

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION
SPONSORED PROJECT INITIATION

alg

Date: 12/1/78

Project Title: EWES Project Study

Project No: A-2198

Project Director: R. M. Goodman

Sponsor: Commonwealth of Australia

Agreement Period: From 8/4/78 Until 4/21/79

Type Agreement: CAPO C338079

Amount: \$200,000

Reports Required: Monthly Progress Reports

Sponsor Contact Person (s):

Technical Matters

Secretary, Dept. of Defense
Canberra, ACT
Attn: Project Mgr.
Dir. of Aircraft Requirements
Russell Offices
Canberra, ACT, Australia 2600

Contractual Matters

(thru OCA)

J. W. Pfitz
Resident
Project Liason Officer
EES/STL/GIT

Defense Priority Rating:

Assigned to: Systems & Techniques (School/Laboratory)

COPIES TO:

Project Director
Division Chief (EES)
School/Laboratory Director
Dean/Director-EES
Accounting Office
Procurement Office
Security Coordinator (OCA)
Reports Coordinator (OCA) ✓

Library, Technical Reports Section
EES Information Office
EES Reports & Procedures
Project File (OCA)
Project Code (GTRI)
Other _____

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION
SPONSORED PROJECT TERMINATION

Date: 11/1/79

Subject Title: EWES Project Study
Subject No: A-2198
Subject Director: R.M. Goodman
Sponsor: Commonwealth of Australia

Effective Termination Date: 4/21/79

Variance of Accounting Charges: 4/21/79

Ant/Contract Closeout Actions Remaining:

- ☒ Final Invoice and Closing Documents
- ☐ Final Fiscal Report
- ☐ Final Report of Inventions
- ☐ Govt. Property Inventory & Related Certificate
- ☐ Classified Material Certificate
- ☐ Other _____

TERMINATED

Assigned to: STL/DED (School/Laboratory)

COPIES TO:

Project Director
Division Chief (EES)
School/Laboratory Director
Dean/Director-EES
Accounting Office
Procurement Office
Security Coordinator (OCA)
Reports Coordinator (OCA)

Library, Technical Reports Section
EES Information Office
Project File (OCA)
Project Code (GTRI)
Other _____

MONTHLY REPORT

CAPO NO. C338079


PROJECT: EWES for RAAF - Project Definition Study

PERIOD: August 3, 1978 to September 30, 1978

Prepared for:

Government of Australia (RAAF)

Signed

 Joe K. Parks
Program Manager

Date

10/11/78

I. PROGRAM PROGRESS FOR REPORTING PERIOD

1.0 Program Initiation

An initial meeting was held by the Georgia Institute of Technology Engineering Experiment Station staff on August 3, 1978 for the purpose of assigning tasks on the EWES program and the introduction of the staff to Squadron Leader Pfitz. The EWES program was divided into the following tasks:

<u>Item</u>	<u>Task Leader</u>
General Program Direction	Robert Goodman
Program Management	Joe Parks
General Technical Direction	George Ewell
Sites 1,2, and 3 Systems	Henry Cotten
Site 4 System	Charles Hilbers
Reference Radars	George Ewell
MTI's	Larry Banta
Central, Debrief and Remote Site Software	Gary Peckham
Central and Debrief Site Hardware	Don Sanford
Operational Control Radar	William Licata
Remote Site Displays	Pat Ryan
Reference Radar Displays	Pat Ryan
Communication System	Hank Jenkins
Optical Tracking	Donald Blue

During the following week a series of individual meetings were held with George Ewell, Joe Pfitz, Joe Parks and each of the technical leaders of the project to discuss technical clarifications on the EWES program and to consider the methods of generating budgetary cost estimates required by the CAPO on or before October 21, 1978.

Several important meetings were held between the EWES task leaders and some of the key potential vendors, such as representatives of the Digital Equipment Corporation. These meetings were very productive and gave the Georgia Tech personnel ample opportunity to discuss the latest equipment available for this program.

A concentrated effort was then organized to obtain sufficient vendor information, which when combined with Georgia Tech's own estimates, would result in a budgetary cost estimate for the EWES program. This estimate was accomplished in time for the visit by RAAF representatives on September 19, 1978.

The following section lists the cost estimates and the assumptions under which the estimates were formulated.

2.0 Budgetary Cost Estimates

The following assumptions apply to the initial (budgetary) cost estimates on the EWES program:

1. The Georgia Institute of Technology will be the prime contractor.
2. Site #2 has been reconfigured to another system.
3. The EWES system (exclusive of the communications link) will be fully tested at the Georgia Institute of Technology facility prior to shipment to Australia. Communication equipment would be "hard wired" between the remote, central and debrief sites.
4. Documentation estimates are based upon Georgia Tech's standards. An estimate of an upgraded level of documentation, which could generally be categorized between a military standard and a commercial standard is given as a separate estimate.
5. AIP estimates have not been generated during the initial stages of cost estimates. AIP was discussed in detail at the September 19, 1978 meeting with the RAAF representatives and a dialogue with the RAAF representative at the Georgia Institute of Technology is continuing on this subject.
6. The non-recurring engineering has been included in the site estimates.
7. Special test equipment has been included in the prices.

8. Current average Georgia Tech labor overhead rates are applicable to the cost estimates given.

Based on the above assumptions, the following budgetary cost estimates were produced:

EWES SYSTEM COST BREAKDOWN

Site 1	4,560,397
Site 2	4,047,880
Site 3	4,437,584
Site 4	4,604,061
EWES Computer Software	1,366,209
Central Control Facility	1,328,330

Computer Hardware	402,696
OCR	526,731
Comm/Data Link/Tel.	398,903

Debrief Facility Equipment	171,238
Qty. 8 Transponder Pods	712,635
Program Management/Administrative Costs	1,272,569
Installation/Checkout/Acceptance Tests	
U.S. Install. & Accept. Tests	1,464,777
Australilian Install. & Accept. Tests	1,028,312
Personnel Training	202,838
General Test Equipment	<u>66,000</u>
TOTAL	25,262,830

Upgraded Documentation	1,317,420
TOTAL (with Upgraded Documentation)	26,580,250

In addition to the above estimated costs certain particular items were requested by the CAPO to be listed separately. These costs (except for the Repeater) are included in the above system costs and are listed as follows:

MTI (for four simulators)	778,793
Optics (for four simulators)	362,184
Comm/Data/Link	265,201
Repeater (unit cost)	49,606
Reference Radar (for four simulators)	2,284,100
Mobile Generator (for four simulators)	145,720
Air Conditioners (for four simulators)	98,428
Air/Ground/Air Comm.	86,487
Telephone Subsystem	47,215

These estimated costs were presented to representatives of the RAAF on September 19, 1978. Between September 19, 1978 and September 29, 1978 several conferences were held with technical and managerial representatives of the RAAF and financial and technical details were explored in depth.

II. PROJECT OBJECTIVES FOR NEXT REPORTING PERIOD

During the next report period a concentrated effort will be initiated to begin writing the formal specifications and the refine the cost estimates. It is anticipated that during the remaining phases of this program several trips will be made to key potential vendors in order to ascertain capability and resources which could be applied to the EWES program. Among vendors considered are Gerstenslager of Wooster, Ohio (electronic vans), Scientific Atlanta of Atlanta, Georgia (pedestals), Datron of Los Angeles (pedestals), Raytheon of Boston, Massachusetts (transmitters), and AIL of New York, New York (operational control radars). For the next month, the main activity will concentrate on specification assimilation, updating, and writing.

MONTHLY REPORT

CAPO NO. C338079

PROJECT: EWES for RAAF - Project Definition Study

PERIOD: October 1, 1978 to November 30, 1978

Prepared for:

Government of Australia (RAAF)

Signed

Joe K. Parks
Program Manager

Date 12/14/78

I. PROGRAM PROGRESS FOR THIS REPORTING PERIOD

During the months of October and November, 1978, a concentrated effort was directed toward updating of the specification and the writing of the formal EWES submission. A two-fold approach has been taken on this effort as follows:

- A. Generalized specifications for the formal inputs to the EWES document have been generated.
- B. Detail specifications have been prepared which are suitable for sending to potential vendors for refined pricing.

Preliminary drafts of several aspects of the EWES specification have been completed. The following represents a partial list of preliminary drafts which have been completed and are currently being reviewed by Georgia Tech personnel as well as the RAAF representative on campus:

- 1. Pedestal Specifications
- 2. Electronics Van Specifications
- 3. Diesel Generator Trailer Specifications
- 4. Antenna Specifications - Sites 1 through 3
- 5. Communications Specifications
- 6. DMTI Specifications
- 7. Diesel Generator Specifications
- 8. Radar Training Device Specification
- 9. Optical Tracking Specifications
- 10. Air Conditioner Specifications
- 11. Transmitter Specifications (H and J band only)

In addition to the above, work has been initiated on the management specifications. In particular, a great deal of effort has been concentrated on both general and specific documentation aspects of the EWES Program. Georgia Tech believes it would be in the best interest of the RAAF to offer a compromise specification on the documentation section which would be less restrictive than the Australian P6 Standard, but more detailed than the documentation normally supplied by commercial contractors or by the Georgia Institute of Technology. It is believed that the documentation

specification offered will result in a somewhat more costly EWES System but will give greater flexibility to the maintainability and spares aspects of this program.

Financial data has been attached to this report showing the expenditures from August through November and projected expenditures until the end of the program. It is anticipated at this time that the program of specification writing and pricing estimates can be accomplished within the contract amount of \$200,000. The accelerated rate of expenditure indicated for January, 1979, represents considerable clerical assistance and system engineering input for that month.

For some items to be purchased, Georgia Tech intends to send revised specifications to vendors for refined pricing. However, certain specific equipment has already received sufficient pricing input from vendors such that a refined price is already available.

II. PROGRAM PROGRESS PLAN FOR THE NEXT REPORTING PERIOD

The program for the next reporting period of December, 1978, includes the following:

- A. Completion of all revised specifications for vendor items.
- B. Initiation of requests for refined pricing from Vendors.
- C. Commencing of preparation for estimates of shipping costs in conjunction with RAAF Personnel.
- D. Initiation of system specifications by system engineering.

<u>MONTH</u>	<u>EXPENDITURES</u>	<u>CUMULATIVE EXPENDITURES</u>
August	\$30,682.45	\$30,682.45
September	40,012.24	70,694.69
October	25,225.12	95,919.81
November	27,393.88	123,313.69
December	23,111.37	146,425.06
January	46,035.81	192,460.87
February	7,044.13	199,505.00



ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

MONTHLY REPORT

CAPO NO. C338079

PROJECT: EWES for RAAF - Project Definition Study

PERIOD: December 1, 1978 to December 31, 1978

Prepared for:

Government of Australia (RAAF)

Signed _____

Joe K. Parks
Program Manager

Date _____

1/8/79

MONTHLY REPORT
CAPO NO. C338079

I. PROGRAM PROGRESS FOR THIS REPORTING PERIOD

During December 1978 a concerted effort was made to complete the writing of particular elements of the EWES specifications and begin completion of the final EWES Cost Estimates. A considerable portion of the EWES Specifications have been completed but significant work remains for January and February 1979

Since it may be helpful to the RAAF to have refined cost estimates as early as possible, the Georgia Tech Research Institute proposes that these estimates be completed in January 1979 with the final written specifications targeted for February 1979. It is hoped that the refined price estimate can be transmitted to the Australian officials on an informal basis as soon as it has been generated.

GTRI anticipates few major changes in the original cost estimates except in the Upgraded Documentation Estimates and the projected shipping costs. Significant information on shipping will be presented with the final EWES Specifications.

The status of a number of significant elements of the EWES Specification is given as follows:

- A. MTI -- The MTI task is in good condition. Specifications are ready for final typing except for some minor editorial format changes. RFQs have been sent to several vendors but only one vendor responded with a quotation. This will be used in the refined cost estimate if no others are received.
- B. Pedestals and Pedestal Trailers -- A very detailed specification was generated and was sent to two vendors before Christmas. A refined quotation is due by January 15, 1979.
- C. Antennas -- Specifications have been written for all sites except Site 4. Few cost estimate changes are anticipated for this task from the original ones made in September 1979.
- D. Receivers -- (Sites 1, 2, 3, and 4) -- Due to flaps on other programs, this specification writing schedule has suffered. This task is central to the successful completion of the EWES project. However, since Project A-2201 has a direct technical bearing on the EWES Specifications, the knowledge gained by GTRI personnel on this program can be directly applied to the EWES Project. The original cost estimates were very detailed and may need only minor adjustment.

- E. Air Conditioner, Electronics Trailer and Diesel Generator & Trailer -- All of these specifications have been written, reviewed, and sent to vendors for quotations.
- F. Transmitters -- Specifications have been written but have not been delivered to vendors at this time. Few revisions are necessary on these specifications.
- G. Ferrite Modulator -- Specifications have been written and one vendor contacted for a bid.
- H. Radar Displays for all Sites -- Work on the initial draft specification is almost complete. The positive side of this task's status is that the original cost estimates were very thorough.
- I. Reference Radar and Reference Radar Displays -- A first draft of the reference radar specifications has been written. The displays specification writing task has been started but additional work remains for January.
- J. Training Device -- This specification has been written.
- K. Optical Tracking -- This specification was written and it was requested that it be rewritten giving more detail, particularly where vendor specification material was needed. The revised specification will be complete by 1/10/79.
- L. Radar Interface Microprocessor -- Additional writing must be completed in January 1979.
- M. Central and De-Brief Hardware -- A specification has been written and submitted for review. Numerous changes have been suggested and a draft copy will be available by 1/10/79. Final pricing has been received from one vendor.
- N. Central and De-Brief Software -- This task also includes interfacing the central computer with the remote sites. The specifications have been written and are presently being typed. The quality of effort appears to be satisfactory. The final cost estimates will be ready near mid-January 1979. The original cost estimates were very detailed and only minor modifications are necessary.
- O. Operational and Control Radar -- A revised specification and final cost estimates have been promised by mid-January 1979. Some additional review will be necessary.
- P. Communication System -- An original specification was reviewed and several changes requested. A revised specification has just been received and needs additional internal review.

- Q. System Engineering -- The original specification writing plan was to draft a Site 2 specification and use this as a guide for the other sites. While this has failed to materilize exactly as planned, a considerable amount of work has been initiated toward writing the system portion of Site 2. While a considerable workload remains on the system aspects of this specification, GTRI has made a significant beginning.
- R. Program Management -- Program Management specification status is as follows:
- 1) Documentation -- A consultant was hired to review the upgraded documentation specifications. Revised specifications have been typed and need review. Final typing should begin no later than January 20, 1979. The consultant also gave a detailed estimate for the cost of the upgraded documentation. These costs have been adjusted and are close to completion.
 - 2) Quality Control -- A quality control specification is in the process of being generated.
 - 3) Management Tools to be used in the EWES Program. These specifications need additional work.
 - 4) Shipping Costs -- We have received some very beneficial help from the RAAF on this task. Some drafting work remains and will be completed in January 1979.
 - 5) Test Equipment -- A new list has been Suggested.

II. PROGRAM PLAN FOR JANUARY 1979

- A. The present intent is to complete the refined cost estimates in January and complete the Specification writing by the end of February. This priority has been applied because of Australian budgeting processes. GTRI anticipates relatively few changes in the pricing structure, although there will be a few significant changes.
- B. Expenditures through January, including encumbrances, are approximately \$153,000. The expenditures in January 1979 are anticipated to be \$33,000 and the expenditures in February 1979 are anticipated to be approximately \$13,500.
- C. A significant amount of work remains to be accomplished in uniformly formatting all of the specifications.



ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

MONTHLY REPORT

CAPO NO. C338079

PROJECT: EWES for RAAF - Project Definition Study

PERIOD: January 1, 1979 to January 31, 1979

Prepared for:

Government of Australia (RAAF)

Signed _____ Date Feb 12, 1979

Joe Parks
Program Manager

MONTHLY REPORT

CAPO No. C338079

I. Program Progress for this Reporting Period

During January, 1979, GTRI completed the major effort on the rough draft of the specification writing task and has essentially completed the cost estimating task. The major specifications which require additional work are in the area of the receivers at the remote sites.

Because of its size, it has been decided to present the specifications in separate volumes. The present outline of the specification will be as follows:

Volume I	Introduction to EWES				
Volume II	Ewes Central Debrief Site and Computer Hardware and Software Specifications				
Volume III	EWES Remote Site No. 1 Specification				
Volume IV	"	"	"	No. 2	"
Volume V	"	"	"	No. 3	"
Volume VI	"	"	"	No. 4	"
Volume VII	Management Specifications and Acceptance Testing Specifications				

The Central/Debrief Site Volume will include sections on the Operational Control Radar and the Communications Specifications. The Remote Site volumes will be self-contained, including full sets of specifications without need for referencing other volumes, except possibly Volume I and Volume II for interface purposes. The Management Specifications will include sections on Documentation and Quality Assurance.

It is anticipated that a clean rough draft of the complete document will be available by Monday, February 19, 1979. Because of the need for accuracy and the required detail review of the specifications to attain this accuracy, GTRI now feels that the completed published specifications will require until March 30, 1979 for completion. A formal request for a no-cost extension of the contract will be made by GTRI.

The cost estimates are almost complete and will be transmitted informally very shortly. GTRI at this time estimates that the requirements of CAPO will be satisfied at an expenditure no more than \$200,000, which is the contract price. Cumulative expenditures through January, 1979, were approximately \$177,200.

II. Program Plan for February, 1979

The present plan is to complete a clean rough draft of the specifications and to complete the formal cost estimates during February, 1979. The entire specifications are planned to be completed by March 30, 1979.

JKP/mlm



ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

MONTHLY REPORT

CAPO No. C338079

PROJECT: EWES for RAAF - Project Definition Study

PERIOD: February 1, 1979 to February 28, 1979

Prepared for:

Government of Australia (RAAF)

Signed

Joe K. Parks
Program Manager

Date 3/13/79

MONTHLY REPORT

CAPO No. C338079

I. PROGRAM PROGRESS FOR THIS REPORTING PERIOD

During February, 1979, GTRI continued the mammoth effort required for completing the RAAF EWES specification. The proposed outline on a volume-by-volume basis was changed slightly, interchanging Volume II and Volume VII in the outline submitted in the January, 1979, report. The new outline is as follows:

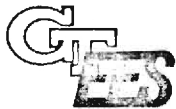
Volume I	Introduction to EWES
Volume II	Management Specification
Volume III	EWES Remote Site No. 1 Specification
Volume IV	" " " No. 2 "
Volume V	" " " No. 3 "
Volume VI	" " " No. 4 "
Volume VII	EWES Central and Debrief Site Computer and Software Specifications

An engineering draft has now been generated for all sections of the specification, and most of the necessary drawings have been entered into the drafting cycle.

It is anticipated that the refined cost estimates should be assembled and totalled by March 16, 1979. As soon as this information is ready, it will be informally transmitted to the RAAF Representative at GTRI.

II. PROGRAM PLAN FOR MARCH, 1979

It is anticipated that the specifications will be completed by March 30, 1979. Due to the large amount of printing required, it is possible that the finished document may not be fully published until mid-April, 1979.



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GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

MONTHLY REPORT

CAPO No. C338079

PROJECT: EWES for RAAF - Project Definition Study

PERIOD: March 1, 1979 to March 31, 1979

Prepared for:

Government of Australia (RAAF)

Signed

Joe K. Parks
Program Manager

Date

4/13/79

MONTHLY REPORT

CAPO No. C338079

I. PROGRAM PROGRESS FOR THIS REPORTING PERIOD

During March 1979, all of the technical writing for the EWES specifications was completed and the major activity centered about the editing, proofing, drafting and reviewing of the written and typed material. Classification of the work has been completed subject to the appropriate classification authority in the United States.

Georgia Tech has utilized the Xerox 850 Word Processor which will store most of the specifications in disk-type magnetic memory. This will readily permit the reproduction and/or correction of the specifications in the future if the need should arise.

As can be expected in a program of this magnitude, the data base upon which the specifications rely increases almost daily. Georgia Tech has striven to include all of the latest pertinent information available up until the time of printing the document. Each volume will have been reviewed by the technical staff at EES as well as by the RAAF representative. It is hoped that the content and format of the specifications will satisfy the RAAF's high standards.

II. PROGRAM PLAN FOR APRIL, 1979

It is anticipated that the completed document will be ready to be submitted to the approving authorities in April 1979. Printing of the required copies will be subsequent to that approval.



ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

MONTHLY REPORT

CAPO No. C338079

PROJECT: EWES for RAAF - Project Definition Study

PERIOD: April 1, 1979 to April 30, 1979

Prepared for:

Government of Australia (RAAF)

SIGNED

Joe K. Parks
Program Manager

DATE

5/6/79

MONTHLY REPORT

CAPO No. C338079

I. PROGRAM PROGRESS FOR THIS REPORTING PERIOD

During April, 1979, the major activity concentrated on completing the corrections to the textual material and art work for the drawings associated with the specifications.

A considerable amount of effort was allocated to the engineering review of the specifications. This has proved to be time consuming, but very useful. A number of areas of the specifications have been refined and clarified during this process. In addition, a partial informal independent review has been performed by other qualified civil US Government personnel and a number of their suggestions have been implemented. It is expected that additional minor corrections will be necessary after submission to the Missile Intelligence Agency. Because of the utilization of the Xerox 850 Word Processor, these corrections can be accomplished with minimum effort.

II. PROGRAM PLAN FOR MAY, 1979

It is hoped that the completed specifications can be submitted to the approving authorities by the end of May or early June, 1979. Printing of the required copies can then be accomplished.



ENGINEERING EXPERIMENT STATION

GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

COST ESTIMATES

CAPO No. C338079

PROJECT: EWES for RAAF -- Project Definition Study

Prepared For
Government of Australia (RAAF)

SIGNED _____

Joe K. Parks
Program Manager

DATE: June 1, 1979

COST ESTIMATES
CAPO No. C338079

I. INTRODUCTION

In accordance with Item 1 of the "Proposed Task" of CAPO C338079, the Revised Cost Estimates are hereby submitted. Item 2 of said CAPO, which proposes Australian Industry Participation (AIP), will be submitted on or before August 1, 1979.

II. COST ESTIMATE ASSUMPTIONS

1. The costs provided by GTRI are based on the following assumptions:
 - a. GTRI will be the Prime Contractor with all items procured in the US and all equipment, except the communication link, installed and initially tested in the US. Subsequent installation in Australia will be carried out by US engineers with a full acceptance test of the system at Woomera and the services of a Field Service Representative for six months subsequent to acceptance.
 - b. No Australian Industry Participation (AIP) considerations have been included and training is based on Training Option 1. Details of this option and Training Option 2 (which incorporates AIP considerations) are contained in Volume II, Section 3.13.1 of the Specifications. Costing for the latter option will be provided in subsequent correspondence.
 - c. The GTRI rates used are those applicable for the 1978/1979 fiscal year, ending June 30, 1979. Labor and retirement rates for the next fiscal year will increase by approximately 9.5% and 0.68%,

respectively, with the overhead rate remaining constant--giving an overall increase of approximately 10.18% on all labor charges.

Since the design, production and installation of EWES equipment will extend over approximately four years, an increase of approximately 10% per year is suggested to cover increased labor and material costs over such a period.

2. Special test equipment is included in each site cost, and a cost element for spares and sea freight for a small number of items has been included in the overall system cost. However, the following costs have NOT been included:

- a. The cost of transporting the bulk of the system from Atlanta, Georgia, to Woomera, Australia, via two USAF C5 aircraft.
- b. The cost of aircraft for system acceptance testing in Australia.
- c. The cost of the pods for the transponders and any required certification testing of these pods.
- d. The cost of any motor transport requirements such as
 - 1) One-sixteen ton and one ten-ton prime mover and any other necessary vehicles which will be used to relocate sites.
 - 2) One sixty-ton crane to facilitate antenna removal for maintenance or prior to site relocation.
 - 3) One truck tanker to refuel each remote site.
- e. The cost of additional site works which may be necessary as a result of computer flooring and screening requirements at the Central Site and more complete pad requirements at each Remote Site.

3. A figure of \$1.374 M has been included to cover the cost of system spares requirements for a period of three years. This figure has been based on both estimates by EES engineers and the recommendations of equipment manufacturers where appropriate. However, the resultant overall figure appears somewhat low considering the location of the EWES and a project estimate of \$2.4 M; based on 20% of hardware costs of approximately \$12 M, is recommended.
4. Estimates are based upon a purchase of the entire EWES system; non-recurring engineering (NRE) costs given on each site refer to certain discrete items. If any one site is purchased without purchasing the other sites, a revised total NRE must be considered.
5. Certain items have increased in price due to re-evaluation since the September, 1978, preliminary cost estimates were submitted. In certain cases the quantity of items, such as Training Devices, were erroneously predicted and the revised estimates reflect the appropriate cost. Also, the total Cost Estimate includes items offered as options during the preliminary estimating phase of this program. These items are as follows: Personnel Training Option I; Shipping Costs; Three-year Spares; Upgraded Documentation; and, General Test Equipment.

III. ESTIMATED COSTS

1. EWES SYSTEM COST BREAKDOWN

SITE 1	\$4,900,666
SITE 2	4,520,366
SITE 3	5,063,115
SITE 4	4,699,633
EWES COMPUTER SOFTWARE	1,166,465
CENTRAL CONTROL FACILITY	1,025,365
COMPUTER HARDWARE & TIMING SYSTEM	\$355,556
COMPUTER MAINTENANCE CONTRACT (3 yr.)	34,800
OCR	246,231
COMM/DATA/ LINK/TEL.	388,778
DEBRIEF FACILITY EQUIPMENT	100,841
DEBRIEF COMPUTER MAINTENANCE CONTRACT (3 yr.)	23,700
TRANSPONDER PODS (Qty. 8)	<u>712,635</u>
SUB-TOTAL	\$22,212,786

III. ESTIMATED COSTS (continued)

2. EWES -- OTHER COSTS

PROGRAM MANAGEMENT/ADMINISTRATIVE COSTS	\$1,267,509
QC SUPPORT	385,605
INSTALLATION/CHECK-OUT/ACCEPTANCE TESTS:	
US INSTALLATION & ACCEPTANCE TESTS	1,530,873
AUSTRALIAN INSTALLATION & ACCEPTANCE TESTS	910,536
AUSTRALIAN TRAVEL/PER DIEM (25 PERSONNEL) FIELD SERVICE REPRESENTATIVE (1 MEMBER, 6 MOS)	167,960
PERSONNEL TRAINING OPTION I	252,838
SHIPPING*	30,000
SPARES (3 YR)	1,374,001
UPGRADED DOCUMENTATION	1,486,907
GENERAL TEST EQUIPMENT	<u>424,751</u>
SUB-TOTAL	\$7,830,980
GRAND TOTAL (ITEM I. plus ITEM II.)	<u>\$30,043,766</u>

3. EWES OPTION ITEM COSTS

COMMUNICATION REPEATER	55,606
SPARES (1 YR) IN LIEU OF 3 YR SPARES	763,629

*NOTE: Major bulk of equipment to be shipped via two C-5 aircraft. This cost reflects sea-freight of remaining items.

III. ESTIMATED COSTS (continued)

4. NRE -- REMOTE SITES

MTI	\$ 68,687
PEDESTAL	263,593
TRAINING DEVICE	42,998
THREAT DISPLAYS	179,128
RRTS DISPLAYS	543,825
REMOTE SITE SOFTWARE	<u>442,217</u>
TOTAL	\$1,540,448
NRE PER REMOTE SITE	\$ 385,112

III. ESTIMATED COST (continued)

5. EWES SITE 1

NRE	\$385,112
Antennas	645,939
MTI Cancellers (Qty. 4)	220,591
Pedestals & Trailer	307,766
Console	141,960
Air Conditioning	26,246
Receiver	480,251
Receiver Integration	185,615
Command Trailer	136,596
Controls	172,286
Generators	35,580
Cabling (Power)	8,000
Transmitters, Modulators and PRF Generator	372,645
Ferrite Modulators (Qty. 2)	109,654
Threat Displays and Software	179,178
Threat Radar Interface Microprocessor	78,000
Remote Site Computer	80,068
Remote Site Maintenance Contract	18,000
Training Devices (Qty. 2)	108,010
Reference Radar System	339,750
RRTS Displays	357,680
Optical Tracking	90,546
System Engineering Testing	418,578
Time Code Generator	<u>2,615</u>
TOTAL	\$4,900,666

III. ESTIMATED COST (continued)

6. EWES SITE 2

NRE	\$385,112
Antennas	301,990
MTI Cancellers (Qty. 2)	114,783
Pedestal & Trailer	349,999
Console	141,960
Air Conditioning	26,246
Receiver	409,067
Receiver Integration	185,615
Command Trailer	136,596
Controls	172,286
Generators	35,580
Cabling	8,000
Transmitters, Modulators and PRF Generator	490,752
Ferrite Modulators (Qty. 2)	109,654
Threat Displays and Software	159,479
Threat Radar Interface Microprocessor	78,000
Remote Site Computer	80,068
Remote Site Maintenance Contract	18,000
Training Devices (Qty. 2)	108,010
Reference Radar System	339,750
RRTS Displays	357,680
Optical Tracking	90,546
System Engineering and Testing	418,578
Time Code Generator	<u>2,615</u>
TOTAL	\$4,520,366

III. ESTIMATED COSTS (continued)

7. EWES SITE 3

NRE	\$385,112
Antennas	434,556
MTI Cancellers (Qty. 3)	164,783
Pedestal & Trailer	370,425
Rotator	118,991
Console	141,960
Air Conditioning	26,246
Receiver	527,599
Receiver Integration	185,615
Command Trailer	136,596
Controls	172,286
Generators	35,580
Cabling	8,000
Transmitters, Modulators and PRF Generator	484,154
Ferrite Modulators (Qty. 3)	164,481
Threat Displays and Software	159,479
Threat Radar Interface Microprocessor	78,000
Remote Site Computer	80,068
Remote Site Maintenance Contract	18,000
Training Devices (Qty. 3)	162,015
Reference Radar System	339,750
RRTS Displays	357,680
Optical Tracking	90,546
System Engineering and Testing	418,578
Time Code Generator	<u>2,615</u>
TOTAL	\$5,063,115

III. ESTIMATED COSTS (continued)

8. EWES SITE 4

NRE	\$385,112
Antennas	350,000
MTI Cancellers (Qty. 1)	62,170
Pedestals & Trailer	396,282
Console	196,760
Air Conditioning	26,246
J-Band and I-Band Controls	172,286
Receiver	577,629
Receiver Integration	185,615
Command Trailer	136,596
Generators	35,580
Cabling	8,000
Transmitters, Modulators and PRF Generator	404,800
Ferrite Modulators (Qty. 2)	109,654
Threat Displays and Software	159,656
Threat Radar Interface Microprocessor	78,000
Remote Site Computer	80,068
Remote Site Maintenance Contract	18,000
Training Devices (Qty. 2)	108,010
Reference Radar System	339,750
RRTS Displays	357,680
Optical Tracking	90,546
System Engineering and Testing	418,578
Time Code Generator	<u>2,615</u>
TOTAL	\$4,699,633

III. ESTIMATED COSTS (continued)

9. RAAF EWES SPARES

REMOTE SITE SPARES:

<u>1 year</u>	<u>3 years</u>	
7,000	8,000	Antennas
105,000	155,000	MTI
88,000	220,000	Pedestals & Trailer
1,240	1,500	Console
80,000	120,000	Receiver
1,220	13,360	Air Conditioning/Heater
1,760	4,868	Command Trailer
2,380	4,070	Controls
2,000	16,000	Generators
3,200	4,200	Cabling (power)
79,600	89,550	Transmitter and Modulator
6,400	8,600	Ferrite Modulator
43,022	125,324	Threat Displays and Software
46,299	138,897	Remote Site Computer
11,600	13,050	Training Device
54,360	81,540	Reference Radar System
48,900	76,241	Displays
14,050	18,550	Optical Tracking
596,031	1,098,750	SUB-TOTAL

CENTRAL AND DEBRIEF SPARES:

94,738	175,211	Computer System Hardware
2,000	4,800	Voice Record/Replay System, Plotter,
		Timing System Hardware
30,000	39,000	OCR
25,500	38,000	Comm/Data/Link
15,360	18,240	Transponder Pods
167,598	275,251	SUB-TOTAL

<u>763,629</u>	<u>1,374,001</u>	GRAND TOTAL
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**ELECTRONIC WARFARE ENVIRONMENT SYSTEM (EWES)
SPECIFICATION CONTRACT**

**FINAL REPORT
AUSTRALIAN CAPO NO. C338079**

1 October 1979

**Joe K. Parks
Project Director**

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ELECTRONIC WARFARE ENVIRONMENT SYSTEM (EWES)
SPECIFICATION CONTRACT
FINAL REPORT
AUSTRALIAN CAPO NO. C338079

1. INTRODUCTION

The Georgia Tech Research Institute (GTRI)* has completed the technical and management specifications for an Electronic Warfare Environment System (EWES) required by CAPO C338079 for the Government of Australia and the Royal Australian Air Force (RAAF). This project had the sponsorship of the Crossbow-S Committee, USAMIA, which served as the classification authority. The basic objectives of this contract were to compile a group of technical specifications and cost estimates for the EWES which will consist of four remote radar sites, a central site, and a debrief site (together with computerized control), four reference radar tracking systems and a centralized communications system. The objectives of this CAPO have been fulfilled as follows:

- A. GTRI developed a set of preliminary cost estimates for the EWES system and presented these preliminary cost estimates to the RAAF during visits to GTRI's facility by RAAF personnel during September, 1978, within approximately six weeks of the contract initiation date of August 4, 1978.
- B. GTRI submitted the final cost estimates for the EWES program on June 1, 1979. Emphasis was placed upon the details of the cost estimates, and all of the cost information, including labor rates, material costs, and subcontract details were shared with the RAAF local representative.
- C. GTRI completed the technical and management specifications for the EWES system and delivered twelve (12) copies of this specification to the Australian Embassy through U.S. Government channels on August 29, 1971. This specification consisted of seven volumes and approximately 1500 pages of material. A table of contents for the specifications is given in Appendix I.

*Note: GTRI is the contracting agency of the Georgia Institute of Technology.

- D. As a part of the Management Specification, GTRI proposed an Australian Industry Participation (AIP) plan by which GTRI would manage the prime contract in conjunction with services supplied by Australian industry personnel. As a supplement to this plan GTRI presents in this report further AIP details, particularly with regard to the benefits as well as additional costs (normally called "penalties") which will accrue to the Australian government as a result of AIP. These details are given in Section 2 of this report.

Additional information given in this report is as follows:

- (1) Specification areas of the EWES System requiring expansion if the EWES is offered as an "open tender" request for proposal (RFP).
- (2) A discussion of final contract cost for this CAPO.
- (3) An evaluation of program feasibility based upon the experience of GTRI.

With the submission of this report, GTRI will have satisfied the contractual requirements of Australian CAPO No. C338079.

2.0 AUSTRALIAN INDUSTRY PARTICIPATION

2.1 General

The general nature of GTRI's proposals regarding AIP were given in Volume II, Paragraph 7.2 and 7.3, of the GTRI produced EWES Specifications. The Specifications basically set forth that GTRI or the Prime Contractor will team with an Australian subcontractor who will generally accomplish the following:

- A. The Australian subcontractor will arrange for the procurement and installation of general purpose EWES equipment in Australia which will not be required for the testing or manufacture of other EWES equipment in the United States.
- B. The Australian subcontractor will provide a number of engineers and technicians who will assist GTRI in EWES equipment design, manufacture, testing, quality assurance, documentation, installation, and training.

Both aspects of this program have the purpose of providing the Australian Government with an on-going support capability. The purpose of using the services

of the Australian contingent of engineers and technicians is to provide substantial transfer of technology in electronics warfare techniques (where U.S. security rules permit) in the design, manufacture, and testing of such sophisticated equipment.

Table 1 summarizes the AIP "Value" which is estimated to be approximately 12% of the total EWES cost.* However, in order to achieve this AIP Value, there will be some offsetting costs which will be incurred by the Australian Government. These offsetting costs mainly result from the management complexities of the suggested teaming arrangement with an Australian subcontractor, possible lack of familiarity of Australian subcontractor technical personnel with the radar and EW technology involved, and the cost differential of employing Australians as opposed to US engineers. These offsetting costs are referred to as AIP "penalties."

GTRI understands that the 12% AIP Value mentioned above is somewhat lower than the percentage generally achieved under similar Australian contracts. It will be shown in Section 2.2.1, however, that the Australian personal services (labor content) of the AIP represents approximately 15% of the total personal services required on the program. The exact percentage of Australian personal services will depend upon the amount of equipment subcontracted by GTRI, which in turn limits GTRI's personal services requirements. The consideration of the numerical value of the AIP should not, however, eclipse the significant intangible value of the transfer of technology offered by GTRI.

2.2 AIP Value

The beneficial contribution of AIP Value to the Australian Government is derived in this section by considering the Australian subcontractor's technical personal services contributions and the subcontracted items scheduled for Australian industry procurement.

2.2.1 Personal Services Contribution

The manpower, or personal services, contributed by AIP is shown in Table II. The AIP Value of Australian manpower is derived by multiplying the total engineering or technical manpower in man-months by the appropriate average GTRI rate. Since the Australian labor rates are not readily available to GTRI, it was assumed that Australian personal service rates are synonymous with GTRI rates for similar personal services. The engineering rate used is \$45,000 per year and the

*Note: Total EWES estimated cost will be \$30,500,000 when costs of items in paragraphs 2.2.2B and 2.2.2D are included. These items were not included in the final cost estimates submitted in the June 1, 1979 report.

Table I

SUMMARY OF AIP VALUE

<u>Item</u>	<u>AIP Value</u>
Engineering Personal Services	\$1,856,000
Technician Personal Services	490,000
DRCS Personal Services	315,000
Australian Contracts	1,000,000
Total AIP Value	\$3,661,000

Table II

AIP PERSONAL SERVICES CONTRIBUTION

<u>AIP Team Member</u>	<u>AIP Period Per Member (Man-Months)</u>	<u>Total AIP Period (Man-Months)</u>
<u>Engineering</u>		
Team Leader	36	36
10 Electronics Engineers	34	340
1 Mechanical Engineer	34	34
1 Computer Hardware Engineer	34	34
1 QA Representative	29	29
1 Documentation Representative	22	<u>22</u>
TOTAL		495
<u>Technician</u>		
5 Electronics Technicians	34	170
1 Mechanical Technician	34	34
1 Computer Programmer	22	<u>22</u>
TOTAL		226

Personal Services Value Calculation

1. Engineering 495 man-months = 41.25 man-years, 41.25 man-years
X \$45,000 per man-years = \$1,856,000
2. Technician 226 man-months = 18.833 man-years, 18.833 man-years
X \$26,000 per man-years = \$490,000

Table II - Continued

AIP PERSONAL SERVICES CONTRIBUTION

Notes to Table II:

1. The GTRI average engineering rate is based on a salary of \$24,300 per annum, an overhead charge of \$18,300 and a retirement charge of \$2,400, resulting in a total of \$45,000 per annum.
2. The GTRI average technician rate is based on a salary of \$14,000 per annum, an overhead charge of \$10,600 and a retirement charge of \$1,400 resulting in a total of \$26,000 annum.
3. On the basis of accommodation and local transportation being provided by the Australian Government, the overseas rate for GTRI engineers and technicians would increase by approximately \$10,000 per annum per individual over the rates cited in item 1 above.
4. All rates are based on the State of Georgia Fiscal 1979 (July 1, 1978 through June 30, 1979) average GTRI personal service rates and are expressed in United States dollars.

technician rate used is \$26,000 per year. These figures include the costs of overhead and retirement. The computed results are shown in Table II. A total manpower contribution of 495 man-months (41.25 man-years) of engineering and 236 man-months (18.67 man-years) of technician effort equates to approximately \$2,346,000 in AIP Value. In addition, it is believed that eighty-four (84) man-months or seven (7) man-years of Australian Defense Research Center Salisbury (DRCS) personnel will be utilized at a rate of \$45,000 per year or a total of \$315,000. This amount, when summed with the previous total, gives a grand total AIP Value for personal services of approximately \$2,661,000.

As indicated above, the Australian manpower effort proposed for direct utilization by GTRI in the design, manufacture, test and installation of EWES equipment, and in administrative functions, is approximately sixty-seven (67) man-years. In addition, approximately two man-years of Australian subcontractor effort will be used for procurement and installation of the Com/Data Link and the Diesel Generator equipment. Since the studies carried out to date indicate that approximately four-hundred and fifty (450) man-years will be required to complete the GTRI aspects of the project, the Australian personal services effort represents approximately 15% of the total manpower requirement.

2.2.2 AIP Value of Proposed Australian Contractual Commitments

The opportunity for Australian industry to produce substantial portions of EWES equipment will be limited because of the specialized nature of the EWES equipment and the fact that the EWES range as a whole must be tested in the United States prior to installation in Australia. The following areas, however, do provide opportunity for Australian industry and are seen as possibly minimum procurements at this time:

- A. The procurement and installation of the range radio link, telephone equipment and the supply of associated spares at a total estimated cost of \$350,000.
- B. The procurement of two prime movers, one crane and one diesel tanker, and the supply of associated spares, at a total estimated cost of \$406,000.
- C. The procurement of eight diesel generators (complete with trailers), four calibration mast generators and the supply of associated spares, at a total estimated cost of \$160,000.

- D. The provision and installation of the central site mast, at a total estimated cost of \$50,000.

The total AIP Value of these proposed minimum contractual commitments is approximately \$1,000,000. However, note should be taken that all site civil works requirements will be the responsibility of the Australian government, and, therefore, will be completed through Australian participation.

2.2.3 Other AIP Value

GTRI is unable to offer other possible manufacturing contracts to Australian industry which would represent additional AIP offsets in areas other than the EWES because GTRI is a non-profit State of Georgia Research Institution. However, as reflected by the EWES specification, every effort will be made to involve Australian industry in EWES fabrication areas other than those listed above, provided the required industry products are competitive in terms of quality, overall price and delivery time.

Since GTRI is a non-profit institution, it is in the best position to determine the most optimum method of producing certain EWES subsystems, whether by subcontract or at its own facility. Thus the overall lowest cost of EWES to the Australian Government can be achieved by utilizing such a non-profit organization, and significant, although as yet undetermined, AIP Value can be realized.

2.2.4 Total AIP Value

The overall measurable economic AIP Value resulting from the use of Australian personal services (manpower) and the proposed contractual commitments with Australian industry is approximately \$3,661,000. This represents approximately 12% of the total EWES system costs of \$30,500,000. This figure includes the costs outlined in paragraphs 2.2.2 (B) and 2.2.2 (D) above. Further details of the EWES system costs may be obtained from the final report on Cost Estimates dated June 1, 1979, which was submitted by GTRI as a part of this contract.

2.3 AIP Penalties

The offsetting costs (or AIP Penalties) which will accrue to the Australian Government as a result of using Australian personal services and Australian industry for specific procurements are discussed in this section. Table III summarizes the total AIP Penalties discussed below.

Table III

AIP PENALTIES

<u>Item</u>	<u>AIP Penalty</u>
Personal Services or Labor Rate Penalty	\$1,149,000
Supervision Penalty	125,000
Administrative Manpower Penalty	175,000
GTRI Administrative Penalty	84,000
Total AIP Penalty	\$1,533,000

2.3.1 Labor Rate Penalty

The personal services (labor rate) cost to the Australian government from supporting twenty-one (21) Australian civil and industrial personnel in the United States is estimated to be approximately \$70,000 per engineer and \$50,000 per technician. These rates were arrived at through discussion with the RAAF representative. These salaries are greater than those for United States engineering and technician personnel by \$25,000 per year and \$24,000 per year, respectively. Thus the amount of time spent by Australian personnel in the United States adds to the costs which will accrue to the Australian Government. As shown in Table IV, the estimate for this penalty is \$1,149,000. Estimates provided by the RAAF representative for the cost of Australian personnel at Woomera indicate that no offsetting costs are applicable for the Australian integration and test period, since the charges for Australian personnel at this location appear to be similar to those applicable to GTRI personnel for whom accommodation and transport are provided.

2.3.2 Supervision Penalty

Some additional GTRI engineering supervisory effort will be required as a result of AIP because of the inexperience of Australian engineers and technicians in EW and radar equipment design and fabrication. It is also anticipated that this inexperience will result in some manpower inefficiency during the early stages of the project. Both of these factors, which are taken into account in the calculation of Table V, will result in an estimated cost penalty of \$125,000.

2.3.3 Additional Manpower Penalty Due to Additional Australian Administrative Requirements

As a result of the size and tour length of the Australian subcontractor team and the complex nature of such a contract, GTRI anticipates that administrative manpower will also be required on the subcontractor team. For the purpose of this calculation, this has been restricted to one team leader who will primarily be responsible for administrative and limited technical control of Australian subcontractor personnel and for contractual, fiscal and administrative liaison with the Australian office of the Australian subcontractor. This team leader will be located in the United States for approximately two and one-half years at an estimated cost of \$70,000 per annum, giving an AIP cost penalty of \$175,000.

Table IV

PERSONAL SERVICES ON LABOR RATE PENALTY

<u>AIP Team Members</u>	<u>AIP Period Per Member (Months)</u>	<u>United States Period Per Member (Months)</u>	<u>Total Penalty (Man-Months)</u>
<u>Engineering</u>			
10 Electronics Engineers	34	28	280
1 Mechanical Engineer	34	28	28
1 Computer Hardware Engineer	34	28	28
1 QA Representative	29	23	23
1 Documentation Representative	22	16	16
<u>Technician</u>			
5 Electronics Technicians	34	28	140
1 Mechanical Technician	34	28	28
1 Computer Programmer	22	16	16

- NOTES: 1. Average Australian engineering rate of \$70,000 less average GTRI engineering rate of \$45,000 = \$25,000. Engineering penalty for period of 375 man-months or 31.25 man-years at \$25,000 = \$781,000.
2. Average Australian technician rate of \$50,000 less average GTRI technician rate of \$26,000 = \$24,000. Technician penalty for period of 184 man-months or 15.33 man-years at \$24,000 = \$368,000.
3. On the basis of accommodation and local transportation being provided, the overseas rate for GTRI engineers and technicians would increase by approximately \$10,000 per annum.

Table V

SUPERVISION PENALTY

<u>AIP Team Member</u>	<u>Penalty or Training Period Per Member (Months)</u>	<u>Total Penalty Period (Man-Months)</u>
<u>Engineering</u>		
10 Electronics Engineers	2 mos.	20 mos.
1 Mechanical Engineer	2 mos.	2 mos.
1 Computer Hardware Engineer	2 mos.	2 mos.
1 QA Representative	1 mo.	1 mo.
1 Documentation Representative	1 mo.	1 mo.
<u>Technician</u>		
5 Electronics Technicians	2 mos.	10 mos.
1 Mechanical Technician	2 mos.	2 mos.
1 Computer Programmer	1 mo.	1 mo.

2.3.4 Penalty Due to Additional GTRI Administrative Costs

GTRI will incur additional administrative costs because of the complexity of the proposed AIP. These will result from the following considerations:

- A. The additional secretarial workload associated with the Australian subcontractor team for a period of two and one-half years is estimated at \$48,000.
- B. Approximately twelve (12) man trips to Australia will be needed for the purpose of selecting an Australian subcontractor, conducting subsequent contract negotiations and coordinating meetings in Australia. These requirements are estimated to cost \$36,000.

These additional administrative costs will result in an AIP cost penalty of approximately \$84,000.

2.3.5 Equipment Procurement Penalty

At the present time, no additional charges are added by GTRI for project equipment procured by GTRI from other sources because GTRI is a non-profit corporation. However, the current AIP proposal contemplates procurement of some items (such as the radio link and the generator equipment) by an Australian subcontractor. Since this subcontractor will probably add general and administrative (and possibly profit) charges to the base equipment price, the cost of these items will be higher than those estimated by GTRI. This increase is seen as a cost penalty resulting from AIP. The actual amount cannot be calculated at this time, since the determining factors will depend on the corporate policy of the Australian subcontractor selected and the actual equipment subject to such procurement.

2.3.6 Total AIP Penalty

As shown in Table III, the overall cost penalty resulting from the use of Australian manpower and proposed contractual commitments with Australian industry is approximately \$1,533,000. This penalty will increase slightly as a result of equipment procurement by the Australian subcontractor (as mentioned in paragraph 2.3.5).

3.0 AREAS FOR SPECIFICATION EXPANSION

As required in the amended CAPO, the Specifications presented to the RAAF are based upon the assumption that GTRI will serve as prime contractor. Should

the RAAF use the current EWES specification for an "open tender" solicitation of RFPs, GTRI recommends that a number of areas of the specification be expanded to improve the quality and accuracy of the responses received and ensure that the system which eventually is produced will meet conceptual and operational requirements. These areas are detailed in the following paragraphs.

3.1 Threat Descriptions and Parameters

In order to meet RAAF flexibility and commonality requirements, the specifications for each threat system as submitted by GTRI were made as broad as possible. This has resulted in a technical specification in which threat parameters and threat modes of operation are not always readily obvious. Therefore, prior to use in an open tender, a detailed description of each threat together with a comprehensive listing of actual and required threat parameters and performance data should be included.

3.2 Antennas

The current antenna specifications presume that the prime contractor has previously produced antennas similar to EWES antennas. Therefore, specification expansion requirements in this area will include additional information on antenna configurations and fabrication.

3.3 Pedestals and Antenna Trailers

Although the Specification briefly describes the requirement for each threat pedestal to be merely moved using the antenna trailer but operated off a fixed pad, additional detail is required on how this system should be implemented. Additional detail is also needed for on-site pad requirements. Such information is considered necessary for open tender use of the Specification.

3.4 Threat Consoles/Displays/Controls

The existing EWES Specification will need additional details of specific threat console requirements, information on the displays and the manner in which they are used. An expansion of these areas will be necessary to ensure that potential prime contractors produce functionally equivalent equipment.

3.5 Optics

The only additional information which needs to be included in the optical subsystem specification is detail on the amount of degradation which needs to be applied to each system and the manner in which this should be achieved.

3.6 Radar Interface Microprocessor

Specific microprocessor parameters are the only additional information considered necessary for this element of the EWES Specification.

3.7 Transmitter/Modulator/PRF Generator

Transmitter, modulator and PRF generator specifications may need expansion to ensure that the various open tender responses are based on similar equipment design approaches.

3.8 RRTS/Transponder

The RRTS and its associated transponder have yet to be fully developed in hardware. Hence, the specification for this EWES subsystem needs to be updated to include any new design approaches which result from developments occurring prior to contract negotiations for the implementation of the full EWES program. Also, for any open tender bid, the Specification would need to be expanded to include additional detail on RRTS elements and signal processing requirements.

3.9 Receivers

Although the submitted EWES Specification of the general signal processing elements for IF, video and tracking portions of each threat receiver is adequate, specific threat requirements have generally not been included. Additional threat data as a part of a specification expansion will rectify this situation, provided adequate attention is given to such parameters as gain and bandwidth requirements. Also, inclusion of additional information on each receiver front end configuration is recommended.

3.10 System Test and Acceptance

Brief details on system test and acceptance requirements are included in the EWES specification. However, for open tender use, GTRI recommends that this area of the Specification be expanded in order to ensure that all elements of the range, and the system as a whole, fully meet operational and technical requirements.

3.11 General

In addition to an expansion of areas of the specification mentioned above, GTRI recommends that the contractors proposed for participation in any open tender process be carefully selected to ensure that they have both the access necessary to any classified data subsequently required, and proven experience in

the design and production of functionally equivalent tracking radars and the integration of other EW range systems.

4.0 CAPO C338079 COST DATA

Under CAPO C338079, GTRI contracted to carry out the EWES specification and cost estimating task at a not-to-exceed cost of \$200,000. The final cost for this effort was \$220,000. However, the additional \$20,000 has been absorbed by the Systems and Techniques Laboratory's overhead account, and the extra expenditure will not be changed to the Australian Government.

5.0 PROGRAM FEASIBILITY

GTRI has been involved in the design and manufacture of Electronic Warfare range equipment for the United States Defense Forces for a number of years and is well aware of the critical importance that EW training plays in reducing aircraft attrition. In carrying out CAPO C338079 tasks for the RAAF, GTRI has reached the considered conclusion that the EWES program, as specified, is technically feasible. Moreover, GTRI fully agrees with the configuration proposed for the range and considers that the range concept adopted should fully satisfy the RAAF requirement in a cost effective and capable manner. Although the program contains a number of innovations which are under current development in the United States, these are considered to pose few problems in the implementation of the EWES.

6.0 CONCLUSION

GTRI is pleased to have had the opportunity to be associated with the RAAF in such an important project as the EWES and will continue to provide any future assistance possible in the support of this program. As requested in previous correspondence, GTRI will prepare at its own cost an unsolicited proposal for the production of the EWES, when program funding is assured. However, GTRI is also willing to participate in future program activity, either as a subcontractor or management consultant and would be willing to contract for future updating of the Technical Specifications prior to the initiation of complete EWES program funding should such efforts be contemplated.

GTRI is grateful for the able assistance of RAAF representative Wing Commander Joe Pfitz. His tireless energy, unique resourcefulness, and complete dedication to this effort has made GTRI's association with him most beneficial.

**ELECTRONIC WARFARE ENVIRONMENT SYSTEM (EWES)
SPECIFICATION CONTRACT**

APPENDIX I

Appendix I

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