



4th Field Survey Squadron

Operation KUMUL 94

Operation Report

An aerial photography operation
conducted in
Papua New Guinea

June - October 1994



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- C. NMB Update Area of Operations
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EXECUTIVE SUMMARY

1. Op KUMUL 94 was an aerial photography operation conducted by 4 Fd Svy Sqn in Papua New Guinea. The operation was conducted in two parts during the periods 4 Jun 94 to 31 Jul 94 and 12 Sep 94 to 24 Oct 94. The base for the operation was Madang, situated on the northern coast of Papua New Guinea.
2. The aim of Op KUMUL 94 was to acquire mapping photography for the plotting of 1:50 000 topographic maps. There were also lesser priority tasks issued by LHQ.
3. Aerial photography acquisition was hampered by unseasonal weather conditions. The deployment period was reduced from the intended length due to the non-conducive conditions and plans were initiated for a second deployment using the remaining funds. Upon redeployment in September, excellent conditions were experienced and a large proportion of the photography was gained in two weeks.
4. Further funding was granted during the second phase, however weather conditions again quickly deteriorated.
5. The single most significant problem which affected the conduct and overall effectiveness of the operation was the unseasonal weather conditions.
6. The most avoidable factor which affected the operation is the same as was experienced in 1993, little advance warning of deployment times and periods.
7. An RC20 aerial camera integrated with GPS was leased for Part 1 of the operation. Due to weather conditions, the effectiveness of the RC20 and its' associated GPS could not be proven.

OPERATION REPORT
OPERATION KUMUL 94
JUNE TO OCTOBER 1994

- References:
- A. HQ ADF Tasking Directive 1/1993 dated 21 Apr 91
 - B. LHQ SIC IAE/Z2Y OPORD 34/94 DTG 270800Z MAY 94
 - C. LHQ Op KUMUL 94 Mounting Instruction 30 May 94
 - D. LHQ SIC IAE/Z2Y OPORD 48/94 DTG 020615Z SEP 94
 - E. LHQ Op KUMUL 94 Part 2 Mounting Instruction dated 2 Sep 94
 - F. DSvy-A Op KUMUL 94 Technical Directive dated 26 May 94
 - G. 8 Fd Svy Sqn Minute 147-1-4 dated 19 May 94
 - H. LHQ SVY 477/94 K94-00042 DTG 160730Z SEP 94
 - I. LHQ Facsimile K94-00042 SVY 483/94 dated 23 Sep 94
 - J. Army Svy Regt Minute 851-17-41 dated 07 Sep 94
 - K. Det 4 Fd Svy Sqn 851-94-4 dated 27 Jul 94
 - L. IP Division Facsimile dated 30 Sep 94
 - M. DSvy-A Facsimile A93-33984 dated 4 Oct 94
 - N. Op NASIKO 93 Operation Report dated 25 Aug 93
 - O. DSvy-A Specifications for Vertical Aerial Mapping Photography undated draft
 - P. Operational Instruction 1/93 Responsibility of Aerial Camera Operators dated 22 Mar 93
 - Q. Standing Operating Procedures for Assessment of Vertical Aerial Photography dated 4 Aug 93 and 30 Jun 94
 - R. LHQ SIC Z2Y SVY 0114 DTG 262355Z JAN 94
 - S. PNG Defence Attache Jakarta Facsimile dated 05 Jul 94

- T. AHQAUST SIC Z2Y 486/COPS DTG 170430Z MAY 94
- U. SURVEY ADELAIDE 851-94-4 DTG 160448Z AUG 94
- V. ARMYACTIVITIES SIC I2D AA673/94
DTG 010145Z AUG 94
- W. Standing Offer: PN8260 dated 1 Oct 91 amended 27 Oct 93
- X. International Aircraft Transport Association -
Dangerous Goods Regulations, 34th edition, effective 1 Jan 94
- Y. Op KUMUL 93 Operation Report dated 10 Dec 93
- Z. DSvy-A Facsimile 00606 A93-33984 dated 7 Jul 94

INTRODUCTION

1. Operation KUMUL 94 was an aerial photography operation conducted in Papua New Guinea. The operation was conducted in two parts, Part 1 between 4 Jun 94 and 31 Jul 94 and Part 2 between 12 Sep 94 and 24 Oct 94. Part 1 was conducted in response to References A, B and C, and Part 2 in response to References A, D and E.

MISSION

- 2. The primary aim of this operation was to obtain aerial photography of Papua New Guinea suitable for mapping at a scale of 1:50 000 IAW Reference F.
- 3. Additional tasking consisted of 1:100 000 blocks and smaller areas for update of existing mapping by PNG National Mapping Bureau. This was IAW Reference G.
- 4. Resource mapping areas were tasked by LHQ at Reference F.
- 5. Further tasking was directed at Reference H in support of Op LAGOON, the peace keeping force on Bougainville Island.
- 6. Reference I requested photography in support of Op CARMINE, the relief effort in the wake of volcanic eruptions at Rabaul on New Britain Island.
- 7. Reference J requested the acquisition of small format Photo Interpretation Guides (PIG) in the Lake Murray and Fly River/Boigu areas.

AREA OF OPERATIONS

8. Mapping Photography. The Area of Operations (AO) for mapping photography was a band one degree wide, on the eastern side of the PNG/Indonesian border extending from 7° South latitude to the northern coast. This is illustrated at Annex A.
9. Other Tasking. AO's for additional tasking were:
 - a. resource mapping areas illustrated at Annex B;
 - b. update photography areas for PNG National Mapping Bureau are shown at Annex C;
 - c. Op LAGOON and Op CARMINE requests, located on Bougainville and New Britain Islands respectively, are illustrated at Annex A; and
 - d. PIG requests were located near the border in the Lake Murray and Fly River/Boigu plotting areas.

CONDUCT OF OPERATION

Outline of Technical Plan

10. To achieve the variety of technical tasks it was necessary to obtain aerial photography from altitudes between 4 000 and 41 000 feet. With the different requirements for each of the tasks it was necessary to alter the combination of lenses, filters and film types.
11. Mapping photography in Part 1 of the operation was attempted using a Gates Learjet 35A. This aircraft was fitted with a Leica RC20 aerial camera (integrated with Sercel GPS) and Super Wide Angle (SWA) lens having a nominal focal length of 88mm.
12. Other tasking during Part 1 was flown by a chartered Cessna Titan 404 fitted with a Wild RC10 camera and Wide Angle (WA) lens (nominal focal length of 152mm).
13. Part 2 utilised only the Learjet fitted with a Wild RC10 camera and SWA lens for mapping photography, and a WA lens for other tasking.
14. Aerial film processing was carried out by RAAF photographic technicians at RAAF Bases Darwin and Amberley as well as Central Photographic Establishment (CPE). Assessment was conducted in the AO during the operation. Final assessment was completed at 4 Fd Svy Sqn and Army Svy Regt at the conclusion of the operation. Details are discussed in the Technical and Equipment Report at Annex D.
15. PIG photography was attempted from the Learjet with a 35mm camera through the glass port after the RC10 camera had been removed.

Conduct

16. The operation was conducted according to the Sequence of Events shown at Annex E. Significant events are discussed in the following paragraphs.

Timings

17. As with all operations conducted in 1993, little notice was given regarding operations and funding. This made it very difficult to plan and make the appropriate arrangements.

18. As directed at Reference B, the operation was to be conducted between 24 May and 10 Aug 94. During the operation little mapping photography was being achieved due to persistent heavy cloud conditions. The dry season is theoretically the optimum time for acquisition of photography in this area, however this year it was extremely late commencing. IAW Reference K, operation personnel and aircraft were redeployed to Solomon Islands on 31 Jul 94 to commence Op BELAMA 94.

19. Part 2 of the operation was approved and mounted IAW References D and E from 10 Sep 94 to 12 Oct 94. In the first two weeks, substantial amounts of photography were achieved in areas that had not been covered in three previous deployments. Due to the excessive flying hours being flown to achieve the photography, funds assigned to Part 2 would be expended well before the planned completion date of 12 Oct 94. Reference L approved a further \$250 000 for the operation, extending the deployment to 24 Oct 94.

20. Reference M indicated that further funds may be available should weather conditions remain favourable, however, further extension was not possible due to aircraft servicing requirements.

21. Initial inquiries for Op LAGOON support were made prior to deployment of Part 2. Once deployed to PNG, the detachment was tasked and subsequently untasked a number of times. This was due to diplomatic clearances firstly not being obtained, and later withdrawn.

22. Op CARMINE requests were unable to be fulfilled due to volcanic dust restricting ability of any jet aircraft to operate in the area.

23. The timings for Part 1 of the Operation were determined by a necessity to expend a portion of the funds within 1993/94 financial year (FY). As was found and recommended in Reference N, ideal flying conditions do not always coincide with a financial year. This can result in relatively large sums of money being expended for little return.

Reconnaissance

24. A reconnaissance of the AO was not conducted prior to deployment. Two similar operations, Op's KUMUL 92 and 93, had taken place in the previous two years and facilities utilised on those operations had proven satisfactory. 8 Fd Svy Sqn, located at Australian High Commission in Port Moresby, was utilised for local liaison and bookings.

Issue of Orders and Instructions

25. The Operation Order (Reference B) and Mounting Instruction (Reference C) for Part 1 were issued on 27 May 94 and 30 May 94 respectively. At least two months lead time would be more appropriate for an operation of this type. Part 2 Operation Order, (Reference D), and Mounting Instruction, (Reference E) were issued with similar lead times.

26. The Technical Directive (Reference F) was not issued until 26 May 94. This left little time to thoroughly examine the document prior to deployment.

Insertion of Force

27. Operation personnel as well as all stores for both Parts were inserted by a combination of civil airline and contracted aircraft.

Establishment of Base

28. Due to utilisation of RAAF facilities in Australia for film processing, the major set up required in previous years was not necessary. An office area was established for assessment and administration.

Aerial Photography

29. Operational photographic sorties of Part 1 commenced on 6 Jun 94 and continued to 29 Jul 94. Part 2 sorties were undertaken between 16 Sep 94 and 23 Oct 94.

30. Cameras, filters, film types, processing and assessment of photography are all covered within the Technical and Equipment Report at Annex D. 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 O, P and Q.

Border Clearances

31. To acquire imagery of the AO capable of being aerotriangulated, the aircraft must at times cross the PNG/Indonesia border. Reference R requested border clearances for overflight of the international border during photographic missions. This had also been requested for Op's KUMUL 92 and 93. The original dates stated were 18 Jul 94 to 26 Aug 94.

32. Lead time for the processing of these applications is approximately four months. With the late notification of the operation, deployment dates were altered and it was too late to change the requested dates. Overflight clearance was issued in Reference S but only for the initially requested dates.

Film Processing

33. The processing of aerial film on previous operations had presented problems, particularly with the WAINCO mobile processor. Arrangements were made and approved in Reference T for film processing to be carried out at RAAF Darwin and RAAF Amberley. Both RAAF bases have KODAK Versamat processors that are accepted as the industry standard for aerial film processing. The excellent standards achieved with the Versamat processors vindicated this decision.

34. The Learjet made two flights to Darwin from Madang for processing. These flights were timed to coincide with minor aircraft servicing and collection of further stores. The Learjet was required to fly to Brisbane for servicing on 18 July and this opportunity was used to process film at RAAF Amberley. Technical details are discussed at Annex D.

35. Although the respective references approved the use of RAAF facilities and contact was made prior to each processing trip, there were a number of occasions where both senior and junior RAAF members were not aware of requirements. The problem was overcome on each occasion but did cause unnecessary concern.

36. During Part 2, a civil air flight was utilised to convey film to RAAF Amberley for processing. Advantages of using civil air for the delivery of film safe hand were:

- a. less expensive than flying the Learjet to Brisbane; and
- b. did not remove the aircraft from the AO, allowing it to continue flying sorties.

37. Processing of the final two rolls of film was conducted by CPE upon return to Australia.

Medivac

38. On the evening of 5 Jul 94 a request was received for the Learjet to conduct a medical evacuation of an Australian citizen from Madang to Cairns. Following consultation with the local doctor and examining all possibilities, a phone call was placed to the Duty Officer at Australian High Commission, Port Moresby. The situation fulfilled all criteria for an Emergency Medical Evacuation and it was conducted as such.

39. The aircraft did not return to Madang until the afternoon of 6 Jul 94 and consequently no sortie was flown that day. No cost was incurred by the Department of Defence as all charges by the aircraft owners were billed direct to the patient. This was confirmed at Reference U in response to Reference V querying any need to recover costs.

Extraction of Force

40. Extraction for both Parts of the operation was a combination of civil and chartered aircraft.

41. Some stores were returned to Australia by a scheduled RAAF C130 training flight at the conclusion of Part 2. Some problems were encountered with customs clearance of these goods in Australia due to a cargo manifest being completed but not on the correct form.

OPERATIONAL RESULTS

Mapping Photography

42. Papua New Guinea. A summary of mapping photography achieved, classified in accordance with Reference O, during Op KUMUL 94 is:

a. X 152.4 km; and

b. Y 2741.0 km.

43. Appendix 1 to Annex D details and illustrates mapping photography achieved during this operation. Total mapping photography coverage in the AO is illustrated at Annex F.

Update Photography

44. Detailed and illustrated in Appendix 2 to Annex D is photography achieved for National Mapping Bureau.

Resource photography

45. Resource photography achieved during Op KUMUL 94 is detailed and shown at Appendix 3 to Annex D.

Op LAGOON

46. This task was not attempted due to diplomatic difficulties.

Op CARMINE

47. Nil photography was achieved in the Gazelle Peninsula region of New Britain due to sulphuric content of volcano ash and its detrimental effects on jet turbines.

ADMINISTRATION AND LOGISTICS

Operation Manning

48. Personnel who participated in Op KUMUL 94 are listed at Annex G.
49. Manning for both parts of the operation was by RA Svy personnel from a number of units. This allowed operators the opportunity to develop and improve skills that in some cases are infrequently used.
50. There was some difficulty experienced with the manning for Part 2 of the operation with a reluctance by certain officers to deploy members.
51. Three members of Part 1 had been deployed to Madang on previous operations and this proved invaluable for quickly establishing local liaison. This is particularly pertinent as there are no ADF personnel based in the area.
52. Three civilian pilots were utilised for the Learjet and one for the Titan.

Support

53. Army. Support provided by Army units for the operation was:
- a. Army Svy Regt:
 - (1) one camera/GPS operator for the duration of Part 1;
 - (2) two camera operators for the duration of Part 2;
 - (3) preparation of flight lines for all mapping photography;
 - (4) assessment of photography at the conclusion of Part 2;
 - (5) development of software for the down loading DHELs data; and
 - (6) technical advice during the operation.
 - b. School of Mil Svy.
 - (1) one camera/GPS operator for a period of Part 1; and
 - (2) development of software for digitising flight lines.
 - c. 1 Topo Svy Sqn.
 - (1) one camera operator for duration of Part 2;

- (2) assistance with the shipment and delivery of camera parts and boxes; and
 - (3) loan of a theodolite for connection of GPS point to Trig station.
- d. 8 Fd Svy Sqn.
- (1) booking of accommodation and hire vehicles in country;
 - (2) liaison with NMB;
 - (3) liaison with PNGDF; and
 - (4) liaison with Australian High Commission.
- e. Military Geographic Information Pilot Project. MGIPP located at Larrakeyah Barracks, Darwin received a freight consignment and gave some computer support.
- f. 4MU.
- (1) booking of all civil airline flights; and
 - (2) issue of Entry Permits (Status of Forces Agreement).

54. Australian High Commission - Port Moresby. Assistance was sought through 8 Fd Svy Sqn in the mounting of the operation and the utmost co-operation was gained. Support provided included:

- a. diplomatic clearance for aircraft and personnel, and
- b. application for Irian Jaya border overflight clearance.

55. RAAF. Support for the operation included:

- a. 6 Sqn. Processing of aerial film at both Amberley and Darwin bases.
- b. RAAF Darwin. RAAF Darwin provided the following additional support:
 - (1) accommodation,
 - (2) customs clearance, and
 - (3) refuelling.
- c. Central Photographic Establishment (CPE).
 - (1) film processing,

- (2) post operation cataloguing, and
 - (3) archival storage.
- d. 36 Sqn. Transport of stores, Madang to Richmond.

56. Civilian. Reference W is a Standing Offer, requiring Airscan Pty Ltd to supply a camera platform and pilots as requested by RA Svy. This arrangement was the same as was used in 1992 and 1993, once again proving satisfactory.

POL

57. AVTUR (Jet A1). Fuel for the Learjet in Papua New Guinea was purchased by the Commonwealth IAW Reference W. This was done by issuing SP21 form (Order and Receipt for supplies) to local suppliers.

58. AVGAS. Fuel for the Titan during Part 1 was also purchased by SP21.

59. Prist. Prist is a fuel additive for the Learjet to prevent icing of the fuel at high altitudes and the incidence of bacterial growth in tropical climates. This is not generally available in Papua New Guinea and all supplies required were imported from Australia. As a Dangerous Cargo IAW Reference X, transportation is more difficult than normal freight and delays were experienced with delivery. Due to nonavailability one flying day was lost.

60. Vehicle Fuel. Fuel for the hire vehicles was purchased through a local service station using SP21.

Vehicles

61. For the duration of Part 1, two vehicles were hired through Budget and paid for using Australian Government Credit Card (AGCC). One vehicle was also hired for the duration of Part 2.

62. Hire vehicle charges in Madang for the duration of the operation totalled over \$20 000.00. Alternatives to this outlay are:

- a. transporting a vehicle from Australia which would involve a C130; or
- b. purchase of a vehicle at the commencement of an operation and resale at the conclusion.

63. Initial investigation for the purchase and resale of a vehicle has shown this is not a viable alternative.

64. Whilst in Darwin and Brisbane, a hire car was utilised through Department of Administrative Services. This proved far more cost effective and convenient than taxis.

Stores and Equipment

65. Stores and equipment deployed with the operational force were sufficient. Only a few minor items were required to be purchased locally. The telephone/facsimile machine would only receive incoming calls after being flooded with water through a leak in the office roof. This was unable to be repaired upon return to Australia.

Cameras

66. A Leica RC20 aerial camera (integrated with Sercel GPS equipment) was leased from Airesearch Pty Ltd for the duration of Part 1. This configuration known as 'Skymap', has been tested in Australia as a total camera station by a number of civilian and academic authorities with good responses.

67. One of the main drawbacks was that the lease of the system cost \$2875.00 per day. Such a cost severely reduced deployment time. There was also a need to train RA Svy personnel in the operation of the equipment and processing of data. Three operation members and three personnel from Data Acquisition Squadron, Army Survey Regiment attended five days of training. This was conducted at 4 Fd Svy Sqn by two Airesearch technicians, Mr John Murphy and Mr Tony Dewy.

68. An RA Svy Wild RC10 camera was fitted in a Cessna Titan 404 for Part 1. This platform was utilised for lower altitude tasking.

69. Due to a restricted financial budget for Part 2, RA Svy's Wild RC10 camera was fitted in the Learjet for the duration.

Aircraft

70. Gates Learjet 35A VH-TPR is the only Learjet in Australia that has the required camera pod and navigation sight modifications. Reference W is a Standing Offer with Airscan Pty Ltd. Vee-H Aviation is a part of this company but does not own a Learjet. The aircraft was leased from Aeromill, the managers of the aircraft for another party. Servicing of the aircraft is managed by Aeromech. This creates a convoluted chain in which correct information was at times difficult to obtain. Twice during the operation, it was revealed at short notice that the aircraft would be required to return to Australia in the near future for servicing.

71. There was uncertainty until mid-May as to the availability of VH-TPR and this was compounded by the fact that RA Svy could not give a commitment to the contract before May. This is in contravention of the Standing Offer that requires six months notice.

72. Cessna Titan VH-CSV was also hired IAW Reference W and utilised for the period 4 Jun 94 to 1 Jul 94. This aircraft is unpressurised and was employed in the acquisition of tasks involving the WA lens at lower altitudes. This aircraft proved very suitable to its tasking.

73. The combination of the two aircraft for Part 1 of the operation worked very well, the Learjet acting as spotter for the slower Titan. This also reduced the need for lens changes in the Learjet during flight (a rather awkward task which increases the possibility of equipment damage).

Pilots

74. Under the terms of Reference W, Airscan supplied a Cessna Titan 404 and pilot from Vee-H Aviation. The pilot, Mr Barry Denny, had no previous experience in PNG or flying aerial photography, however he soon adapted to the conditions and operational requirements.

75. The Learjet requires two pilots at all times. One of these, Mr Mike Juelg, has operated the Learjet on RA Svy operations for the past three years. His experience with the operational requirements in general and the AO in particular, proved invaluable.

76. The second Learjet pilot was supplied by Aeromill, Mr Barry Ney for Part 1 and Mr John Farson for Part 2. Only one of these pilots had previous photography experience in a Learjet and this at times proved to be a problem. Both pilots were representatives of the company that managed the aircraft for the owner.

Aircraft Servicing

77. Operations KUMUL 94 and BELAMA 94 were initially planned for a duration of four months involving approximately 200 flying hours. Initial indication from Airscan was that no servicing for the aircraft would be required for the duration of the charter.

78. On 7 Jul 94, Aeromills' representative and pilot, Mr Barry Ney, informed Det Comd that 27 hours flying time remained before a three day service was due. To accommodate the operational schedule, this was agreed to be conducted at Maroochydore during which film processing would be conducted by Det personnel at RAAF Amberley.

79. On 29 Sep 94, Aeromills' representative and pilot, Mr John Farson, informed Det Comd that 14 flying hours remained before an engine service was due. A further 19 hours after that, a major service was due, requiring the aircraft to be grounded for seven working days. The most economical means of achieving this was to have an engineer fly to Madang to perform the engine service. An extension of flying hours was requested and granted to 25 Oct 95. This negated any possibility of extending the operation past this date.

Shipment of Stores

80. Stores were inserted and extracted using civil freight companies, chartered aircraft and RAAF training flights. Due to simultaneous and consecutive air camera operations as well as breakdowns, there was a requirement for some items to be transported rapidly to new locations. Owing to the weight of some of these articles, air freight proved to be expensive.

Accommodation

81. Accommodation for all operation personnel was at Smugglers Inn, Madang. Each member had a single room paid for weekly using AGCC.

Civil flight bookings

82. All civil flight bookings were made by 4th Movement Unit. With an operation of this nature, occasionally movements need to be organised quickly. Problems were created by detachment not being able to directly make the bookings using AGCC.

Messing

83. Meals were available from the hotel and several restaurants within the town. Payment for these was by individual members using Overseas Travelling Allowance paid prior to departure.

Medical

84. A main hospital is located in Madang which includes operating and x-ray facilities. There are also several medical practitioners within Madang for minor problems. Medical standards are not considered equivalent to Australia. It was of the general opinion of Australians in the area that if any major medical treatment were required, medical evacuation to Australia would be recommended.

85. Prior to deployment, a First Aid kit was prepared by Keswick Medical Centre. Some medications are not always available locally (Anti-biotics S3 and S4), and a letter stating the contents and purpose of the kits was obtained from the Keswick RMO.

86. Medical attention required while deployed was:

- a. SGT Langeberg - throat infection; and
- b. CPL Austine:
 - (1) throat infection;
 - (2) food poisoning; and
 - (3) broken finger.

87. During PT, SGT Purdey injured a finger. Upon return to Australia this was x-rayed and found to be broken.

88. Madang is located in a malarial zone. In accordance with References C and E all personnel were issued anti-malarial treatment by their respective Medical Centres. Members from the four different units were all given differing treatments and some were given blood tests where others were not.

Allowances

89. Allowances for military operation personnel were:

- a. Overseas Travelling Allowance (Papua New Guinea). Allowance was paid in accordance with INDMAN 1, Vol 4, Instr 3601 at the rate of:
 - (1) 80.00 Kina per day for the first 28 days; and
 - (2) 64.65 Kina per day after 28 days.
- b. Overseas Equipment Allowance. In accordance with INDMAN 1, Vol 4, Instr 3602 overseas equipment allowance was payable to members who had not received that allowance in the previous three financial years. The rate is:
 - (1) Overseas - \$ 200.00; and
 - (2) Tropical - \$ 185.00.
- c. Difficult Post Allowance. Following a continuous overseas detachment of 28 days, military members are entitled to a payment at a rate of \$ 207.76 per fortnight in accordance with INDMAN 1, Vol 3, Instr 3719.
- d. Flight Duties Allowance. Flight duties allowance was paid in accordance with INDMAN 1, Instr 0107, calculated from the hours shown at Annex H.

90. Overseas Travelling Allowance and Overseas Equipment Allowance were paid to members prior to deployment. Upon return to Australia, allowances were recalculated to allow for changes in deployment dates and entitlements. Difficult Post Allowance and Flight Duties Allowance were calculated and paid retrospectively.

91. Pilots contracted under Reference W were entitled to a meal and accommodation allowance of \$A210.00 per day. An advance of \$ 30 660.00 was made to Airscan Pty Ltd prior to deployment and pilots individual payments were then the responsibility of Airscan Pty Ltd. This proved to be an acceptable method of operation.

Leave

92. Remote Locality Leave. IAW INDMAN 1, Vol 3, Chap 26, Instr 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.

93. Flying Leave. Flying leave was accrued IAW INDMAN 1, Vol 3, Instr 2601, and is to be calculated retrospectively according to the hours flown by individual members (shown at Annex H).

Passports and Visas

94. Official passports were issued to all military members of the detachment except SSGT Hammond who travelled on a civilian passport. This was due to Army Svy Regt not being able to process the passport application in time for departure.

95. Visas for entry into Papua New Guinea are not required by ADF personnel on operation. An Entry Certificate, issued pursuant to Article 12(3) under the Statement of Forces Agreement (SOFA) is acceptable. These were issued by 4MU prior to deployment.

Banking

96. Banking facilities in Madang are provided by:

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

97. Each of these banks has affiliations with their Australian counterparts, however, Australian passbooks or accounts are not able to be used. Personal credit cards may be used to obtain cash advances, however, this requires a telephone call to Australia each time an advance is made and the cost of that call is charged to the customer.

98. Travellers cheques proved to be the most efficient form of converting currency.

Mail

99. Mail rates to Australia were comparable to Australian overseas rates and delivery time to Australia varied between seven and ten days. All incoming mail was addressed care of the hotel which proved to be reliable.

Visit

100. A visit was made to the operation by MAJ P.C. Demaine (OC 4 Fd Svy Sqn) during the period 22-25 Jul 94.

Contact Information

101. Contacts made within the AO that may be useful in the mounting of further operations in the area are contained at Annex I.

FINANCE

Control

102. Responsibility of financial expenditure for previous air camera operations had been divided between DSvy-A, 4 Fd Svy Sqn and 8 Fd Svy Sqn. With this arrangement it had proved difficult to maintain an accurate record of total expenditure as well as individual charges.

103. IAW recommendations from Reference Y, total financial responsibility for Op KUMUL 94 was divulged to 4 Fd Svy Sqn. Although there were initially a few minor internal problems with this, they were corrected and overall worked well. Advantages of centralised control were:

- a. continuous accurate record of expenditure;
- b. continuous checking of all bills, particularly aircraft charges, which had not previously been done; and
- c. removal of financial responsibility from 8 Fd Svy Sqn whose role returned solely to advisers and local liaison.

Australian Government Credit Card (AGCC)

104. Det Comd, 2IC and SGT Longbottom were each issued with an AGCC prior to deployment on Part 1 having a limit of \$400 000.00 per month. This limit was more than adequate. Due to the staggered deployment from Australia and return trips to Australia for processing it was necessary to have three cards with the detachment.

105. During Part 2 only Det Comd was in possession of an AGCC. This was a minor problem as no other members of the detachment were authorised to sign the Purchase Authorisations and restricted planning for movement of members.

SP21

106. The use of Order and Receipt of Supplies, Form SP21, for the purchase of fuel and other services proved to be very functional. Problems arose when Department of Finance, DC-A made payment on each of these invoices with no records, cross reference or check. This made it difficult to determine what bills had and had not been paid.

Petty Cash

107. A cash advance of \$2 000.00 was issued to Det Comd in Adelaide and converted to travellers cheques prior to deployment. These were converted to Papua New Guinea Kina (K) for use as necessary.

Cost Codes

108. Cost codes for Op KUMUL 94 were issued in two parts. The first consisting of \$700 000.00 was for expenditure in FY 1993/94 and Part 2 funds of \$400 000.00 for FY 94/95. A further \$250 000.00 was approved at Reference K. The initial cost codes were not issued until 18 Apr 94 due to the lateness of the Operation being approved. With an operation of this nature, stores must be ordered and allowances organised well in advance.

109. Cost Codes used in accordance with Reference B were:

- a. Aircraft Hire -
 - Req No. AE4470040
 - Cost Centre 352270
 - Account Code 61012
 - SLID/SLAC 5/203
 - Amount \$ 560 000.00

- b. T & S -
 - Req No. AE4470040
 - Cost Centre 322470
 - Account Code 24366
 - SLID/SLAC various
 - Amount \$ 100 000.00

- c. Stores & Equipment -
 - Req No. AE4470040
 - Cost Centre 352270
 - Account Code 61875
 - Amount \$ 40 000.00

- d. Freight and cartage -
 - Req No. AE4470040
 - Cost Centre 352270
 - Account Code 28152
 - Amount part of T&S

110. Part 2 codes issued at Reference Z were:

- Req No. 4309014CP
- Cost Centre 541806

Account Code 64732
Amounts \$ 400 000.00 + \$ 250 000.00

Total costing

111. The total cost of Op KUMUL 94 was approximately \$1 255 600.00¹. Due to delays in the submission of some bills and varying exchange rates, this is not a final figure. A break down of the costings is as follows:

Aircraft hire	
Fuel	\$ 107 500
Flying hrs	\$ 509 000
Standing charges	\$ 174 000
Admin Charges	\$ 13 500
RC20 camera	\$ 185 000
Accommodation ²	\$ 59 000
Allowances	
Military pers	\$ 53 500
Pilots ³	\$ 45 000
Civil Airfares	\$ 29 000
Hire vehicles/taxis	\$ 26 000
Phone/Fax	\$ 5 500
Freight and Cartage	\$ 14 500
Stores	\$ 33 000
Petty Cash	\$ 1 100
TOTAL	\$ 1 255 600

- Notes: 1 Some costs have been converted from Papua New Guinea Kina to Australian Dollars, and hence they are only approximations due to the fluctuation of exchange rates.
2 Accommodation element is for military personnel only.
3 Pilots allowances contain both meal and accommodation elements.

Devaluation and Float

112. During the operation, the PNG unit of currency, was devalued substantially and then floated on international markets. Over the deployment time value with relation to Australian Dollar fell by almost 50%. This made it difficult to obtain a clear picture of expenditure due to time delays of transactions being forwarded to Australia by local companies and banks.

COMMAND AND SIGNAL

Command

113. Command arrangements specified in References C and E were both suitable and functional.

Telephone/Facsimile

114. A telephone/facsimile machine was part of detachment stores. A direct line was installed by Post and Telecommunications (PTC) to the office accommodation in the hotel. This line took ten days to be installed and in the meantime hotel facilities were used. Billing for the calls on the PTC line was direct to 4 Fd Svy Sqn.

115. During a rainstorm, water flooded into the office and damaged the phone/fax machine. After this, only incoming phone calls could be received. Incoming facsimiles and outgoing phone calls and facsimiles were made through the hotel facilities. Hotel charges for these facilities were extremely high.

116. Personal telephone and facsimile facilities were available through the hotel, however the most economical means was to arrange for calls from Australia on weekends.

SITREP's

117. Weekly SITREP's were sent by facsimile to 4 Fd Svy Sqn IAW References C and E. To decrease expenses, 4 Fd Svy Sqn then retransmitted the SITREP to all Australian addressees. LHQ requested that transmission dates be amended to Thursday and this was implemented.

CONCLUSIONS

General

118. Op KUMUL 94 was a reasonably successful aerial photographic operation. The failure to achieve full photographic coverage of mapping tasking can be attributed entirely to adverse weather conditions. The task requires perfectly clear weather conditions but the nature of the topography and its' location in the tropics results in cloud free areas being a rarity. Acquisition of acceptable aerial photography for mapping becomes more a fact of being in the right place at the right time and having both equipment and personnel ready to operate. The first two weeks of Part 2 is a good example of this.

Timings

119. The timing of this, and other operations were confirmed only weeks prior to deployment as was the case in 1993. This left little time for:

- a. planning,
- b. stores acquisition,
- c. issue of orders and instructions,
- d. forecast of air hours for both RAAF and civilian charter, and
- e. application for border clearances.

120. Due to the necessity to expend a portion of the funds in FY 93/94 deployment occurred well outside the ideal photography time. In retrospect, and with the aid of local knowledge, late August to October would appear to be the premium deployment period.

Film Processing

121. If processing is not to be conducted in country, safe hand flights by civil air is the most acceptable and cost effective means.

Manning

122. Manning for the operation was satisfactory. There was some difficulty experienced in obtaining personnel for Part 2 of the operation. Part of this difficulty appears to be due to superiors not recognising the advantages to both soldiers and units in a deployment of this nature.

123. Having at least one member of the detachment who had previously been deployed to the AO was advantageous for immediate liaison.

POL

124. The purchase of POL through the use of SP21 was reliable and proved to be an accurate record of expenditure.

Vehicles

125. Hire vehicles were utilised for both parts of the operation however this proved expensive, however there are no viable alternatives.

126. Hire of vehicles during processing sorties to Australia proved to be very cost effective and convenient when compared to taxis.

Equipment

127. A full assessment of equipment is included at Annex D.

Aircraft

128. Major points in relation to the aircraft utilised and associated contract are:

- a. Adequate notice should be given to the contractor for likely deployment dates.
- b. Cessna Titan was ideally suited to acquiring imagery of larger scale targets.
- c. Servicing requirements should be clearly understood by all parties prior to deployment.
- d. One days flying was lost due to insufficient quantities of PRIST being available.

Shipment of Stores

129. The commercial shipping of stores proved to be reliable. The exception to this involved DC, as was experienced in 1993. Where air freight was utilised, it was found to be particularly expensive.

130. Correct Cargo Manifest forms are essential for the smooth passage of goods through customs.

Medical

131. Medical precautions from different Army Medical centres varied considerably.

Finance

132. Conclusions in relation to finances are:

- a. Cost codes should be issued well in advance for an operation of this nature.
- b. All financial control being located with the operational unit is the ideal arrangement.

- c. POL purchases with SP21 proved to be acceptable to suppliers and enabled the det to maintain an accurate record of expenditure.

SP21

133. Cross referencing and recording of SP21 payments is essential.

Communications

134. Telephone and facsimiles are far more cost effective when made through a private line rather than hotels.

RECOMMENDATIONS

135. As a result of the observations made throughout Op KUMUL 94 and the consequences and conclusions as detailed in this report, the following recommendations are made with respect to both Papua New Guinea and future aerial photography operations. Further recommendations concerning technical matters are contained at Annex D.

<u>Recommendation</u>	<u>Recommended Action by</u>
136. <u>Timings.</u> An acceptable lead time be given to enable overseas operations to be properly coordinated. This problem is a recurring one that effects a number of the planning aspects and does not appear to have been addressed, despite similar recommendations previously.	IP Div LHQ DSvy-A
137. All future camera operations to this AO should be conducted between late August and October.	DSvy-A 4 Fd Svy Sqn
138. <u>Film Processing.</u> Civil air flights should be utilised to return film by safe hand if processing is to be conducted in Australia.	4 Fd Svy Sqn
139. <u>Manning.</u> All RA Svy units should take advantage of operations such as this to broaden the knowledge base of soldiers, by permitting any qualified members to participate where possible.	All RA Svy units
140. At least one member of the Det should have been deployed to the AO previously.	4 Fd Svy Sqn
141. <u>POL.</u> All POL should be purchased by SP21.	4 Fd Svy Sqn

142. Aircraft.

- a. Servicing requirements be firmly established prior to deployment. 4 Fd Svy Sqn
Airscan
- b. If large scale photography is a part of the tasking, the use of Cessna Titan should be considered. 4 Fd Svy Sqn
- c. Ensure sufficient quantities of PRIST be available. Airscan

143. Shipment of Stores.

- a. Where possible this is to be anticipated well in advance to avoid the necessity of air freight and to enable DC to be positioned in time. 4 Fd Svy Sqn
- b. Cargo Manifest documentation be obtained prior to deployment. 4 Fd Svy Sqn


144. Medical. All medical precautions should be similar, regardless of the issuing unit. DMS

145. Finances.

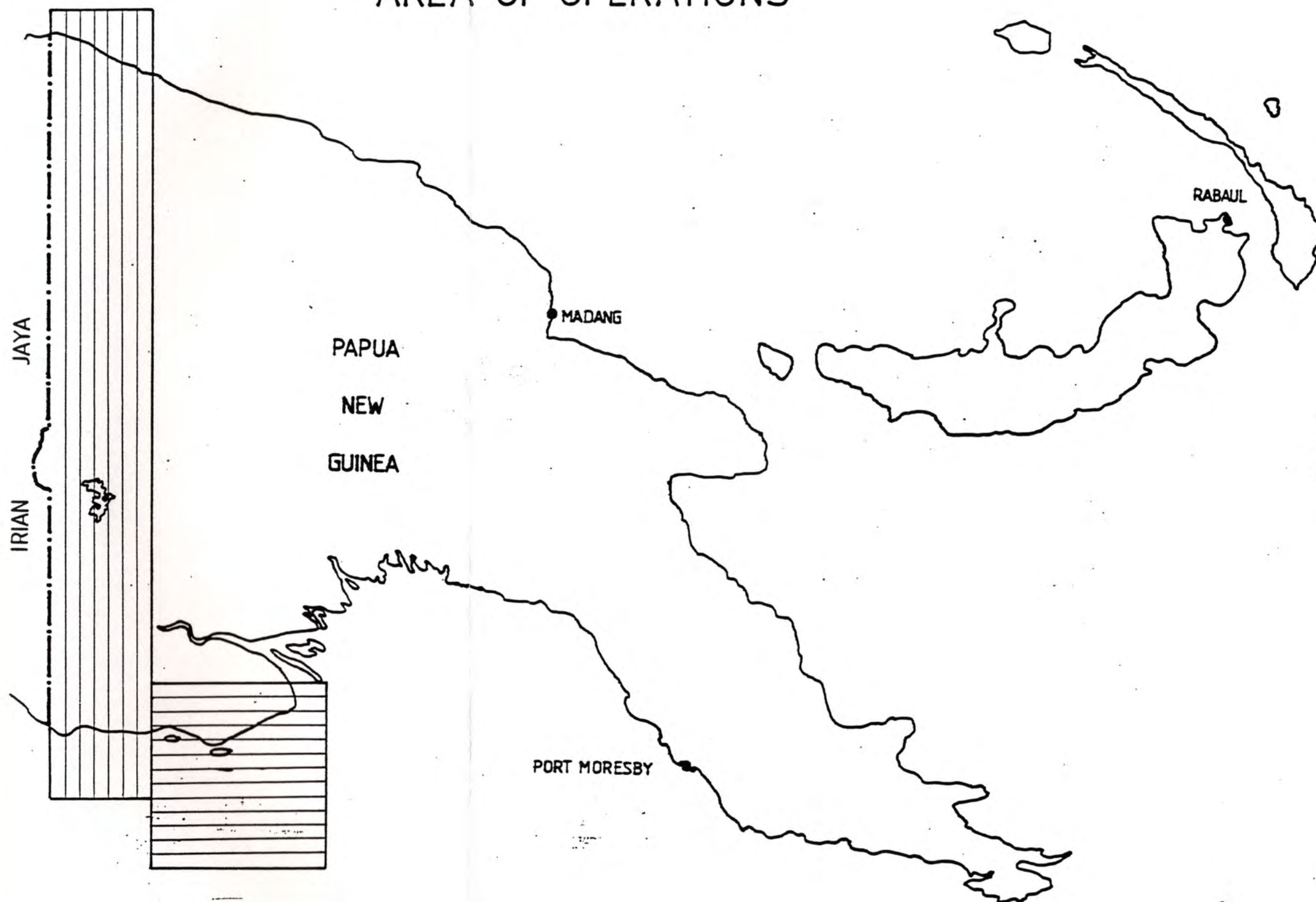
- a. Control should be maintained by the operational unit. DSvy-A
- b. SP21 recording and cross referencing should be upgraded. DC-A
(Finance Branch)

146. Communications. Telephone and facsimile communications to be established independent of hotels. 4 Fd Svy Sqn

13^H December 1994


P.C. DEMAINE
Major
Officer Commanding

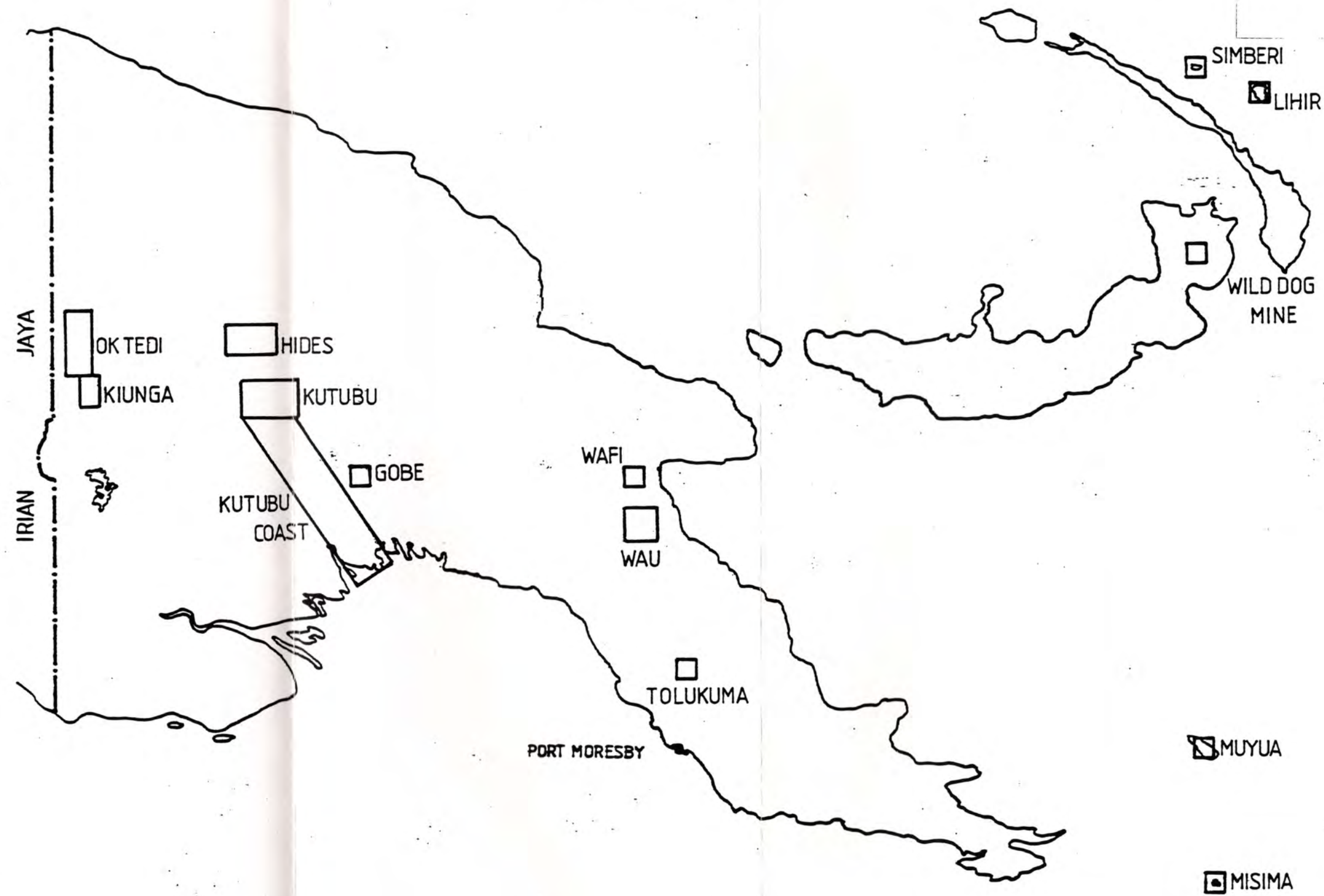
MAPPING PHOTOGRAPHY AREA OF OPERATIONS



- ▨ WESTERN BORDER AREA
- ▨ SOUTH WESTERN COASTAL AREA

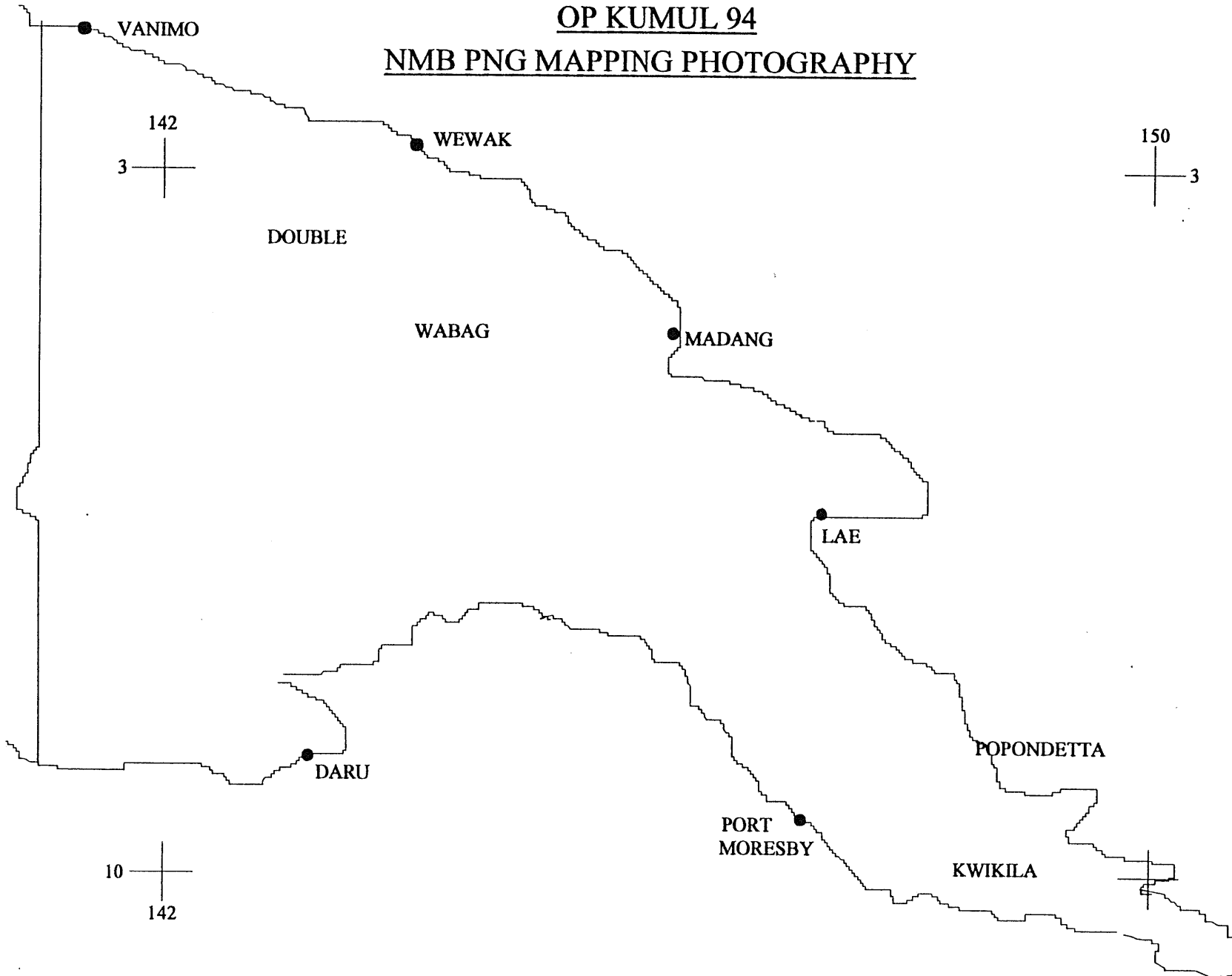
PNGDF RESOURCE SITES

ANNEX B TO
OP KUMUL 94
OPERATION REPORT
DATED 13 DEC 94



OP KUMUL 94

NMB PNG MAPPING PHOTOGRAPHY



ANNEX C TO
OP KUMUL 94
OPERATION REPORT
DATED 13 DEC 94

ANNEX D TO
OP KUMUL 94
OPERATION REPORT
DATED 13 DEC 94

TECHNICAL AND EQUIPMENT REPORT
OPERATION KUMUL 94
PARTS 1 AND 2
4 JUN 94 - 31 JUL 94 AND 12 SEP 94 - 24 OCT 94

INTRODUCTION

1. Operation KUMUL 94 was an aerial photography operation conducted in two parts by 4 Fd Svy Sqn in Papua New Guinea during the periods 4 Jun to 31 Jul and 12 Sep to 24 Oct 94.
2. The aim of the operation was to:
 - a. Complete the photographic coverage of Papua New Guinea as described in References B and D.
 - b. Acquire supplementary photography to assist the National Mapping Bureau of PNG (NMB) in their 1:100 000 revision program, as requested at Reference G.
 - c. Acquire outstanding PNG Resource photography as detailed at References B and D.
 - d. Acquire Photo Interpretation Guide imagery of the FLY RIVER/BOIGU and LAKE MURRAY plotting blocks as requested at Reference J.
3. The Areas of Operations are shown at Annexes A, B and C.

OPERATIONAL RESULTS

4. Mapping Photography. All mapping photography obtained was assessed and classified in accordance with Reference O. Suitable mapping photography achieved during Op KUMUL 94 is detailed and illustrated at Appendix 1 to Annex D.

5. Total line kilometres of useable mapping photography obtained is:

a. Part 1.

Serial	MAPPING BLOCK	X km	Y km	TOTAL km
(a)	(b)	(c)	(d)	(e)
(1)	Vanimo \ Aitape	43.4	142	185.4
(2)	Daru (Cape York 1C)	-	396	396
(3)	TOTALS	43.4	538	581.4

a. Part 2.

Serial	MAPPING BLOCK	X km	Y km	TOTAL km
(a)	(b)	(c)	(d)	(e)
(1)	Kiunga	82	1314	1396
(2)	Ok Tedi	27	664	691
(3)	Mianamin	-	71	71
(4)	Daru (Cape York 1C)	-	154	154
(5)	TOTALS	109	2203	2312

6. Annex F depicts the photographic coverage required to complete tasking.

National Mapping Bureau (NMB) of PNG Supplementary Photography

7. Part 1. Of the 12 areas requested by NMB none were completed during Part 1. Portions of photography was obtained on an opportunity basis in the following areas:

- a. Madang,
- b. Wabag,
- c. Minj, and
- d. Adelbert.

8. Part 2. During Part 2 complete coverage was obtained in the following areas:

- a. Wabag,
- b. Double,
- c. Popondetta, and
- d. Kwikila.

9. Coverage obtained is detailed and illustrated at Appendix 2 to Annex D.

PNG Resource Photography

10. Nil Resource Photography was achieved during Part 1.
11. During Part 2 partial photographic coverage of the Kutubu task was achieved. This is detailed and illustrated at Appendix 3 to Annex D.

Photo Interpretation Guide (PIG) Imagery

12. Of the 24 requested PIG targets requested by Reference J, 20 were captured.
13. A CANON EOS 1000F 35mm camera using KODAK 100 GOLD and automatic exposure was utilised for the task. Imagery was captured at an altitude of 5 000ft from the Learjet through the camera port after removing the RC10 camera.
14. The Learjet was not suitable for this task due to the speed at which the aircraft travels. This gave little lead time for the operator to aim at the target and the strong possibility of the hand held camera scratching the camera port if the aircraft were buffeted.

PROCESSING AND PRINTING

Part 1

15. During Part 1, film was transited to RAAF Versamat facilities at Darwin for processing. Initially results were inconsistent due to high temperatures and operators unfamiliarity with 2412 film.
16. RAAF Amberley was utilised for processing of film from the Bourke Test Range and also once for mapping photography.
17. Versamat tests using 2412 film prior to deployment were conducted at Department of Environment and Land Management (DELM) Adelaide. Results were very good, however, actual operational terrain, light conditions and achievable processing temperatures did not allow test settings to be used.
18. Printing was carried out by Detachment personnel utilising RAAF facilities.

Part 2

19. Part 2 processing was conducted at 6 SQN RAAF Base Amberley and CPE Laverton. Prints were produced at 6 SQN and Army Survey Regiment.
20. Op KUMUL 94 funds provided replacement chemistry for RAAF processing equipment and photographic paper used.

ASSESSMENT

21. During Part 1 photo assessing of photography was carried out by Det personnel in the AO in accordance with References O, P and Q.
22. Part 2 photography assessment was carried out by Det personnel in the AO during, and at 4 Fd Svy Sqn and Army Survey Regiment on completion of the operation.

EQUIPMENTCameras

23. The following camera systems were used during the operation:
- a. LEICA RC20 Serial No. 5154 - Part 1;
 - b. WILD RC10 Serial No. 2611 - Part 1; and
 - c. WILD RC10 Serial No. 3294 - Part 2.

LEICA RC20 Serial No. 5154

24. The LEICA RC20 camera was hired from Airesearch Pty Ltd and mounted in the Learjet (VH-TPR) for the duration of Part 1, proving to be very reliable. All missions flown utilised the 88.5 mm f4 lens. A 152 mm lens was available however this was retained in Darwin as a second aircraft was assigned the Wide Angle tasking.
25. The RC20 is self monitoring during operation and self diagnostic testing allows problems to be identified quickly. Navigation sight for the RC20 is an NF3 which functioned well.
26. The RC20 at power up automatically transports a blank and an exposure in quick succession, this is an automatic system test. It is therefore advantageous to leave the camera on through out a mission or blanks and erroneous exposures will appear. A minimum of one blank must be placed after the test exposure or the test frame will become the first frame in a run.
27. All test frames were numbered and recorded as "test exposure" on flight reports to minimise confusion.

LEICA RC20 Problems

28. Following the daily cleaning routine on the 23 Jul 94 the camera indicated an error with the illumination for fiducial marks/marginal data. On inspection of the camera a cracked illumination diode was found.
29. The diode (1 of 2) is located in a window on the lower section of the drive unit. It is in such a position as to be open to the Lens Information prism when the drive unit is placed on the

lens. The diodes protrude only fractionally from the window, however enough to contact the lens unit body during removal/replacement of the drive unit.

30. A programmed Service Test was performed and the error was confirmed to be the loss of the Lens Identification number only. Airesearch was notified and as no spares were available in the AO or Australia, operations continued resulting in no lens identification data being exposed on subsequent missions.

31. No further mechanical problems were encountered, however at the conclusion of Part 1 the camera was redeployed to the Solomon Islands for a short period. In this time extensive 'small island and reef' photography was flown. After processing, it was found that a 'ghost image', or faded 'second image' of the target was in each frame.

32. No explanation as to the cause of the ghost image could be ascertained. The camera appeared to operate normally with no indicated errors and the clarity of the target and 'ghost' do not indicate film motion. Subject to further investigation, the missions flown during Part 1 may have the same aberration which was not evident due to the land content in each frame.

WILD RC10 Serial No. 2611

33. Aerial camera number 2611 was used in conjunction with UAg lens 1006 having a calibrated focal length of 151.75mm (calibration date 16 Feb 94). The camera was installed in Cessna Titan aircraft (VH-CSV) at Canberra by 4 Fd Svy Sqn personnel for Op KUMUL 94 Part 1.

RC10 2611 Problems.

34. The camera operated normally up to 14 Jun 94 when the vacuum pump burnt out. A replacement drive unit was freighted from 4 Fd Svy Sqn and fitted in Cairns.

35. The replacement unit also showed a vacuum problem but this was isolated to a faulty indicator dial, replacement not being necessary.

Wild RC10 Serial No. 3294

36. WILD RC10 camera Serial No. 3294 was installed in Learjet (VH-TPR) for Op BELAMA 94, prior to redeployment to PNG for Op KUMUL Part 2. The camera was used with SWA Lens Serial No. 2121 (calibrated focal length 87.98mm, 5 Apr 94) and WA Lens Serial No.1006 (calibrated focal length 151.75mm, 16 Feb 94).

RC10 3294 Problems

37. Shutter Speed Control. An intermittent problem with the exposure mechanism resulted in the shutter speed dropping to zero. The fault was traced to Board No. 2 not being correctly seated in the circuitry unit. When the board was correctly seated it was still not possible to maintain a shutter speed below 1/120 second.

38. Film Transportation. During film transportation between exposures the drive unit emitted a high pitched noise. Possible rectification of the problem was to remove the cover plate and lubricate the mechanism. Correct lubricant required was a graphite base which was not available in the AO. Oil based lubricants cannot be used due to the possibility of the oil coming into contact with the lens.

39. NF2 Controlled Levelling. Automatic levelling of the camera could not be used or relied upon. When engaged, the drift, tip and tilt servos described an agitator action within a one degree arc. The problem was attributed to aircraft power fluctuation. The problem was remedied by disengaging the servos and manually adjusting for tip and tilt aided by two spirit levels. Drift was set manually from navigators directions.

40. NF2 Navigation Sight. The NF2 Navigation Sight forward view was inoperative for the first two weeks of Part 2. This was due to a broken prism cam wheel roller. Local engineering sources manufactured a replacement which operated while the aircraft was on the ground. Wind resistance during flight caused heavy friction which could break the whole system and it was decided to not to risk use of the forward viewing system.

41. Lens fiducial. On processing the film it was noticed that lens fiducial No. 4 was partly obscured by either a foreign object or by a misalignment of its' optical train. The centre mark of the fiducial was not affected and should not hinder fiducial measurements.

SERCEL GPS

42. The Skymap system utilises a Leica RC20 camera in conjunction with a SERCEL 103 GPS unit mounted in the aircraft. This provides raw co-ordinates for each camera exposure during a mission. The data is recorded directly onto a Toshiba notebook hard drive for post mission processing.

43. Two SERCEL 101 ground units, located at known co-ordinates, are operated during all photo missions. These units provide correction data for post processing airborne files to accurately determine coordinates of each exposure. All data is required to be in World Geodetic System 84 (WGS 84) datum.

44. Only one Permanent Survey Mark (PSM) having WGS 84 coordinates was known to be located in the Madang area. This station was atop a mountain accessible only by rough track in good weather conditions. Two new stations were established by the det.

45. The new stations were established for security and accessibility:

- a. Station APT adjacent to Madang Airport taxiway, and
- b. Station SMG in the confines of Smugglers Hotel Madang.

46. All ground station data, recorded during successful photo missions, was down loaded later to the mobile Toshiba notebook from the airborne unit. All observed data was compressed and duplicated on 2 sets of 3.5" floppy disks with a 3rd copy being stored on a Toshiba T4800CT.

47. Data files were labelled by:

- a. location_date_month (for ground unit files ie. APT or SMG_23_7); and
- b. mission no_date_month (for airborne unit files ie. 523_23_7).

48. No further processing was carried out. The data was dispatched to Army Survey Regiment by safe hand at the conclusion of Part 1.

Sercel GPS Problems

49. No problems were encountered with the GPS equipment.

Differential Height Estimation and Logging System (DHELs)

50. The requirement for DHELs (Statoscope) data for Other Tasking was not specified until 1 Jun 94 (the day of deployment) and the equipment had already been dispatched to Sydney for shipping to Op BELAMA 94. Equipment recovery was initiated for dispatch to Darwin.

51. Only one processing flight to Darwin eventuated prior to the Titan's return from the Operation. This flight found the DHELs equipment to be deficient the sampler tube and Data Transfer Device (DTD) mounting screws. Consequently no DHELs data was recorded during Part 1.

52. DHELs equipment was utilised with the RC10 camera in the Learjet during Part 2. No problems were encountered with the DHELs Airborne Unit while capturing imagery.

53. An unsuccessful attempt was made to transfer the data from the DTD's to a laptop computer using software and hardware supplied by the Army Survey Regiment. The following problems were encountered:

- a. TOSHIBA T2200SX laptop has only one communications port (COM1). It was discovered after consultation with the Army Survey Regiment that "hard wired" into the software was the requirement for the data to be transferred via the COM2 port. Attempts to make COM1 equal COM2 were unsuccessful.
- b. Wires within the supplied cable from the laptop to the DHELs Ground Transfer Unit were broken and required resoldering. Care was taken to ensure these were replaced onto the correct pins. All cabling and connections were tested by a local electrician and no other faults were detected.
- c. Upon return to Australia extensive testing of the software was conducted at Army Survey Regiment. The final answer was that the incorrect baud rate for transfer had been stated in the original specifications.

Camera Platforms

54. Camera platforms used during Op KUMUL 94 were:

- a. Gates Learjet 35A VH-TPR (Parts 1 and 2); and

b. Cessna Titan VH-CSV (Part 1 only).

55. Both aircraft were equipped with GARMIN GPS-100 for navigational purposes.

VH-TPR

56. VH-TPR performed well, the speed, range and stability allowing tasking flexibility in difficult conditions. Good communication between pilots and camera crew was effected by head sets, hot wired for hands off operation.

57. The Garmin GPS was used exclusively for initial navigation and proved valuable, particularly when forward viewing through NF2 was not available due to malfunction or haze. Once a mapping run had been identified it was necessary to navigate manually as the reliability of existing maps in the AO is not high and hence GPS navigation can be erroneous.

58. Aircraft cables and air hoses on the starboard cabin wall have been updated and interfere with camera movement when the 152 mm lens is fitted.

VH-CSV

59. VH-CSV proved to be an operational asset. The aircraft was tasked with obtaining all wide angle photography where altitude requirements were less than 25 000ft.

60. The aircraft was suited to the lower level tasking as it was able to fly below cloud at a speed suitable for film exposure in limited light.

61. The aircraft range allowed coverage of the AO, however aircraft speed restricted rapid response to ever changing weather conditions. By using the Lear as a high level spotter in transit to the border area, the Titan could track directly to an area within the AO where conditions were likely to provide photography.

Film

62. KODAK Panatomic 2412 was used for all tasks, with KODAK Plus-X 2402 only being used when light conditions required a faster film. On two occasions due to time and weather constraints, 2402 was used for mapping photography. Results were indifferent as the conditions were unfavourable due to heavy haze.

CONCLUSIONS

63. Op KUMUL 94 achieved much of the overall tasking, but was unable to complete it due to adverse weather conditions minimising photographic opportunities. The advent of a second deployment later in the dry season provided more frequent photographic opportunities.

64. Equipment utilised on OP KUMUL 94 functioned serviceably with only minor problems which did not suspend the operation.

65. The major area of concern is the RC10 cameras. The serviceability of the equipment is a major concern as they surpassed their Life Of Type (LOT) in 1992 and each camera system is an accumulation of parts from various others.

66. Uncommon problems are appearing which can only be attributed to length of service. As WILD no longer provide replacement parts, cannibalism and patchup servicing can only provide support for a limited time.

RECOMMENDATIONS

Recommendation:

Recommended
Action by:

67. A aerial camera with Image Motion Compensation (IMC) be purchased to replace current cameras.

DSvy-A

68. All future operations commence no earlier than late August.

DSvy-A
4 Fd Svy

W.J. Shephard
WO2
DET 2IC

13 Dec 94

APPENDIX 1 TO
ANNEX D TO
OP KUMUL 94
OPERATION REPORT
DATED DEC 94

MAPPING PHOTOGRAPHY ACQUIRED

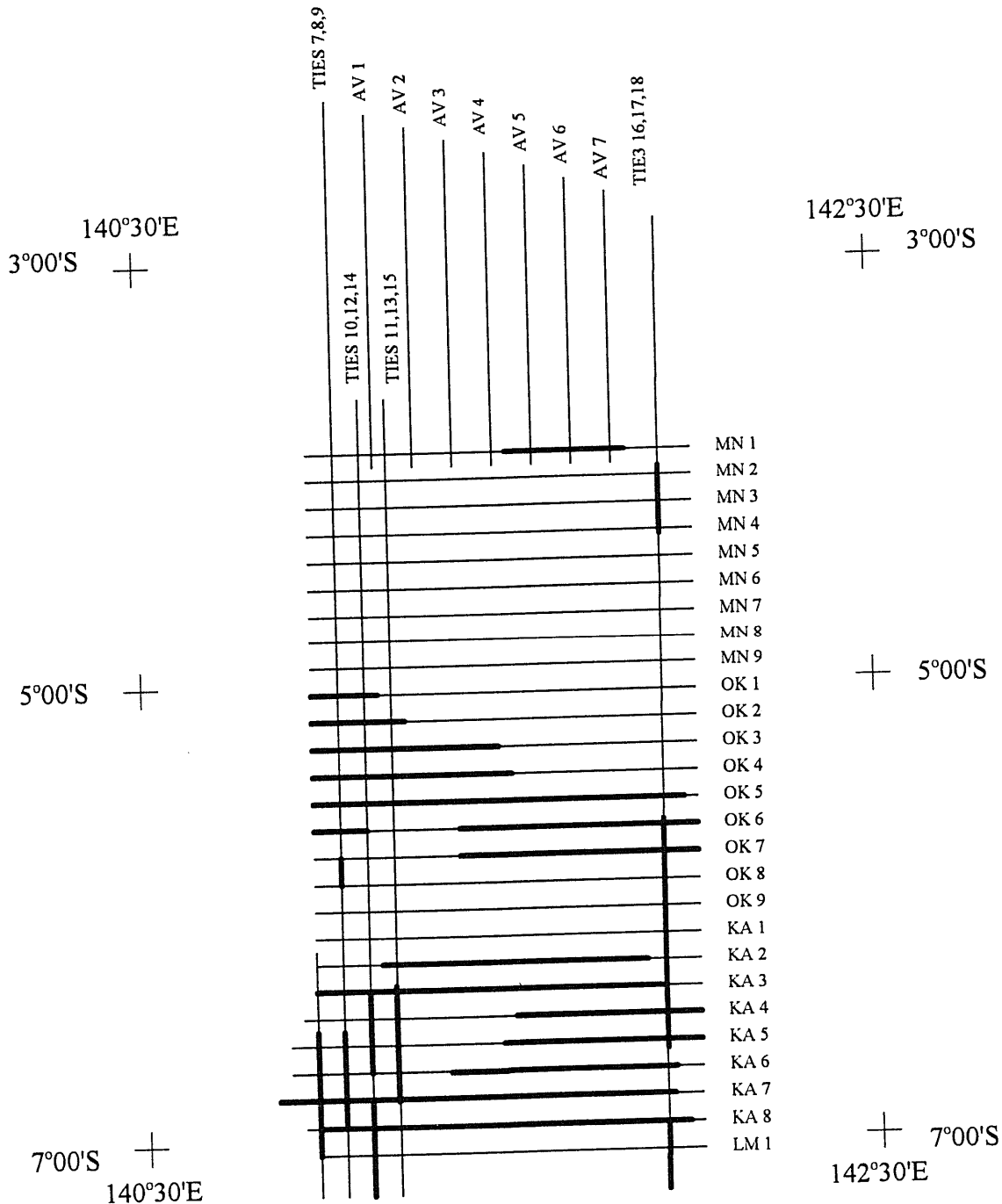
Run	Mission	Start		Finish		Line Kilometres			
		Lat ° ' "	Long ° ' "	Lat ° ' "	Long ° ' "	X	Y	Z	Total
KIUNGA RUN 1	4 FDP 536	6 07 10	141 55 00	6 07 10	140 55 00	-	-	110	110
KIUNGA RUN 2	4 FDP 537	6 14 10	141 01 00	6 14 10	142 15 00	-	82	86	168
KIUNGA RUN 3	4 FDP 537	6 21 10	142 15 00	6 21 10	141 00 00	-	118	27	145
KIUNGA RUN 4	4 FDP 535	6 28 10	142 15 00	6 28 10	141 45 00	-	82	-	82
KIUNGA RUN 4	4 FDP 537	6 28 10	141 00 00	6 28 10	142 15 00	-	-	145	145
KIUNGA RUN 5	4 FDP 535	6 35 10	142 15 00	6 35 10	140 55 00	33	51	62	146
KIUNGA RUN 6	4 FDP 535	6 42 10	140 55 00	6 42 10	142 10 00	-	31	103	134
KIUNGA RUN 6	4 FDP 543	6 42 10	141 15 00	6 42 10	142 14 00	-	47	60	107
KIUNGA RUN 7	4 FDP 538	6 49 10	140 53 00	6 49 10	141 47 00	-	44	55	99
KIUNGA RUN 7	4 FDP 539	6 49 10	142 07 00	6 49 10	140 48 00	-	131	7	138
KIUNGA RUN 7	4 FDP 543	6 49 10	142 08 00	6 49 10	140 52 00	-	98	40	138
KIUNGA RUN 8	4 FDP 538	6 56 15	141 49 00	6 56 15	140 53 00	-	76	25	101
KIUNGA RUN 8	4 FDP 542	6 56 15	140 48 00	6 56 15	142 15 00	-	129	25	154
KIUNGA RUN 8	4 FDP 543	6 56 15	142 12 00	6 56 15	141 18 00	-	40	73	113

Run	Mission	Start		Finish		Line Kilometres			
		Lat ° ' "	Long ° ' "	Lat ° ' "	Long ° ' "	X	Y	Z	Total
KIUNGA TIE 1	4 FDP 538	7 02 00	140 56 00	6 27 00	140 56 00	-	60	8	68
KIUNGA TIE 9	4 FDP 538	6 25 00	141 01 00	6 55 00	141 01 00	-	45	4	49
KIUNGA/OK TEDI TIE 9	4 FDP 541	5 32 00	141 01 00	6 45 00	141 01 00	-	31	102	133
KIUNGA TIE 14	4 FDP 538	6 49 00	141 05 40	7 15 00	141 05 40	-	47	-	47
KIUNGA TIE 14	4 FDP 539	6 15 00	141 05 40	7 14 00	141 05 40	-	60	47	107
KIUNGA TIE 15	4 FDP 538	7 15 00	141 13 50	6 42 00	141 13 50	-	-	60	60
KIUNGA TIE 15	4 FDP 539	7 14 00	141 13 50	6 05 00	141 13 50	-	57	68	125
KIUNGA TIE 18	4 FDP 538	6 55 00	141 58 00	6 11 00	141 58 00	-	36	43	79
KIUNGA/OK TEDI TIE 18	4 FDP 539	6 28 00	141 58 00	5 30 00	141 58 00	33	32	40	105
KIUNGA TIE 18	4 FDP 543	6 30 00	141 58 10	7 14 00	141 58 10	16	17	47	80
OK TEDI RUN 1	4 FDP 522	5 04 00	141 49 00	5 04 00	141 12 00	-	-	68	68
OK TEDI RUN 1	4 FDP 537	5 04 00	141 50 00	5 04 00	141 15 00	-	-	137	137
OK TEDI RUN 2	4 FDP 537	5 11 00	140 55 00	5 11 00	142 10 00	-	-	64	64
OK TEDI RUN 2	4 FDP 541	5 11 00	141 19 00	5 11 00	140 55 00	-	32	10	45
OK TEDI RUN 3	4 FDP 538	5 18 00	142 10 00	5 18 00	141 32 00	-	-	70	70
OK TEDI RUN 3	4 FDP 541	5 18 00	140 52 00	5 18 00	141 35 00	-	52	27	79
OK TEDI RUN 4	4 FDP 541	5 25 00	141 31 00	5 25 00	141 01 00	-	-	55	55
OK TEDI RUN 4	4 FDP 541	5 25 00	141 39 00	5 25 00	140 53 00	-	66	17	83
OK TEDI RUN 4	4 FDP 541	5 25 00	140 55 00	5 25 00	142 14 00	-	71	74	145

Run	Mission	Start		Finish		Line Kilometres			
		Lat ° ' "	Long ° ' "	Lat ° ' "	Long ° ' "	X	Y	Z	Total
OK TEDI RUN 5	4 FDP 541	5 32 00	141 00 00	5 32 00	141 36 00	-	-	65	65
OK TEDI RUN 5	4 FDP 541	5 32 00	142 10 00	5 32 00	140 50 00	-	140	5	145
OK TEDI RUN 6	4 FDP 539	5 39 00	141 19 00	5 39 00	142 10 00	-	42	51	93
OK TEDI RUN 6	4 FDP 541	5 39 00	141 39 00	5 39 00	140 54 00	-	-	80	80
OK TEDI RUN 6	4 FDP 541	5 39 00	140 55 00	5 39 00	142 15 00	-	116	29	145
OK TEDI RUN 7	4 FDP 539	5 46 00	142 15 00	5 46 00	141 19 00	-	82	20	102
OK TEDI RUN 7	4 FDP 541	5 46 00	142 12 00	5 46 00	140 53 00	27	63	53	143
OK TEDI TIE 8	4 FDP 543	5 31 00	141 01 00	4 52 00	141 01 00	-	-	67	67
OK TEDI TIE 12	4 FDP 522	4 33 30	141 06 00	5 02 00	141 06 00	-	-	51	51
MIANMIN RUN 1	4 FDP 537	4 01 00	142 10 00	4 01 00	141 20 00	-	36	55	91
MIANMIN RUN 2	4 FDP 537	4 08 00	141 28 00	4 08 00	141 58 00	-	-	50	50
MIANMIN TIE 16	4 FDP 537	3 45 00	141 58 00	4 35 00	141 58 00	-	35	56	91
MIANAMIN RUN 9	4 FDP 522	4 57 00	140 55 00	4 57 00	141 40 00	-	-	83	83
PNG BLK 1C RUN 1	4 FDP 538	9 03 00	142 15 00	9 03 00	142 40 00	-	36	9	45
PNG BLK 1C RUN 1	4 FDP 539	9 03 00	142 15 00	9 03 00	143 37 00	-	118	32	150
PNG BLK 1C RUN 5	4 FDP 523	8 57 00	143 34 00	9 04 00	142 49 00	-	83	-	83
PNG BLK 1C RUN 7	4 FDP 523	9 45 00	143 13 00	9 35 00	143 27 00	-	48	-	48
PNG BLK 1C RUN 2	4 FDP 523	9 10 00	142 19 00	9 09 00	143 03 00	-	77	4	81
PNG BLK 1C RUN 4	4 FDP 523	8 51 00	143 24 00	9 22 00	142 27 00	-	119	-	119
PNG BLK 1C RUN 6	4 FDP 523	9 12 00	142 54 00	8 57 00	143 29 00	-	69	-	69

Run	Mission	Start		Finish		Line Kilometres			
		Lat ° ' "	Long ° ' "	Lat ° ' "	Long ° ' "	X	Y	Z	Total
AITAPE / VANIMO RUN 5	4FDP 522	2 47 10	141 37 00	3 05 20	141 36 30	-	-	33.5	33.5
AITAPE / VANIMO TIE 4	4 FDP 522	2 51 00	141 27 30	3 03 30	141 56 45	43.4	-	15.2	58.6
AITAPE / VANIMO TIE 4	4 FDP 523	3 02 00	141 51 00	2 39 00	141 00 00	-	88	15	103
AITAPE / VANIMO RUN 4	4 FDP 523	2 38 00	141 29 00	3 08 00	141 29 00	-	54	-	54

OP KUMUL 94
MAPPING PHOTOGRAPHY ACQUIRED



LEGEND

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USABLE MAPPING PHOTOGRAPHY ACQUIRED

APPENDIX 2 TO
ANNEX D TO
OP KUMUL 94
OPERATION REPORT
DATED DEC 94

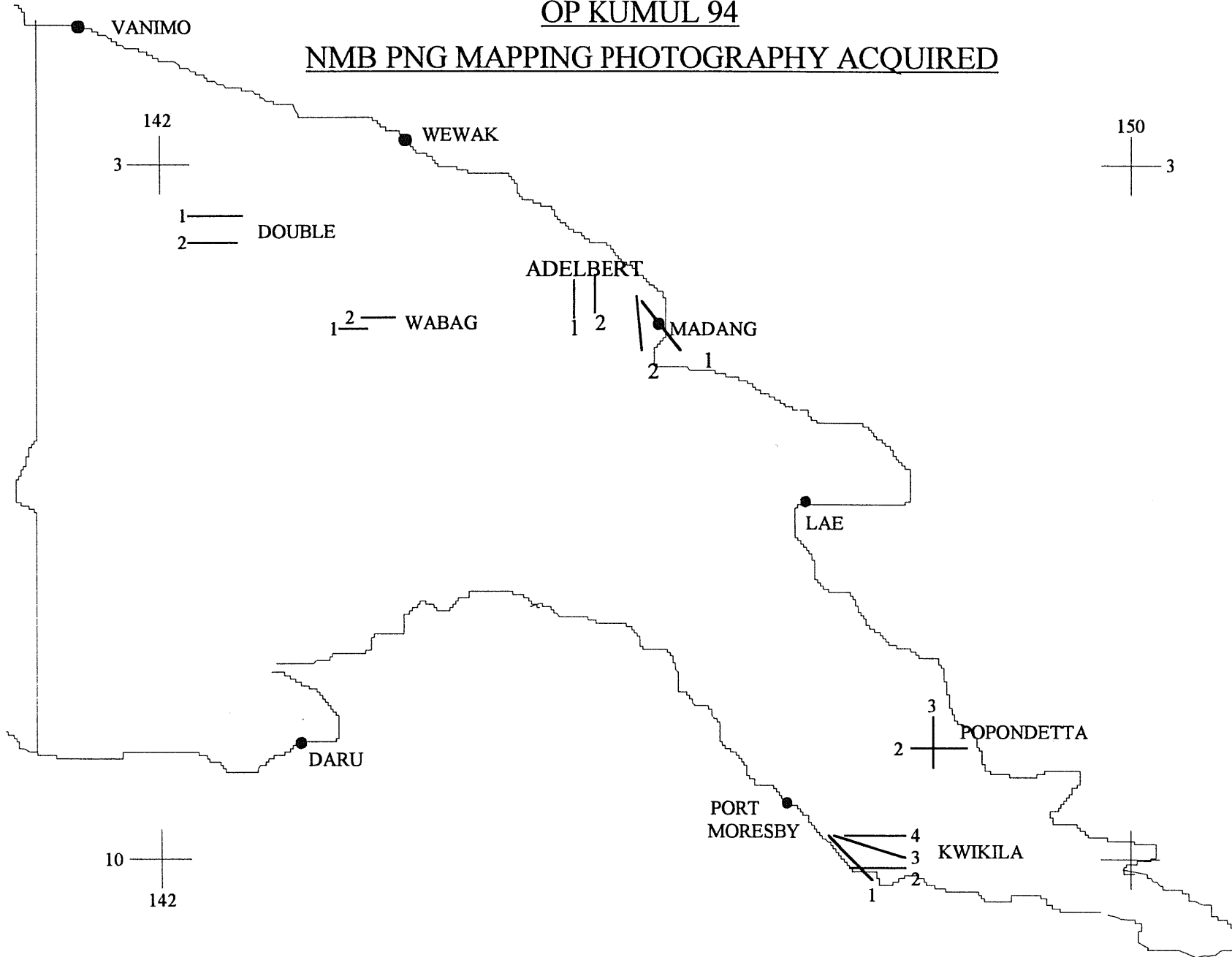
NATIONAL MAPPING BUREAU - PNG MAPPING PHOTOGRAPHY ACQUIRED

Run	Mission	Start		Finish		Line
		Lat ° ' "	Long ° ' "	Lat ° ' "	Long ° ' "	Kilometres Total
DOUBLE RUN 1	4 FDP 535	4 57 30	142 44 00	4 57 30	142 30 00	25
DOUBLE RUN 2	4 FDP 535	4 43 15	142 29 30	4 40 00	142 53 00	35
WABAG RUN 1	4 FDP 535	5 26 45	143 29 35	5 26 45	143 47 25	32
WABAG RUN 2	4 FDP 535	5 22 30	143 45 10	5 22 30	143 59 30	28
POPONDETTA R3	4 FDP 544	8 35 00	148 04 00	9 00 00	148 04 00	50
POPONDETTA R2	4 FDP 544	8 46 00	148 04 35	8 46 00	148 14 00	15
POPONDETTA R2	4 FDP 544	8 46 00	148 29 00	8 46 00	148 05 00	30
POPONDETTA R1	4 FDP 544	8 40 00	148 05 00	8 40 00	148 29 00	30
KWIKILA RUN 1	4 FDP 545	9 47 36	147 29 53	10 00 20	147 40 49	30
KWIKILA RUN 2	4 FDP 544	9 58 09	147 41 45	9 58 09	148 00 16	35
KWIKILA RUN 3	4 FDP 544	9 53 12	148 00 30	9 46 25	147 32 50	54
KWIKILA RUN 4	4 FDP 544	9 43 00	147 42 30	9 43 00	148 00 30	33

Run	Mission	Start		Finish		Line Kilometres
		Lat ° ' "	Long ° ' "	Lat ° ' "	Long ° ' "	Total
Madang Run 2	4 FDP 523	5 10 00	145 40 00	4 38 00	145 19 00	
Madang Run 3	4 FDP 523	5 27 00	145 34 00	5 08 00	145 34 00	
Madang Run 3	4 FDP 523	5 08 00	145 34 00	5 29 00	145 34 00	
Adelbert Run 1	4 FDP 523	4 55 00	145 03 00	4 40 00	145 03 00	
Adelbert Run 2	4 FDP 523	4 56 00	145 19 00	4 38 00	145 19 00	
Adelbert Run 2	4 FDP 523	4 38 00	145 19 00	4 56 00	145 19 00	

OP KUMUL 94

NMB PNG MAPPING PHOTOGRAPHY ACQUIRED



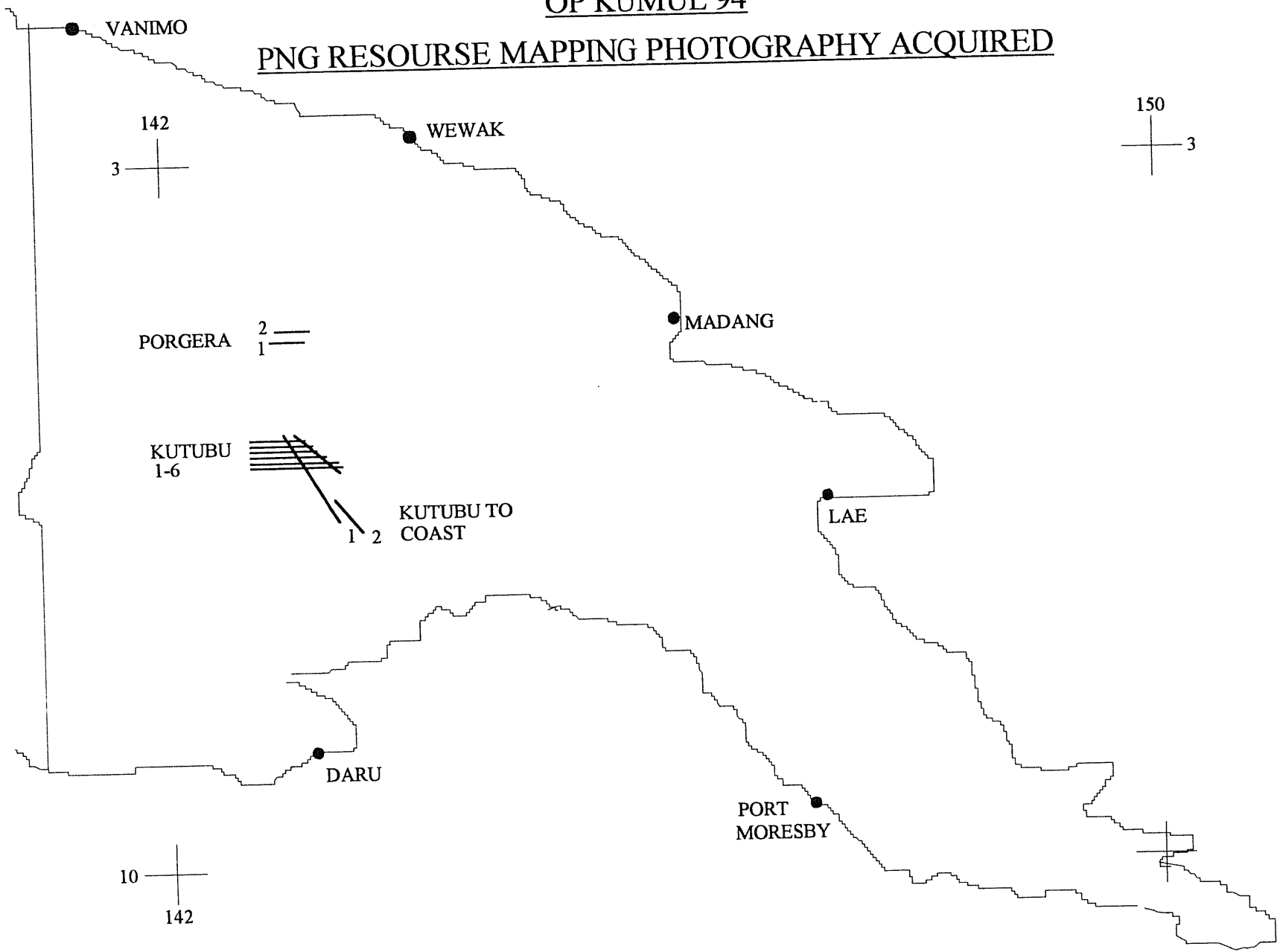
APPENDIX 3 TO
ANNEX D TO
OP KUMUL 94
OPERATION REPORT
DATED DEC 94

PNG RESOURCE MAPPING PHOTOGRAPHY ACQUIRED

Run	Mission	Start		Finish		Line Kilometres
		Lat ° ' "	Long ° ' "	Lat ° ' "	Long ° ' "	Total
KUTUBU RUN 1	4 FDP 540	6 18 30	143 03 30	6 18 30	143 18 00	27
KUTUBU RUN 2	4 FDP 540	6 21 00	143 21 00	6 21 00	143 03 30	32
KUTUBU RUN 3	4 FDP 540	6 23 30	143 03 30	6 23 30	143 24 00	38
KUTUBU RUN 4	4 FDP 540	6 26 00	143 27 00	6 26 00	143 03 30	43
KUTUBU RUN 5	4 FDP 540	6 28 30	143 03 30	6 28 30	143 29 00	47
KUTUBU RUN 6	4 FDP 540	6 29 45	143 29 50	6 16 45	143 11 30	41
KUTUBU TO COAST RUN 1	4 FDP 540	6 16 00	143 08 00	6 49 20	143 34 30	78
KUTUBU TO COAST RUN 2	4 FDP 540	6 41 00	143 30 00	6 54 00	143 44 00	30
PORGERA RUN 1	4 FDP 535	5 29 00	143 10 00	5 28 00	143 03 00	14
PORGERA RUN 2	4 FDP 535	5 26 00	143 05 00	5 27 00	143 13 00	16

OP KUMUL 94

PNG RESOURCE MAPPING PHOTOGRAPHY ACQUIRED



ANNEX E TO
OP KUMUL 94
OPERATION REPORT
DATED 13 DEC 94

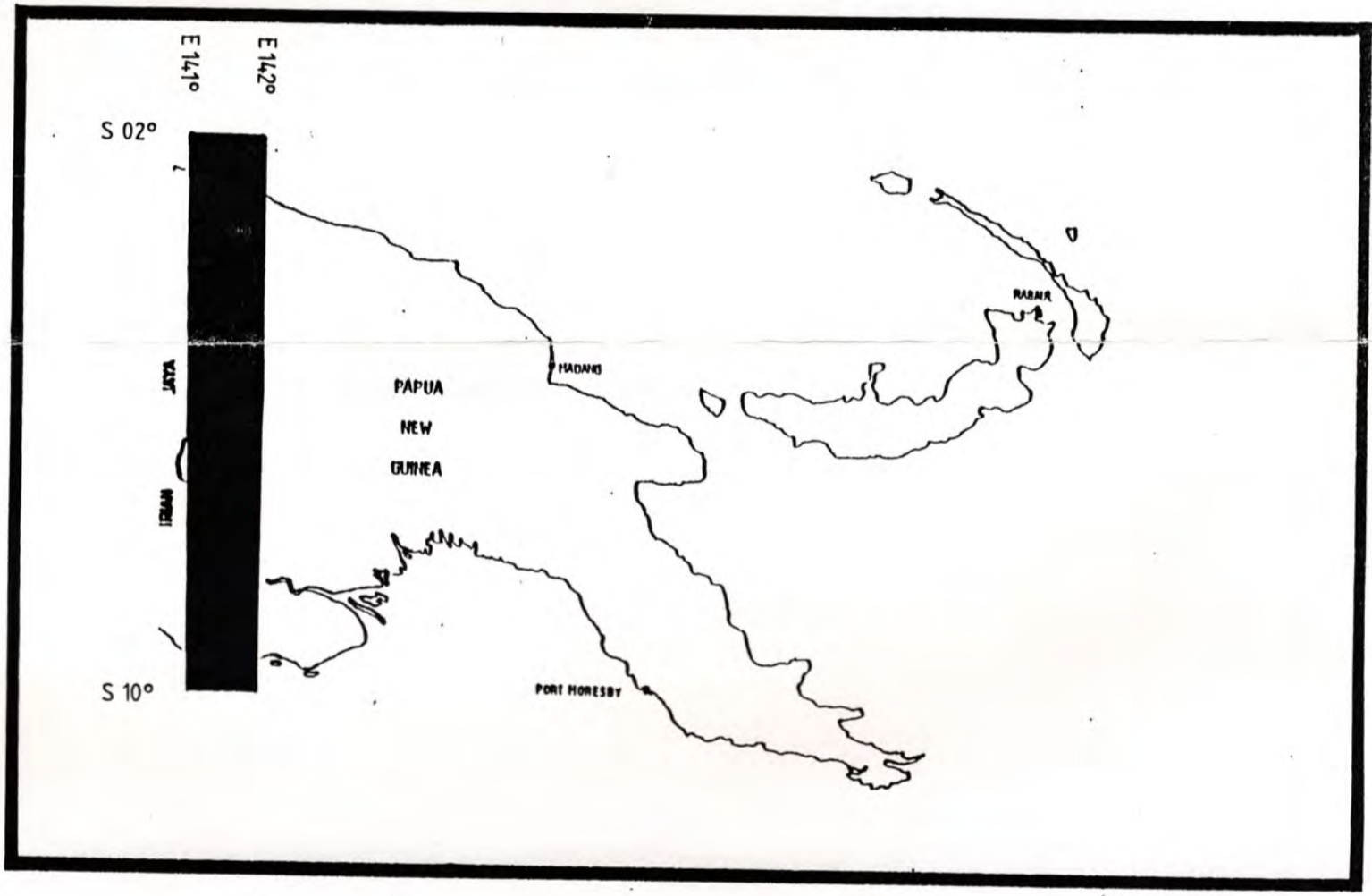
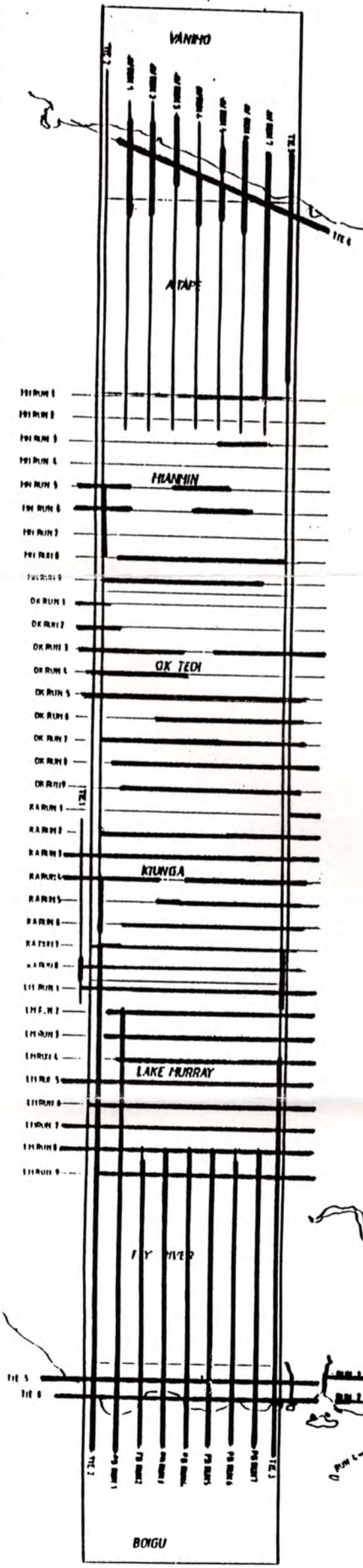
SEQUENCE OF EVENTS

Serial	Date	Event
(a)	(b)	(c)
1	26 Apr 94	Concept of Operations issued
2	30 Apr 94	Stores ordered
3	17 - 20 May 94	Recce to Brisbane and Darwin
4	24 May 94	SSGT Shephard and SGT Longbottom Adelaide - Brisbane
5	25-26 May 94	Fit RC20 to Learjet
6	26 May 94	Technical directive issued
7	27 May 94	Operation Order issued
8	27 May 94	WO2 McNamara, SSGT Hammond, SGT Miller & SGT Langeberg Bendigo - Adelaide
9		SGT Longbottom & Mr John Murphy Brisbane - Adelaide Civ air
10	28 May 94	Learjet transit Bris - Adl via Bourke Test Range SSGT Shephard & Mr Tony Dewy
11	28 May - 2 Jun 94	RC20 training in Adelaide by AIReSEARCH
12	30 May 94	SGT Longbottom Adelaide - Canberra Civ air
13		Mounting Instruction issued
14	31 May 94	CAPT Gray Adelaide to Brisbane Civ air
15		SGT Longbottom fit RC10 to Titan
16	1 Jun 94	Titan SGT Longbottom Canberra - Bourke - Brisbane
17		CAPT Gray Brisbane - Port Moresby Civ air
18		Process Titan Bourke test film at RAAF Amberley
19		Process Lear Bourke test film at DELM Adelaide
20	2 Jun 94	CAPT Gray Port Moresby - Madang Civ air
21	3 Jun 94	Army Svy Regt assess Bourke test films
22		Learjet SSGT Shephard & SGT Langeberg Adelaide - Bourke - Brisbane
23		CPL Crawford, Mr Murphy & Mr Dewy Adelaide - Brisbane Civ air

Serial	Date	Event
(a)	(b)	(c)
24	4 Jun 94	Learjet SSGT Shephard & SGT Longbottom Brisbane - Madang
25		Titan SGT Langeberg & CPL Crawford Brisbane - Port Moresby
26	5 Jun 94	Titan SGT Langeberg & CPL Crawford Port Moresby - Madang
27		Learjet Pilots rest day
28	6 Jun 94	Titan pilots rest day
29		Learjet commenced mapping photography
30	7 Jun 94	Titan commences additional tasking photography
31	9 Jun 94	Learjet Madang - Darwin process film
32	10 Jun 94	Learjet Darwin - Madang
33	30 Jun 94	Learjet Madang - Darwin film processing
34	1 Jul 94	Titan CPL Crawford Madang - Darwin Extract RC10
35		SGT Brinsmead Bonegilla - Darwin
36	2 Jul 94	Learjet Darwin - Madang SGT Brinsmead
37		CPL Crawford Darwin - Adelaide Civ air
38	18 Jul 94	Learjet Madang - Brisbane for servicing
39	19 Jul 94	Film processing RAAF Amberley
40	21 Jul 94	Learjet Brisbane - Cairns
41		MAJ Demaine Adelaide - Sydney
42	22 Jul 94	Learjet Cairns - Madang
43		MAJ Demaine Sydney - Madang
44		SGT Longbottom Madang - Port Moresby
45	23 Jul 94	SGT Longbottom Port Moresby - Adelaide
46	25 Jul 94	Learjet Madang - Darwin - Madang MAJ Demaine
47	30 Jul 94	CAPT Gray, WO2 Shephard Madang - Honiara Civ air
48	31 Jul 94	Learjet SGT Langeberg, SGT Brinsmead Madang - Honiara
End Phase I		
Phase II		
49	2 Sep 94	Mounting Instruction issued
50		Operation Order issued
51	12 Sep 94	CAPT Gray Adelaide - Cairns Civ air
52		SSGT Hammond, SGT Purdey Bendigo - Cairns Civ air
53		CPL Austine Brisbane - Cairns Civ air

Serial	Date	Event
(a)	(b)	(c)
54	13 Sep 94	CAPT Gray, SSGT Hammond, SGT Purdey & CPL Austine Cairns - Madang Civ air
55	14 Sep 94	Learjet Honiara - Madang WO2 Shephard
56	15 Sep 94	Pilots rest day
57	16 Sep 94	Commence mapping and additional tasking photography
58	22 Sep 94	WO2 Shephard Madang - Sydney Civ air
59	23 Sep 94	WO2 Shephard Sydney - Adelaide Civ air
60		Additional funds approved
61	4 Oct 94	CAPT Gray Madang - Port Moresby Civ air
62	5 Oct 94	SGT Longbottom Adelaide - Brisbane Civ air
63		Aircraft Engineer Brisbane - Madang Civ air
64	6 Oct 94	Learjet servicing - Madang
65		SGT Longbottom Brisbane - Adelaide Civ air
66	7 Oct 94	Aircraft Engineer Madang - Brisbane Civ air
67		CAPT Gray Brisbane - Madang Civ air
68	23 Oct 94	CPL Austine Madang - Brisbane Civ air
69		Learjet Madang - Brisbane CAPT Gray, SSGT Hammond, SGT Purdey
70	24 Oct 94	Remove camera from Learjet
71		Brisbane - Bendigo Civ air SSGT Hammond, SGT Purdey
72		Brisbane - Adelaide Civ air CAPT Gray
73	25 - 30 Oct 94	Photography assessment (Army Svy Regt)
74	27 Oct 94	Film processed by CPE

PNG MAPPING PHOTOGRAPHY TO DATE



— Planned line
 — Achieved X & Y photography

ANNEX G TO
OP KUMUL 94
OPERATION REPORT
DATED / 3 DEC 94

OPERATIONAL MANNING

1. 4 Fd Svy Sqn.

322069	MAJ	P.C. Demaine	Visitor	22 - 25 Jul 94
5104899	CAPT	R.L. Gray	OC Det	31 May - 30 Jul 94 12 Sep - 24 Oct 94
46446	SSGT	W.J. Shephard	Det 2IC	4 Jun - 30 Jul 94
		Promoted to WO2 on 13 Sep 94		14 Sep - 23 Sep 94
49654	SGT	P.D. Longbottom	Camera Op	4 Jun - 22 Jul 94
454834	CPL	R.C. Crawford	Camera Op	5 Jun - 1 Jul 94

2. Army Svy Regt.

4401491	SGT	P. Langeberg	Camera Op	5 Jun - 31 Jul 94
223520	SSGT	B. Hammond	Det 2IC	12 Sep - 24 Oct 94
4401748	SGT	T.M. Purdey	Camera Op	12 Sep - 24 Oct 94

3. School of Mil Svy

180845	SGT	N. Brinsmead	Camera Op	1 Jul - 31 Jul 94
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4. 1 Topo Svy Sqn

234855 CPL P.A. Austine Camera Op 12 Sep - 24 Oct 94

5. Airscan Pty Ltd.

Mr M.N. Juelg Pilot VH-TPR 26 May - 31 Jul 94
VH-TPR 12 Sep - 24 Oct 94

Mr B. Denny Pilot VH-CSV 31 May - 2 Jul 94

6. Aeromill Pty Ltd.

Mr B. Ney Pilot VH-TPR 26 May - 31 Jul 94

Mr J. Farson Pilot VH-TPR 12 Sep - 24 Oct 94

7. Aeromech Pty Ltd.

Mr P. Watt Engineer 5 Oct - 7 Oct 94

ANNEX H TO
OP KUMUL 94
OPERATION REPORT
DATED 13 DEC 94

FLYING HOURS

Serial	Date	Aircraft	Pilots	Crew	Hours	Comments
(a)	(b)	(c)	(d)	(e)	(f)	(g)
1	28 May 94	VH-TPR	Mr B. Ney Mr M. Juelg	SSGT J. Shephard MR J. Farson MR T. Dewey MR J. Murphy	3.1	Brisbane - Adelaide
2	29 May 94	VH-TPR				Nil Flying
3	30 May 94	VH-TPR				Nil Flying
4	31 May 94	VH-TPR	Mr B. Ney Mr M. Juelg	SSGT J. Shephard SGT P. Langeberg CPL R. Crawford MR T. Dewy MR J. Murphy	3.2	Adelaide - Camerons Corner
5	01 Jun 94	VH-CSV	Mr B. Denny	SGT D. Longbottom	5.5	Canberra - Bourke, Amberly & Brisbane
6	01 Jun 94	VH-TPR				Nil Flying

Serial	Date	Aircraft	Pilots	Crew	Hours	Comments
(a)	(b)	(c)	(d)	(e)	(f)	(g)
7	02 Jun 94	VH-TPR				Nil Flying
8	02 Jun 94	VH-CSV				Processing
9	03 Jun 94	VH-CSV				Processing
10	03 Jun 94	VH-TPR	Mr B. Ney Mr M. Juelg	SSGT J. Shephard SGT P. Langeberg	1.9	Adelaide - Brisbane
11	04 Jun 94	VH-TPR	Mr B. Ney Mr M. Juelg	SSGT J. Shephard SGT D. Longbottom	3.5	Brisbane - Port Moresby & Madang
12	04 Jun 94	VH-CSV	Mr B. Denny	SGT P. Langeberg CPL R. Crawford	7.2	Brisbane - Cairns & Port Moresby
13	05 Jun 94	VH-CSV	Mr B. Denny	SGT P. Langeberg CPL R. Crawford	2.1	Port Moresby - Madang
14	05 Jun 94	VH-TPR				Pilot's Rest Day
15	06 Jun 94	VH-CSV				Pilot's Rest Day
16	06 Jun 94	VH-TPR	Mr B. Ney Mr M. Juelg	SGT D. Longbottom SGT P. Langeberg	2.4	Madang - Vanimo & Kiunga
17	07 Jun 94	VH-TPR	Mr B. Ney Mr M. Juelg	SGT D. Longbottom CPL R. Crawford	2.4	Madang - Vanimo & Kiunga
18	07 Jun 94	VH-CSV	Mr B. Denny	SSGT J. Shephard	4.6	Madang - Mt Hagen
19	08 Jun 94	VH-CSV	Mr B. Denny	SSGT J. Shephard	3.6	Madang - Kutubu & Ramu
20	08 Jun 94	VH-TPR	Mr B. Ney Mr M. Juelg	SGT D. Longbottom SGT P. Langeberg	2.8	Madang - Vanimo

Serial	Date	Aircraft	Pilots	Crew	Hours	Comments
(a)	(b)	(c)	(d)	(e)	(f)	(g)
21	09 Jun 94	VH-TPR	Mr B. Ney Mr M. Juelg	CAPT R. Gray SGT D. Longbottom CPL R. Crawford	4.3	Madang - Port Moresby & Darwin
22	09 Jun 94	VH-CSV	Mr B. Denny	SSGT J. Shephard SGT P. Langeberg	3.1	Madang - Ramu & Porgera
23	10 Jun 94	VH-TPR	Mr B. Ney Mr M. Juelg	CAPT R. Gray SGT D. Longbottom CPL R. Crawford	3.3	Darwin - Port Moresby & Madang
24	10 Jun 94	VH-CSV				Weather Status U/S
25	11 Jun 94	VH-CSV				Weather Status U/S
26	11 Jun 94	VH-TPR				Pilot's Rest Day
27	12 Jun 94	VH-TPR	Mr B. Ney Mr M. Juelg	CAPT R. Gray SGT P. Langeberg	2.5	Madang - Madang
28	12 Jun 94	VH-CSV	Mr B. Denny	SSGT J. Shephard	2.9	Madang - Mt Hagen
29	13 Jun 94	VH-CSV				Nil Flying
30	13 Jun 94	VH-TPR	Mr B. Ney Mr M. Juelg	SGT D. Longbottom CPL R. Crawford	2	Madang - Madang
31	14 Jun 94	VH-TPR	Mr B. Ney Mr M. Juelg	SGT P. Langeberg CPL R. Crawford	2.3	Madang - Madang
32	14 Jun 94	VH-CSV	Mr B. Denny	SSGT J. Shephard	4.6	Madang - Port Moresby & Cairns
33	15 Jun 94	VH-CSV	Mr B. Denny	SSGT J. Shephard	5.3	Cairns - Port Moresby & Madang

Serial	Date	Aircraft	Pilots	Crew	Hours	Comments
(a)	(b)	(c)	(d)	(e)	(f)	(g)
34	15 Jun94	VH-TPR	Mr B. Ney Mr M. Juelg	SGT D. Longbottom CPL R. Crawford	2.1	Madang - Madang
35	16 Jun 94	VH-TPR	Mr B. Ney Mr M. Juelg	CAPT R. Gray SGT P. Langeberg	1.4	Madang - Madang
36	16 Jun 94	VH-CSV	Mr B. Denny	SSGT J. Shephard	0.5	Madang - Mt Hagen
37	17 Jun 94	VH-TPR	Mr B. Ney Mr M. Juelg	SGT D. Longbottom CPL R. Crawford	2.2	Madang - Madang
38	17 Jun 94	VH-CSV	MR B. Denny	SSGT J. Shephard	2.5	Madang - Mt Hagen & Kutubu
39	18 Jun 94	VH-CSV				Pilot's Rest Day
40	18 Jun 94	VH-TPR				Pilot's Rest Day
41	19 Jun 94	VH-TPR	MR B. Ney MR M. Juelg	CAPT R. Gray SGT P. Langeberg	2.2	Madang - Vanimo & Kiunga
42	19 Jun 94	VH-CSV	MR B. Denny	SSGT J. Shephard CPL R. Crawford	3.1	Madang - Kutubu & Porgera
43	20 Jun 94	VH-CSV	MR B. Denny	SGT P. Langeberg	3.1	Madang - Tambul & Porgera
44	20 Jun 94	VH-TPR	MR B. Ney MR M. Juelg	SGT D. Longbottom CPL R. Crawford	2.0	Madang - Vanimo & Kiunga
45	21 Jun 94	VH-TPR	MR B. Ney MR M. Juelg	CAPT R. Gray SGT P. Langeberg	2.3	Madang - Daru, Kiunga & Vanimo

Serial	Date	Aircraft	Pilots	Crew	Hours	Comments
(a)	(b)	(c)	(d)	(e)	(f)	(g)
46	21 Jun 94	VH-CSV	MR B. Denny	SSGT J. Shephard CPL R. Crawford	0.8	Madang - Ramu
47	22 Jun 94	VH-CSV	MR B. Denny	SSGT J Shephard	2.9	Madang - Porgera
48	22 Jun 94	VH-TPR	MR B. Ney MR M. Juelg	SGT D. Longbottom CPL R. Crawford	2.6	Madang - Vanimo & OK Tedi
49	23 Jun 94	VH-TPR	MR B. Ney MR M. Juelg	SGT D. Longbottom CPL R. Crawford	2.1	Madang - Vanimo, OK Tedi & Kiunga
50	23 Jun 94	VH-CSV	MR B. Denny	SSGT J. Shephard SGT P. Langeberg	5.5	Madang - Port Moresby, Kutubu & Madang
51	24 Jun 94	VH-TPR	MR B. Ney MR M. Juelg	SGT D. Longbottom CPL R. Crawford	2.5	Madang - Vanimo & OK Tedi
52	24 Jun 94	VH-CSV	MR B. Denny	SGT P. Langeberg	2.9	Madang - Moro & Porgera
53	25 Jun 94	VH-CSV				Pilot's Rest Day
54	25 Jun 94	VH-TPR				Pilot's Rest Day
55	26 Jun 94	VH-TPR	MR B. Ney MR M. Juelg	CAPT R. Gray SGT P. Langeberg	2.8	Madang - Vanimo, Kiunga & OK Tedi
56	26 Jun 94	VH-CSV	MR B. Denny	SSGT J. Shephard	5.1	Madang - Moro, Porgera & OK Tedi
57	27 Jun 94	VH-CSV	MR B. Denny	SGT P. Langeberg	2.6	Madang - Moro
58	27 Jun 94	VH-TPR	MR B. Ney MR M. Juelg	SGT D. Longbottom CPL R. Crawford	2.6	Madang - Vanimo & OK Tedi

Serial	Date	Aircraft	Pilots	Crew	Hours	Comments
(a)	(b)	(c)	(d)	(e)	(f)	(g)
59	28 Jun 94	VH-TPR	MR B. Ney MR M. Juelg	CAPT R. Gray SGT P. Langeberg	1.9	Madang - Vanimo & OK Tedi
60	28 Jun 94	VH-CSV	MR B. Denny	SSGT J. Shephard	2.2	Madang - Porgera & Kiunga
61	29 Jun 94	VH-CSV	MR B. Denny	SSGT J. Shephard	3.1	Madang - Kiunga
62	29 Jun 94	VH-TPR	MR B. Ney MR M. Juelg	SGT D. Longbottom CPL R. Crawford	2.4	Madang - Vanimo & OK Tedi
63	30 Jun 94	VH-TPR	MR B. Ney MR M. Juelg	SSGT J. Shephard SGT P. Langeberg	5.2	Madang - Port Moresby & Darwin
64	30 Jun 94	VH-CSV	MR B. Denny	CPL R. Crawford	4.3	Madang - Kiunga
65	01 Jul 94	VH-TPR				Pilot's Rest Day
66	01 Jul 94	VH-CSV	MR B. Denny	CPL R. Crawford	8.5	Madang - Darwin
67	02 Jul 94	VH-CSV	MR B. Denny		8.2	Darwin - Canberra
68	02 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	SSGT J. Shephard SGT P. Langeberg SGT N. Brinsmead	2.6	Darwin - Madang
69	03 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	CAPT R. Gray SGT N. Brinsmead	2.4	Madang - Vanimo & OK Tedi
70	04 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	SGT N. Brinsmead SGT P. Langeberg	2.4	Madang - Vanimo, Kiunga & Daru
71	05 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	SGT D. Longbottom SGT N. Brinsmead	2.4	Madang - Vanimo, Kiunga & Daru
72	06 Jul 94	VH-TPR				Medivac

Serial	Date	Aircraft	Pilots	Crew	Hours	Comments
(a)	(b)	(c)	(d)	(e)	(f)	(g)
73	07 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	SGT D. Longbottom SGT P. Langeberg	1.9	Madang - Kiunga & Mianmin
74	08 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	SGT D. Longbottom SGT N. Brinsmead	2.9	Madang - Vanimo & Kiunga
75	09 Jul 94	VH-TPR				Pilot's Rest Day
76	10 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	SSGT J. Shephard SGT P. Langeberg	2.2	Madang - Vanimo & Kiunga
77	11 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	SGT D. Longbottom SGT N. Brinsmead	2.1	Madang - Vanimo & Kiunga
78	12 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	SGT N. Brinsmead SGT P. Langeberg	2.8	Madang - Vanimo, OK Tedi, Vanimo & Adelbert
79	13 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	SSGT J. Shephard SGT D. Longbottom	4.3	Madang - Vanimo, Daru & Port Moresby
80	14 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	CAPT R. Gray SGT P. Langeberg	2.2	Madang - Vanimo & Daru
81	15 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	SGT N. Brinsmead SGT P. Langeberg	2.1	Madang - Kiunga & Daru
82	16 Jul 94	VH-TPR				Pilot's Rest Day
83	17 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	CAPT R. Gray SSGT J. Shephard	2.3	Madang - Vanimo

Serial	Date	Aircraft	Pilots	Crew	Hours	Comments
(a)	(b)	(c)	(d)	(e)	(f)	(g)
84	18 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	CAPTR. Gray SGT N. Brinsmead SGT P. Langeberg	5.7	Madang - Port Moresby & Brisbane
85	19 Jul 94	VH-TPR				400 hour service
86	20 Jul 94	VH-TPR				400 hour service
87	21 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	CAPTR. Gray SGT P. Langeberg SGT N. Brinsmead	2.2	Brisbane - Cairns
88	22 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	CAPTR. Gray SGT P. Langeberg SGT N. Brinsmead	3	Cairns - Madang
89	23 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	SGT P. Langeberg SGT N. Brinsmead	2.7	Madang - Ok Tedi
90	24 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	MAJ Demaine SSGT Shephard SGT Langeberg	2.3	Madang - border AO
91	25 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	MAJ Demaine SSGT Shephard SGT Brinsmead	4.5	Madang - Port Moresby Port Moresby - Darwin
92	25 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	SSGT Shephard SGT Brinsmead	3.2	Darwin - Port Moresby Port Moresby - Madang
93	26 Jul 94	VH-TPR				Pilots rest day

Serial	Date	Aircraft	Pilots	Crew	Hours	Comments
(a)	(b)	(c)	(d)	(e)	(f)	(g)
94	27 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	SGT P. Langeberg SGT N. Brinsmead	2.4	Madang - Kiunga
95	28 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	SGT P. Langeberg SGT N. Brinsmead	1.9	Madang - border AO
96	29 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	SGT P. Langeberg SGT N. Brinsmead	1.9	Madang - Kiunga and Vanimo
97	30 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	SGT P. Langeberg SGT N. Brinsmead	2	Madang - border AO
98	31 Jul 94	VH-TPR	MR B. Ney MR M. Juelg	SGT P. Langeberg SGT N. Brinsmead	2.8	Madang - Port Moresby Port Moresby - Honiara
PHASE II						
99	15 Sep 94	VH-TPR				Pilots rest day
100	16 Sep 94	VH-TPR	Mr M. Juelg Mr J. Farson	WO2 J. Shephard SSGT B. Hammond CPL P. Austine	4	Madang - Kiungu
101	17 Sep 94	VH-TPR	Mr M. Juelg Mr J. Farson	WO2 J. Shephard SSGT B. Hammond SGT T. Purdey	2.2	Madang - border AO
102	18 Sep 94	VH-TPR	Mr M. Juelg Mr J. Farson	WO2 J. Shephard SSGT B. Hammond CPL P. Austine	2.2	Madang - border AO

Serial	Date	Aircraft	Pilots	Crew	Hours	Comments
(a)	(b)	(c)	(d)	(e)	(f)	(g)
103	19 Sep 94	VH-TPR	Mr M. Juelg Mr J. Farson	WO2 J. Shephard SSGT B. Hammond SGT T. Purdey	3.9	Madang - Kiunga
104	20 Sep 94	VH-TPR	Mr M. Juelg Mr J. Farson	SSGT B. Hammond CPL P. Austine	3.6	Madang - Ok Tedi
105	21 Sep 94	VH-TPR	Mr M. Juelg Mr J. Farson	SSGT B. Hammond SGT T. Purdey	2.7	Madang - Daru
106	22 Sep 94	VH-TPR	Mr M. Juelg Mr J. Farson	SSGT B. Hammond SGT T. Purdey	4	Madang - Kiunga
107	23 Sep 94	VH-TPR	Mr M. Juelg Mr J. Farson	SSGT B. Hammond CPL P. Austine	1.9	Madang - PNG Border
108	24 Sep 94					Pilots rest day
109	25 Sep 94	VH-TPR	Mr M. Juelg Mr J. Farson	SSGT B. Hammond SGT T. Purdey CPL P. Austine	2.4	Madang - PNG Border
110	26 Sep 94	VH-TPR	Mr M. Juelg Mr J. Farson	SSGT B. Hammond SGT T. Purdey CPL P. Austine	3.4	Madang - Kiunga/Daru
111	27 Sep 94	VH-TPR	Mr M. Juelg Mr J. Farson	SSGT B. Hammond SGT T. Purdey CPL P. Austine	3.6	Madang - Ok Tedi
112	28 Sep 94	VH-TPR	Mr M. Juelg Mr J. Farson	SSGT B. Hammond SGT T. Purdey	3	Madang - Kutubu

Serial	Date	Aircraft	Pilots	Crew	Hours	Comments
(a)	(b)	(c)	(d)	(e)	(f)	(g)
113	29 Sep 94	VH-TPR	Mr M. Juelg Mr J. Farson	SGT T. Purdey CPL P. Austine	2.8	Madang - Ok Tedi/Sepik
114	30 Sep 94	VH-TPR	Mr M. Juelg Mr J. Farson	SSGT B. Hammond SGT T. Purdey	4.1	Madang - Ok Tedi
115	1 Oct 94	VH-TPR				Pilots rest day
116	2 Oct 94	VH-TPR	Mr M. Juelg Mr J. Farson	SSGT B. Hammond SGT T. Purdey CPL P. Austine	2.6	Madang - Ok Tedi
117	3 Oct 94	VH-TPR	Mr M. Juelg Mr J. Farson	SSGT B. Hammond SGT T. Purdey CPL P. Austine	2.8	Madang - Ok Tedi
118	4 Oct 94	VH-TPR	Mr M. Juelg Mr J. Farson	CAPT R. Gray SGT T. Purdey CPL P. Austine	3	Madang - Kiunga - Port Moresby - Madang
119	5 Oct 94	VH-TPR	Mr M. Juelg Mr J. Farson	SGT T. Purdey CPL P. Austine	3	Madang - Ok Tedi - Port Moresby - Madang
120	6 Oct 94					Aircraft maintainence
121	7 Oct 94	VH-TPR	Mr M. Juelg Mr J. Farson	CAPT R. Gray SGT T. Purdey CPL P. Austine	2.9	Madang - Kiunga - Port Moresby - Madang
122	8 Oct 94	VH-TPR	Mr M. Juelg Mr J. Farson	SGT T. Purdey CPL P. Austine	2	Madang - Ok Tedi

Serial	Date	Aircraft	Pilots	Crew	Hours	Comments
(a)	(b)	(c)	(d)	(e)	(f)	(g)
123	9 Oct 94	VH-TPR	Mr M. Juelg Mr J. Farson	SGT T. Purdey CPL P. Austine	2	Madang - Ok Tedi
124	10 Oct 94	VH-TPR	Mr M. Juelg Mr J. Farson	SGT T. Purdey CPL P. Austine	3.2	Madang - Kiunga - Poppendetta - Madang
125	11 Oct 94	VH-TPR	Mr M. Juelg Mr J. Farson	SGT T. Purdey CPL P. Austine	3	Madang - Kiunga - Port Moresby - Madang
126	12 Oct 94					Pilots rest day
127	13 Oct 94	VH-TPR	Mr M. Juelg Mr J. Farson	SGT T. Purdey CPL P. Austine	3.0	Madang - Ok Tedi - Popondetta
128	14 Oct 94					Nil flying due weather
129	15 Oct 94	VH-TPR	Mr M. Juelg Mr J. Farson	SSGT B. Hammond SGT T. Purdey	3.3	Madang - Kwikila
130	16 Oct 94	VH-TPR	Mr M. Juelg Mr J. Farson	SGT T. Purdey CPL P. Austine	2.0	Madang - Ok Tedi
131	17 Oct 94	VH-TPR	Mr M. Juelg Mr J. Farson	SGT T. Purdey CPL P. Austine	2.1	Madang - Ok Tedi
132	18 Oct 94	VH-TPR	Mr M. Juelg Mr J. Farson	SSGT B. Hammond SGT T. Purdey	3.7	Madang - Fly River - Lake Murray
133	19 Oct 94	VH-TPR	Mr M. Juelg Mr J. Farson	SSGT B. Hammond SGT T. Purdey	2.8	Madang - border AO
134	20 Oct 94					Pilots rest day

Serial	Date	Aircraft	Pilots	Crew	Hours	Comments
(a)	(b)	(c)	(d)	(e)	(f)	(g)
135	21 Oct 94	VH-TPR	Mr M. Juelg Mr J. Farson	SGT T. Purdey CPL P. Austine	2.2	
136	22 Oct 94	VH-TPR	Mr M. Juelg Mr J. Farson	SGT T. Purdey CPL P. Austine	2.4	
137	23 Oct 94	VH-TPR	Mr M. Juelg Mr J. Farson	CAPT R.Gray SSGT B. Hammond SGT T. Purdey	3.5	Madang - Port Moresby - Brisbane

ANNEX I TO
OP KUMUL 94
OPERATION REPORT
DATED 13 DEC 94

CONTACT INFORMATION IN THE AO

International telephone and facsimile access is:

To Papua New Guinea from Australia:

Tel: 0011 675 XX XXX

Fax: 0015 675 XX XXX

From Papua New Guinea to Australia:

Tel: 05 61 X XXX XXXX

Fax: 05 61 X XXX XXXX

NAME	Contact	Appointment/ Business	Phone	Fax	Address
PAPUA NEW GUINEA					
8 Fd Svy Sqn Australian High Commision	MAJ Parkinson Duty Officer	OC 24 hr contact	25 9233 25 9333	25 9068	c/- Australian High Commission PO Box 9129 HOHOLO NCD Papua New Guinea
Madang Airport	Control Tower		25 6787		
	Flight Services	Flight Information	82 2232		
Port Moresby airport	Flight Services	Flight Information	25 6787		
J.B. Security	Mr Joseph Bukikun	Manager security sevices Madang	82 2553 a/h 82 2284	82 3095	P.O. Box 854 MADANG PNG
Royal PNG Constabulary	Inspector James Kupi Ian Dosser	OIC CID Aust exchange officer	82 2222 82 3956	82 2286 82 3957	P.O. Box 748 MADANG PNG

NAME	Contact	Appointment/ Business	Phone	Fax	Address
PAPUA NEW GUINEA					
Smugglers Resort	Mr Derek Connolly	Manager - Accommodation and Budget hire cars	82 2744	82 2267	P.O. Box 303 MADANG PNG
Gateway Hotel		Accommodation Port Moresby	25 3855	25 4585	
ANZ Bank	Mr Chris Dermott	Manager	82 2866	82 2408	P.O. Box 10 MADANG
Post & Telecommunication	Willie	Manager - Madang			
Air Niugini		International flights Domestic flights	27 3444 27 3555		
QANTAS		International flights	21 1200		
Heli Niugini	Mr Horst Allmann Mr Peter Todd	Managing Director Accountant Aircraft servicing	82 2521	82 2520	P.O. Box 914 MADANG PNG
Mobil Oil New Guinea Ltd		Head Office	22 2111	22 2100	P.O. Box 485 PORT MORESBY
		Aircraft Fuel	82 2349	82 3063	P.O. Box 485 Port Moresby PNG
		Vehicle Fuel	82 2230		Modilon Rd MADANG
KSS Aviation	Jan	Airport contact	82 3977	82 3976	P.O. Box 373 MADANG
Takitaki Medical Centre	Dr F. Takitaki	General Practitioner	82 3733		P.O. Box 71 MADANG PNG
Business Systems		Cannon Supplier	82 2354	82 3147	P.O. Box 605 MADANG