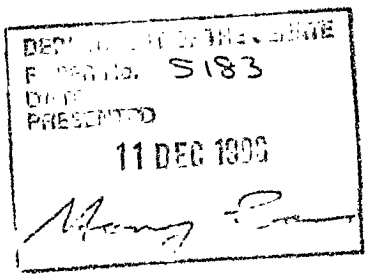
The Parliament of the Commonwealth of Australia

Parliamentary Standing Committee on Public Works



Report relating

to the proposed

Development of facilities for 5 Aviation Regiment at RAAF Base Townsville

(Fourth Report of 1996)

Parliamentary Standing Committee on Public Works

REPORT

relating to the proposed

DEVELOPMENT OF FACILITIES FOR 5 AVIATION REGIMENT AT RAAF BASE TOWNSVILLE

(Fourth Report of 1996)

THE PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA
1996

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MEMBERS OF THE PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS

(Thirty-Second Committee)

Mr Neil Andrew MP (Chairman)
Mr Colin Hollis MP (Vice-Chairman)

Senate	**House of Representatives**
Senator Paul Calvert	Mr Richard Evans MP
Senator Alan Ferguson	Mr John Forrest MP
Senator Shayne Murphy	Mr Ted Grace MP
	Mr Michael Hatton MP*

* Replaced The Hon Michael Lee MP on 26 June 1996

Committee Secretary: Bjarne Nordin

Inquiry Secretary: Michael Fetter

Secretarial Support: Lynette Sebo

EXTRACT FROM THE VOTES AND PROCEEDINGS OF THE HOUSE OF REPRESENTATIVES

No. 25 dated Wednesday, 21 August 1996

PUBLIC WORKS - PARLIAMENTARY STANDING COMMITTEE - REFERENCE OF WORK - DEVELOPMENT OF FACILITIES FOR 5 AVIATION REGIMENT AT RAAF BASE TOWNSVILLE

Mr Jull (Minister for Administrative Services), pursuant to notice, moved - That, in accordance with the provisions of the *Public Works Committee Act 1969*, the following proposed work be referred to the Parliamentary Standing Committee on Public Works for consideration and report: Development of facilities for 5 Aviation Regiment at RAAF Base Townsville.

Debate ensued.

Question - put and passed.

PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS

Development of facilities for 5 Aviation Regiment at RAAF Base Townsville

By resolution on 21 August 1996, the House of Representatives referred to the Parliamentary Standing Committee on Public Works for consideration and report the proposed development of facilities for 5 Aviation Regiment at RAAF Base Townsville.

THE REFERENCE

1. The Department of Defence proposes to construct an advanced wash facility and environmental shelters equipped with dehumidification equipment for Black Hawk and Chinook helicopters to reduce corrosion caused by operation and open storage of the helicopters in salt-laden atmospheric conditions. The shelters will also reduce degradation of the helicopters from high temperatures and exposure to ultra-violet radiation and will alleviate occupational health and safety problems associated with personnel working on the helicopters in the tropical sun.

2. Defence also proposes to refurbish a helicopter arming area and relocate 5 Aviation Regiment's transport and vehicle workshop facilities within the existing regimental precinct to enhance operational efficiency.

3. The estimated cost of the proposed work, when referred to the Committee, was $21.332 million.

THE COMMITTEE'S INQUIRY

4. The Committee received a written submission from Defence and took evidence from Defence officials at a public hearing held in Townsville on Thursday 24 October. The Deputy Mayor of Townsville (Councillor Ann Bunnell) also gave evidence at the public hearing.

5. Written submissions were also received from the:

- Australian Heritage Commission;
- Environment Protection Agency;

- Australian Nature Conservation Agency; and

- Commonwealth Fire Board.

6. On Wednesday 23 October, the Committee inspected existing facilities at 5 Aviation Regiment, helicopter washing operations and the sites proposed for the various works components in the reference.

7. A list of witnesses who appeared at the public hearing is at APPENDIX A. The Committee's proceedings will be printed as Minutes of Evidence.

BACKGROUND

5 Aviation Regiment

8. In 1988-89, the Department of Defence purchased 39 Sikorsky S-70A-9 Black Hawk helicopters. In 1989, 27 of the helicopters were allocated to 5 Aviation Regiment, located at RAAF Base Townsville. The Regiment also operates five Iroquois and four Chinook helicopters.

9. With a strength of 539 personnel, under the command of the Army's 1st Division, 5 Aviation Regiment is responsible for providing helicopter support to land force units located in northern Australia. The Regiment's main customer is 3 Brigade, located at Lavarack Barracks, Townsville. The Brigade provides a Rapid Deployment Force capability for the Australian Defence Force through air mobile and air portable operations.

RAAF Base Townsville

10. RAAF Base Townsville forms part of a chain of military airfields stretching across northern Australia - from Learmonth in Western Australia to Townsville in north Queensland. The airfields are maintained for the defence and surveillance of Australia's northern areas. Together with RAAF Base Scherger, now under construction, RAAF Base Townsville provides for the air defence of north Queensland as well as being a centre for military transport operations.

11. The base is a joint user facility which supports civil aviation including domestic regular public transport, general aviation and international flights.

Previous Committee reports

12. The Committee has inquired into and reported on a number of major works sponsored by Defence at RAAF Base Townsville and Lavarack Barracks and by the Defence Housing Authority in recent years. These reports are detailed below:

- Construction of Lavarack Barracks, Stage 2 development, Townsville - estimated cost $6.2 million (May 1980 prices) - Committee's Eleventh Report of 1980 - Parliamentary Paper 228/1980;

- Provision of Army housing at Townsville, Qld - estimated cost $5.25 million (February 1981 prices) - Committee's Third Report of 1981 - Parliamentary Paper 114/1981;

- Development of new utility helicopter facilities at RAAF Base Townsville, Qld - estimated cost - $20.7 million (October 1986 prices) - Committee's Second Report of 1987 - Parliamentary Paper 69/1987;

- Upgrade of Army living-in accommodation at various locations Australia-wide - estimated cost of Queensland buildings - $28.2 million - Committee's Third Report of 1988 - Parliamentary Paper 134/1988;

- Development of new utility helicopter facilities, Phase 2, at RAAF Base Townsville and Oakey Army Airfield, Qld - estimated cost $19.2 million (October 1987 prices) - Committee's Eighth Report of 1988 - Parliamentary Paper 321/1988;

- Redevelopment of Lavarack Barracks, Stage 1, Townsville - estimated cost $20.96 million (December 1991 prices) - Committee's Sixteenth Report of 1992 - Parliamentary Paper 499/1992; and

- Joint Venture development with Delfin Property Group of the Willows for Defence Housing - estimated cost - $59.817 million - Committee's Seventeenth Report of 1995 - Parliamentary Paper 121/1995.

Other approved and planned Defence projects

13. Defence advised the Committee of a number of other major Defence works in progress or planned in the Townsville region. These are:

- Development of facilities for 10 Terminal Regiment and the Army Maritime School, Townsville. This proposal, estimated to cost $25.914 million was examined and reported on by the Committee in 1995 (Committee's Eighteenth Report of 1995 - Parliamentary Paper 167/1995). Work on the project commenced in March 1996 and is expected to be completed by June 1998.

- Military Operations in Urban Terrain (MOUT) training facility. This project, costing $4.23 million, involves the design and construction of a mock township typical of the style found in northern Australia. Work commenced in July 1996 and is expected to be completed by March 1997.

- Development of infrastructure of the Townsville Field Training Area. This proposal was examined by the Committee concurrently with the works proposed in this reference and is the subject of a separate report. The estimated out-turn cost is $18.694 million with construction planned to commence in March 1997 and completed by May 1999.

- Defence High Frequency Modernisation Project - the facilities aspects of this proposal have been referred to the Committee and will be the subject of a report. Facilities in the Townsville area are proposed at Bohle River and Speed Creek.

- Lavarack Barracks redevelopment, Stage 2. This proposal, which has not been approved, is designed to complete the upgrading of Lavarack Barracks. The estimated cost is $87.6 million and is currently programmed for commencement in 1997/98. When approved, the project will need to be referred to the Committee for consideration and report to Parliament.

- RAAF Base Townsville redevelopment. This proposal has also not been approved and will provide for the redevelopment of a number of facilities and engineering services at the RAAF Base. The estimated cost is $40 million and is programmed for 1998/99.

14. These proposals, and completed works at RAAF Base Townsville and Lavarack Barracks, reflect substantial investments made in Defence facilities which are planned to continue in the Townsville region during the next four years and beyond. This investment provides reinforcement of current Defence policy. The Government has emphasised the need for Australia's continued defence self-reliance and enhanced operational effectiveness, including the defence of northern approaches and northern land areas.

15. Defence advised the Committee that the capability of the Australian Defence Force to intercept and defeat widely dispersed incursions in northern Australia is based on a combination of surveillance, protective and response forces. Units deployed by 5 Aviation Regiment's helicopters from forward bases, such as Townsville, would combine with other Defence force elements to provide the necessary effective operational response.

THE NEED

16. Defence believes a need has arisen to reduce corrosion in Black Hawk helicopters by the provision of environmental protection shelters and associated corrosion control facilities and for a new transport compound and workshop to be provided for the Regiment's extensive fleet of vehicles.

17. Defence advised the Committee that, since the introduction of Black Hawk helicopters, an unanticipated high rate of corrosion has been identified in the helicopters at RAAF Base Townsville. Maintenance costs associated with the repair of corrosion affected components are expected to exceed sustainable funding levels. In addition, the capacity to operate the helicopters through to Life of Type (LOT) is diminished. When the Black Hawk helicopters were acquired, it was expected that their LOT would extend to 2015. To ensure that the Black Hawk can be operated cost effectively through to LOT, Defence has initiated a corrosion control program for the Regiment's helicopter fleet.

Corrosion

18. Logistic managers of the helicopter fleet, with the assistance of the Defence Science and Technology Organisation (DSTO), have isolated and defined the extent of the corrosion problem. The causes of the corrosion are mainly due to:

- the severe and corrosive salt contaminated operating environment at RAAF Base Townsville;

- the use of high strength, light weight corrosion susceptible alloys in the helicopter structures; and

- difficulty in identifying the extent and level of the corrosion problem when the Black Hawks first commenced service with 5 Aviation Regiment.

19. The corrosivity of the atmospheric environment at RAAF Base Townsville was studied by DSTO. The study determined that the local corrosive environment is moderate to severe, depending on the strength and direction of prevailing winds, which are predominantly from the north-east to south-east. The location of RAAF Base Townsville is an important factor. The Base is within one kilometre of the ocean and prevailing winds carry airborne salt contaminants which accumulate on the helicopter's airframes. This increases the incidence of corrosion and accelerates the rate at which corrosion progresses. Comparisons between salt accumulation in helicopters parked on the apron and inside aircraft maintenance hangars show that significantly lower salt deposits occur in a sheltered environment.

20. Defence advised the Committee that high strength alloys, such as the aluminium and magnesium alloys used in the Black Hawk's airframe, are generally susceptible to corrosion. Furthermore, it is possible that the structure of the helicopter provides scope for moisture traps which further promotes corrosion.

21. The occurrence of corrosion in the Black Hawk is identified during routine maintenance and corrective action is taken when appropriate. Defence indicated that over recent years, the total number of hours spent on deeper level maintenance, referred to as an R3 service, has increased. In 1992, the average R3 service required 50 man hours of maintenance per helicopter. By 1995, the average time required for an R3 service had increased to 230 man hours. A significant proportion of the increase is attributable to the detection, removal and repair of corrosion. In 1995, the additional labour cost for corrosion related maintenance only, for four Black Hawks, was $1.5 million.

22. High ambient temperatures experienced at Townsville are a further cause for concern. Defence advised the Committee that it is not unusual for cockpit temperatures in helicopters, parked on the apron, to exceed 50^0C for extended

periods of the day. As a result, internal electronic components and plastic fittings are exhibiting premature failure and the rate of corrosion is increased. This is further exacerbated by the prolonged exposure to ultra-violet radiation which also reduces the life and effectiveness of the helicopter's paintwork.

23. The Committee questioned Defence about the basis of the decision to base the Black Hawk helicopters at RAAF Base Townsville. Defence advised that the original decision was based on operational requirements in support of 3rd Brigade. The Defence Force has operated helicopters from RAAF Base Townsville since the 1970s. The Iroquois helicopters, based at Townsville before the introduction of the Black Hawk, are more robust aircraft. The Black Hawks are constructed of lightweight and high strength alloys which require greater care and attention than the more robust Iroquois.

Corrosion Control Plan

24. Following the identification of the corrosion problem being experienced in the Black Hawk helicopters, DSTO recommended the implementation of a Corrosion Control Plan (CCP) to control and reduce the incidence of corrosion. The CCP comprises a range of approaches, as no one action will substantially reduce the level of corrosion. The CCP includes:

- regular washing of the helicopter with corrosive inhibiting detergents and the application, where possible, of corrosive preventatives;

- the use of paints and sealants with higher protection levels;

- the training of staff in corrosion prevention and control;

- modification of the environment within the helicopter by providing dehumidified air within the airframe; and

- the protection of the helicopters from salt laden moist air, high temperatures and ultra-violet exposure.

25. The Committee questioned Defence about a number of aspects of the incidence of corrosion and other practical ways in which it could be reduced. The first line of questioning related to whether similar corrosion has occurred in Black Hawk helicopters owned by other armed forces. Defence advised that at the time the helicopters were purchased, Black Hawks were being operated

in the continental United States, but the Australian Defence Force was not aware that environmental conditions in Townsville would be substantially different from those experienced by the Americans. Also, at the time, data on operating experience with the newly introduced Black Hawks would have been scarce. In relation to contemporary experience, Defence advised that Black Hawk helicopters are operated by the United States 25th Infantry Division in Hawaii. These helicopters are not kept under cover because latent conditions are different from those at RAAF Base Townsville. While Hawaii is an island, the Division's air base is located inland and a few hundred feet above sea level. At Townsville, the helicopters are parked almost adjacent to the sea, at sea level and prone to salt-laden sea air.

26. The second line of questioning related to the practicalities of marinising the Black Hawk fleet to guard against corrosion. The Royal Australian Navy has Sea Hawk helicopters from the same manufacturer (Sikorsky) which have been marinised. Defence advised that to make comparisons between the Black Hawk and Sea Hawk is difficult. The Sea Hawk has significant avionics and different rotor systems for ship operation, whereas the Black Hawk is a utility helicopter designed for troop movement around the battlefield. The RAN uses an aggressive (daily) washing program and applies corrosion prevention compounds similar to the Army's current program. Defence advised that the Sea Hawk marinisation cannot be retrofitted to the Black Hawks as it primarily involves the preparation, coating and sealing of airframe structural components at the time of assembly.

Alternatives examined

27. Defence advised that a broad view of alternatives to improve the sustainability of the Black Hawk helicopter fleet was adopted. The wide range of options considered included:

- maintenance of the status quo;
- the construction of a wash point and the provision of dehumidification equipment only;
- the relocation of the helicopter fleet to a less corrosive environment, which included the following alternative sites:
  - ◊ Macrossan, approximately 100 kilometres south-west of Townsville;

  - ◊ Lavarack Barracks in Townsville; and
  - ◊ Oakey near Toowoomba; and
- the construction of the facilities required under the CCP at RAAF Base Townsville.

28. Defence believes the first two options would not satisfactorily address the problem of corrosion in the Black Hawk. The first option, to maintain the status quo, would not be cost effective and would not support the introduction of a CCP for the Chinook helicopter. The second option would improve working conditions for personnel conducting the helicopter washing and provide dehumidified air to internal compartments of the helicopters. This option does not, however, address the effects of prolonged exposure of the helicopters to the aggressive environment, including heat and degradation, from ultra-violet light and would only partially satisfy the requirement of the CCP to arrest the corrosion problem in the helicopter fleet. For these reasons, Defence eliminated further consideration of the first two options.

29. Options involving the relocation of unit operations to a less corrosive environment were also examined in detail by Defence. This examination involved a review of the way the Regiment integrates with its customer base and the impact of conducting unit operations from locations other than RAAF Base Townsville.

30. The Committee was advised that the capital and operating costs associated with relocating the Regiment wholly or partially away from RAAF Base Townsville are inherently high. To relocate the helicopters to another location would require expenditure of $80 million for facilities and would also result in significant operating costs. Defence also advised that it would not be possible to relocate the helicopters to Lavarack Barracks due to noise limitations. For these reasons and to ensure operational integration with 3 Brigade can be maintained, the options to relocate the Regiment from RAAF Base Townsville were not supported. The preferred option is therefore to construct all of the proposed facilities at RAAF Base Townsville.

Implementation of Corrosion Control Plan

31. Defence advised that the first three components of the CCP have been implemented. Washing of helicopters is now conducted on an 18 day cycle and is undertaken by hand, by contract staff, on a designated parking position on the apron. During the inspection of the Regiment's facilities, the Committee

witnessed a helicopter being washed at a time when strong winds were blowing. This confirmed that the exposed working environment with lack of protection, often in extreme weather conditions, is far from ideal. It is manpower intensive and does not provide suitable working conditions in accordance with reasonable occupational health and safety standards. From an environmental standpoint, the washing of helicopters in the open does not provide for the capture of wash overspray, although runoff is captured and processed through a pollutant trap to ensure that nearby wetlands are not contaminated.

32. The remaining components of the CCP require facilities. Defence believes there is a requirement for the provision of environmental protection shelters and dehumidification equipment to supply dehumidified air to Black Hawk helicopters when parked in the shelters.

33. Defence advised that similar arguments could be used for the implementation of a CCP for the Chinook helicopters. DSTO research supports the implementation of a CCP for the Chinook, which is of a similar construction to the Black Hawk.

34. Corrosion problems have not been evident in the Iroquois fleet, which is approaching its LOT. The provision of environmental shelters for Iroquois is therefore not considered cost effective.

35. The Committee questioned the benefits which would result from the full implementation of the CCP in respect of Black Hawk and Chinook helicopters. Defence advised that each Black Hawk is worth $24 million and the entire Black Hawk fleet is valued at $792 million. Implementation of the CCP will enable the helicopters to be operated through to the planned LOT in a more affordable manner. Corrosion control is currently labour intensive and expensive as was evidenced during 1995 when $1.5 million was spent on corrosion control work on four helicopters. The Committee was advised that the cost of providing Black Hawk and Chinook helicopters with environmental protection, estimated to be $11 million, would be recovered in two years based on corrosion control costs experienced in 1995.

Number of shelters required

36. Defence believe that a sheltered environment is required for all 27 Black Hawk and 4 Chinook helicopters operated by the Regiment. In the case of the Black Hawk, six helicopters are normally undergoing R1 or R2 maintenance

and are sheltered in the existing aircraft maintenance hangar, while two helicopters are undergoing R3 maintenance remote from the Regiment. Chinook helicopters are sheltered in an aircraft maintenance hangar for 30 percent of the time. The existing hangar, where Chinook maintenance is undertaken, also houses Iroquois helicopters undergoing routine maintenance. This prevents the long term sheltering of Chinook helicopters. On the basis that helicopters undergoing maintenance require sheltered environments and the lack of environmental protection for the balance, Defence believes there is a requirement for 19 Black Hawk and four Chinook shelters.

Committee's Conclusions

37. Black Hawk helicopters operated by 5 Aviation Regiment at RAAF Base Townsville have experienced unexpectedly high rates of corrosion. This has been attributed to the use of high strength, lightweight alloys in helicopter structures and the operation and storage of aircraft in humid and salt laden atmospheric conditions. Prolonged exposure to ultra-violet radiation has affected internal electronic components and plastic fittings.

38. RAAF Base Townsville remains the preferred location of 5 Aviation Regiment due to the proximity of 3 Brigade and impracticalities and considerable investment associated with alternative locations.

39. High corrosion rates have diminished the capacity to operate the helicopters through to Life of Type, planned for 2015, affected aircraft serviceability and has required expenditure on maintenance, with associated costs expected to exceed sustainable funding levels.

40. The Department of Defence has implemented a Corrosion Control Program for the helicopters to permit 5 Aviation Regiment's Black Hawk helicopters to operate effectively through to Life of Type.

41. To satisfy the requirements of the Corrosion Control Program, there is a need to provide environmental protection shelters serviced by dehumidification equipment and an enclosed helicopter washing facility.

42. Based on the number of Black Hawk and Chinook helicopters operated by 5 Aviation Regiment and current maintenance programs, there is a requirement for 19 Black Hawk and four Chinook shelters.

43. The Department of Defence estimates that cost of environmental protection shelters would be recovered after two years, based on the $1.5 million cost of corrosion control undertaken in 1995 on four helicopters.

Appropriately located facilities

44. In 1989, when facilities were provided for the establishment of the newly created 5 Aviation Regiment, some activities were accommodated in existing facilities with extant RAAF activities. Defence believes there is now a need to provide appropriately located facilities for:

- the secure parking of general service and specialist vehicles;
- facilities for vehicle maintenance;
- general engineering; and
- small arms repair and refurbishment of ordnance loading aprons.

Transport compound and vehicle maintenance workshops

45. Current arrangements for the operation, maintenance and security of the Regiment's vehicle fleet involve accommodating vehicle storage and maintenance functions at separate sites at RAAF Base Townsville. The sites are remote from the Regiment's precinct and remote from each other. This leads to inefficient unit operations.

46. The Regiment's vehicles are located in a fenced compound adjacent to the RAAF Transport Compound, more than two kilometres from the regimental precinct. There is no shelter provided for the vehicles and the compound is difficult to secure as it is bordered by residential properties.

47. Vehicle maintenance is undertaken in an aircraft hangar approximately half way between the Regimental precinct and the vehicle storage compound. The vehicle maintenance facility is small and all maintenance must be done with jack stands operated off the floor. There are no ramps or servicing pits. Neither the vehicle compound nor the vehicle maintenance facility were purpose designed.

48. These unsatisfactory arrangements were confirmed by the Committee during the site inspection.

General engineering workshop

49. The Regiment's general engineering section is located in Building 295 where activities are limited by lack of space. The problem of space was compounded in 1993, when it was necessary to further reduce the space available to the Section to allow the Regiment to accommodate Chinook helicopters. Under current arrangements, equipment awaiting repair is stored in the open, adjacent to the aircraft hangar, which impinges on aircraft operating clearances and promotes the deterioration of the equipment from exposure to weathering. In addition, the Section is also located remotely from its main customer, the Quartermaster Store, which is over half a kilometre away.

Committee's Conclusions

50. Existing transport and some technical workshop facilities are located at inappropriately remote sites, from 5 Aviation Regiment's precinct at RAAF Base Townsville.

51. The facilities are inadequate and their locations present an ongoing cost to unit efficiency.

Ancillary works

52. Defence also believes there is a need to undertake ancillary works, which involve the relocation of the small arms repair section and the refurbishment of ordnance loading aprons.

53. The Regiment's small arms repair section is located 400 metres from the unit armoury, which is located in the Quartermaster store. Consequently, weapons requiring repair must be transported and stored within the existing small arms repair section. Defence believes these arrangements are inefficient and present a potential security risk.

54. The helicopter arming point, Ordnance Loading Apron No 6 (OLA6), requires refurbishment to repair existing revetments and to improve access for helicopters and equipment.

Committee's Conclusion

55. There is a need to relocate 5 Aviation Regiment's Small Arms Repair Section and to refurbish the gunship helicopter arming point.

THE PROPOSAL

Scope

56. The scope of the proposed work encompasses:

- construction of 19 Black Hawk and four Chinook environmental protection shelters;
- provision of dehumidified air to the internal components of the Black Hawk and Chinook helicopters;
- construction of a purpose built helicopter wash facility;
- construction of a transport compound and workshop complex for vehicle maintenance and general engineering;
- relocation of Small Arms Repair Section to a location adjacent to the unit armoury; and
- refurbishment of OLA6.

Helicopter Shelters

57. Two basic forms of shelter were considered for this component of the reference: individual helicopter shelters separated by a wall of Fire Resistance Level (FRL) 90/90/90; and multiple bay helicopter shelters accommodating two or more helicopters. Defence advised the Committee that the unit cost per square metre for the provision of a multiple bay helicopter shelter was significantly higher (in excess of 20 per cent) than that for individual helicopter shelters. This was due to the additional fire protection measures required and the height and span of the structure. Therefore, Defence proposes to shelter the helicopters in 19 Black Hawk size and four Chinook size single bay shelters.

58. Each shelter will be provided with fire detection in accordance with Defence policy and will be separated from other shelters by a wall of FRL 90/90/90.

59. Initial concept planning for the helicopter shelters has shown that a portal frame structure would be the most economical way to meet clear span requirements, while minimising the height of the structure (a key siting

constraint). The dimensions proposed include clear spaces around the helicopters to allow for towing and for the hand turning of the rotor blades. The Committee questioned the need for substantial portal framing for the structures. Defence advised that due to height constraints applying at the proposed location and because helicopters have high points extending across the width of their rotors, the portal frame is an economic way of meeting height constraints and providing appropriate clearances.

60. Some maintenance activities will be undertaken within the helicopter shelters, but these will be confined to activities that do not contravene fire regulations or require specialist equipment (eg gantry cranes). Defence advised that this may include some pre and post-flight actions and other minor maintenance currently carried out in the open on the existing helicopter apron.

61. The shelters will be provided with natural ventilation and their environment will not be controlled in any way. Air, for temperature and dehumidification purposes, will be provided to internal compartments by flexible ducting. Some leakage of air from helicopters could occur, which will affect the internal environment of shelters. Defence believes this will only occur to a limited degree.

62. To support these activities, the following engineering services will be provided:

- 240V 50Hz power;
- 115V 400Hz power;
- suitable lighting to Australian Standards;
- compressed air;
- communications cabling;
- mains pressure water;
- lightning protection; and
- emergency eyewashes and showers.

63. Doors will be provided for each shelter. Defence believes this will give enhanced security for the helicopters and protection to the helicopters during inclement weather including cyclonic conditions. The provision of doors will

also maximise protection of the helicopters from the prevailing salt laden winds.

64. The construction of the helicopter shelters will limit supervision of the helicopter apron and taxiing areas from the flight line facilities located in the annexes of the two aircraft maintenance hangars. Supervision of the flight line is necessary for the management of aircraft movements and to ensure the safety of personnel operating on the helicopter apron. For these reasons, the provision of remote monitoring by close circuit television of the helicopter apron area from the existing flight line facilities is included as part of the proposed work.

Dehumidification

65. The proposal includes provision of dehumidification plants to provide ducted dehumidified air to each helicopter when inside the proposed shelters or in the existing aircraft maintenance hangars. Dehumidified air will be introduced under positive pressure to one or more locations on the helicopter, including the engine intakes and the cockpit. The Committee was advised of DSTO research showing that corrosion of the high strength, light weight alloys used in the Black Hawk and Chinook will not commence if relative humidity levels can be contained below 40 per cent. Therefore, appropriate quantities of dehumidified air introduced into sheltered helicopters will ensure that corrosion will not occur within the helicopter's airframe. The temperature of the dehumidified air will also be contained to 30^0C, or less, to ensure that internal electronic components and plastic fittings are not fatigued by excessive temperatures.

66. Dehumidified air will be delivered to the helicopters from three air handling plants, one located near each group of helicopter shelters. The three plants will deliver air through rigid and flexible duct systems to the individual helicopter shelters and to the helicopter parking areas within each aircraft maintenance hangar. In order to achieve the criteria of less than 40 per cent relative humidity and 30^0C, a mix of refrigerated and desiccant technology will be utilised.

Helicopter wash facility

67. The helicopter wash facility must be capable of washing helicopters up to, and including, the size of a Chinook, requiring a structure similar to the Chinook environmental shelter. The wash facility will need to be able to be

fully enclosed during washing operations to ensure the capture of overspray and treatment and/or recycling of used wash water.

68. The concept of the wash facility includes the provision of automatic application of water, corrosion inhibiting detergents and corrosion preventatives through moving gantries and in floor nozzle systems. Because of the nature of the surface of the helicopters, manual scrubbing and cleaning will still be required on some areas of the helicopter exterior and, therefore, personnel access docking and platforms will also be required. Defence advised the Committee that the use of dehumidified air to blow dry helicopters at the end of wash cycles will also be considered. It is anticipated that the time required to wash each helicopter may be reduced by up to 50 per cent compared with the current manual methods.

69. The Committee asked Defence if a facility, as proposed, already exists. Defence advised that it is intended to modify a truck washing facility. There is, however, no intention to provide mechanical brushing due to possible damage to windscreens and other protrusions. The helicopter wash will provide water and cleaning agents, by controlled high pressure, to areas on the exterior of helicopters.

70. The Committee also asked Defence if the proposal to provide shelters for the Black Hawk helicopters is in any way linked to the tragic Black Hawk accident. The senior Defence official responded to this question in the following terms:

The answer is no. We commenced development of the 5 Aviation Regiment proposal over 12 months ago as part of the corrosion control plan. This proposal predates the accident and is not linked in any way with the Black Hawk crash. (Transcript, p. 36)

71. Asked if there was a link between corrosion on Black Hawks and the tragic accident, the same senior official responded:

Mr Chairman, the public hearings for the Black Hawk board of inquiry are still in progress. It would be inappropriate for me to discuss matters that are still before the board. I would reiterate that this proposal predates the accident. We believe it is not linked in any way to the Black Hawk crash. (Transcript, p. 36)

Committee's Conclusion

72. The proposed environmental protection shelters, the provision of dehumidification equipment and the helicopter wash facility can be justified as providing the necessary facilities for the successful and economic implementation of the Corrosion Control Plan.

Transport compound and workshop

73. The transport compound and workshop facilities will accommodate 30 personnel and 199 vehicles in a single secure complex. The following facilities are proposed as part of the complex:

- a vehicle wash point with appropriate environmental controls;
- vehicle servicing bays and ramps;
- general office areas and amenities;
- a flammable liquids/dangerous goods store;
- carport style covered vehicle bays for canvas covered general service vehicles (97 vehicles);
- open vehicle parking bays for non-canvas covered general service vehicles (91 vehicles);
- secured, carport style covered vehicle parking bays for high value vehicles (11 vehicles);
- a general engineering workshop and office;
- an electrical fitters workshop;
- a repair parts store and office;
- a vehicle component paint booth;
- a vehicle workshop with vehicle hoists and service pits;
- a welding bay; and
- a battery store/servicing/charging area.

Committee's Conclusion

74. The scope of works for the transport compound and workshop facilities can be justified on the basis of considerably improved working conditions, improved shelter and security for the extensive fleet of vehicles and resulting improved efficiency.

Minor Ancillary Works

75. The minor ancillary works included as part of this proposal include:

- the refurbishment of an area of the Quartermaster Store to allow the relocation of the Small Arms Repair Section to a location adjacent to the existing unit armoury;
- the refurbishment of OLA6, including pavement works, and the construction of new revetments; and
- the refurbishment of the area in Building 295 vacated by the general engineering section, to cater for aircraft component workshops and office space.

Ordnance Loading Aprons

76. The Committee questioned the proposed orientation and the design of the proposed revetments for OLA6 from the point of view of public safety. Defence advised that the design of the facilities will take account of siting, master planning and safety distances. There will be a requirement for a Siting Board of suitably qualified officers to certify the final location. As well, the Department has given an assurance that it will review the design of the proposed revetments. Following the public hearing Defence provided further information to the Committee indicating that safety concerns have been taken into account in the location of helicopter parking positions and revetments.

Committee's Conclusion

77. The extent of proposed ancillary work will improve the Small Arms Repair Section and Ordnance Loading Aprons.

PLANNING AND DESIGN

Planning

78. Defence advised that significant siting constraints minimise the development sites within the Regiment's precinct. Potential sites for the proposed helicopter facilities are influenced by:

- safety distances associated with explosive ordnance (EO) activities near the precinct;
- height restrictions from the nearby glide path antennae; and
- height restrictions from the 07/25 runway clearance surfaces.

79. Defence believes that because of the functional relationships between the existing regiment facilities and the requirement to ensure that flight line operations are conducted efficiently, the helicopter facilities should be located as close as possible to the operational base of the Regiment. This will ensure that capital costs are reduced by maximising the use of existing aircraft strength pavement and minimising the distance required for the provision of engineering services. A number of options were considered by Defence, each with varying limitations because of the existing siting constraints. Defence have adopted the preferred layout because it is functional and can be accommodated within all existing constraints.

80. The location proposed for the transport compound and associated workshop facilities is adjacent to the Regiment's main Quartermaster Store in the south east corner of the precinct. This allows the collocation of related transport and workshop functions and will satisfy the requirement to minimise the distance between the Quartermaster Store and the workshops. The Small Arms Repair Section will be collocated with the Regimental armoury in the Quartermaster Store.

81. Ordnance Loading Apron 6 will remain in its existing location.

Manpower implications

82. Defence advised the Committee that, if implemented, the proposed works will result in productivity efficiencies associated with the transport compound and workshop which will be offset by the additional manpower that may be

required to tow helicopters in and out of the new shelters. There will not be an increase in the manning levels of 5 Aviation Regiment as a result of these works.

Master planning

83. Defence advised that the proposed facilities are located within appropriate Master Plan Zones in accordance with the existing RAAF Base Townsville Master Plan. The Committee was assured that proposed facilities will not impact on other master planned facilities. Allowances have been made for additional helicopter shelters and transport compound requirements, should expansion of these facilities be required in the future. This includes the provision to consolidate all Base vehicle storage and maintenance requirements for both Army and RAAF.

Site investigations

84. Defence advised that preliminary site investigations and survey work have been undertaken to verify that initial planning assumptions were correct.

Site investigations included electricity and water supply capacity and hydraulic service capacity and quality.

Design standards

85. Where appropriate, the design of the proposed facilities will conform to the relevant sections of the following:

- current Australian Standards and Codes, including the Building Code of Australia (BCA);
- local, State and Commonwealth Environmental legislation;
- the Defence Fire Protection Engineering Manual (FACMAN2);
- the Defence Security Manual (SECMAN);
- occupational health, safety and welfare legislation;
- the International Civil Aviation Organisation Air Traffic Services Planning Manual;

- the Defence Aerodrome Design Criteria (ADFP602);
- the Defence Explosives Safety Manual (OPSMAN3); and
- the Manual of NATO Safety Principles for the Storage of Military Ammunition and Explosives.

Design philosophy

86. The philosophy adopted in the design of the proposed facilities has incorporated the following considerations:

- the provision of austere and utilitarian facilities of efficient design suitable for the harsh climate;
- maximum use of existing infrastructure to minimise capital costs;
- adoption, where possible, of conventional construction techniques and materials, in particular those commonly used by the construction industry in northern Queensland, with due regard given to climatic conditions including cyclone protection; and
- utilisation of readily available and durable materials that combine long life with minimum maintenance.

Fire protection

87. The following philosophy has been adopted in respect to the design of the fire protection systems:

- all construction and fire protection systems will, as a minimum, conform to the provisions of the BCA, FACMAN2 and all other applicable Codes and Standards;
- Defence will require certification from a suitably qualified certifier, that the design and construction meet the requirements of the BCA, FACMAN2, relevant Codes and Standards and any additional local, state and Commonwealth requirements;

- the Queensland Fire Brigade will be invited to comment on the proposal, visit the site and offer comment throughout the construction phase to ensure that operational requirements are met;
- any recommended departures from BCA requirements in relation to the project will be technically assessed by Defence specialist fire protection staff and will require written approval at Director General level; and
- successful tenderers will be required to produce a Quality Assurance Plan to clearly show how BCA, Australian Standards and any additional Defence requirements in relation to fire protection and safety will be met and the required standards for construction/installation maintained.

88. The helicopter shelters will not be provided with fire sprinklers and the Committee questioned the rationale for adopting this stance. Defence justified the decision not to provide sprinklers on the basis of asset protection through compartmentation. The shelters will be for individual helicopters, which will be separated by fire-rated walls. Fire detection systems, to enable early responses, will be provided. Fire suppression systems, involving foam and water would be corrosive. In addition, there would be difficulties associated with accidental activation of such systems. In addition to detection devices, the helicopter shelters will be monitored by close circuit television. For these reasons, Defence believes reliance on detection, response and compartmentation will provide adequate levels of protection.

Energy conservation

89. The design of all power supply and electrical and mechanical equipment will include an assessment of energy use, applying life cycle costing techniques and power demand analysis. Facilities will incorporate building management systems, metering and other provisions to measure and monitor energy use and to allow regular energy audits.

90. Where possible, to reduce energy consumption, lighting is to be controlled by photo electric switches in conjunction with time-switch schedules. This is to include provision of personnel sensor controlled lighting to amenities and other intermittently occupied areas. Lamps are to be high

efficiency fluorescent, compact fluorescent or discharge type. External lighting is to be designed to minimise glare and colour distortion.

Aircraft noise and acoustics

91. The siting of all proposed facilities has been in accordance with:

- Australian Standard 2021 - 1994, Acoustics - Aircraft noise intrusion - Building siting and construction; and
- Australian Standard 2107 - 1987 Acoustics - Recommended design sound levels and reverberation times for building interiors.

ENGINEERING

Hydraulic

92. Preliminary investigations indicate that the existing domestic water supply has sufficient capacity to service the new facilities. Some additional works may be required to ensure that an adequate fire fighting supply is maintained. This requirement will be fully scoped during detailed design.

Electrical

93. The existing high voltage electrical system requires extension to allow connection of a new substation to service the proposed helicopter shelters and wash facility. The extension to the system will involve the development of the high voltage system already established on the Base. Power to the new helicopter facilities will be provided by low voltage cables from the new substation. Low voltage power to the transport compound and workshops will be drawn from an existing substation in the emergency power house located in the Regiment's precinct. Installation of electrical cabling will utilise existing cable ducts, where possible. A local generator to service each group of helicopter shelters will be constructed to provide aircraft power (115V, 400Hz), required for maintenance purposes and pre and post-flight activities, to the helicopter shelters.

Mechanical

94. Maximum use of natural ventilation will be incorporated for workshops and storage areas (eg roof ventilators), with mechanical ventilation provided for amenity areas. Offices will be airconditioned.

Pavements

95. The design of the road pavements will incorporate asphalt surfacing capable of accepting movements by the critical design vehicles. Aircraft pavements will match those existing and be of sufficient strength to accommodate the Chinook and Black Hawk helicopters. Aircraft earthing points will be provided within each shelter.

Stormwater

96. Stormwater runoff will be directed away from the new facilities and connected to the existing system. The existing oil fuel interceptor pits servicing the existing helicopter wash and stormwater systems will be upgraded to meet best practice. A new pollution control pit will be installed at the proposed vehicle wash point.

Security

97. The transport compound and workshop complex is located inside the RAAF Base but outside the Regiment's security fence. Therefore, physical security in the form of security fencing will be provided for these facilities. Additional physical security measures are not required for the helicopter shelters and wash facility.

Sewerage

98. The existing sewerage system will support the proposed development.

ENVIRONMENT AND HERITAGE

99. The proposed facilities are proposed to be constructed within existing developed areas containing similar activities and will be designed to conform to established Commonwealth, State and Local Government environmental standards. An Environmental Certificate of Compliance has been issued for the project. There are no heritage issues related to this project.

TOWNSVILLE CITY COUNCIL

100. Townsville City Council advised the Committee of its support for the project. According to the Council, the proposal will have positive social and economic benefits and reinforces the importance of Townsville as the location of several strategic military facilities.

101. The Committee was advised that the Centre for Applied Economic Research and Analysis at James Cook University estimated the economic benefits of the project as follows:

- additional gross output - $34.8 million;
- contribution to gross State product - $16.9 million;
- contribution to wages and salaries - $9.1 million; and
- full time and part time employment - 328 persons.

102. The land occupied by 5 Aviation Regiment is zoned Special Purposes under the City of Townsville Planning Scheme, which recognises the use of the land for Defence purposes. Council does not believe that the proposal will have any negative environmental impacts or that the helicopter wash facilities and transport compound will impact on residential areas.

RELATED DEVELOPMENTS

103. Defence advised the Committee that the proposal is related to three studies and projects currently underway. These are:

- *Restructuring the Australian Army*
- *AIR 87* - which is investigating the replacement(s) for the Iroquois and Kiowa helicopters; and
- *AIR 130* - which is examining the procurement of additional Chinook helicopters.

104. The Committee was advised that *Restructuring the Australian Army* retains 5 Aviation Regiment's air mobility and its basing in Townsville. The

disposition of the replacement Iroquois and Kiowa helicopters purchased under *AIR 87* is yet to be determined.

105. The Committee was also advised that under *AIR 130*, two additional Chinooks will be based at 5 Aviation Regiment. Preliminary master planning has allowed for the expansion of the shelter and dehumidification facilities should this option prevail. Funding for the additional facilities will be sought from *AIR 130*.

PROJECT DELIVERY, TIMING AND COST

Delivery

106. The proposal is currently in its developmental stage and has not yet proceeded to detailed design and documentation. Approval of concurrent documentation is being sought as part of the Defence Major Investment Submission for the 1996/97 Budget.

107. The contractor and consultant will be appointed using the following mechanism:

- calling for expressions of interest (EOI);
- assessment of EOIs and the preparation of a short list;
- request for tender proposals from the short list; and
- assessment of proposals and appointment of the contractor and consultant.

108. Defence advised the Committee that maximum opportunities will be provided, through the competitive tendering process, for locally based contractors and consultants to be employed on the project.

109. The Committee questioned how this will be achieved. Defence advised that the project will be delivered using the Managing Contractor form, also known in the construction industry as Construction Management. Using this method, Defence will engage a managing contractor who will be responsible for both the design and construction of the various elements of the project. Subcontractors will be engaged under trade packages to execute the work.

110. Defence believes this will provide a number of benefits. First, it will provide the opportunity for small and medium-sized businesses in Townsville to bid for the various trade packages. Secondly, it will provide security of payment for subcontractors, because payment will be made by Defence through a trust account. Thirdly, it will provide Defence with flexibility in designing the work because the Managing Contractor will be responsible for both design and construction.

111. The Committee questioned if tenders are tested against prevailing market conditions. Defence reiterated that all work is offered to tenderers through a competitive process. In response to advertisements seeking registrations of interest, 60 to 80 large building companies generally respond. This number is reduced through a merit selection process to a short list for tendering. At the tendering stage, depending on the form of project delivery, Defence develops a pre-tender price, which is validated by independent quantity surveyors. Defence is also assisted by industry experts in selecting the preferred tenderer, to ensure that the Commonwealth obtains value for money.

Timing

112. Subject to Parliamentary approval, the works are planned to commence in March 1997 with construction to be completed by December 1998.

Cost

113. The preliminary estimate for the proposed construction works is $19.1 million at December 1995 prices. The out-turn cost is $21.332 million.

114. The Committee questioned Defence about the allocation of 8 per cent of the cost for contingencies. Defence advised that this percentage is usually allocated for such projects. The contingency makes allowances for market conditions and caters for any developments which may occur during the detailed design of the proposal.

115. The preliminary estimate is a program cost to which an escalation factor can be added, based on assessments of the duration of the project. This produces the out-turn cost as a cost cap which cannot be exceeded on any project. If the project cannot be delivered within the cost cap, it is necessary to delete items from the scope the work. If savings are made, and the project is delivered below the cost cap, these can be allocated for other works.

Committee's Recommendation

116. The Committee recommends the development of facilities for 5 Aviation Regiment at RAAF Base Townsville at an out-turn cost of $21.332 million.

CONCLUSIONS AND RECOMMENDATIONS

117. The Committee's conclusions and recommendations and the paragraphs in the report in which they occur are set out below:

1. **Black Hawk helicopters operated by 5 Aviation Regiment at RAAF Base Townsville have experienced unexpectedly high rates of corrosion. This has been attributed to the use of high strength, lightweight alloys in helicopter structures and the operation and storage of aircraft in humid and salt laden atmospheric conditions. Prolonged exposure to ultra-violet radiation has affected internal electronic components and plastic fittings. (Paragraph 37)**

2. **RAAF Base Townsville remains the preferred location of 5 Aviation Regiment due to the proximity of 3 Brigade and impracticalities and considerable investment associated with alternative locations. (Paragraph 38)**

3. **High corrosion rates have diminished the capacity to operate the helicopters through to Life of Type, planned for 2015, affected aircraft serviceability and has required expenditure on maintenance, with associated costs expected to exceed sustainable funding levels. (Paragraph 39)**

4. **The Department of Defence has implemented a Corrosion Control Program for the helicopters to permit 5 Aviation Regiment's Black Hawk helicopters to operate effectively through to Life of Type. (Paragraph 40)**

5. **To satisfy the requirements of the Corrosion Control Program, there is a need to provide environmental protection shelters serviced by dehumidification equipment and an enclosed helicopter washing facility. (Paragraph 41)**

6. **Based on the number of Black Hawk and Chinook helicopters operated by 5 Aviation Regiment and current maintenance programs, there is a requirement for 19 Black Hawk and four Chinook shelters. (Paragraph 42)**

7. **The Department of Defence estimates that cost of environmental protection shelters would be recovered after two years, based on the $1.5 million cost of corrosion control undertaken in 1995 on four helicopters. (Paragraph 43)**

8. **Existing transport and some technical workshop facilities are located at inappropriately remote sites, from 5 Aviation Regiment's precinct at RAAF Base Townsville. (Paragraph 50)**

9. **The facilities are inadequate and their locations present an ongoing cost to unit efficiency. (Paragraph 51)**

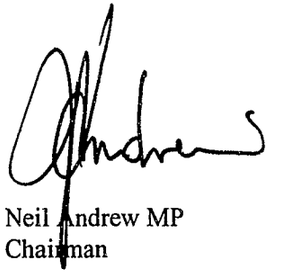
10. **There is a need to relocate 5 Aviation Regiment's Small Arms Repair Section and to refurbish the gunship helicopter arming point. (Paragraph 55)**

11. **The proposed environmental protection shelters, the provision of dehumidification equipment and the helicopter wash facility can be justified as providing the necessary facilities for the successful and economic implementation of the Corrosion Control Plan. (Paragraph 72)**

12. **The scope of works for the transport compound and workshop facilities can be justified on the basis of considerably improved working conditions, improved shelter and security for the extensive fleet of vehicles and resulting improved efficiency. (Paragraph 74)**

13. **The extent of proposed ancillary work will improve the Small Arms Repair Section and Ordnance Loading Aprons. (Paragraph 77)**

14. **The Committee recommends the development of facilities for 5 Aviation Regiment at RAAF Base Townsville at an out-turn cost of $21.332 million. (Paragraph 116)**



Neil Andrew MP
Chairman

5 December 1996

APPENDIX A

WITNESSES

BUNNELL, Councillor Ann, Deputy Mayor, Townsville City Council, Walker Street, Townsville, Queensland 4810

CHAPMAN, Mr Timothy Christopher Cady, Senior Engineer, Gutteridge, Haskins and Davey Pty Ltd, 216 Northbourne Avenue, Braddon, Australian Capital Territory 2601

FRASER, Lieutenant Colonel Anthony Peter, Commanding Officer, 5th Aviation Regiment, RAAF Base Townsville, Townsville, Queensland 4810

HINTON, Dr Bruce Roy William, Head of Corrosion Control Group, Defence Science and Technology Organisation, Aeronautical and Maritime Research Laboratory, 561 Lorimer Street, Fishermens Bend, Victoria 3207

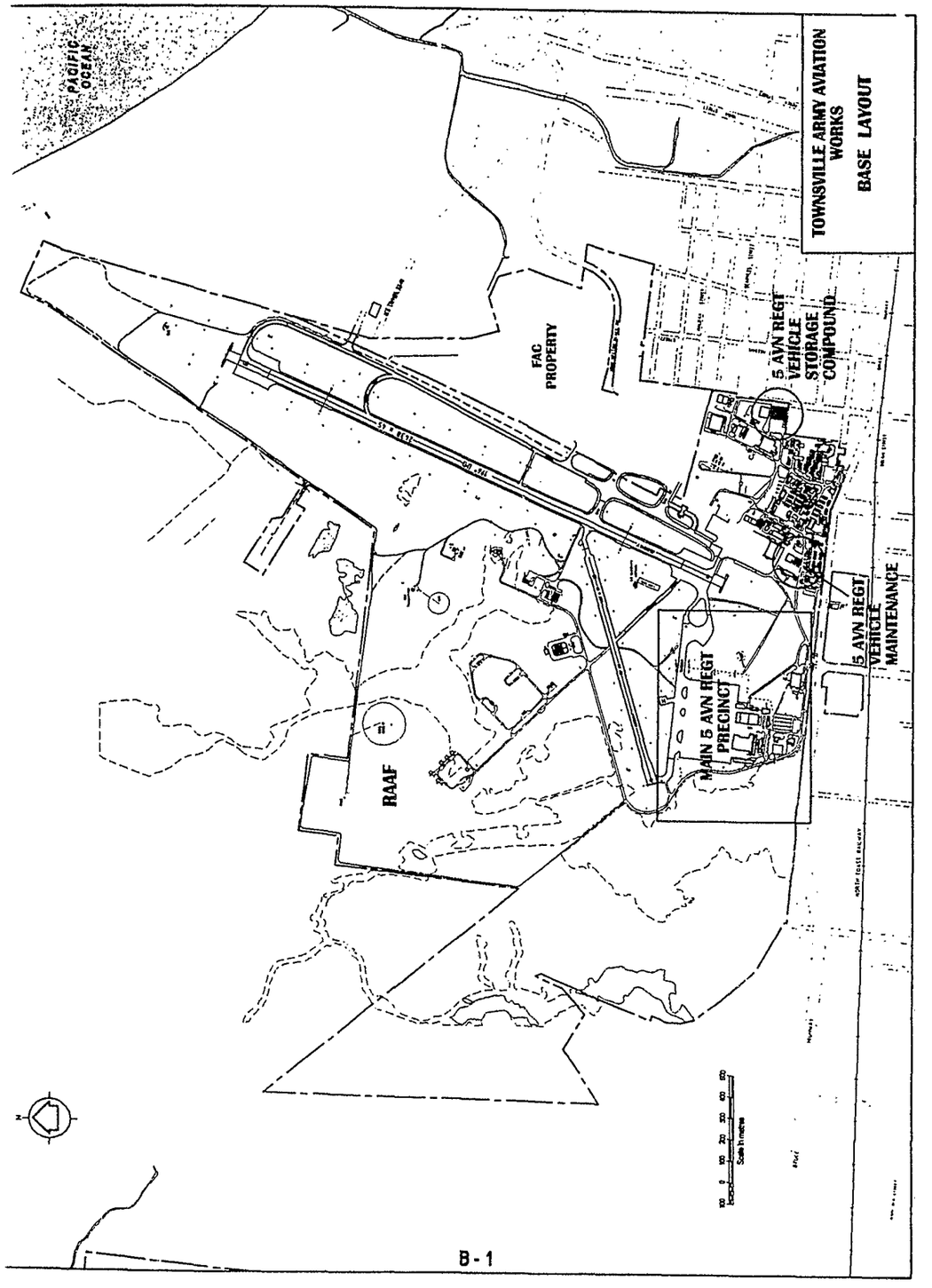
McCANN, Brigadier Raymond Leslie, Director General Accommodation and Works—Army, Facilities and Property Division, Department of Defence, Campbell Park Offices, Canberra, Australian Capital Territory 2601

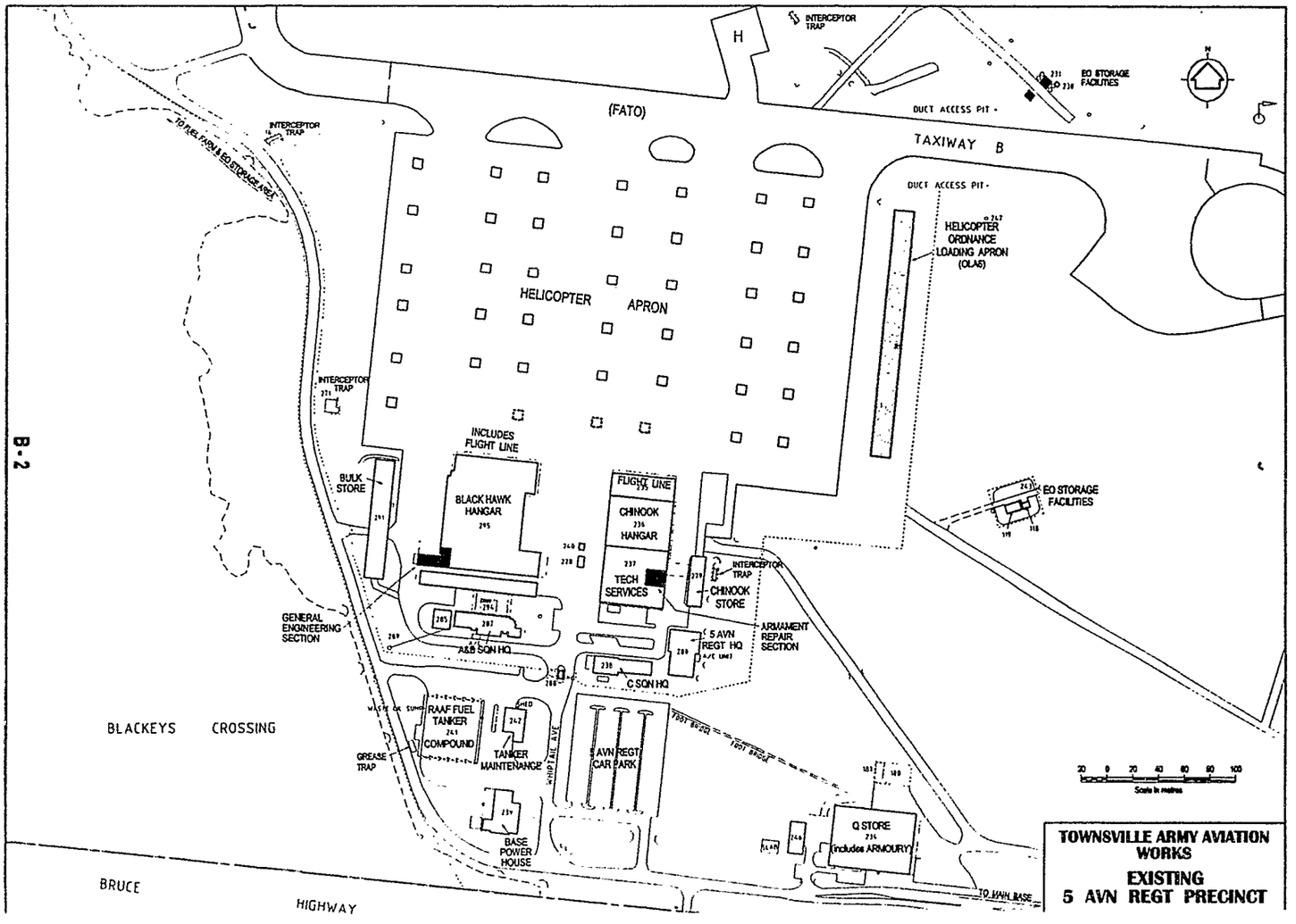
MELLOR, Brigadier William Julian Andrew, Commander, Aviation Support Group, Australian Defence Force, Oakey Airfield, Oakey, Queensland 4401

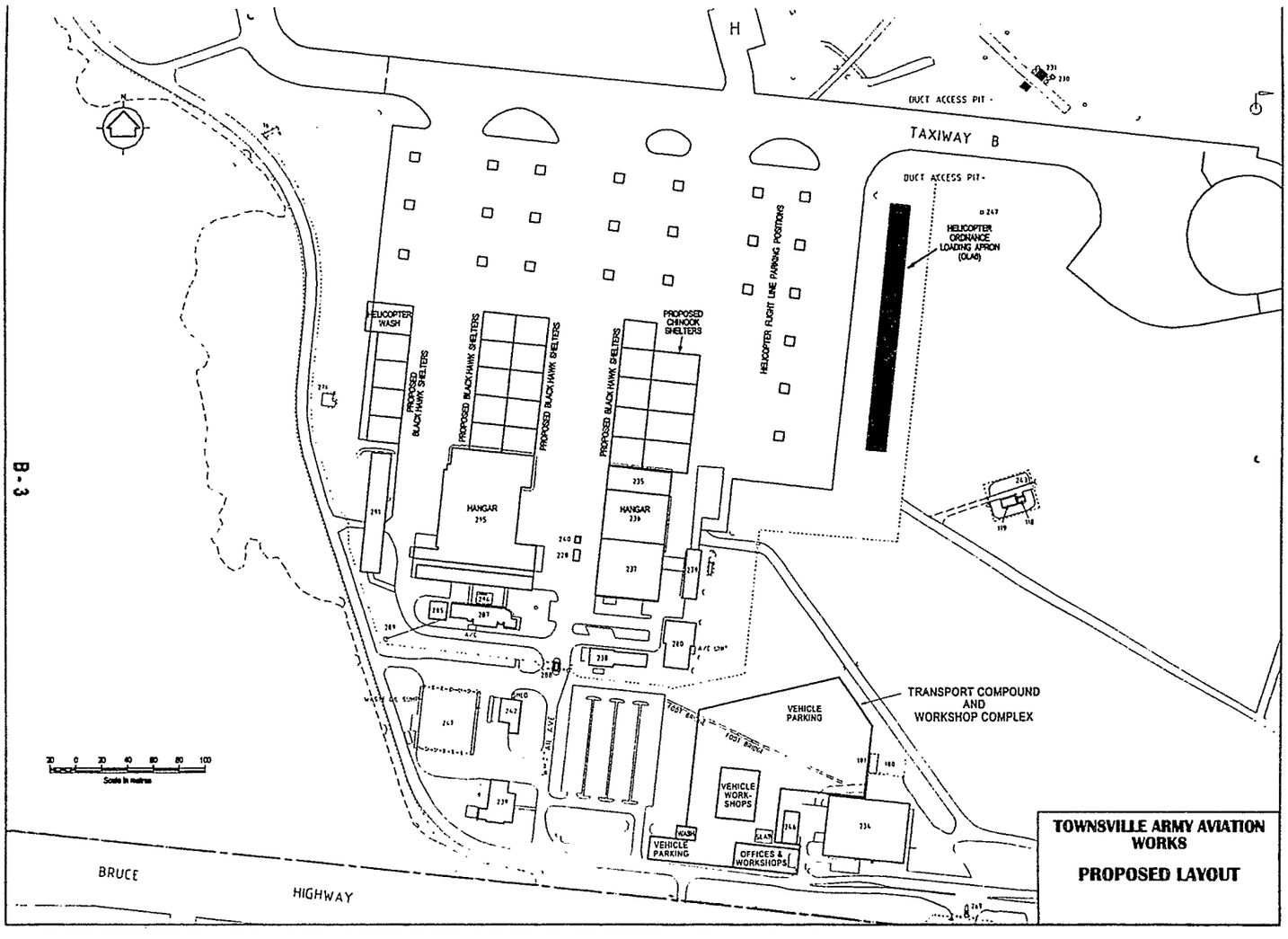
STRACHAN, Lieutenant Colonel Olga Nina, Project Director, Facilities and Property Division, Campbell Park Offices, Canberra, Australian Capital Territory 2601

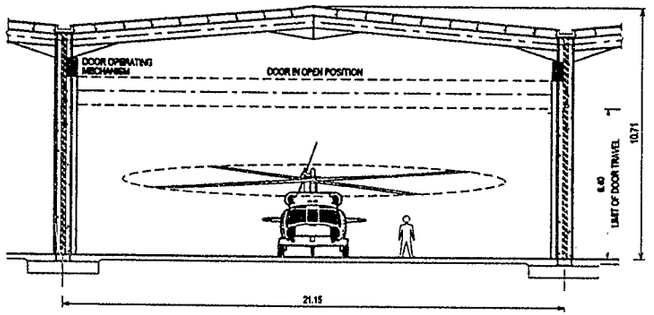
APPENDIX B

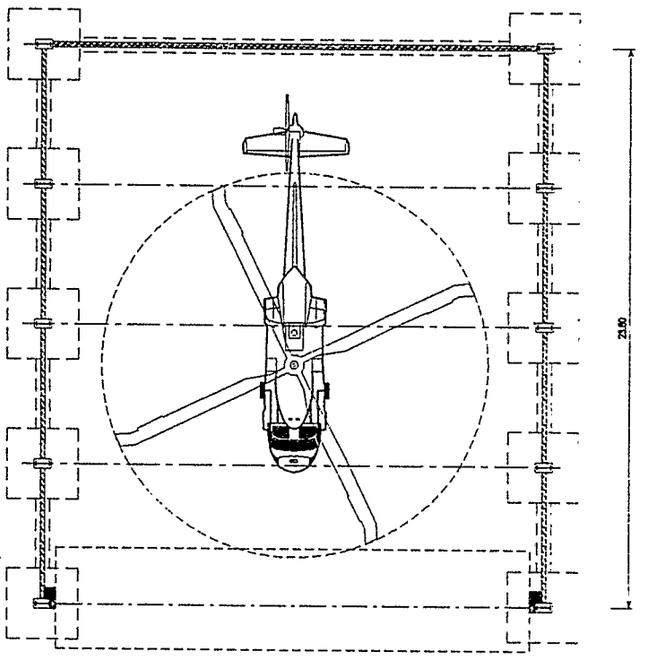
PROJECT PLANS AND DRAWINGS

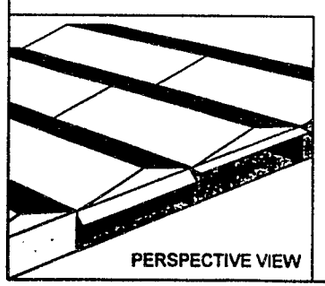



B-2
H
(FATO)
INTERCEPTOR TRAP
EO STORAGE FACILITIES
DUCT ACCESS PIT
TAXIWAY B
TO FUEL FARM & EO STORAGE AREA
HELICOPTER APRON
HELICOPTER ORDNANCE LOADING APRON (OLA6)
INCLUDES FLIGHT LINE
BULK STORE
BLACK HAWK HANGAR
FLIGHT LINE
CHINOOK HANGAR
TECH SERVICES
CHINOOK STORE
GENERAL ENGINEERING SECTION
A&B SQN HQ
C SQN HQ
5 AVN REGT HQ
ARMAMENT REPAIR SECTION
RAAF FUEL TANKER COMPOUND
TANKER MAINTENANCE
5 AVN REGT CAR PARK
GREASE TRAP
BLACKEYS CROSSING
BASE POWER HOUSE
Q STORE (includes ARMOURY)
TO MAIN BASE
BRUCE HIGHWAY
Scale in metres
TOWNSVILLE ARMY AVIATION WORKS
EXISTING
5 AVN REGT PRECINCT


B-3
H
DUCT ACCESS PIT
TAXIWAY B
HELICOPTER ORDNANCE LOADING APRON (OLA6)
HELICOPTER FLIGHT LINE PARKING POSITIONS
HELICOPTER WASH
PROPOSED BLACK HAWK SHELTERS
PROPOSED BLACK HAWK SHELTERS
PROPOSED BLACK HAWK SHELTERS
PROPOSED CHINOOK SHELTERS
HANGAR 295
HANGAR 239
TRANSPORT COMPOUND AND WORKSHOP COMPLEX
VEHICLE PARKING
VEHICLE WORK-SHOPS
VEHICLE PARKING
OFFICES & WORKSHOPS
BRUCE HIGHWAY
Scale in metres
TOWNSVILLE ARMY AVIATION WORKS
PROPOSED LAYOUT







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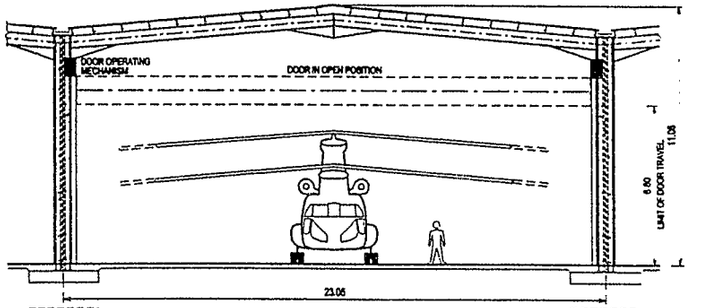
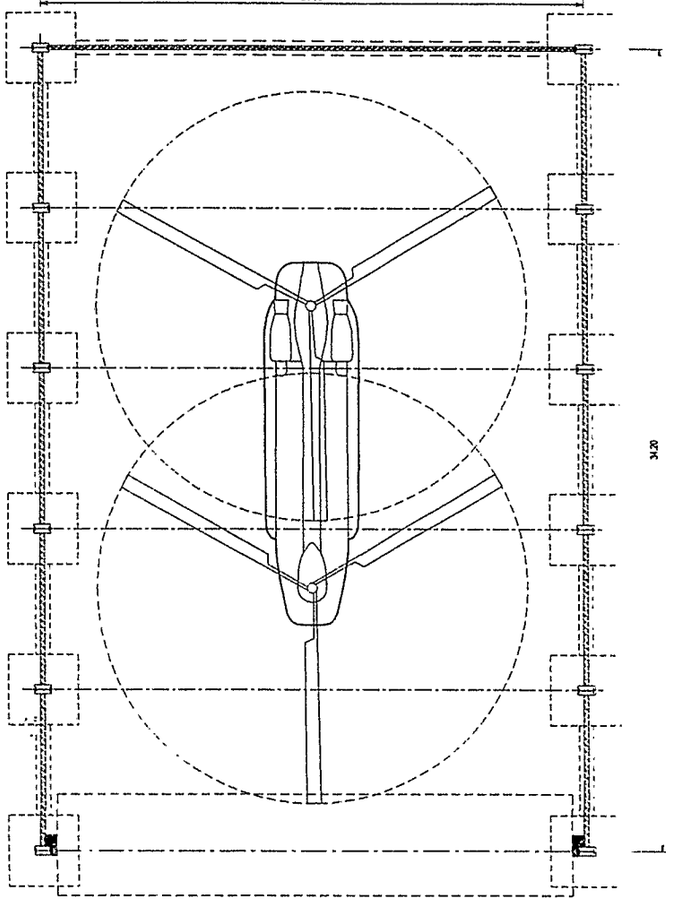
Note: Dimensions in metres

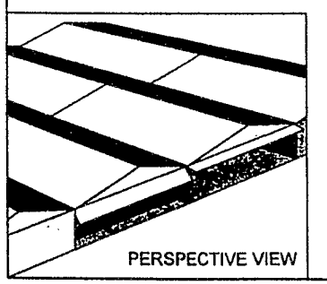
TOWNSVILLE ARMY AVIATION WORKS

BLACK HAWK SHELTER

B - 4







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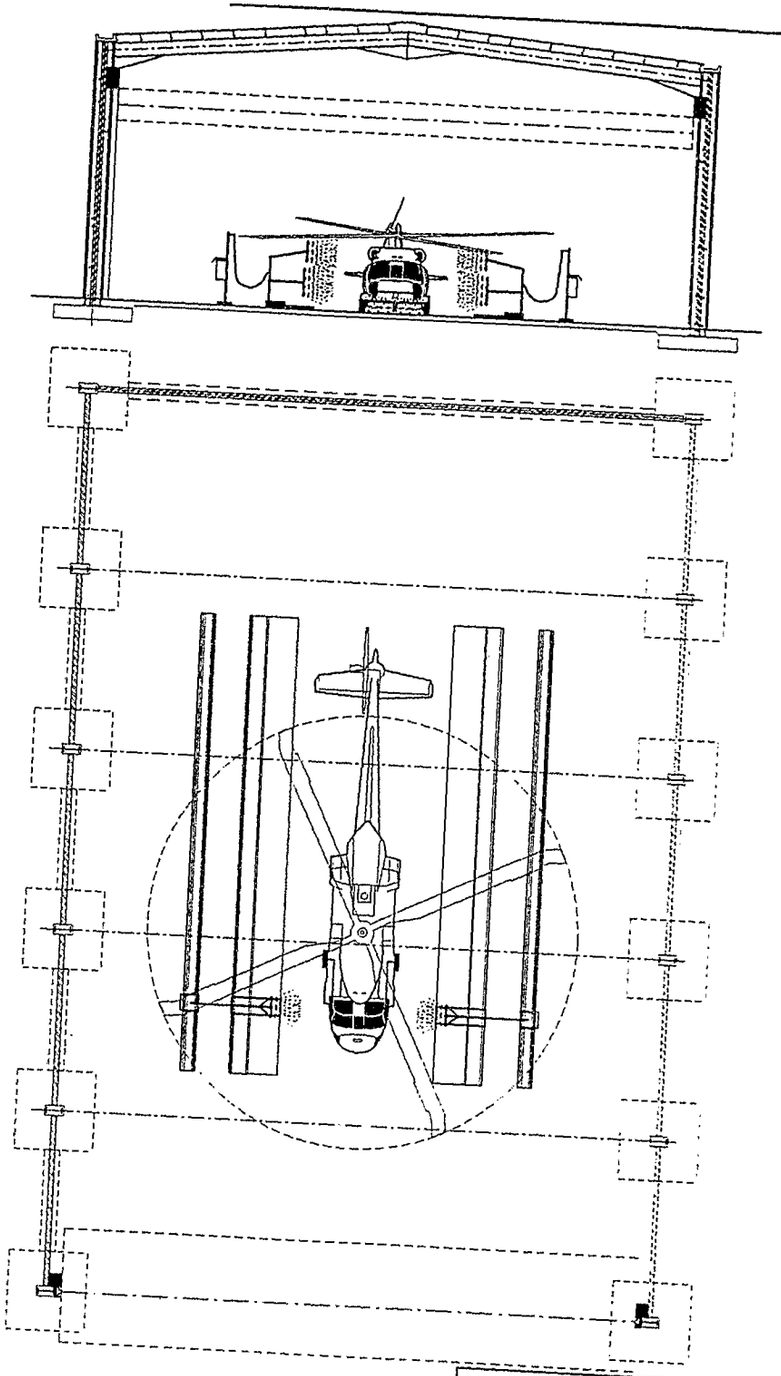
Note: Dimensions in metres

TOWNSVILLE ARMY AVIATION WORKS

CHINOOK SHELTER

B - 5



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B - 6

TOWNSVILLE ARMY AVIATION WORKS

HELICOPTER WASH FACILITY

OFFICES AND WORKSHOPS - FUNCTIONAL SPACE DIAGRAM

TOTAL AREA 1000m²
includes:

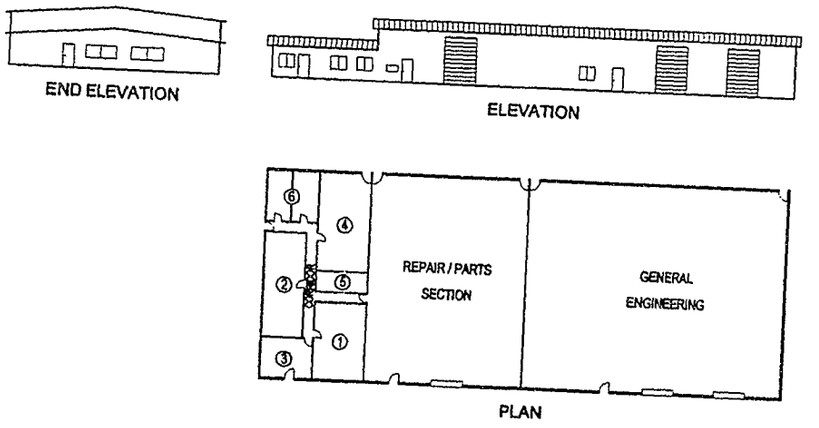
OFFICE ACCOMMODATION

1. Offices
2. Operations Cell
3. Reception Area
4. Lunchroom / Conference / Training Room
5. Kitchenette
6. Amenities

WORKSHOPS

General Engineering
- electrical fitters
- paint booth
- welding bay
- battery store
- offices
- storage

Repair / Parts Section



5 0 5 10 15 20 m
(1:500 for A4 plot)

B - 7

TOWNSVILLE ARMY AVIATION WORKS

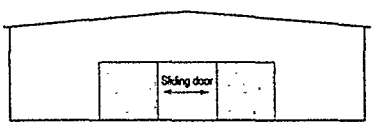
TRANSPORT COMPLEX OFFICE BUILDING AND WORKSHOPS

VEHICLE WORKSHOP - FUNCTIONAL SPACE DIAGRAM

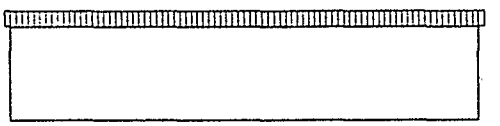
TOTAL AREA 1200m²
includes:

ALLOWANCE FOR VEHICLE WORKSHOPS, incorporating:

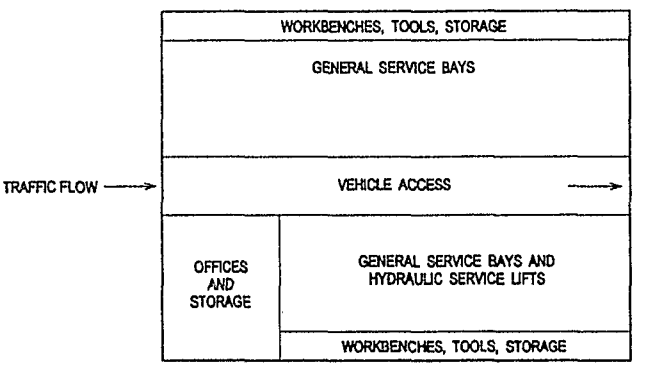
- General Service Bays
- Hydraulic Service Lifts
- Storage Space
- Office Space



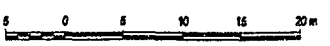
END ELEVATION



ELEVATION



PLAN



TOWNSVILLE ARMY AVIATION WORKS

TRANSPORT COMPLEX VEHICLE WORKSHOP BUILDING