowed tasking flexibility in difficult conditions. Excellent communication between pilots and camera crew was effected by head sets, hot wired for hands off operation. The on board GPS system proved to be very reliable.
28. The pilots proved to be experienced professionals who, having worked aerial survey missions previously, contributed significantly in weather liaison and interpretation as well as anticipating and reacting to changing weather conditions to maximise photo opportunities.
29. Platform Problems. Some of the problems encountered were:
- a. Aircraft arrival in Adelaide on 9 Jul 93 revealed the following:
    - (1) incomplete NF2 Sight mounted backwards,
    - (2) incompatible power connections for camera and DHELs,
    - (3) incorrect pilot indicator lamp supplied and fitted, and
    - (4) control unit bracket not fitted.
  - b. Aircraft compass drive unit required replacement,
  - c. Aircraft fuel control computer required replacement and calibration,
  - d. Pilots emergency oxygen supply leak required refill in Port Moresby,
  - e. Lens /glass port clearance for 152mm lens is minimal restricting tip/tilt correction,
  - f. The NF2 is mounted with a 1.5 degree rotation off the aircraft axis. This requires manual compensation.
30. NF2 Sight. The NF2 sight is hard mounted with a 1.5 degree rotation to the right of the aircraft axis. This can be compensated for by the operator, however it must be taken into account when setting drift, as a 1.5 degree drift correction to the right will read 0 degree on the Drift Graduation Ring, where the same correction to the left will read 3 degree.

31. Fogging. Port glass fogging caused problems on numerous occasions Remedial action was time consuming and on one occasion ineffective (to the detriment of an opportunity task).
32. An aircraft modification to direct bleed air across the glass port was implemented from recommendations made from 1992 operations, however the airflow is minimal and not effective directly under the filter, especially with the 152mm lens fitted as the air gap between port and filter is approx 1cm. Airflow originating closer to and directed under the filter may be more effective.
33. The existing air vents are forward and aft of the lens. It would be more advantageous to have bleed air directed from either side of the lens reducing the distance of air flow by half. Slower descent rates from high altitudes reduces the risk of fogging, however until such times as the glass port stabilises in temperature, penetration of cloud should be avoided as 'fog up' will occur.
34. The optimum descent rate is 500 ft per minute to negate fog up.

### Camera

35. Camera 2611 operated with only a few problems:
- a. NF2 Spiral. The apparent speed spiral as viewed in the navigation sight developed a 'skip' during each camera exposure which indicated a greater overlap would be obtained than the set 80%, this proved to be false as test film exposures ranged from 79-82%. Action taken was to ignore the skip. The skip eventually abated then reappeared again to a lesser degree and was thought to be a fault in the spiral drive mechanism. Overlap was not affected and again skip was ignored.
  - b. Overlap. Inconsistent overlap problems were encountered on some occasions and a series of tests and remedial action failed to indicate why it occurred. The camera was recording close to 90% overlap while set for 80%. Tests were conducted to determine if the control unit overlap selection switch was at fault due to manipulation immediately prior to the runs at fault. Test runs were flown at 60%, 65%, 70%, 75%, and 80% all runs proved to be within 1% of selected percentage. The tests indicated no problem existed and operator error was attributed to be the cause. Overlap was found to be excessive on KIUNGA Tie Runs, a test was conducted to determine if circuit board 6 was defective. Two runs over even terrain with board change between runs failed to indicate any problem. A replacement Control Unit was ordered and despatched on 13 Aug 93 due to a consistent 40% overlap being obtained on a setting for 80%. It was determined the Control Unit % switch does not register true, the problem arises immediately after switch manipulation. Control unit was replaced on 20 Aug 93. All overlap on mapping photography exceeded specifications (ie, excessive overlap). On advice given in Telecon SGT Gloster / SSGT Hammond dated 17 Aug 93, runs over even terrain were not down graded for excessive overlap.
  - c. Camera Clock. The camera clock adjustment screw became detached during setting. Prior to a replacement arriving, the clock face was covered by tape for resource photography so as to provide no information in preference to incorrect

information. Date/time information is available from corresponding A36 Flight Reports.

### DHELS

36. DHEL airborne unit 1 had intermittent problems with pulse recognition. Operation procedure was modified to remedy possible counting of camera on/off manipulation.
37. Initially, runs were recorded with some overlap in finish and subsequent start times, this was thought to be due to a record of pulsing by camera on/off switch manipulation or faulty DTD. Remedial action taken was to replace DTD and start Run Mode after camera was turned on and exit Run Mode prior to camera off.
38. Recordings failed to start on two occasions and both times were found to be due to Run Mode being initiated prior to camera on.

### Film

39. Film types used for Op KUMUL 93 were:
- a. KODAK 2412 for SWA mapping photography,
  - b. KODAK 2402 and 2405 for WA Resource tasking, and
  - c. KODAK 2445 for colour Resource and Opportunity tasking.
40. Film Problems.
- a. 2412 is a high resolution film requiring a large exposure and a lot of light. Used over dark rainforest the exposures are bordering on the cameras' physical limits. As a result, some negatives are slightly underexposed. Compensation for lesser conditions, ie. very heavy haze or overcast cloud, is therefore restricted to slowing the aircraft. Substitution of a 'faster' film would allow more flexibility but not the same resolution.
  - b. 2402 provided good negatives however one test roll caused problems during processing in that the emulsion would not dry properly. This was attributed to the individual film roll as subsequent rolls caused no problems.

### WAINCO Film Processor

41. Initial teething problems of excessive scratching, heat buckling, creasing and incorrect drying were overcome by persistent testing and implementation of positive actions to provide consistent results. The processor quality improves with quantity, in both individual roll lengths and number of rolls put through. For consistently good results a minimum of 100 frames should be processed at a time.

42. All films were processed emulsion down as recommended by user manual, resulting in only minor emulsion scratches and pinholes.

43. Processing Problems. The major problem encountered was incomplete drying of films which caused film to stick internally. This resulted in massive scratching, heat buckling and caused the processor to force the drying racks upwards popping two self tapping screws which secured the hinge plate to the framework. The hinge plate was re-secured by drilling and replacing the self tapping screws with bolts and nuts.

44. It was determined that the particular roll of film (2402) used for testing was suspect, as a second roll dried without causing any adverse problems.

45. Interruption during processing should be minimised to avoid over development of film, over heating of film, and the likelihood of sticking. This can be avoided altogether by increasing the number of blank frames on the trailing edge to 25 and overriding the cut-out switch with tape. This procedure means that scratching is restricted to blank area only and no interruption occurs during processing.

46. It is more economical to increase the trailing edge to 25 and reduce the leading edge to 5 frames than risk a run of photography by interruption to affix a leader.

47. The top take up spindle was replaced with the bottom spindle as it had been bent during transit and caused uneven film feed onto the take up spool.

48. WAINCO Problems. Problems associated with the construction of the WAINCO film processor include:

- a. cassette holder assembly attachment screw(s) rusted;
- b. dip rod locating rod washers are corroded and remnants are inside solution tanks, possibly the cause of pinholes; and
- c. solution tank overflow outlets, exposed to air when dip rods are removed, are corroding and depositing residue in tanks.

49. Equipment components must be checked constantly for degeneration and corrosion build up due to chemistry and humid conditions in Operation areas.

50. Chemistry and Solutions. WAINCO chemistry was not replaced during the Operation. Wash tanks only were drained, rinsed and refilled after each process.

51. The Photolab addition of a regulator to the water feed hose proved successful and no over-filling or leakages occurred, however the regulator needs to be adjusted to accommodate tap pressure at each new location. A drainage hose attached to the silver recovery outlet pipe also reduces the likelihood of leakage.

52. Replenishment chemistry and a constant room temperature (19.5° C) provided consistent conditions and results (base plus fog range of 1.3 to 1.4). Processing speed adjustment was therefore manipulated only to accommodate a particular film or run of exposures.

53. The alcohol bath must be monitored as the solution will strengthen to 100% as the initial water/alcohol mix is replenished only with pure alcohol.

Metaform

54. The paper processor performed well during the Operation .
55. Metaform Problems. The first wash bath solution becomes contaminated during operation and requires replacement before each production session. The addition of a water replenishment bottle would remedy this problem.

CONCLUSION

56. Adverse weather conditions minimised photographic opportunities on Op KUMUL 93 although the LAKE MURRAY block was able to be completed. Trial colour mapping photography could not be attempted in transit from Australia and in country opportunities did not arise.
57. The equipment utilised on OP KUMUL 93 functioned well with only minor problems. However, RC10 cameras are becoming difficult to maintain as they have surpassed their Life Of Type (LOT) and spare parts are no longer being manufactured. Cannibalisation of some cameras will become increasingly necessary. High contrast, fine grain film such as Kodak 2412 requires a slow exposure and a large aperture. Exposure problems associated with the use of this film in high speed aircraft can be overcome with modern cameras with Image Movement Compensation.
58. The WAINCO film processor provided consistent results however scratching and pinholes, however minor, are still unacceptable for AI mapping photography.

RECOMMENDATIONS

- |   |                         |
|---|-------------------------|
| 59. All camera installation in contracted aircraft be conducted or supervised by a competent RA Svy camera operator at the aircraft service base. | 4 Fd Svy Sqn            |
| 60. Camera PAV11 mount in VH-TPR be spaced with washers 1cm above standard position to accommodate the 152mm lens.                                | 4 Fd Svy Sqn            |
| 61. Aircraft anti fogging air flow be redirected to originate from the sides or closer to the lens base.  | Airscan<br>DSvy-A       |
| 62. The useability of the LAKE MURRAY block should be assessed utilising all existing photography.  | Army Svy Regt           |
| 63. Extra Tie Runs parallel to the PNG / Irian Jaya border be included at planning stage for implementation should border clearance be denied.    | DSvy-A<br>Army Svy Regt |
| 64. Imagery from MSN 4FDP458 Runs 4 and 6 be assessed for aerotriangulation and stereocompilation useability.                                     | Army Svy Regt           |

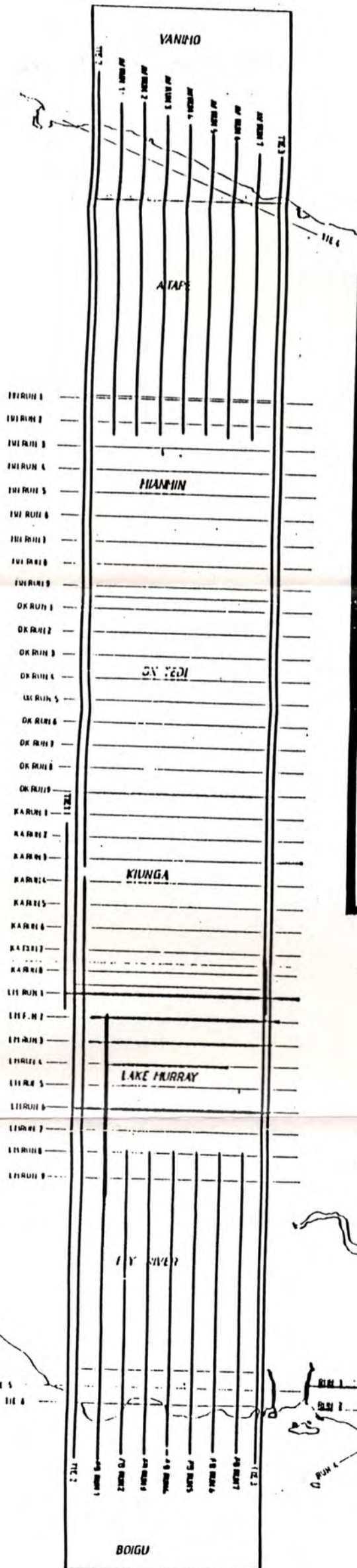
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| 65. Specifications for Aerial Mapping Photography be amended to include KODAK 2402 as a substitute for 2412 when conditions require a faster film. | DSvy-A        |
| 66. The aerotrig/plotting acceptability of different films being used on adjoining runs (2412 and 2402).   | Army Svy Regt |
| 67. All DHELs Data Transfer Devices be tested for battery life and serviceability.   | 4 Fd Svy Sqn  |
| 68. WAINCO operation procedures be modified to:  |               |
| a. reduce interruption during processing by increasing trailer length to negate leader attachment, and   | 4 Fd Svy Sqn  |
| b. leave chemistry unchanged unless contaminated.  | 4 Fd Svy Sqn  |
| 69. WAINCO to be scrutinised for any components subject to corrosion and replace with stainless steel equivalents.                                 | 4 Fd Svy Sqn  |
| 70. WAINCO chemistry tank outlets be treated to avoid corrosion buildup.   | 4 Fd Svy Sqn  |
| 71. A replacement camera with Image Motion Compensation (IMC) be investigated.   | LHQ<br>DSvy-A |

W.J. SHEPHARD  
SSGT  
DET 2IC

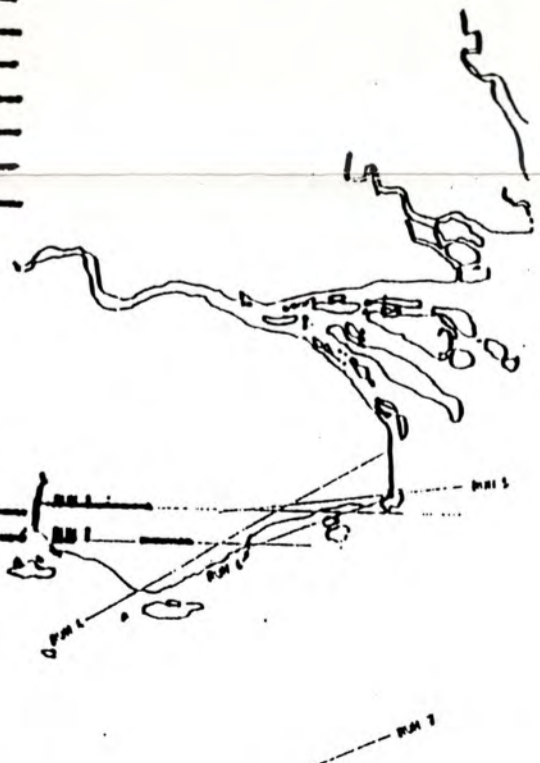
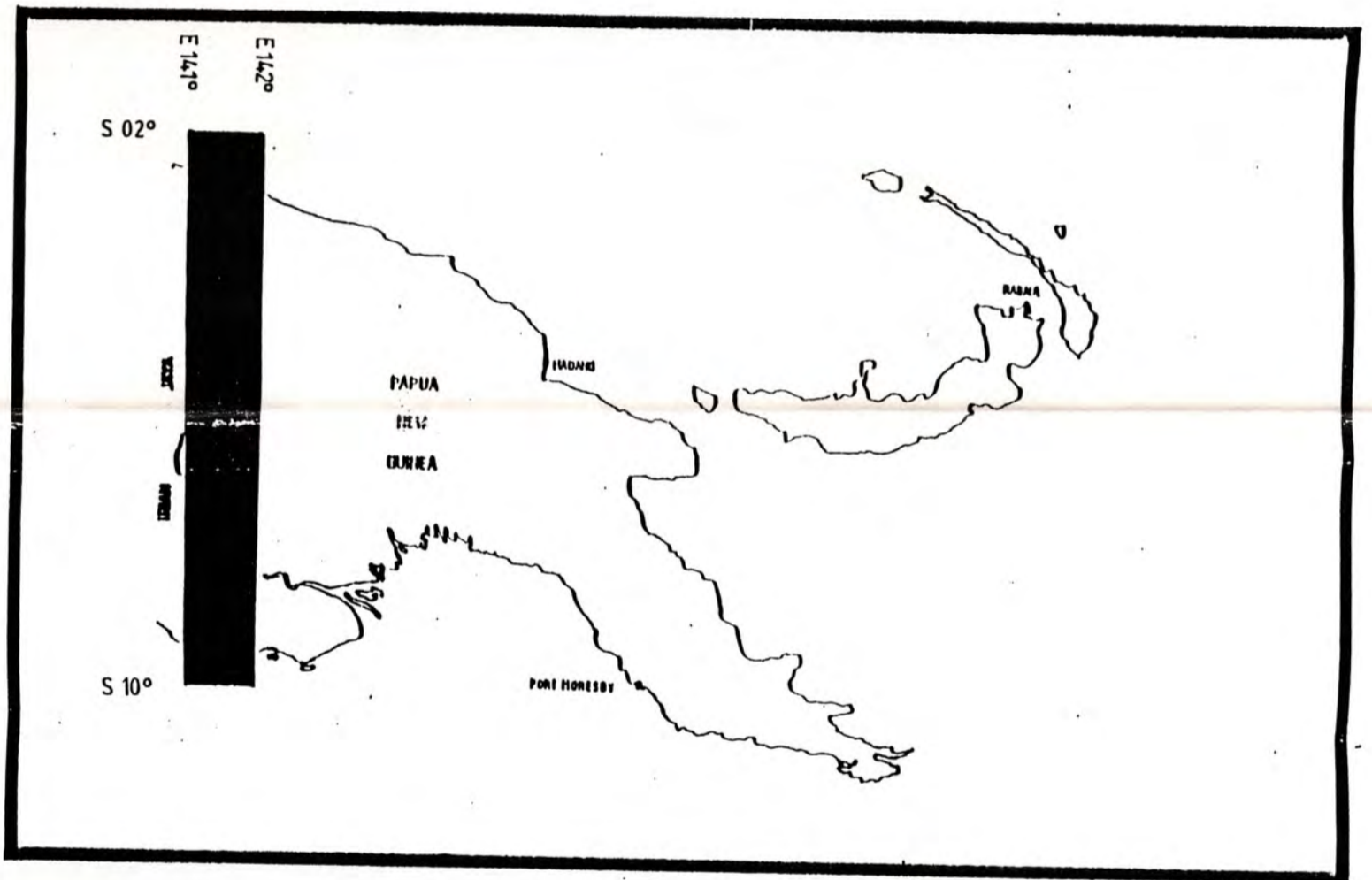
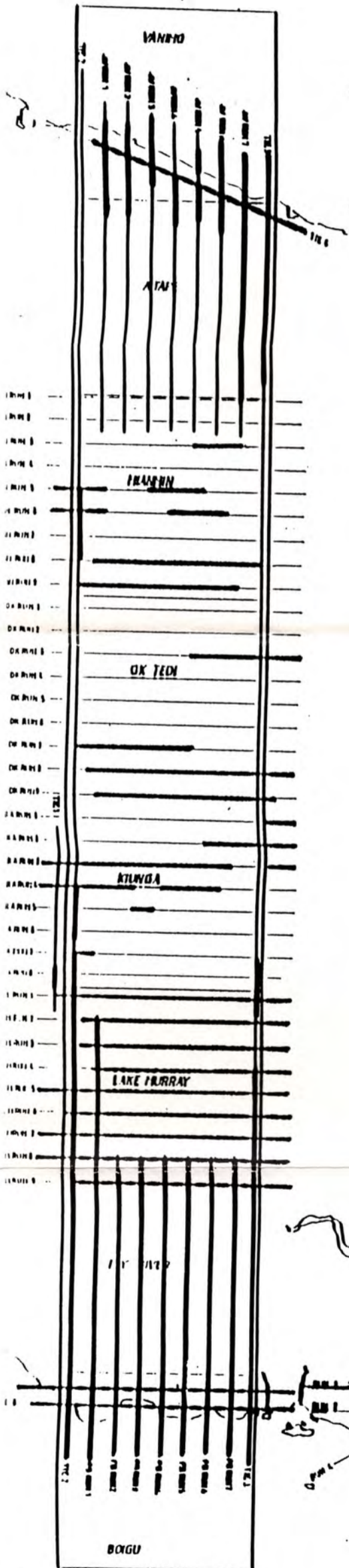
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# OP KUMUL 93

## MAPPING PHOTOGRAPHY

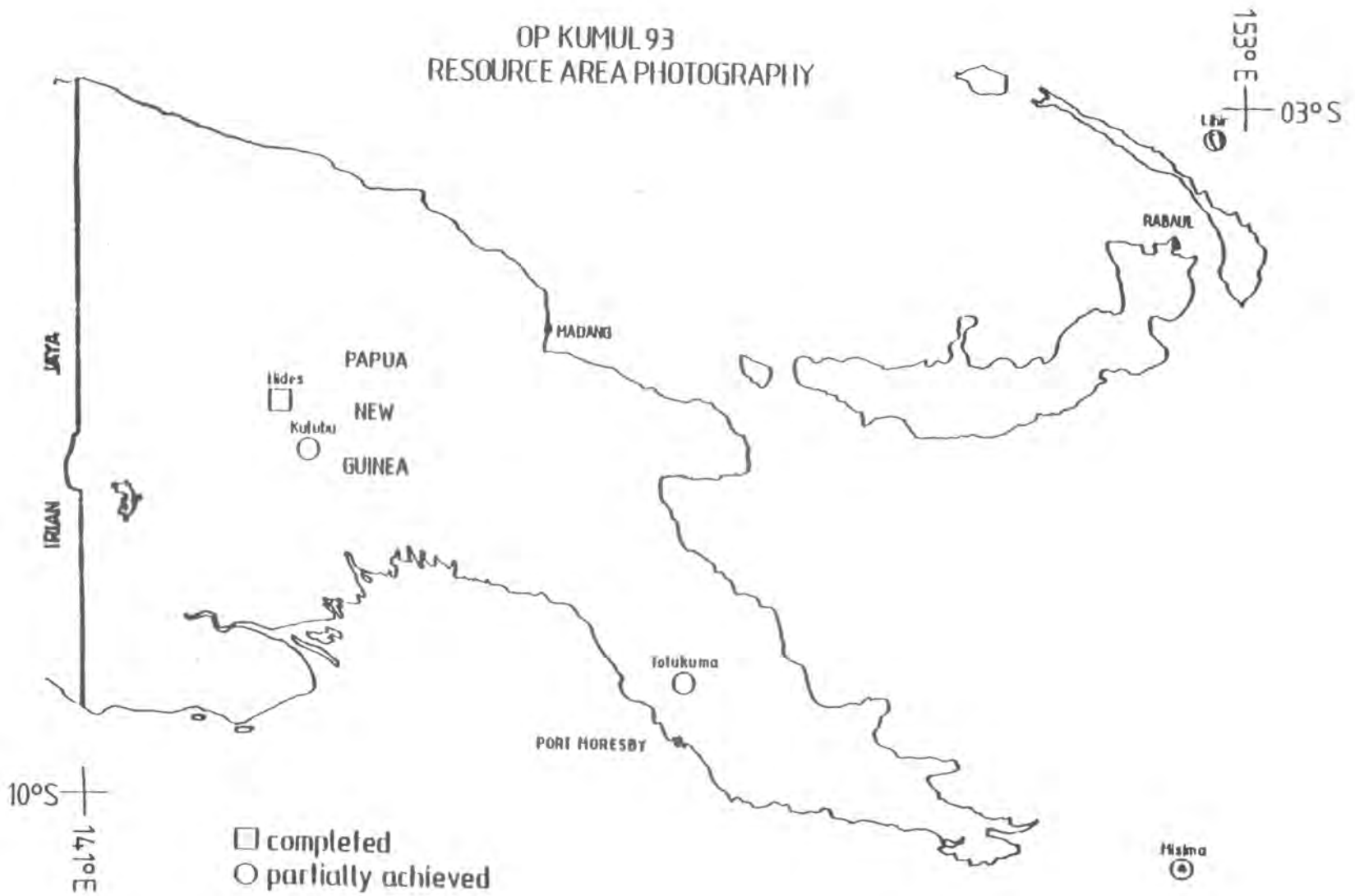


# PNG MAPPING PHOTOGRAPHY TO DATE



Planned line  
 Achieved X & Y photography

OP KUMUL 93  
RESOURCE AREA PHOTOGRAPHY



ANNEX I TO  
4 FD SVY SQN  
OP KUMUL 93  
OPERATION REPORT  
DATED 10 DEC 93

OPERATION MANNING

1. 4 Fd Svy Sqn.

|         |                  |           |                   |
|---------|------------------|-----------|-------------------|
| 5104899 | LT R. Gray       | OC Det    | 6 Jul - 27 Aug 93 |
| 46446   | SSGT J. Shephard | Det 2IC   | 9 Jul - 28 Aug 93 |
| 227127  | SGT P. Baker     | Camera Op | 6 Jul - 28 Aug 93 |
| 325734  | CPL P. Ball      | Camera Op | 9 Jul - 28 Aug 93 |

2. Army Svy Regt.

|        |                |           |                   |
|--------|----------------|-----------|-------------------|
| 316826 | SGT S. Gloster | Camera Op | 8 Jul - 28 Aug 93 |
|--------|----------------|-----------|-------------------|

3. Airscan Pty Ltd.

|             |       |                    |
|-------------|-------|--------------------|
| Mr M. Juelg | Pilot | 14 Jul - 27 Aug 93 |
|-------------|-------|--------------------|

4. Tipperary Aviation.

|              |       |                    |
|--------------|-------|--------------------|
| Mr H. Morton | Pilot | 14 Jul - 27 Aug 93 |
|--------------|-------|--------------------|

5. Pacific Aviation.

|             |                   |                                      |
|-------------|-------------------|--------------------------------------|
| Mr Pat Watt | Aircraft Engineer | 21 Jul - 23 Jul 93<br>26 - 27 Aug 93 |
|-------------|-------------------|--------------------------------------|

ANNEX J TO  
4 FD SVY SQN  
OP KUMUL 93  
OPERATION REPORT  
DATED 10 DEC 93

FLYING HOURS

Aircraft hours used in the acquisition of Aerial Photography during Op KUMUL 93 were as laid out in the table below.

| Serial | Date      | Crew <sup>1</sup>            | Hours | Comments   |
|--------|-----------|------------------------------|-------|--|
| (a)    | (b)       | (c)                          | (d)   | (e)  |
| 1      | 9 Jul 93  | Nil                          | 1.6   | Transit Canberra - Adelaide                                  |
| 2      | 9 Jul 93  | SSGT Shephard<br>CPL Ball    | 2.2   | Adelaide - Brisbane  |
| 3      | 10 Jul 93 | Nil                          | Nil   | Aircraft repairs   |
| 4      | 11 Jul 93 | SSGT Shephard<br>CPL Ball    | 1.6   | Brisbane - Bourke  |
| 5      | 11 Jul 93 | SSGT Shephard<br>CPL Ball    | 1.3   | Bourke - Melbourne   |
| 6      | 11 Jul 93 | SSGT Shephard<br>CPL Ball    | 1     | Melbourne - Adelaide   |
| 7      | 12 Jul 93 | SSGT Shephard<br>CPL Ball    | 2     | Adelaide - Brisbane  |
| 8      | 13 Jul 93 | SSGT Shephard<br>CPL Ball    | 2.9   | Brisbane - Port Moresby                                      |
| 9      | 14 Jul 93 | SSGT Shephard<br>CPL Ball    | 0.8   | Port Moresby - Madang  |
| 10     | 15 Jul 93 | SSGT Shephard<br>SGT Gloster | 1.9   | Madang - Madang via border and resource areas Op Photography |
| 11     | 16 Jul 93 | SSGT Shephard<br>SGT Gloster | 1.5   | Madang - Madang via border and resource areas Op Photography |
| 12     | 17 Jul 93 | SSGT Shephard<br>SGT Gloster | 1.5   | Madang - Madang via border and resource areas Op Photography |
| 13     | 18 Jul 93 | Nil                          | Nil   | Pilots rest day  |
| 14     | 19 Jul 93 | SSGT Shephard<br>SGT Gloster | 1.2   | Madang - Madang via border and resource areas Op Photography |

| Serial | Date      | Crew <sup>1</sup>  | Hours | Comments   |
|--------|-----------|--|-------|--|
| (a)    | (b)       | (c)  | (d)   | (e)  |
| 15     | 20 Jul 93 | SSGT Shephard<br>CPL Ball                                | 1.2   | Madang - Madang via border and resource areas Op Photography               |
| 16     | 21 Jul 93 | SGT Baker<br>SGT Gloster                                 | 1.5   | Madang - Madang via border and resource areas Op Photography               |
| 17     | 22 Jul 93 | SSGT Shephard<br>CPL Ball                                | 2.5   | Madang - Madang via border and resource areas Aitape-Vanimu Op Photography |
| 18     | 23 Jul 93 | SGT Gloster<br>SGT Baker                                 | 1.8   | Madang - Madang via border and resource areas Op Photography               |
| 19     | 24 Jul 93 | SSGT Shephard<br>CPL Ball                                | 1.6   | Madang - Madang via border and resource areas Op Photography               |
| 20     | 25 Jul 93 |  | Nil   | Pilots rest day  |
| 21     | 26 Jul 93 | SGT Gloster<br>CPL Ball                                  | 1.8   | Madang - Madang via border and resource areas Op Photography               |
| 22     | 27 Jul 93 | SSGT Shephard<br>SGT Baker                               | 2.3   | Madang - Madang via border and resource areas Op Photography               |
| 23     | 28 Jul 93 | SGT Gloster<br>CPL Ball                                  | 1.4   | Madang - Madang via border and resource areas Op Photography               |
| 24     | 29 Jul 93 | SSGT Shephard<br>SGT Baker                               | 2     | Madang - Madang via border and resource areas Op Photography               |
| 25     | 29 Jul 93 | LT COL Cates<br>MAJ Greggs<br>SSGT Shephard<br>SGT Baker | 2.1   | Madang - Rabaul<br>Colour photography                                      |
| 26     | 29 Jul 93 | LT COL Cates<br>MAJ Greggs<br>SSGT Shephard<br>SGT Baker | 1.1   | Rabaul - Madang  |
| 27     | 30 Jul 93 | SGT Gloster<br>CPL Ball                                  | 1.6   | Madang - Madang via border and resource areas Op Photography               |
| 28     | 31 Jul 93 | SSGT Shephard<br>SGT Baker                               | 2.6   | Madang - Madang via border and resource areas Op Photography               |
| 29     | 1 Aug 93  | -  | -     | Pilots rest day  |
| 30     | 2 Aug 93  | SGT Gloster<br>CPL Ball                                  | 3.5   | Madang - Madang via border and resource areas Hides - Daru                 |
| 31     | 3 Aug 93  | SSGT Shephard<br>SGT Baker                               | 2.3   | Madang - Madang via border<br>Lake Murray                                  |

| Serial | Date      | Crew <sup>1</sup>          | Hours | Comments                                       |
|--------|-----------|----------------------------|-------|--|
| (a)    | (b)       | (c)                        | (d)   | (e)  |
| 32     | 4 Aug 93  | SGT Gloster<br>CPL Ball    | 2.9   | Madang - Madang via border<br>Lake Murray      |
| 33     | 5 Aug 93  | SSGT Shephard<br>SGT Baker |       | Madang - Madang via border<br>Kiunga           |
| 34     | 6 Aug 93  | SGT Gloster<br>CPL Ball    |       | Madang - Madang via border<br>Lake Murray      |
| 35     | 7 Aug 93  | SSGT Shephard<br>SGT Baker |       | Madang - Madang via border<br>Kiunga           |
| 36     | 8 Aug 93  | -                          | Nil   | Pilots rest day                                |
| 37     | 9 Aug 93  | -                          | Nil   | Mr M. Juelg rested with malaria                |
| 38     | 10 Aug 93 | SSGT Shephard<br>CPL Ball  | 1.7   | Madang - Madang via border<br>Lake Murray      |
| 39     | 11 Aug 93 | SGT Gloster<br>SGT Baker   | 4.6   | Madang - Port Moresby via border and<br>Misima |
| 40     | 12 Aug 93 | SGT Gloster<br>SGT Baker   | 3.8   | Port Moresby - Madang via Misima and<br>border |
| 41     | 13 Aug 93 | SGT Gloster<br>CPL Ball    | 2.2   | Madang - Madang via border<br>Vanimo           |
| 42     | 14 Aug 93 | SSGT Shephard<br>SGT Baker | 2.6   | Madang - Madang<br>Op Photography              |
| 43     | 15 Aug 93 | -                          | Nil   | Pilots rest day                                |
| 44     | 16 Aug 93 | SGT Gloster<br>SGT Baker   | 2.5   | Madang - Madang<br>Op Photography              |
| 45     | 17 Aug 93 | SSGT Shephard<br>CPL Ball  | 2.4   | Madang - Madang<br>Op Photography              |
| 46     | 18 Aug 93 | SGT Gloster<br>SGT Baker   | 2.3   | Madang - Madang<br>Op Photography              |
| 47     | 19 Aug 93 | SSGT Shephard<br>CPL Ball  | 1.5   | Madang - Madang<br>Op Photography              |
| 48     | 20 Aug 93 | SGT Gloster<br>SGT Baker   | 4.3   | Madang-Port Moresby-Madang                     |
| 49     | 21 Aug 93 | SSGT Shephard<br>CPL Ball  | 2.2   | Madang - Madang<br>Op Photography              |
| 50     | 22 Aug 93 | -                          | Nil   | Pilots rest day                                |
| 51     | 23 Aug 93 | SGT Gloster<br>SGT Baker   | 1.8   | Madang - Madang<br>Op Photography              |

| Serial | Date      | Crew <sup>1</sup>         | Hours | Comments                          |
|--------|-----------|---------------------------|-------|-----------------------------------|
| (a)    | (b)       | (c)                       | (d)   | (e)                               |
| 52     | 24 Aug 93 | SSGT Shephard<br>CPL Ball | 1.6   | Madang - Madang<br>Op Photography |
| 53     | 25 Aug 93 | SGT Gloster<br>SGT Baker  | 2.2   | Madang - Madang<br>Op Photography |
| 54     | 26 Aug 93 | SSGT Shephard<br>CPL Ball | 2.9   | Madang - Madang<br>Op Photography |
| 55     | 26 Aug 93 | -                         | 1     | Transit Madang-Port Moresby       |
| 56     | 27 Aug 92 | -                         | 2.3   | Transit Port Moresby-Honiara      |

<sup>1</sup> Note: Pilots for all sorties were:

- a. Mr Harvey Morton, and
- b. Mr Mike Juelg.

VISA EXAMPLE

CERTIFICATE OF ENTRY  
INTO PAPUA NEW GUINEA

This is to certify that

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is a member (or is a dependant of a member) of a Visiting Force in accordance with the definitions contained in Article 1 of the Status of Forces Agreement (SOFA) between Papua New Guinea and Australia, as deposited with the United Nations on 14 July 1978.

Pursuant to Article 12(3) of the SOFA, this certificate will serve in lieu of a visa when travel is undertaken under the authority of a movement order.

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MOVEMENT CONTROL OFFICER  
ADELAIDE MCO

CONTACT INFORMATION IN THE AO

ARMY

1. Austalian Defence Staff - PNG  
Australian High Commission  
P.O. Box 9129  
HOHOLA NCD  
PAPUA NEW GUINEA  
  
Telephone: 0011 675 259 333  
Facsimile: 0011 675 259 068
  - a. 8 Field Survey Squadron
    - (1) OC  
ext 233
    - (2) WO1  
ext 233
  - b. Duty Officer  
259 333 (24 hours)

AUSTRALIAN GOVERNMENT

2. Bureau of Meteorology  
Darwin  
  
Mr Ian Butterworth  
Co-ord Weather Services  
Tel: (089) 824 710  
  
Daily Forecaster  
Tel: (089) 824 724

PNG GOVERNMENT

3. Airport Control Tower  
Tel: 256 787
4. Public Works Dept  
Mr Ivan Kitchen (Engineer)  
PO Box 602  
Madang PNG

CIVILIAN

5. Mr Derek Connolly  
Manager  
Smugglers Resort Inn  
P.O. Box 303  
MADANG, PAPUA NEW GUINEA  
Tel: 0011 675 822 744  
Fax: 0011 675 822 267  
Responsibility: Manager of accomadation facilities and also Budget Hire Cars.
6. Mr Mark Probert  
Manager  
Gateway Hotel  
Port Moresby, PNG  
Tel: 0011 675 25 3855  
Fax: 0011 675 25 4585
7. Mr Joseph Bukikun  
General Manager  
J.B. Security Services Pty Ltd  
P.O. Box 854  
MADANG, PNG  
Tel: 82 3290  
Fax: 82 3095  
Responsibility: Security services for overnight protection of aircraft. Also has a branch in Port Moresby.
8. ANZ Bank  
Tel: 0011 675  
Responsibility: Exchange of travellers cheques, Australian passbooks not useable.
9. Air Niugini  
Service desk

Madang  
Tel: 822 542

Cargo Section  
Madang  
Tel: 823 392

10. TNT Air Freight  
Madang Airport  
Tel: 822 664

11. Doctor F.F Takitaki  
Kasagten Road  
P.O. Box 71  
Madang  
Tel: 823 733

12. Business Systems  
Kasagten Road  
Madang  
Supply of Cannon parts, Facsimile rolls, etc.