

*New Title
Light House*

OPERATION LIGHTHOUSE

INITIAL SUMMARY STATEMENT

(Second Issue)

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Trials Planning Branch,
AWRE
Aldermaston.
22nd July, 1958.

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OPERATION LIGHTHOUSE

1. Introduction

This paper is intended to give, in outline, the anticipated nature and scope of Operation Lighthouse and to indicate the demands likely to be made on the Air Ministry, the Ministry of Supply and other Departments. This, the second issue, supersedes that dated 31st March 1958.

2. Scope

2.1 For the purpose of immediate planning, it is assumed that Operation Lighthouse will be mounted at Maralinga, South Australia, in the latter half of 1959. The trial will be on similar lines to Operation Buffalo, held in 1956. There will be full Target Response and Indoctrinee participation, the Indoctrinee force including both Service and Civil Defence personnel.

2.2 For the purpose of this statement, it is assumed

- (a) that the trial may consist of four rounds, the first of which will be fired on the existing 300 ft. tower at Gona; the other three rounds will be fired from balloon systems, and that
- (b) Target Response and Indoctrinee participation will be confined to the first round with one or two minor exceptions.

2.3 A specification of the balloon and hydrogen supplies has been sent by SSEPT to DAW/T. This covers balloon firings at Lighthouse if supplies are produced according to the following programme:

- (i) Place orders for the balloon systems about October 1958.
- (ii) Order in October 2,000 gas cylinders to raise the total available for Lighthouse to 7,000.

2.4 The MRE assumption is that not more than 20,000 manhours of effective engineering effort available from the Maralinga Range Support Unit (MRSU) can be allocated to the Target Response programme at present proposed by the Ministry of Defence Target Response Working Party. This effort is associated with about eleven Target Response Groups, viz. Structures, Land Service Targets, Air and Missile Targets, Electronics, Thermal, Nuclear, Biological, Lethality, User Trials, Indoctrination and Instrumentation. Planning is already well advanced and a tentative time-table has been prepared.

3. Staff

3.1 Planning is proceeding on the basis of a total of 200 officers in MRE Groups, including those taking part in Minor Trials concurrent with Operation Lighthouse, and 70 officers in the Target Response Groups. It is estimated that there will be accommodation in Maralinga Village for 290 officers of the

[REDACTED]

above groups leaving a balance of accommodation for 20 officers which must be held against contingencies at this stage of the planning. It is presumed that the Indoctrinees will be accommodated in a tented camp which could be somewhere near Roadside.

3.2 To fill the complement of some of the ANRE Groups it will almost certainly be necessary to ask Service Departments to provide staff. Experience on Operation Antler showed that this provides welcome indoctrination of the men concerned. It is essential that a proportion of the attached staff should be seconded to ANRE to undergo preliminary training for periods up to a month or more, before departing for Maralinga. ANRE Security clearance for these chosen personnel should begin at an early stage of the planning.

3.3 At this stage of the planning, it must be assumed that ANRE and Target Response Groups taking part will be of similar composition to those on Operation Buffalo or Antler. As will be seen from the tentative time-table attached to this document, (Appendix A), it is important that the Group compositions and tasks should be considered as early as possible and the requirements arising specified at an early stage so that site layouts and drawings can be forwarded without delay through the Ministry of Supply to the Maralinga Range Support Unit.

4. Requirements on the Air Ministry

4.1 The Air Support required for Lighthouse is likely to be substantially the same as that provided for Antler, and these requirements are set out in some detail in Appendix B.

Attention is drawn particularly to the following:-

- (i) A balloon unit will be required and it will be necessary to call on the services of an aircraft to shoot down a balloon in the event of a breakaway.
- (ii) Aircraft will be called upon to carry out a pre-firing warning patrol along certain sections of the Trans-Continental Railway.
- (iii) It is assumed that the decontamination of all R/F aircraft is an R/F responsibility. The Decontamination Unit will require an R/F Medical Officer specializing in radiation and preventive medicine who during the trial will be responsible to the ANRE Health Physics Group Leader for R/F crew Health Physics. ANRE will cease to have Health Physics responsibility for the R/F personnel and equipment from the time the R/F personnel leave Maralinga. The R/F will require Health Physics Control at Edinburgh Field.

4.2 It is important that close liaison between the Air Ministry (Ops. INT) and ANRE should be maintained and extended at an early date to include the R/F Task Group appointed to give air support to Operation Lighthouse.

5. Facilities Required from the Ministry of Supply:

The Ministry of Supply is required to provide facilities covering the engineering, domestic and logistic support for the Trial, and the provision and operation of essential outstations (Appendix C). The increases relative to support for Antler are caused by the addition of the Target Response and Indoctrinee Groups.

5.1 Test Area Installations

5.1.1 In the Test Areas civil and electrical engineering works and field works will be necessary together with the provision of telephone services and cabling. It is assumed that the heavy civil engineering (Appendix D) will be the responsibility of the Department of Works and its contractors; the field works (Appendix E) will be undertaken by the Sappers in the Range Support Unit; the Range Support Unit's Electrical and Mechanical Group will carry out the electrical works (Appendix E) and the Australian EIG's Department's staff at the Range will supply the telephone services and lay new control cables (Appendix F).

5.1.2 To assist in the maintenance of security and to avoid two construction organisations operating in the same parts of the Test Area simultaneously, it is proposed that the heavy civil engineering should be started by the Department of Works in 1958 in order to have completed work in the Forward Area before installation of targets and instrument sites. In the same period the Range Support Unit Sappers may be expected to rehabilitate and modify the existing balloon firing site at Taranaki.

5.1.3 During the main construction phase (Phase 1) from mid-March, 1959 to mid-August, 1959, the Sapper component at the Range Support Unit will be required to undertake test and target installations and other fieldworks. The total effective engineering effort involved will be about 60,000 manhours of which ANRE will require about 40,000. A force of 80 Sappers will be available to provide this effort, and it will require domestic and logistic backing from the other Range Support Unit Groups. Also in this phase the Electrical and Mechanical component of the Range Support Unit will be required to carry out field electrical installations and to provide assistance to the advance party of the scientific staff.

5.1.4 The Operational Phase (Phase 2) which starts mid-August and ends three weeks after the last round has been fired, provides the Sapper force with two tasks. First, 2,100 manhours of engineering effort are required each week in support of ANRE scientific and operational tasks. Secondly, 2,000 manhours of G.D. technical and engineering assistance are required each week for allocation to scientific staff and groups. These two tasks, amounting to 4,100 manhours each week, can be met by a Sapper force with a strength of 80.

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5.1.5 The Ministry of Supply is requested to make the necessary arrangements with the Australian Dept. of Works and FIG's Department to enable them to complete their tasks.

5.2 Transport and Mechanical Handling Equipment

5.2.1 The transport, mechanical handling equipment, special vehicles and plant provided for Antler was satisfactory for the needs of the Antler scientific staff and just adequate for the Range Support Unit as then composed. Light vehicles were at times barely sufficient to meet all requirements originated by the Range engineers. The cranes provided for borehole work proved impracticable, resulting in a heavy unforeseen demand on cranes allocated to scientific tasks. Provision of vehicles at Lighthouse on the same scale as for Antler results in an increased requirement for most types of vehicles to cover the larger Support Unit and the Target Response Groups.

5.2.2 Detailed statements of requirements (Appendices H and I) are being prepared and it will be necessary to have an assurance of the extent to which they can be met in sufficient time for a review of the scientific and target response requirements, which will be adjusted to the transport known to be available.

5.3 Assistance to Scientific Staff and Groups

5.3.1 Beginning in May 1959, or earlier, a number of Electrical and Mechanical staff and some G.D. assistants from the Range Support Unit will be required to support the scientific advance parties. These assistants will be needed until the end of the Operational Phase.

5.3.2 During the operational phase it is estimated that up to 40 Range Support Unit staff will be required from time to time to provide direct assistance (engineering, technical and GD) to scientific staff and HQ Groups. At this stage it is not possible to detail the requirements but past experience shows a peak in the initial unpacking period with other peaks immediately following each firing. A few men will be required continuously throughout the phase. Requests will be passed from Trials HQ to the Range Chief Engineer giving, wherever possible, 12 hours notice of the tasks.

5.3.3 In addition a number of Range Support Unit staff will be required to cover duties as orderlies, R/T operators, drivers, vehicle mechanics and plant and crane operators. Typing effort will be required occasionally.

5.4 Domestic and Logistic Support

Throughout the Operational Phase, and the construction phase preceding it, the Range Support Unit will be expected to provide the necessary domestic and logistic support. This will include the provision of quarters, messing, medical attention, main services, workshops, transport and engineer plant servicing, stores handling, Peace Officer guards for secure areas and other village and camp facilities. It will also include messing in

[REDACTED]

the Test Areas and at Roadside, and the necessary backing for the Sapper, Balloon, and Indoctrinee Forces. With the assistance of the RIF and the Australian PMG's staff, the Range Commander will be responsible for the operational maintenance of the external communications and the internal telephone services.

5.5 Permanent Buildings

A small programme of major and minor works and modifications will be required. It is expected that this work will be carried out by the Dept. of Works before 30th June, 1959. Associated with these works will be a few requirements for Support Unit and PMG assistance.

5.6 Alice Road Outstations

The Alice Road outstations at Mount Clarence, Wellbourne Hill and Mulgathing are expected to be used on a similar scale as for Antler. AWStaff, Ministry of Supply, will be asked to Rehabilitate, equip, and man these stations. This will include the use of the civilian staffed Australian Radiation Detection Unit. The MOS will be asked to arrange with the Air Ministry for a Decca operating contract.

5.7 Balloon Systems

The Ministry of Supply is asked to undertake, in conjunction with AMMB, the procurement of three operational balloon systems, with spares

6. Weapon Mounting

6.1 The present 300 ft. tower at Gona limits the use of the surrounding area. For this reason, and also because the Target Response programme as planned requires a contaminating burst, the first weapon should be fired on this tower. The remaining rounds, assumed to be three in number, will be fired from balloons.

6.2 The site at Tufi and Taranski will need modifications to suit present requirements.

7. Meteorology

7.1 It is assumed that as on Buffalo and Antler, meteorology will be the responsibility of the Australian Commonwealth Bureau of Meteorology.

7.2 A requirement will be the provision of adequate met. data over the sight and humidity data local to the explosions and along predicted cloud paths. This entails a requirement on the Air Ministry. See Appendix B.

8. Provisional Time-table

8.1 The main party will arrive at Haralinga about the end of August, 1959 for a possible firing about the end of September. Events leading up to this are given in Appendix A and an outline of the provisional firing programme in para. 8.3 below.

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8.2 Definition of Significant Days

The significant days and times associated with any one firing are:-

- A-Day = Arrival on site of the scientific force.
- SR-Day = The Scientific Rehearsal day, the date of rehearsal of all technical control links including communications, control sequences, etc.
- OR-Day = The date of a full Operational Rehearsal. On this occasion the complete operational firing phase is rehearsed, including the Meteorological forecasting, movement forward into the Test Area by the Scientific and Indoctrinee Forces, setting up of instruments, control sequence testing, withdrawal to Roadside from the Test Area culminating in a dummy firing. In addition, air support is included (cloud sampling Canberra aircraft) and re-entry into the target area is rehearsed. The rehearsal is intended to be carried out with as much similarity to the actual firing as possible. It is expected that only one full Operational Rehearsal, that before Round 1, will be necessary. The subsequent Operational Rehearsals will be confined to the Weapon and Balloon Groups.
- S-Day = The first day of the Standby phase, in which all is ready for a firing at the first suitable occasion as governed by the meteorological situation.
- D-Day = Firing Day. This could be the first day of Standby.
- Z-Hour = Commencement of the Firing Phase, at which the main operational movement forward commences. The aim is to fire six hours after Z-Hour and experience shows this can be done for tower bursts; for balloon rounds it may be eight hours before firing.
- F = Instant of firing.

8.3 Provisional Firing Programme

An idealised programme has been formulated (Appendix A). Throughout the operation, contingency periods may have to be inserted for extended Standby phases whilst awaiting suitable meteorological situations. The dates quoted below, therefore, with the exception of S1 -Day (Standby for Round 1) should be regarded as target dates only.

- SR.1 = 23rd September, 1959.
OR.1 = 27th September, 1959.
S.1 = 1730 hrs. 29th September, 1959.
Earliest possible D.1 = 30th September, 1959.
OR.2 = 2nd October, 1959 (confined to a Weapon and Balloon Operational Rehearsal)

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SR.2 = 3rd October, 1959.
S.2 = 2200 hrs. approx. 5th October, 1959
Earliest possible D.2 = 6th October, 1959.

SR.3 = 10th October, 1959.
S.3 = 2200 hrs. approx. 11th October, 1959
Earliest possible D.3 = 12th October, 1959.

SR.4 = 16th October, 1959
S.4 = 2200 hrs. approx. 17th October, 1959
Earliest possible D.4 = 18th October, 1959.

9. Operational Phases of Each Firing

The activities associated with any one firing will be related to the following three phases:

Preparatory Phase: From the day of arrival on site, or of a previous firing, until the first day of Standby.

Standby Phase: From the declaration of Standby until the declaration of the Firing Phase at some time, dependent on the meteorological forecasts, on any day of Standby.

Firing Phase: From the declaration of the Firing Phase after a favourable meteorological forecast has been given until the firing of the weapon. The commencement of the Firing Phase can be at any hour of the day or night and so can the time of firing.

10. Present State of Planning

Planning is already well advanced with Target Response Groups and to some extent with AIRE, but to meet the September 1959 firing date purchasing, particularly of items with long delivery; or those urgently required, should begin at once.

The Executive is asked to endorse the proposals in the foregoing.



Appendix:

Title

- A Time-table
- B Air Requirements.
- C Facilities Required from the Ministry of Supply.
- D Heavy Civil Engineering Tasks.
- E Fieldworks and Test Area Installations.
- F Electrical Installations.
- G Telephone Services and Cabling.
- H Transport Requirements.
- I Cranes, Mechanical Handling Equipment, Engineer Plant and Special Vehicles.
- J WARSU Assistance to Scientific Staff and Groups.
- K New Permanent Works, Maralinga.
- L Alice Road Outstations.
- M Group Composition.
- N Summary of Group Tasks.
- O Procedure during Operational Phases.





New Zealand
Lighthouse

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Appendix A to

OPERATION LIGHTHOUSE 1959 INITIAL SUMMARY STATEMENT

This time table is based on the following assumptions.

1. There may be four rounds:-
 - (a) 300 ft Tower - Contaminating Round for TR.
 - (b) Balloon Burst
 - (c) Balloon Burst
 - (d) Balloon Burst

2. There will be three firing sites, corresponding to items (a) to (d) above:-
 - (a) Gona Tower - existing.
 - (b) & (d) Taranaki Balloon Site - to be rehabilitated and modified.
 - (c) Tufi Balloon Site - to be modified.

3. The date of firing will be the end of September. In order to produce a programme the first possible day of Firing has been taken as Wednesday, 30th September, and Standby could, therefore, commence in the late afternoon or early evening of 29th September.


With the modern balloon techniques it is considered that a period of five clear days is all that need elapse between rounds, provided that balloon handling has been proved prior to Round 1 by extensive trials both in the U.K. and Australia.

4. It is assumed that modifications to Tufi will be carried out by the Department of Works in 1958. The modifications to Taranaki may be carried out by MARSU also starting in 1958.

5. The responsibility for Health Physics will rest with the Trial Director from the arrival of the Scientific Party, and will end on the departure of the Scientific staff at about D4 + 14.

6. It is assumed that the civil engineer component of MARSU is likely to be:-
 - (1) Approx. 18 up to 28th February, 1959, with the addition of perhaps 6 surveyors and some stores, plant, and drawing office staff in February, 1959.
 - (2) Approx. 80 during Phase 1 from 1st March, 1959, to 1st September, 1959, with some additional E. & M. staff for electrical installations.
 - (3) Approx. 80 including 40 staff for Engineer and G.D. assistance to Groups during Phase 2 from 2nd September, 1959, to D4 + 21, with some additional E. & M. and G.D. staff assisting T.S. Group.
 - (4) Department of Works and G.D. staff and Contractors as necessary up to 15th August, 1959. About 30 Department of Works care and maintenance staff after 15th August, 1959.



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- (5) HQ field staff as necessary from 1st March, 1959, to D4 + 21.
 - (6) Approx 5 officers and 6 men of the Chief Engineer's Staff.

7. This timetable supersedes that dated 8th April, 1958.

Trials Planning Branch,
A.W.R.E.,
Aldermaston, Berks.
22nd July, 1958.

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OPERATION LIGHTHOUSE

TIME TABLE

1958

April	Submit planning statement for endorsement by the Atomic Weapons Trials Executive and obtain approval to plan for a Lighthouse trial of three balloon and one tower round and to undertake expenditure on items with long delivery dates.
4th July	General planning commences.
31st August	TR Programme completed and passed to AWRE, including priorities and engineering effort calculations.
31st August	AWRE engineer requirements with SPT.
During August	Department of Works and MARSU commence Civil Engineering programme.
30th Sept.	Estimate of man-power and engineer equipment and stores passed by AWRE to DAW/T with programme above.
30th November	TR Layout drawings and general specifications complete at AWRE.
30th November approx.	(AWRE and TR engineer stores at AWRE for packing. (Balloon manufacture contract placed.
1st to 31st December	Range C.E. in U.K. for discussion of programme at Ministry of Supply and AWRE.
20th December	Revised stores and equipment lists for Engineer use passed to DAW/T.
31st December approx.	AWRE and TR Engineer stores shipped.

1959

9th January	Final TR Engineer detail drawings at AWRE.
9th Jan.	Number and yield of AWRE rounds indicated for final planning purposes.
23rd January	TR Engineer drawings all despatched to Chief Executive Officer, Haralinga Project.
23rd January to 9th February	Range Commander or one of his staff in U.K. for discussions of logistic and domestic support with Ministry of Supply and A.W.R.E. unless this duty has been carried out by the Second-in-Command.

1952

30th January TR Engineer drawings in Australia.
90 per cent AWRE Engineer drawings in Australia.

31st January Heavy TR equipment at AWRE for shipment.

During Jan & Feb. Annual changeover of MRSU Engineer staff.

8th February Sapper, & Balloon camp sites complete.
Sapper tents erected.

9th February Range Surveyors start site layout.
Engineer stores and equipment positioned and checked.

1st March Construction Phase starts - Phase 1 starts.

1st April Balloon Practices start at RAF Cardington.

30th April Balloon stores complete at AWRE for packing.

15th May Light TR equipment at AWRE for packing.

9th June All balloon stores shipped.

16th June All scientific stores shipped.

16th June approx. Last date of packing for late stores.
SPT Engineer representatives at Range.

17th June RAF decontamination Crew and RAF Regt. HP
Crew at AWRE for training.

18th July approx. Last late stores ship leaves U.K. First Ex-
plosives ship leaves U.K.

Early July Advance Party RAF Task Group in Australia.

July RAF Task Group begin move to Australia.

3rd August SPT and TR Advance Party arrive Maralinga.
RAF transport flights to Maralinga from
RAF Edinburgh Field begin.

5th August approx. Last explosive stores shipped.

By 9th August Construction at Mt. Clarence complete and
DCCA stations ready.

By 9th August MRSU complete erection of Balloon Unit Tents.

By 9th August Balloon stores all at Range.

9th August Balloon Unit Advance Party arrives at Maralinga.

15th August End of Test Area and building construction.

16th August to 1st September Period of engineering redeployment, checking
and testing.

1952

By 14th August All scientific stores at Range and at Mt. Clarence.

20th August End of Cardington balloon rehearsals.

26th August Balloon Unit at Range. AMB Health Physics Group begins operations.

26th August to 3rd September Scientific Party and main TR party arrive.

26th August RAF transport flights to Mt. Clarence begin.

30th August Balloon Handling commences.

30th August approx. First explosive and secure stores on site. Late stores on range.

30th August to 2nd September Mt. Clarence and Decca staff arrive at Mt. Clarence Decca Stations.

2nd September A-Day - Operational Phase begins - Phase 2 starts.

Mt. Clarence outstation in operation.

7th September Decca chain operational.

7th September First balloon handling rehearsal. BR1.

7th September HQ Indoctrinee Force arrive at Range.

by 7th September IF camp Site complete.

13th September Balloon handling Operational Rehearsal. BR2.

15th September 1st Balloon Scientific Rehearsal. BSR1

16th September approx. All explosive stores and secure stores on site.

16th September to 24th September Indoctrinee Force arrive at Range.

16th September 2nd Balloon Scientific Rehearsal. BSR2

18th September 3rd " " " BSR3

21st September 4th Balloon Scientific and Operational Rehearsal. BOR1

23rd September Final Scientific Rehearsal, Round 1. SR1

24th September Air Operational Rehearsal and Balloon Handling exercise. AOR.

27th September Operational Rehearsal, Round 1. CR1.

1952

29th September 17.30 hrs. approx. - Standby for Round 1. S1

30th September FIRST FIRING DAY. ROUND 1 - GONI. D1.

D1 + 1 day Weapon Shed Round 2 complete at TARANAKI.
Balloon site ready.

D1 + 2 days Balloon Operational Rehearsal.
(Limited to Weapon and Balloon Groups). BCR2

D1 + 3 days 1st Scientific Rehearsal Round 2. BSR4

D1 + 4 days 2nd " " " SR2

D1 + 5 days at 22.00 hrs. approx. Standby. S2.

D1 + 6 days FIRST FIRING DAY - ROUND 2 - TARANAKI D2

F2 + 3 hours TUFI weapon shed ready.

D2 + 2 days Balloons inflated and site ready. Start
rehabilitation TARANAKI.

D2 + 3 days 1st Scientific Rehearsal Round 3 BSR5

D2 + 3 to
D2 + 10 days Indoctrinee Force departs.

D2 + 4 days 2nd Scientific Rehearsal Round 3. SR3

D2 + 5 days at 22.00 hrs. approx. Standby. S3

D2 + 6 days FIRST FIRING DAY - ROUND 3 - TUFI D3

F3 + 3 hrs. Weapon Shed Round 4 ready at TARANAKI.

D3 + 1 day Start rehabilitation TUFI.

D3 + 2 days Balloons inflated and site ready.

D3 + 3 days 1st Scientific Rehearsal, Round 4. BSR6

D3 + 4 days 2nd " " " SR4

D3 + 5 days at 22.00 hrs. approx. Standby. S4.

D3 + 6 days FIRST FIRING DAY - ROUND 4 - TARANAKI D4

D4 + 1 day Start Range rehabilitation.

D4 + 1 day Rehabilitate centre TUFI and outer circle
TARANAKI.

D4 + 4 days Rehabilitation TUFI complete.

D4 + 5 days Start rehabilitation centre of TARANAKI.

D4 + 7 days Preliminary reports on operation completed
and with Trial Director.

1952

D₄ + 3 days Rehabilitation TWR/III complete.

D₄ + 10 days All Scientific staff including Target Response, evacuated. AWRB Health Physics Group closes down.

D₄ + 15 days Last measurements at Mt. Clarence. Last air scientific support flight to Mt. Clarence. Decca chain closes down.

D₄ + 21 days Mt. Clarence and Decca chain evacuated. End of Phase 2 Engineering. Last R/F transport flight from Mt. Clarence.

D₄ + 22 days Inter-trial Engineering Phase begins, Rehabilitation, Care and Maintenance. SPT Engineer staff evacuated.

D₄ + 22 to
D₄ + 23 days Last R/F transport flights from Haralings to RAAF Edinburgh Field.

D₄ + 35 days Preliminary Results published.

D₄ + 42 days Preliminary Results colloquy at AWRB (AWRE Groups)

D₄ + 49 days Preliminary Results Colloquy (Target Response Groups).

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Appendix E to Operation
Lighthouse Initial Summary
Statement dated 22nd July
1958

Requirements on the Air Ministry

1. Summary of Requirements

The A W A E requirements on the Air Ministry for Operation Lighthouse are likely to be as follows:-

- Task 1. Cloud sampling by Canberra aircraft on all rounds.
- Task 2. Radiological surveys on all rounds.
- Task 3. Cloud tracking and sampling by cascade impactors on all rounds.
- Task 4. Medium and light air transport throughout the operation.
- Task 5. Daily flights to obtain meteorological data.
- Task 6. Aerial photographic surveys.
- Task 7. The provision of signals and cipher staff.
- Task 8. The provision of a Balloon Handling Unit.
- Task 9. The decontamination of aircraft.
- Task 10. A prefiring warning flight along certain sections of the Trans-Continental Railway.
- Task 11. The provision of an aircraft to shoot down a balloon system in the event of a breakaway with a live load.
- Task 12. The provision of meteorological staff to man the Albany Peninsula meteorological station.
- Task 13. The provision of 26 officers, NCO's and men of the RAF Regiment for employment with scientific Groups.

A fuller statement of the probable requirements for each task follows under the separate headings in Section 4.

2. Personnel

It is presumed that, as on previous operations, questions of staff and accommodation will be dealt with directly between the Air Ministry and DGAW(LOS).

3. Safety

(a) Radiological Safety

As previously, all personnel on the operation, whether at Haralinga or elsewhere, will be subject to the Radiological Safety Regulations, Haralinga and to any Radiological Safety Instruction issued by the Trial Superintendent.



[REDACTED]

The Health Physics Group will be responsible for providing, at Maralinga, film badges, dosimeters, protective clothing and contamination and radiation monitoring equipment.

The RAF Medical Officer with the Decontamination Unit will be responsible to the A W R E Health Physics Group Leader whilst RAF personnel are at Maralinga. A W R E will cease to have responsibility for the RAF Health Physics from the time the RAF personnel leave Maralinga. Health Physics Control will be required at Edinburgh Field.

All RAF personnel, whether their normal duties involve contact with radioactivity or not, should have a medical examination, including a blood examination, before they arrive at Maralinga. The blood standards required are laid down in Air Ministry letter C 95567/57/M4 dated 1st November, 1957, to all Principal Medical Officers.

(b) Aircraft Safety

The RAF will be required to maintain surveillance on and be responsible for the safety of all aircraft airborne over the test area. The Trial Superintendent will be responsible for providing the RAF with times of balloon hoistings and weapon firings and knowledge of all areas hazardous to aircraft.

4. Detailed Statement of Requirements

4.1 Task 1. Cloud Sampling

Cloud sampling will be required after each round from F + 10 min and up to F + 3 hours depending on the conditions at firing. A Sampling Controller and two sampling aircraft will be airborne with a third sampling aircraft standing by.

The Airborne Sampling Controller will direct sampling aircraft as a result of information gained on his initial reconnaissance run and that received by v.h.f. R/T from the RAF/AWRE Sampling Liaison Officer immediately after the return of the primary samples to base. If the primary sample is not satisfactory it will be necessary to commit one or more of the other sampling aircraft.

Background samples from the Mk.3 ducts and impactors will be required on the D-1 day of each round.

All sampling aircraft must be equipped as follows:-

- (a) Mark 3 ducts on both wing tip tanks for particulate sampling,
 - (b) Mark 9 duct on port bomb door strong point,
 - (c) Mark 10 duct on starboard bomb door strong point,
 - (d) Mark 3 gas sampling equipment in bomb bay,
 - (e) A drum, or other type of impactor, in the camera hatch for particle size measurement. (If an alternative type of impactor is used, it is likely to be similar in size and shape to the drum impactor).
- [REDACTED]

- [REDACTED]
- (f) Integrating γ -dosimeter,
 - (g) Recording dose-rate meter for determining cloud dimensions and intensities,
 - (h) Cabin air sampling equipment.

4.2 Task 2. Radiological Surveys

Two specially equipped survey aircraft and 1 helicopter will be required for surveys after each firing.

The survey aircraft should have navigational equipment to give range with an accuracy of $\pm 10\%$ and bearing with an accuracy of $\pm 2^\circ$, from a known point. An accurate radio altimeter, giving height to $\pm 3\%$, should be fitted and arrangements made for the position data to be displayed on the Auto-Observer records.

A member of the Radiological Measurements Group will fly on each sortie to operate the A W R E survey equipment.

The programme of flights is likely to be as follows:-

- (a) Each S - 4 day, flights by both survey aircraft and the helicopter, to test A W R E equipment.
- (b) Each S-3 to S day, survey flights at 300 ft. AGL out to 300 miles by one or both aircraft, to establish background.
- (c) Each D-day, F + 1 hr. to F + 3 hr, calibration sortie of about 3 hrs. duration over the Test Area. In the case of a night firing this sortie will be made as soon as possible in daylight.
- (c) Each D-day, starting between F + 2 hr. and F + 2 1/2 hr, a survey at a height of 300 ft. AGL out to a distance which will be stated at the aircrew briefings.
- (c) Each D - day, from F + 3 hr onwards, several short surveys over the Test Area at heights of from 50 to 2000 ft. In the case of a night firing these surveys will be made as soon as possible in daylight.

4.3 Task 3. Cloud Tracking and Particle Size Sampling.

There will be a requirement for cloud tracking by suitable aircraft after each round from about F + 3 hr until the cloud leaves the Australian mainland. A subsidiary requirement on these flights will be to carry out Particle Size Sampling using Cascade Impactors and also Cabin Air Sampling.

It is presumed that, as previously, the RLF will be responsible for formulating the operational plan for this task, including arrangements for the use of Australian airfields other than Maralinga, and for the installation of the necessary equipment in the aircraft.

[REDACTED]

A W R E will, as in the past, advise on radiological precautions and will provide protective clothing for use of the aircrews in emergencies and diversions.

The programme is likely to be as follows:-

Before S1 day - Familiarisation flights and A W R E equipment checks.

After each round -
F + 3 to F + 10 hr, Determination of cloud position out to 100 miles,
determination of cloud dimensions by dose rate observations,
particle size sampling and cabin air sampling.

F + 24 hr., as for F + 3 hr. but out to 1200 miles.
Particle size sampling may be omitted.

F + 48 hr, as for F + 24 hr. if the cloud is still over the Australian mainland.

D + 3, D + 4 etc. Possible requirement for dawn tracking sortie if the cloud has not cleared the mainland.

4.4 Task 4. Air Transport

U.K. to Maralinga

Flights will be required for the transport of weapon components and late and urgent stores from UK to Maralinga. These will in due course be specified in detail by SSWP/AWRE. There will be a requirement for the return of classified documents and some stores to UK at the end of the operation.

Maralinga to Darwin, Sydney or Perth

Suitable aircraft will be required to leave Maralinga about F + 7 hr. on each D-day to transport radioactive samples to Darwin, Sydney or Perth for connection with commercial airlines. The samples will be required in UK preferably by F + 72 hr. and in any case not later than F + 90 hr.

A W R E will state the airline connection and will be responsible for the diplomatic and radiological clearance of the samples.

There may also be a requirement to return solid radioactive and inactive samples to UK by the normal Transport Command Australia - UK flights.

[REDACTED]

RAAF Edinburgh and Adelaide to Maralinga.

Provision should be made for a shared daily ferry air service between RAAF Edinburgh and Maralinga, beginning 3rd August 1959. Experience suggests that up to two flights per day may be required.

There also may be a requirement for flights for up to 40 people of Press and Special Observer parties from Adelaide or Edinburgh to Maralinga, a few hours prior to any firing. Two aircraft may be required on some of these flights.

Maralinga to Alice Road area

Air transport will be required for logistic support to stations in the Alice Road area, starting 26th August 1959 and ending 21 days after the last firing. The estimated load is one ton per week, but there may be an occasional additional requirement for the transport of from three to six people with spare equipment to these stations.

There will be a further requirement on S-1 day and D day for each round, or as required by the Scientific Director, for the transport of three or four people and about 600 lb. of freight.

Maralinga to Giles, Ceduna and Woomera.

For occasional flights, beginning at the end of August 1959, will be required to Giles Meteorological Station, Ceduna and Woomera, for transport, searches of fallout areas, connection with civil airlines and emergencies.

Helicopter Flights

There may be occasional requirements for helicopter flights for local reconnaissance, searches, and emergencies. A helicopter will be required to stand by at Forward Control during all the operational phases.

4.5 Task 5. Meteorological Coverage

It is assumed that, as previously, meteorology will be the responsibility of the Australian Commonwealth Bureau of Meteorology, but the RAAF will again be required to collect data as detailed below:-

Long Range Meteorological Reconnaissance

Flights by Shackleton aircraft from Pearce over the Australian Bight beginning about S1 -11 days, with four sorties between S1 -11 and S1 - 4 days and then daily sorties until a few days after the last firing. The flight plan is likely to be similar to that for Operation Antler except that one additional ascent and descent, with full readings throughout, will be required on each sortie.

Sorties by Shackleton aircraft covering the eastern half of the Australian Bight, the frequency and procedure to be similar to that for the flights from Pearce. This requirement may later be reduced to flights on demand.

High Level Wind Finding Sorties

One or two sorties per round by Canberra aircraft from Maralinga or RAAF Edinburgh may be required. A full briefing will be given prior to each sortie by the Meteorological Group Leader, Maralinga or the Meteorological Officer, RAAF, Edinburgh, as appropriate.

Humidity Measurement Sorties

One flight, by a Canberra aircraft fitted with a Dobson-Brower frost point hygrometer, will be required before each firing at F - 9 hr. to F - 6 hr. Three background flights will be required between S1 - 20 days and S1 - 1 day. Arrangements should be made between Air Ministry and A W R E for the hygrometers to be provided and installed in Canberras. The Air Ministry will also be called upon to provide an observer who will be capable of servicing and maintaining the equipment.

Miscellaneous Met. Flights

There will be an occasional requirement for Canberra aircraft to investigate frontal conditions and lightning areas in the interest of balloon safety.

Up to three special flights by Shackleton aircraft may be requested before each firing by the Meteorological Group Leader, Maralinga.

4.6 Task 6. Aerial Photographic Surveys

The photographic survey requirement will probably be limited to five sorties, each of about 100 exposures, for a survey to a scale of 1: 5000 of the instrument lanes in the Test Area, and other instrumentation sites, before and after each firing. A W R E will again require record and cine photography from a helicopter over the Test Area before and after firings, for which tasks they will supply film, and a photographer.

The RIF will, as previously, be required to develop and print survey photographs. A W R E will require 5 copies of each print, one of which should be available within 48 hrs. for the quick assessment of coverage.

4.7 Task 7. Provision of Signal and Cypher Staff

Signal and cypher staff will be required in the Maralinga area, RAAF Edinburgh and in the Alice Road Area as detailed below. Except for the Alice Road area, services should begin by 3rd August 1959, and should be fully operational by 26th August. The Alice Road area services should begin about 2nd September and be fully operational by 7th September.

[REDACTED]

Arrangements should be made for the installation, servicing and maintenance of 'Eureka' beacon at Watson.

Maralinga Area

The RAAF should provide a Range Signals Officer who will be responsible to the Range Commander for the Maralinga signal services.

The RAAF will be required to provide staff :-

to man the Village and Roadside telephone exchanges on a 24 hr. basis,

to man the Village teletype centre on a 24 hr. basis, and
to operate, service and maintain:-

all radio communications, navigational aids, including the Eureka beacon at Watson, and the meteorological radar equipments. This will include a new v.h.f. link between building H.5 and the Airborne Sampling Controller (see Task 1).

RAAF Edinburgh

The RAAF will be called upon:-

to provide additional manning to operate the teletype centre on a 24 hr. basis,

to man the Edinburgh terminal of the Maralinga - RAAF Edinburgh radio net,

to provide cypher officers.

Alice Road Area

To provide operators for:-

the h.f. point-to-point and ground-to-air radio,

the h.f. mobile vehicle network control station,

the v.h.f. local mobile network and ground-to-air radio,

the navigational aids.

These services will be required in normal working hours during the preparation phases, but may be on a 24 hr. basis for a few days only, after each firing.

4.8 Task 6. Provision of a Balloon Handling Unit

RAAF will be called upon to provide a Balloon Unit for the handling of balloon systems. The Balloon Unit will advise SPT/AWRE of all technical equipment required for hoistings, and SPT/AWRE will be responsible for the provision of this equipment, whether the source of supply is MOS, Air Ministry or AWRE.
AWRE.

[REDACTED]

In addition to up to 3 balloon systems for weapon hoisting, there will be a requirement to handle a small tripod balloon system on each round, for Target Response tests.

The operation control of the Balloon Unit will be by the Trial Superintendent acting through the Commander, Air Task Group.

4.9. Task 9. Decontamination of Aircraft

As on Operation Antler, the decontamination of all aircraft should be an R&F responsibility. This will involve the provision of an Active Handling flight, the establishment of which should include provision for a small team to travel on short notice to service any radioactive aircraft which may have landed away from base and become unserviceable.

A W R E will advise on methods of protection and decontamination and will train R&F personnel as required.

The A W R E Decontamination Group may from time to time require access to aircraft for the testing of protective systems and decontamination methods, and to obtain other relevant data.

In addition to all tools and normal ground equipment for aircraft servicing and handling, the R&F will be expected to supply decontamination and other reagents, protective clothing and special equipment.

A W R E will supply monitoring instruments and will launder protective clothing.

4.10 Task 10. Prefiring Warning Flights

A pre-firing warning flight along certain sections of the Trans-Continental Railway will be required before each balloon firing.

Aircraft should take off at about F - 2½ hr, proceed to Cook and from there fly low along the railway to Barton, then returning to Maralinga. A report that the mission has been completed will be required.

4.11 Task 11. Balloon System Safety Aircraft

Should a balloon system carrying a live store break from its moorings and the various safety devices incorporated fail, it is essential that an aircraft be airborne and suitably armed to shoot down the balloon system.

The R&F is therefore requested to provide such an aircraft, which should be airborne at about 15 000 ft from F - 2 hr for each balloon firing. The aircraft should patrol on a racetrack pattern to the east of Maralinga Field, the pattern being followed anti-clockwise and the inbound heading 270° T towards Maralinga 'Eureka' beacon.

Schedule No. REM 2 dated 29th July 1953

HEAVY CIVIL ENGINEERING TASKS

APPENDIX D to Operation Lighthouse Initial
Summary Statement dated 22nd July 1953

Serial No. A	Task	Proposed Source of Materials	Proposed Constructer	Source of Designs	First Estimate of Costs (Str)	Notes
EM 101	<u>Modify TUFU</u>	(1) Concrete - Australia (2) Anchors and reinforcing - Australia (3) Above ground structures - U.K.	Dept. of Works	A.W.R.E.	£9,000	The installations completed for Antler do not meet with the requirements of the Balloon system modified as a result of the Antler experience. A portion of the site requires relaying to suit the new system.
EM 102	<u>Rehabilitate Taranaki & modify</u>	- Ditto -	Dept. of Works or MARSU	- Ditto -	£12,000	At Antler Taranaki was damaged and now requires repair, in addition it requires modification as for Tufi above.
EM 103	<u>Modify balloon beds No.3 and No.2 at Ivara</u>	Australia	Dept. of Works	- Ditto -	£3,000	Balloon Bed No.3 is the existing filling bed which requires extending to accept the new longer balloons. The new systems contain 4 balloons and 2 filling beds are required to enable 2 balloons to be filled simultaneously. The No.3 mooring bed is to be modified for this purpose.
EM 104	<u>Erect Photographic Tower CLEAR VIEW with base shed</u>	(1) Tower & Shed - AWRE (2) Foundation material - Australia	Dept. of Works	- Ditto -	£4,000	This Photographic Tower, 150 ft. high, is required to enable clear photography of the Air shock rocket trails to be obtained. Owing to topography there are no suitable existing camera towers and Gona used during Antler will no longer be available.
EM 105	<u>Erect Camera Tower KIRIWA Area with base shed</u>	(1) Tower - at range (2) Foundations - Australia (3) Shed ex AWRE	Dept. of Works or MARSU	- Ditto -	£4,000	This camera tower is required to give a view of the Gona and Tufi sites at right angles to the main axis of photography. There is no existing suitably placed tower.
EM 106	<u>Modify 2 existing Camera Towers and overhaul additional existing Camera Towers</u>	A.W.R.E.	Dept. of Works or MARSU	- Ditto - and A.W.R.E. Specification	£1,350	The tower staves on existing camera towers are inadequately protected against the weather. The modifications are to install suitable protection where this was not completed for Antler. All towers have been erected for nearly 3 years and require a thorough overhaul and inspection.
EM 107	<u>Overhaul GONA tower</u>	A.W.R.E.	Dept. of Works	A.W.R.E. Specification	£1,000	The Gona tower has been erected for 2 years although not designed to remain erected for so long and requires a thorough overhaul and inspection.
EM 108	<u>Overhaul 4 existing Aerial Towers</u>	A.W.R.E.	Dept. of Works	- Ditto -	£1,000	The four main telemetry control towers at the control area will have been erected for over 3 years and require overhaul and inspection.
EM 109	<u>Construct 11 miles tracks - dozed, graded and compacted & repair track to HURPU & improve track to Brimpton</u>	Australia	Dept. of Works or MARSU	Dept. of Works Specification	£4,000	These tracks form the approach roads to KIRIWA and CLEAR VIEW and to the permanent instrumentation sites south of TUFU. The tracks to the HURPU and Brimpton camera tower requires repair in places as do some other tracks.
EM 110	<u>Install any necessary cable ducts under roads and tracks</u>	Australia	Dept. of Works or MARSU	Dept. of Works Specification	£600	A small number of cable ducts for AWRE firing control cables will be required under new and existing tracks.
EM 111	<u>CONTINGENCIES</u>	-	Dept. of Works or MARSU	A.W.R.E.	£10,000	This item is included to cover late or unforeseen requirements or minor changes of plan.

Schedule No. RFM 2 dated 29th July 1958 (Contd.)

APPENDIX D to Operation Lighthouse Initial
Summary Statement dated 22nd July 1958

<u>Serial No.</u>	<u>Task</u>	<u>Proposed Source of Materials</u>	<u>Proposed Constructor</u>	<u>Source of Designs</u>	<u>First Estimate of Costs (Stg)</u>	<u>Notes</u>
EM 112 to EM 120 NOT USED						
<u>FOR TARGET RESPONSE</u>						
<u>B</u>						
EM 121	For Target Response- Supply:- (1) 75 tons cement (2) 250 yds. fines (3) 250 yds. coarse aggregate	(1) AWSTAFF (2) Quarry Contractor (3) Quarry Contractor	MARSU	A.W.R.E. Specification	£5,000	This is the basic material to be used by the Structures Group of the Target Response Teams. The material is used in the manufacture by the Group of their test specimens. Cement at 15 tons/month starting 1.3.59. Sand and Aggregate at 50 to 100 yds. per month starting 1.3.59.
For Concrete Laboratory BL 15.						
EM 123 to EM 130 NOT USED						
<u>CIVIL ENGINEERING ITEMS SUGGESTED TO BE CARRIED OUT BY MARSU</u>						
<u>C</u>						
EM 131	Move AWPE (TS Group) P.V.H. forward Workshop from Camp 43 to Roadside Sapper Camp (To become EC 28)	At Range	MARSU	As existing building	£300	The AWPE workshop was erected at Camp 43 for Antler as a temporary measure. It is now proposed that it should be re-erected close to the AWPE Forward Area Store near the Roadside Sapper Camp.
EM 132	Divert existing controlled ("Dirty") track to run at least 440 yds. clear of Sapper Balloon and Indoctrinee Camps situated south of Roadside.	-	MARSU	As for existing track		The track used by contaminated vehicles runs very close to the new Sapper Camp and therefore, presumably, the Balloon Camp. It must be diverted to run at least 440 yards clear of these camps and of any other proposed camps in the area. The new route requires adequate direction signs. This is a radiation safety requirement.
EM 133	Re-erect security barrier double swinging poles at EC 1.2	At Range	MARSU		£350	The barrier across the main test area road at EC 1.2 Roadside was removed after Antler. This is the main checking point for staff safety in the forward area and a barrier is required at this point. It should preferably be of the double type to admit of two-way usage.
EM 134	Inspect, repair and waterproof all P.V. Huts at Roadside and in the Forward Area	Australia	MARSU		£500	The existing P.V. Huts, now 5 years old, require a thorough inspection and in many instances require attention to the waterproofing, particularly where rubber sealing strips have perished. A number of damaged hinges require replacement.
EM 135	FOR TARGET RESPONSE. Recover, Inspect, Strip, Repair and store parts of two existing Heavy Girder Bridges.	-	MARSU		£100	These bridges were used during Buffalo and will be required again. They are to be recovered from the present RED ACTIVE areas, stripped, cleaned and repaired ready for future use.

Schedule No. RFM 2 dated 29th July 1958 (Contd.)

<u>Serial No.</u>	<u>Task</u>	<u>Proposed Source of Materials</u>	<u>Proposed Constructor</u>	<u>Source of Designs</u>	<u>First Estimate of Costs (Stg)</u>	<u>Notes</u>
<u>C</u>						
EM 136	Recover AVRE Forward recording shelters & lockers & BICC masts as per schedule left with Range CE at end of Antler and continue other maintenance tasks in that schedule	-	MARSU	-	-	At the conclusion of Antler a schedule of maintenance and recovery for the Test Area was agreed between ANSTAFF, RANGE CE and AVRE. This item covers the continuation of those tasks up to 1st March 1959. ANSTAFF have already covered the financial aspects of this work.
EM 137 to EM 140 NOT USED						
				<u>TOTAL</u>	<u>£55,900</u>	Say, £56,000 Sterling

- H.B.
1. In connection with these works AVRE will, it is expected, provide a foreman erector to advise and assist on items EM 104, 105, 106, 107 and 108. The erector was at Maralinga in 1957 and is familiar with all the towers. This erector will be available at Maralinga from mid January 1959.
 2. Costs are based on Australian 1957 figures and are estimates based on limited engineering data, no conscious effort has been made to include Dept. of Works Overheads and "on costs". Costs will be revised as more detail becomes available.
 3. Costs for MARSU are nominal costs to cover materials.

New Works, Major and Minor Modifications and Maintenance
To Existing Works

<u>Part 1</u>	<u>Serials: FM1 to FM10</u>	<u>NEW WORKS</u>	First Estimate of Costs	<u>£27,500</u>	Stg approx.
<u>Part 2</u>	<u>Serials: FM11 to FM30</u>	<u>MAJOR MODIFICATIONS</u>	First Estimate of Costs	<u>£20,800</u>	Stg approx.
<u>Part 3</u>	<u>Serials: FM31 to FM60</u>	<u>MINOR MODIFICATIONS</u>	First Estimate of Costs	<u>£3,215</u>	Stg approx.
			<u>TOTAL</u>	<u>£51,515</u>	
				i.e. <u>£51,500</u>	approx.

Revised Estimates will be submitted as further information becomes available.

H.B.

1. The costs estimates are based on Australian costs in 1957. No allowance has been made for subsequent price charges for contingencies or for changes in the Australian wages structure.
2. No allowance has been made for Australian Dept. of Works Overheads or "On Costs".
3. In some cases costs have been estimated before Engineering studies have been started and could be subject to considerable variation.

PART I - NEW WORKS - MARALINGA 1958-59.

<u>Serial No.</u>	<u>AWSTAFF No.</u>	<u>Building Ref.</u>	<u>Task</u>	<u>Source of Supplies</u>	<u>Proposed Constructor</u>	<u>First Estimate of Costs</u>	<u>Notes</u>
FM 1	AW 6	BL 26	Balloon Equipment store and Workshop/Generator Workshop. Size 37' 6" x 45' x 18' high.	Australia	Dept. of Works.	£15,000	This building is to be used as a workshop and store for balloon equipment at a trial, and also as a workshop for T.S. Generators where field maintenance can be carried out. The space originally reserved in BW 1 has not been made available for the latter. The space originally used as a balloon store/workshop is no longer available. During a trial the building will be used for ballooning purposes, during inter-trial periods it will be used by the A.W.R.E. Overseas Technical Unit for first line generator maintenance.
FM 2	AW 7	BL 2.4	Scientific Laboratory/Office Block. Size 60' x 30'	Australia	Dept. of Works.	£7,500	A block of 8 Record Reading Rooms, computer rooms and offices. Technical Office space was overloaded at Antler, and with Target Response also at a trial, is quite inadequate to meet scientific group requirements. Since the original requirement for technical offices was formulated the demand has grown considerably, this has been caused by a large increase in Range Staff Officers requiring office space in the Village the necessity for the Services Commander and Air Task Group to have office space in the Village the unforeseen size of the administrative component at trials and the necessity to provide office space for the Overseas Technical Unit and the Minor Trials teams in the Village. As stated above space was at a premium at Antler and with an increase of nearly 100 officers from A.W.R.E. and Target Response for Lighthouse the existing space is insufficient. Even with this additional space the main laboratories will still be overcrowded. During Antler the opportunity was taken of convincing local Ministry of Supply staff of the necessity for a modest increase of 8 to 12 offices.
FM 3		BL 7.6	New met radar ramp.	Australia	Dept. of Works.	£2,500	This ramp is required for the proposed standby met radar set and is required to raise the set above obstructing buildings. A second radar set is necessary to provide 100% reliability for the vital meteorological observations used to predict firing conditions.
FM 4		FC 27	Install new "Dynes" anemograph station at Roadside.	Australia	Dept. of Works.	£1,600	A dynes anemograph at Roadside, with remote instruments available to the trials director has been called for in the Antler Met. Report. This will also meet a ballooning need, which was tragically apparent at Antler. The ground wind pattern in the forward Areas was found to vary markedly from that in the Village airfield area. The new instrument will give more representative forward area data.
FM 5		BL 7.7 FC 27.1	Install lightning flash indicator equipment.	A.W.R.E.	Dept. of Works.	£400	This equipment is used in connection with forecasting for balloon flights. All the equipment has been supplied by A.W.R.E. and is at site or en route. There are no other means of detecting and recording local and medium range electrical storms, which are a considerable hazard to balloon operations.

PART I - NEW WORKS - MARALINGA 1958-59. continued.

<u>Serial No.</u>	<u>AWSTAFF No.</u>	<u>Building Ret.</u>	<u>Task</u>	<u>Source of Supplies</u>	<u>Proposed Constructor</u>	<u>First Estimate of Costs</u>	<u>Notes</u>
FM 6		LA 5.4	Radio Active waste disposal pit.	Australia	Range Staff	£500	A stock of Radioactive waste which has low natural rate of decay is building up a Maralinga. A burial pit is required for this material. The pit must be fenced and secure and easy of access from the Village and airfield, but in a remote easily inspected area. This is a radioactive safety requirement.
FM 7 as FM 10 NOT USED							
						<u>TOTAL £27,500 Sterling.</u>	

PART 2 - MAJOR MODIFICATION AND MAINTENANCE TO EXISTING WORKS.

<u>Serial No.</u>	<u>AWSTAFF No.</u>	<u>Existing Building Ref.</u>	<u>Task</u>	<u>Source of Supplies</u>	<u>Proposed Constructor</u>	<u>First Estimate of Costs</u>	<u>Notes</u>
FM 11	AW 1	BL 14	Modification to Stabilised Power Supply System serving existing Laboratory area.	U.K.	Range Staff and A.W.R.E. Staff.	£1,000	To enable stabilised circuits to be run from the mains in cases where the turbine supply has proved to be of sufficient quality. Saves on watchkeeping staff and generators.
FM 12	AW 2	LA 5.2	Installation of new Hot Box and access in building LA 5.2.	A.W.R.E.	Dept. of Works.	£1,000	To house new A.W.R.E. equipment for handling Radioactive samples at trials. The equipment reduces radiation exposures and is operationally a necessity.
FM 13	AW 8	XA 1.1 XA 2.2 XA 1.2 XA 2.1	Improvements to ventilation system and inclusion of space heating in existing process buildings.	U.K.	Dept. of Works and Range Staff.	£2,000	The existing ventilation systems serve only to cool the magazines. Trouble has been experienced during some months with explosives being too cold and the present works are designed to raise the temperature in assembly buildings to the standard magazine temperature at which components were originally fitted together. Provision for fixing safety alarms is included.
FM 14	AW 9	BL 4	Improvements to ventilation and minor modifications.	U.K.	Dept. of Works.	£1,250	Difficulties exist in this building because of the unforeseen use of electronic equipment for some tasks carried out by the Radiochemical group. The works involved are to eliminate the waste heat and allow access to the equipment.
FM 15	AW 12	BL 25	Increase Hydrogen storage area.	Range Resources	Dept. of Works.	£500	This task is the construction of about $\frac{1}{3}$ mile of hard tracks and hardstandings for hydrogen cylinder storage sufficient to hold enough to cover Maralinga Operations. This work will extend the existing storage area by about 100%.
FM 16		DC 4	Modify DC 4 by adding two lock up stores, each 15' x 15'.	Australia	Dept. of Works.	£2,000	The two stores are to be Active Laundry "Receipt" and "Despatch" departments. They are made necessary by the large volume of work caused by repeated balloon firings, which have proved the existing facilities to be inadequate.
FM 17		DC 4	Modify DC 4 by providing oil fired flash boiler and install stock pumps and a tumbler dryer.	Australia (Pumps and dryer from A.W.R.E.).	Range Staff	£1,850	This equipment to be installed in parallel with an electric flash boiler which imposes a very heavy load on the power station and also has caused temporary power failures often with serious consequences. The electric installation will in future be used as a standby.
FM 18		DC 1	Extend existing hard-standing by 1 section to South add two bags to open store in North side, and add sludge trap.	Australia (Range Resources)	Dept. of Works.	£900	An extension of one section to the hardstanding used as an active equipment washdown has proved necessary, as particularly after balloon firings the amount of equipment to be cleared has proved much greater than expected. The two sheds are for ancillary equipment used in the decontamination processes.

PART 2 - MAJOR MODIFICATION AND MAINTENANCE TO EXISTING WORKS Continued.

<u>Serial No.</u>	<u>AFSTAFF No.</u>	<u>Existing Building Ret.</u>	<u>Task</u>	<u>Source of Supplies</u>	<u>Proposed Constructor</u>	<u>First Estimate of Costs</u>	<u>Notes</u>
FM 19		BL 15	Extend casting beds and mixing areas, add storage area and carry out minor repairs and modifications.	Australia (Range Resources)	Dept. of Works.	£5,800	These works are to increase the facilities available in the concrete laboratory (Bl 15) and to enable it to be used for Lighthouse. The works consist mainly of a new larger casting bed and a mixing area all in heavy concrete. <u>Required by February, 1958.</u>
FM 20		LA 7.1	Extend effluent sump by 4 times existing capacity and complete with fence.	Australia	Dept. of Works.	£1,000	The existing effluent sump is of too small capacity to enable aircraft decontamination to be carried out efficiently. A sump of 4 times present capacity is required. The present sump overfills rapidly and as a result aircraft decontamination has to be suspended until the sump has cleared.
FM 21		LA 5	Resurface washdown area with hard surface, finish with finest sand, seal well, broomed off.	Australia	Dept. of Works.	£3,000	The aircraft washdown was resurfaced for Antler with Entar which proved unsatisfactory and has left a soft sticky surfact which requires relaying completely before it can be re-used.
FM 22		BL 6	Improve ventilation in counter rooms.	U.K.	Dept. of Works.	£500	This involves the provision of some space heating to maintain temperatures at a reasonable level for instrumentation during cold weather. The existing system provides only for cooling in very hot weather.

FM 23 to FM 30 NOT USED.

TOTAL £20,800 Sterling.

PART 3 - MINOR MODIFICATIONS AND MAINTENANCE TO EXISTING WORKS.

<u>Serial No.</u>	<u>Existing Building Ret.</u>	<u>Task</u>	<u>Source of Supplies</u>	<u>Proposed Constructor</u>	<u>First Estimate of Costs.</u>	<u>Notes.</u>
FM 31	BL 8	Install 2 rooms air conditioners in teleprinter room.	A.W.R.E. Stocks	Range Staff	£300	In very hot and in cold weather, the working conditions in the teleprinter room are very bad. This can be improved sufficiently by installing two room air conditioners.
FM 32	LA 5	Modify outler to LA 5 by installing sludge trap at outfall with storm water diversion. (To be known as LA 5.3).	Australia	Dept. of Works.	£200	This sludge trap is required as a protection for the effluent tanks to stop large items from blocking the system, a storm water diversion is essential to prevent over filling the system during storms.
FM 33	DC 4	Provide concrete ramps to outer doors and thresholds to inner doors leading off laundry.	Range Resources	Dept. of Works.	£200	These are ramps to provide access for trolleys, and in other cases thresholds to prevent the spread of contaminated fluids.
FM 34	BL 14.2	Fit fume cupboard and Vent axia fan.	A.W.R.E. Stocks and Range Resources	A.W.R.E. Staff.	£50	Small fume cupboard and fan required by A.W.R.E. Technical Unit for work on their test equipment.
FM 35	DC Area	Increase area of DC Enclosure by moving fence 40-ft. to North.	Range Resources.	Range Staff.	£50	The present DC enclosure is too small to contain the equipment required to be left there between trials.
FM 36	LA 26	Construct Battery housing on South Side.	Range Resources	Dept. of Works.	£75	Protective housing for batteries used in connection with aircraft survey equipment serviced in LA 26.
FM 37	BL 12	Install 6 KW heaters in cooler tanks supplying BL 9.	A.W.R.E.	Range Staff	£100	At present, Maralinga night temperatures are such that special process water falls below the temperature at which it can be used. This work will cure the defect.
FM 38	RB 1	Build shelter over compressor tank at N.W. Corner.	Range Resources	Dept. of Works.	£50	Protective covering for the compressed air storage tank at RB 1, which is at present without any sun protection.
FM 39	RB 7	Build double strand mind wire fence round RB 7 and make jeep access track.	Australia	Dept. of Works.	£50	RB 7 is a radioactive store. The plan is to provide a safety fence at 30-ft. distance and an access track. This is a radioactive safety requirement.
FM 40	BL Area	Construct 4-ft. wide sealed path connecting BL 4, 5, and 6.	-	Dept. of Works.	£300	This path was originally part of the Kwinana contract but was shelved. A path is required for movement of equipment from one laboratory to the other without excessive vibration and resultant damage.
FM 41	LA 11.4	Construct jeep access to East end of building.	-	Dept. of Works.	£50	This building is a special battery shop. Access is required to the east end for vehicles bringing batteries.

PART 3 - MINOR MODIFICATIONS AND MAINTENANCE TO EXISTING WORKS Continued.

<u>Serial No.</u>	<u>Existing Building Ret.</u>	<u>Task</u>	<u>Source of Supplies</u>	<u>Proposed Constructor</u>	<u>First Estimate of Costs.</u>	<u>Notes</u>
FM 42	(LA 11.2 (LA 11.1	Construct sealed jeep access path 6-ft. wide to West door of 11.1 and complete as 3' wide chipped path to North end of 11.1. Construct sealed jeep 6' access path to workshop door. East side of LA 11.2.	-	Dept. of Works.	£300	This access track is to the main West door of LA 11.1 and is used for the transfer of stores and equipment. The path is to ancillary generators at the rear, an area which is also used for experimental firings of exploders. Similarly the access door on the East Side of 11.2 used for the approach to the workshop requires making good.
FM 43	LA 6	Make additional internal doorway. Convert existing door to "dutch" type.	Australia	Dept. of Works.	£50	These changes are to improve circulation of staff in the Radioactive Change Room, building LA 6. At present staff movement run counter to the movements of personnel undergoing decontamination, the result is confusion, inconvenience and wasted time and effort.
FM 44	LA 6	Add water stand pipe at South end of building.	Australia	Dept. of Works.	£40	A water stand pipe is required at the outside of LA 6 for washing down the boots and equipment used for aircraft decontamination.
FM 45	LA 6	Construct open store to South of building LA 6 and leave access gate in fence.	Australia	Dept. of Works.	£120	A small store is required for temperate storage of boots and gloves used by decontamination crews.
FM 46	LA 19	Install wash basin and water heater in crew room.	Australia	Dept. of Works.	£80	For use in the main crew room for aircrew returning for sorties.
FM 47	LA 6.3	Install sink in one office, and wash basin and water heater in crew room.	Australia	Dept. of Works.	£100	For use in the rooms used by decontamination crews. As the nature of their work is to deal with radioactive materials, tea breaks and smoking must be carried out under supervised and clean conditions.
FM 48	BL Effluent Area	Complete protective fencing around effluent sumps.	Australia	Dept. of Works.	£300	Completion of the safety fence round the radioactive effluent sump near the village.
FM 49	RA Effluent Tanks (BL DC/RB and LA Areas).	Install electric float type alarm switches operating audible and visible alarms.	U.K.	Range Staff.	£300	Alarm systems on the effluent tanks to alleviate the dangers of over-filling and consequent spillage of radioactive liquids.
FM 50	BL 7.	Install new Met. Plotting Bench, Display Panel and door.	Australia	Dept. of Works.	£200	Existing plotting facilities are inadequate and an additional bench is required in BL 7. The display boards are required for displaying for access normal plotting data as received.
FM 51	FC 1.2	Rewire west end of FC 1.2. Lay lino floor covering.	Australia	Range Staff	£100	The west end of FC 1.2 is the operational control room, the existing wiring and flooring is now in need of replacement.

PART 3 - MINOR MODIFICATIONS AND MAINTENANCE TO EXISTING WORKS Continued.

<u>Serial No.</u>	<u>Existing Building Ret.</u>	<u>Task</u>	<u>Source of Supplies</u>	<u>Proposed Constructor</u>	<u>First Estimate of Costs.</u>	<u>Notes</u>
FM 52	XA Area	Improve vehicle access facilities round each building XA 1.1, 1.2, 2.1, 2.2, 3.1 and 3.2 and construct parking areas opposite XA 1.2, 2.1 and 2.2.	-	Range Staff	-	At present, the magazine buildings have not, in some cases, all round access and in other cases there is no reasonable nearby parking space for vehicles and stores.
FM 53	(XA 4.1 (4.2 (4.3 (4.4	Add false ceilings doorstops, bolts and approach ramps and door seals. Repaint white. Add lighting.	Australia	Dept. of Works.	£200	These radioactive source stores have proved to be too hot and too dusty. The present plans are designed to alleviate these problems. R.A. components for weapons are stored in these buildings.
FM 54 to FM 60		NOT USED.				

TOTAL £3,215 Sterling, approx.