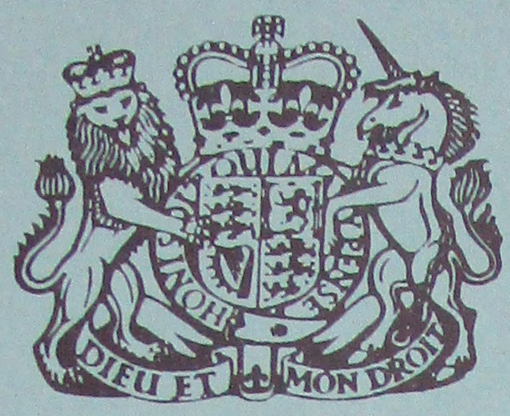
M S E A Howes

024/05/015



PROCUREMENT EXECUTIVE
MINISTRY OF DEFENCE

Propellants, Explosives and Rocket Motor Establishment, Waltham Abbey, Essex

DEFE 15/2533

Memorandum 69

Visit to Australia
18 November - 15 December 1978 (U)

E. A. Howes

November 1979

EMENT EXECUTIVE
Y OF DEFENCE

and Rocket Motor
Establishment,
Waltham Abbey, Essex

2 S 33

Memorand

Visit to Au

18 November

. A. Howes

PROPELLANTS, EXPLOSIVES AND ROCKET MOTOR ESTABLISHMENT
WALTHAM ABBEY, ESSEX

Memorandum No 69

Approved 16.8.79

VISIT TO AUSTRALIA 18 NOVEMBER - 15 DECEMBER 1978 (U)

by

E A Howes

SUMMARY

An account is given of a visit made by the author to Australia in November/December 1978. The places visited were the Materials Research Laboratories, Melbourne, the Joint Tropical Trials and Research Establishment, Innisfail, the British Defence Research and Supply Staff and the Services Laboratories and Trials Division, Canberra, and the Defence Research Centre, Salisbury. The running of JTTRE since its formation and the input from the other establishments visited was discussed. (U)

CONTENTS

1 INTRODUCTION

The purpose of the visit was to become more familiar with the facilities and activities of the Joint Tropical Trials and Research Establishment (JTTRE) and of the various establishments and groups in Australia which provide support for JTTRE. The other places visited were the Materials Research Laboratories (MRL), the British Defence Research and Supply Staff (BDRSS), the Services Laboratories and Trials Division (SLT) of the Department of Defence and the Defence Research Centre (DRC). Discussions were held on the practicalities of running exposure tests at JTTRE, particularly since it was formed by the amalgamation of the Joint Tropical Research Unit (JTRU) and the Tropical Trials Establishment (TTE).

2 ITINERARY

18th November	Depart Heathrow
22nd November	AL
23 - 24 November	MRL Melbourne
27 Nov - 1 Dec	JTTRE Innisfail
4th December	BDRSS Canberra
5th December	Joint Programme Review Committee Meeting, Canberra
6th December	DRC Salisbury
7 - 12 December	AL
15 December	Arrive Heathrow

3 BACKGROUND

Up to October 1977 all exposure tests on materials were conducted at JTRU and trials of equipment were conducted at TTE. Both establishments are based in the same area in Northern Queensland, Australia. A new Memorandum of Understanding was negotiated between Australia and the UK which took effect in October 1977 and at that time JTRU and TTE were amalgamated to form JTTRE. As with any rationalisation new management organisations were proposed for JTTRE and the practical working of these was discussed with the Senior British Officer there.

At about the same time as this amalgamation the Australian Department of Defence set up a new division, SLT, to administer the running of various Australian Trials Sections including JTTRE. This effectively removed MRL from their previous position of running JTRU as a direct counterpart to PERME in the UK. It has since been found that some scientific experience is necessary in the discussion and acceptance of programmes of work for JTTRE. In the draft SLTI/78 "Joint Programme Tasking Procedure for JTTRE Innisfail", drawn up by SLT division provision was made for Australian scientific establishments to be requested to provide "scientific oversight" of UK exposure tests. To a large extent this involves MRL as they are the Australian establishment with experience in a wide range of materials. However their level of participation is now reduced and this was discussed at MRL.

4 MATERIALS RESEARCH LABORATORIES (MRL)

During my two days at MRL my host was Dr J A McRae who introduced me to various colleagues with an interest in JTTRE and in the work we have been doing in the Polymer Assessment Section at PERME. Dr McRae is, in effect, the Liaison Officer for work sent to MRL associated with JTTRE.

I spoke with Mr P Dunn, Superintendent Organic Chemistry Division, and Dr McRae on the question of the scientific oversight they are being requested to supply. The nature of the comments MRL have made so far was discussed and is satisfactory to both parties. I expressed PERME's initial concern that an establishment providing scientific oversight on UK exposure tests might decide to alter or interfere with our work. Assurances were received that this would not happen. Overall the various parties concerned appear fairly happy with this side of the work as it is at the moment. I expressed the view that, at the least, it provides an official mechanism for MRL to know what the UK are doing and will hopefully retain the strong ties between our two establishments that have been built up over the years. MRL, however, did give an impression of being reluctant to participate further than at present due to the fact that they were no longer directly involved.

To a large extent my time at MRL was spent within the Organic Chemistry Division. Dr D Pinkerton, Head of this Division, gave me an introduction to their work before I met the other staff. The Organic Chemistry Division has a total complement of about 90 staff, including over 50 scientific staff. This was subdivided into eight major groups which were in the process of being rearranged whilst I was there.

The work done on Kevlar and its composites in the Polymer Section of Waltham Abbey was of particular interest to Dr P J Burchill, Dr J R Brown and Dr G A George in the Deterioration Research Group. They had seen references to our work and various details were discussed. The work of this group includes performance assessment, using such techniques as the measurement of electronic absorption and emission spectra, luminescence and reflectance spectra and oxyluminescence, and stabilisation of materials. In the latter area attempts have been made to graft co-polymerise a monomeric ultra violet stabiliser to surface layers. Results to date indicate that this method is effective for polyolefins but as yet there appears to have been little success with materials such as Kevlar. The use of hindered amine anti-oxidants is also being assessed. These compounds appear to restrict oxidation of the polymer chain even when the anti-oxidant in the substance can no longer be detected. The current work on Kevlar, Nomex and PBI fibres at MRL is an investigation of the changes in mechanical and flammability properties after thermal, oxidative and photo-degradation and of the mechanisms of thermal degradation itself. On a percentage strength loss basis Kevlar fibres perform worse than Nomex fibres when subjected to thermal degradation.

A small sub-section of the Deterioration Research Group is working on adhesives. I discussed this work with Dr C E M Morris. The main interest in this section is in structural adhesives and assessments are made of both the uncured materials and on adhesive bonded aircraft systems. Attempts are being made to accurately characterise such systems both chemically and physically. Equipment such as a high pressure liquid chromatograph, a gel permeation chromatograph, a light scattering instrument, osmometers and

spectroscopic apparatus is being used for the chemical characterisation which also forms part of the TTCP-TP3 assignment in the characterisation of polymeric materials in which PERME is also taking an active part. The ultimate aim is to pin down the compositions of the adhesive in use, tying this up where possible to mechanical properties, and thereby being able to say whether an adhesive can still reasonably be used after periods of storage and advise on replacement systems.

The problem of storage of adhesives appears to be a problem for the Australians as small quantities of specialised materials, as are often required, have to be purchased from the UK or the USA in the absence of manufacturers in their own country. With the practical problems of transit of materials a situation could arise where a resin has exceeded its shelf life in transit. Although it is appreciated that durability is a problem with adhesives, particularly in hot/wet environments, this section has no plans at present to send materials to JTTRE for environmental testing. The majority of adhesives of interest to them are or have been investigated by RAE, who have many tests at JTTRE, and tests sponsored by MRL would merely duplicate effort.

The Environmental Research Group, also part of the Organic Chemistry Division and whose professional officer is Dr McRae, is involved in the collection and collation of environmental data that is of Service interest. The work is directed towards provision of an adequate definition of climatic factors throughout Australia for use by the Services both for specification and logistic purposes. The data from the automatic weather stations at the various JTTRE sites are sent to this section for analysing. Use is made of a direct link from MRL to the ARL computer and different ways of presenting the met data have been assessed.

Whilst at MRL I also spoke to Mr N Dempster, Technical Assistant to the Chief Superintendent, Mr R A Cummins, Group Leader of the General Chemistry Group, Mr J Bishop, Marine Environment Group, Mr W R Hindson, Group Leader of the Textiles Group, and Mr F Marson, Paints Group.

My overall impression at MRL was that they were not particularly interested in sending materials to JTTRE for assessment, even though the conditions at Innisfail are likely to be more detrimental to most materials than at Melbourne. Two reasons were put forward for this attitude. Firstly, the UK send out many materials on exposure that are of interest to MRL and they do get to see all the Progress Statements on the relevant tests. Thus they are well aware of the current state of the art in many areas, indeed keeping well up to date with published literature appears to feature much at MRL. Secondly Australia tends to buy the majority of its defence equipment. This appears to be a political decision of not affording the cost of development. The materials used in this equipment will have been proved satisfactory by the foreign suppliers and in the Australian view there is thus little incentive to conduct many exposure tests. This does, however, appear somewhat unrealistic as the northern areas of Australia are tropical and it would seem possible that hostile action could come from north of the country, that is, other tropical areas.

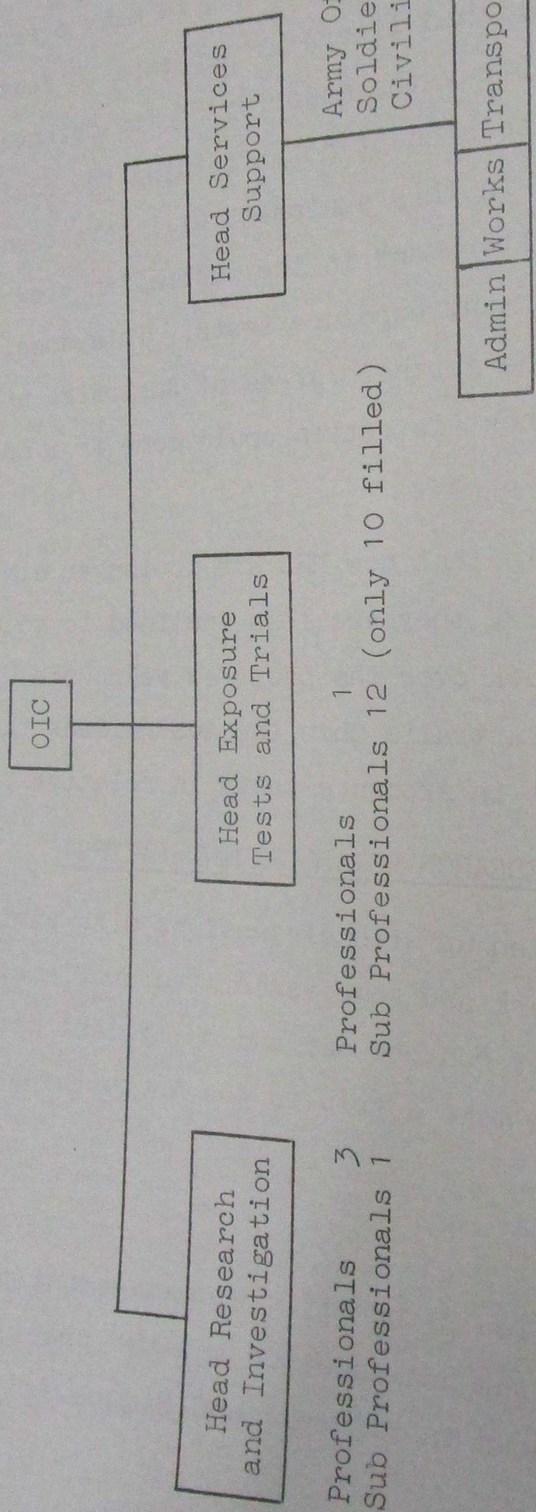
There is also the possibility that now MRL are no longer directly concerned with the running of JTTRE they are less inclined to mount exposure tests there. However, looking back over the past few years the UK consistently have more tests in Australia than the Australians themselves, indicating that MRL's involvement in exposure tests in relatively unchanging.

5 JOINT TROPICAL TRIALS AND RESEARCH ESTABLISHMENT (JTTRE)

My time at Innisfail was taken up with discussions with various members of staff on current and future work and some associated problems. I was able to go on the Downey Creek Met run one day and on my last morning there the winds dropped sufficiently to make a trip to the North Barnard marine immersion site possible.

5.1 Management

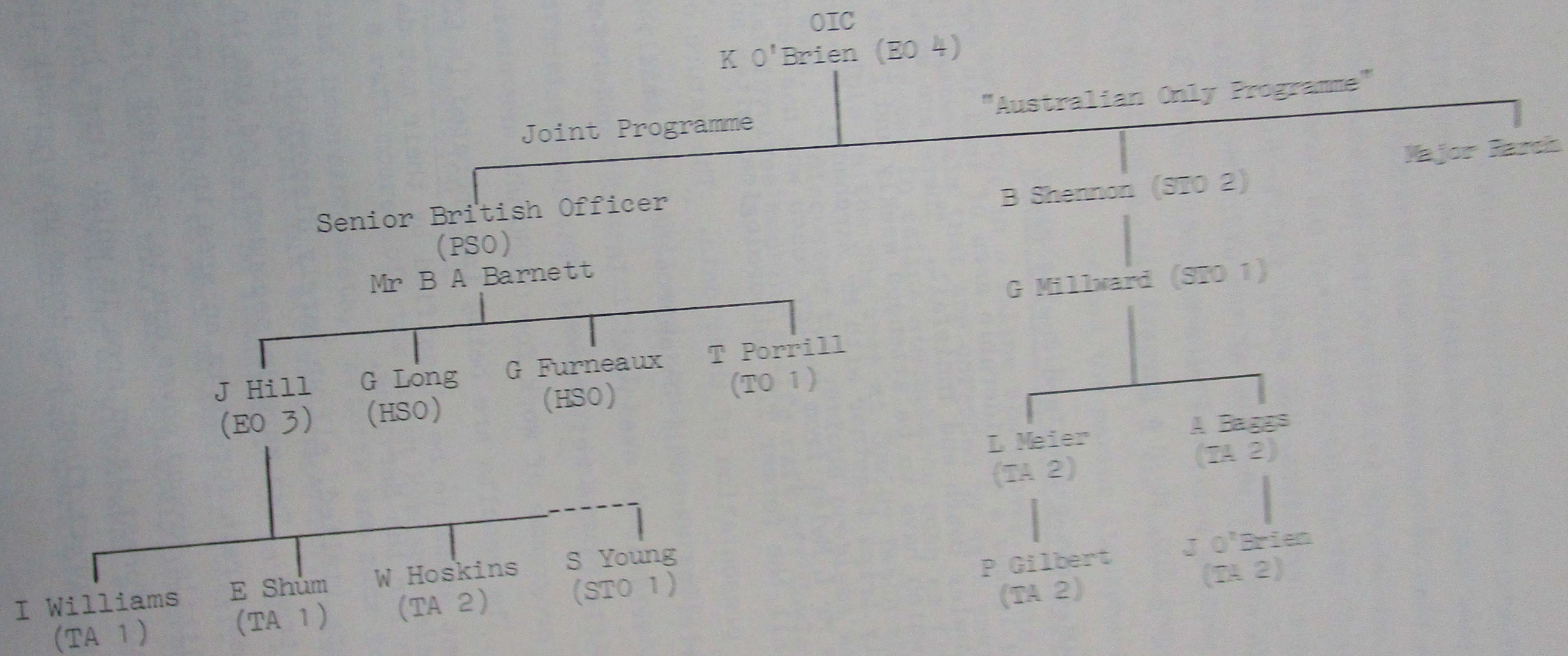
As explained briefly in Section 3 the official management organisation at JTTRE as drawn up at the time of the amalgamation and the practical working situation differ. The two are shown in Figure 1 and Figure 2. The major



OFFICIAL ARRANGEMENT

FIGURE 1

WORKING ARRANGEMENT



difference of particular interest to the UK is the responsibility of the Senior British Officer (SBO) at the establishment. The official arrangement has him merely as a head of the Research and Investigation section with few people. The practical working arrangement that has evolved and that has been mutually agreed by the SBO and the OIC is that the former should take responsibility for all Joint Programme work, that is all exposure tests on materials, and is, in effect, the work of the old JTRU. This situation, which appears to be working well, has been worked on by Mr A R Marchant. It is hoped that the new SBO, Mr B A Barnett will also follow this arrangement.

5.2 Visit to Downey Creek Area and Cowley Beach

The army owns and leases a considerable area of land in the tropical rain forest close to Cowley Beach and Innisfail. There are small met stations in this area which have to be attended weekly and I was able to join one of these weekly trips together with Mr Marchant. Our host, and driver, for the day was Mr L Meier from Cowley Beach who has responsibility for the maintenance of all the former TTE meteorological sites and equipment and the correlation and presentation of their data. The nature of the area is such that the sites visited can only be approached via small, rough tracks where a four wheel drive vehicle is essential. Indeed I understand that the tracks can become impassable in the wet season. The information obtained from these sites is part of a programme of work for CSIRO who are conducting an area survey of met data. The results are being incorporated in QSTAG 360 and should enable the different areas to be classified by their met data and provide useful information for the Services.

Three met stations were visited, all up barely discernible paths at least 100 m from the main track. Two were in secondary and one in primary tropical rain forest. Primary rain forest is an area in which no trees have been felled and hence has little ground cover due to the lack of light at ground level. Secondary rain forest is an area in which trees have been cut. This then allows light to the forest floor and dense undergrowth then grows.

Areas of primary rain forest are rare now as man pursues his own interests in obtaining timber and generally only exists because of its lack of accessibility. Having visited this area I now appreciate the need for adequate insect repellants and reasonable protective clothing for the barbed vines and leaves that are common in the area. It is appreciated that the UK are unlikely to mount many exposure tests on materials in such areas due to the natural screening of UV. They do however provide ideal sites for trials on equipment in real tropical rain forest conditions.

I was then taken to Cowley Beach where I saw some of the ranges and facilities available there. I visited the marine atmospheric exposure site, an area similar to that at Innisfail with exposure racks but only about 100 m from the sea and hence in a saline atmosphere. This site is of particular use for materials that are corroded by salt environments or that are likely to be operated in saline atmospheres such as flight deck coatings and life jackets. This is the one area at Cowley Beach that is devoted to Joint Programme work. I discussed the various problems associated with a UK exposure test that involves mooring a life raft off Cowley Beach and this is looked at later.

I also spoke with Mr G Millward about the current tasks at Cowley Beach. Although it was not stated implicitly I have the impression that there is very little work there at present and that any equipment trials the UK could send there would be welcome.

5.3 Marine Immersion Raft

JTTRE has a raft moored off the North Barnard Islands, SE of Mourilyan for use in marine immersion tests. Efforts are made to visit here on an approximately weekly basis but are very dependent onwweather. If the sea is rough it would obviously be inadvisable to go out in a small boat but it would be quite impossible to work on the raft itself. The exposure racks slot into the raft so that they are completely immersed in sea water. Every time the specimens need examining or withdrawal a complete rack is removed from the raft. All this is done by two operators balancing on the raft and

hence requires reasonably calm conditions. My visit to this raft has certainly increased my understanding of the practical difficulties faced when conducting exposure tests there.

5.4 BRE Sensors and Meteorological Data

JTTRE have four BRE sensors used for monitoring ultra-violet radiation. They have two at a wavelength of 315 nm, one at 350 nm and one at 400 nm, all of which were supplied by PERME for tropical evaluation. This programme has now been run for three years during which time it has been found that although the 315 nm ones have given unreliable results the 350 nm and 400 nm ones have provided much useful information. This work is now being terminated and reports are being written by JTTRE and PERME.

Discussions took place between myself and Mr Marchant, Mr G C Furneaux and Mr G Long, individually, about the presentation of the met data available, particularly for the hot/wet (Pin Gin Hill) and hot/dry (Cloncurry) sites. Mr Furneaux had averaged twelve years data, where it was available, and used the results to plot graphs of the annual variations in rainfall and UV of the hot/dry, hot/wet and temperate (PERME) sites. The author felt that these graphs were a step in the right direction for showing potential test originators the vast range of conditions and has since obtained the information and drawn similar graphs. It became apparent that there are two different requirements of the met data, one is to show the sites as harsh environments to potential originators and the other is to record accurately the data required by originators once a test is started. The latter requirement is adequately performed at present but I agreed to advise JTTRE of any needs we may have for the former. Various methods of presenting the information in this context will be assessed.

Mr Furneaux is actively involved in the analysis of results from the BRE sensors and associated tasks and is applying an enquiring mind to the assessment of the results. At the suggestion of PERME he has also made contacts to discuss monitoring of ozone levels and erythema sensors. The presence of ozone is an important aspect in the degradation of un-saturated rubbers. The

erythema sensors, which have been developed as a result of concern over the effects of UV causing skin cancer, also tie in well with our interests in the short wavelengths of UV which are detrimental to polymeric materials.

I discussed with Mr Marchant the use that is made of the met summaries that are sent to all test originators. I expressed the opinion that very few take note of the met data at all and rely solely on the time of exposure for analysis of results. I assured him, however, that the information being collected at present is of real use in providing a continual up-date of the weather patterns, it will provide information to those who assess their work in retrospect and require met data and, hopefully, will be used more as PERME try to persuade test originators that they should look at their results in terms of UV dosage, fluctuating temperatures, relative himidity etc.

5.5 Mechanical Testing Capabilities

I had very informative discussions with Mr E J Hill and Mr S Young on the current state of the mechanical testing equipment at JTTRE which were prompted, in part, by requests from JTTRE to purchase many replacement parts, eg valves and motor brushes for one of their testing machines. JTTRE currently rely on one testing machine for all mechanical testing, except the metal-to-metal adhesives work from RAE. This work is done on an old Denison machine which has severe limitations for use on any other work. The main machine is a 2,500 kg capacity Monsanto Tensometer Type "E".

The Monsanto is at least six years old now and it appears only to be in reasonable working order because of the efforts of Mr Young, the electronics expert at JTTRE. The manufacturers no longer service or provide spares for this machine, even in the UK, and it is doubtful that major faults could be repaired quickly. The other limitation with this machine is its capacity which, although rated at 2,500 kg has only been calibrated to 2,000 kg. This imposes limitations on its use. In particular JTTRE were offered the work of testing the materials from Exposure Test No 150, Tropical Exposure of Composites, originated by ARL and AFML and had to refuse it. It is also likely that the large proposed exposure test originated by RAE and Westland Helicopters Ltd will not be possible. The establishment is obviously

unhappy at having to turn away work. On site testing facilities, such as are offered in the limited way at present, are quite essential for all materials which are sensitive to moisture or might suffer changes in properties during the return to the test originators. For example, the properties of composite materials and nylons are much affected by moisture content and a test originator is often interested in the lowest strength and modulus of the material. Hence they have to be tested "wet", that is, immediately on withdrawal.

During these discussions I put forward my personal view that an exposure site such as JTTRE, in its unique position of offering immediate testing facilities, should not have to rely on one slightly doubtful machine. I stated that in my opinion moves should be made to ascertain the feasibility of acquiring a new machine. Research in the UK had revealed that there is only one firm that can readily supply a suitably versatile machine and provide maintenance services in Australia. The same conclusion had already been reached by the staff at JTTRE and that was the main contender would be an Instron. I discussed with JTTRE their requirements of a mechanical testing machine and, based on knowledge of such equipment, advised them on the parts they should consider. As a result of the discussions on this equipment I raised these points, later in the visit, with HOS/BDRSS and at the Joint Programme Review Committee Meeting.

5.6 The Work of the British Staff (HSOs)

Mention has previously been made on the work of Mr Furneaux on aspects of met data. It appears that he is settling in well and approaching his various tasks with enthusiasm and is bringing fresh ideas into the work. He is engaged in continuing R and I items, originated by PERME and JTTRE, and is making plans for future work when these projects are completed.

Mr Long is occupied in the running of the many exposure tests originated by MVEE as he has had previous experience required for the metallurgical examinations. He also conducts the annual inspection of the Medium Girder Bridge from MVEE, on exposure and in use at the Cowley Beach site.

5.7 Life Raft Exposure Tests Originated by AMTE (HH)

This item deserves a section on its own because of the many discussions held on varying aspects of the work and possible future implications. In 1977 AMTE(HH) sent to JTTRE samples of rubber coated nylon fabric and life jackets and life rafts made of these fabrics. The exposure schedule requested that the life jackets be worn periodically and the life rafts be put through simulated usage of personnel climbing in and out. This was felt necessary to give indications of weak areas when the components were subjected to use. An arrangement was reached between JTRU and TTE, when these plans were being discussed, that TTE staff (now non-Joint Programme Staff) could be used free of charge for mooring the rafts off Cowley Beach and for the simulated usage.

It was pointed out to me that since the amalgamation of the two establishments and a resultant programme of booking time spent to specific projects that the services of Cowley Beach Staff might no longer be provided free of charge for future work. It is likely that the Joint Programme Staff from Innisfail could do this work but it is time consuming and would involve much travel. Cowley Beach is approximately 25 miles from Pin Gin Hill. The originators have now been warned of the possibility of having to pay for part of their work and obviously when the next series of schedules are sent for approval (due in February/March 1979) there may be many discussions of this aspect. It also appears that there is no set man-day rate for non-Joint Programme Staff as there is for Joint Programme Staff. Estimates of likely costs could, therefore, not be obtained.

The many problems of keeping the life rafts moored off Cowley Beach and the associated work were discussed. Cowley Beach is an unsheltered area which poses problems in taking a fully inflated 25 man life raft out to anchorage and there are also problems in preventing the raft dragging its anchor. I agreed to discuss these problems with the originator on return to the UK and have done so. The rafts are now moored in Mourilyan Harbour, a reasonably sheltered spot, as a result of suggestions by Mr B A Barnett and agreement of AMTE(HH). It remains to be seen if this site is more satisfactory. One point

of concern was that the harbour site is potentially less secure than the one off Cowley Beach. However as one life raft, which was washed ashore, has been vandalised on Cowley Beach, which is public property up to the high tide mark, it is felt that there is little to lose in the recent change.

5.8 Miscellaneous

The work by JTTRE using a dynamic rubber testing machine supplied by MRL was discussed. PERME had supplied a series of 'O' rings for use in assessing this equipment. It appears that the whole project is fraught with problems and it is unlikely that any useful information will be obtained.

Discussions with Mr Young revealed some useful information. Firstly, it is not always appreciated by those in the UK that everything that is sent to JTTRE is subject to the prevailing conditions. Examples were quoted of the incorrect choice of thermocouples being made. Although these had been sent out in the material for testing they are often corroded before the staff have an opportunity to make any measurements. The only suitable thermocouple is copper/constantan. Secondly, during work performed on determining surface temperatures of various materials on exposure an interesting feature was noted. It is well known that the diurnal and yearly temperature ranges are greater at Cloncurry than Innisfail. However what had not been appreciated was the very sudden and large fluctuations that can occur in surface temperatures at Innisfail as a result of rapid cloud cover etc. Thus Cloncurry is not necessarily the most obvious choice of site where temperature fluctuations in a material are likely to be detrimental.

Many other minor points were discussed about the day to day running of exposure tests at JTTRE. These were of particular value to all concerned as it gave us a chance to clear up a series of small things by appreciating each others working environment. In this respect my visit, as the one who arranges all the UK exposure tests, appeared much appreciated.

5.9 General Views of JTTRE

JTTRE as a whole appears to be settling into its new pattern of day to

day running since the amalgamation. I had relatively little contact with the non-Joint Programme side, in fact I deal only with Joint Programme work in the UK. The remainder of my comments therefore apply to this part of JTTRE as found at the Pin Gin Hill site.

The staff at Pin Gin Hill appear to run efficiently and capably the exposure tests they have in hand. As a whole everyone appeared to get on well and this is important for such a small closely knit community. This should be borne in mind when recruiting new staff.

The British Staff at JTTRE all raised one point, to varying degrees. Primarily they are there to conduct research into various aspects of the environment and mechanisms of degradation of materials. Wherever they have particular expertise in a field related to an exposure test they also work on that and this ties them in with the others. However I understand that perhaps insufficient emphasis has been made in the past of the research aspect when recruiting. Ideally new HSOs sent to JTTRE should have arranged a programme of work prior to departure and ensured an adequate supply of materials. Once in Australia there is a tendency for someone to feel "out of sight out of mind". With the increased involvement of the UK Liaison Officer who corresponds regularly on all aspects this is to an extent alleviated. However, since my return, I have strongly advised that the replacement being sought for September 1979 be fully briefed on these points, as to a reasonable extent Mr Furneaux was recently. Continued and increased awareness of this problem at PERME should help in the future.

The efforts that have been made in the UK over the last year to ensure that results supplied by JTTRE are assessed on receipt and comments returned to JTTRE has been appreciated. Even if the comments are pointing out errors or discrepancies they are a welcome sign that the efforts of JTTRE staff are not going un-noticed. Attempts will be made to encourage this policy in future.

6 BRITISH DEFENCE RESEARCH AND SUPPLY STAFF (BDRSS), SERVICES LABORATORIES AND TRIALS DIVISION (SLT) AND THE JOINT PROGRAMME REVIEW COMMITTEE MEETING

Discussions were held with Mr W T S Pearson, HOS/BDRSS, on the various agenda items of the Joint Programme Review Committee meeting. Mr Pearson briefed me on the various topics likely to arise and we discussed the subject of mechanical testing facilities at JTTRE. Mr Barnett joined us during the day and we were taken to the Department of Defence buildings and introduced to Air Vice Marshal R Noble (CSLT). He advised us that in February 1979 he would be taking up the post of Chief Air Force Technical Services and Air Vice Marshal L Compton currently in that post would become CSLT.

The Joint Programme Review Committee meeting was held on Tuesday 5 December. It is not my intention here to reproduce the minutes of this meeting, except to highlight certain points of specific interest to PERME. The work load predictions for the Joint Programme at JTTRE were discussed. I pointed out items of particular interest in those I had submitted. Again this year it appears that the UK have a far greater programme of work for JTTRE than do the Australians. Even allowing for some proposed tests to fall by the way the proposed UK commitment is large. A current trend of our work now is towards tests on materials with specific end uses in mind, eg, propellants, rocket motor cases, composites for use in helicopters, transparencies for aircraft canopies etc. Possible causes for the lack of Australian interest were discussed in Section 4 (MRL). Air Vice Marshal Noble did state, however, that he had recently visited ARL and that the Chief Superintendent and his staff had shown interest in the JTTRE facilities.

During discussion of the financial estimates I brought up the subject of a mechanical testing machine for JTTRE and explained why I thought this should be considered. I also stated that, at that time, this was a personal view as I had not yet discussed it at PERME. Whilst the committee was sympathetic to my views they also expressed concern over costs. It was, however, agreed that this was an item that should be considered.

Difficulties in allocating costs to commercially originated exposure tests were mentioned. I had spoken with Mr R Smith of BDRSS Salisbury on this and suggested, in his absence due to other commitments, a suitable way of organising this. These proposed arrangements appeared agreeable to all parties concerned.

An additional item brought up by Mr Pearson was related to the Australian and UK Health and Safety at Work Acts. Australia has recently had a similar act to ours introduced and Mr Pearson has been advised that UK staff have to comply with the requirements of both Acts. I mentioned that PERME were taking seriously the safety restrictions involved when handling propellants, which are likely to be sent to JTTRE by PERME, and advised the committee that with the help of the PERME Safety Officer a set of instructions had been written for JTTRE staff. These clearly lay down all safety aspects in sufficient detail for those not used to dealing with such materials. I also pointed out that I would be visiting DRC on the following day to pursue this further.

This committee, which was meeting for the second time, appears to give due consideration to manpower requirements and financial aspects of the Joint Programme at JTTRE. Scientific and Technical input is gained from co-opted members such as the OIC and SBO of JTTRE.

7 DEFENCE RESEARCH CENTRE SALISBURY (DRCS)

The Defence Research Centre, formerly known as the Weapons Research Establishment (WRE), essentially consists of four establishments, the Weapons Systems Research Laboratory (WSRL), the Electronics Research Laboratory (ERL), the Advanced Engineering Laboratory (AEL) and the Trials Resources Laboratory (TRL). My host for the day was Mr J Stutchbury, Principal Officer of the Propellants and Polymers Group of WSRL.

The purpose of my visit to DRC was to discuss the various proposed exposure tests from PERME, Waltham Abbey and Westcott, on propellants and hydroxy-terminated polybutadiene binders. Mr Stutchbury had already been asked to give scientific oversight on an R and I item on HTPB, being run as a

preliminary to a main exposure test. The nature of this oversight was discussed and agreement reached.

During these discussions I was introduced to Mr A Wilkie, of the Rocket Propulsion Group, Mr B Hamshere and Mr R Kempson, all of WSRL. I explained the aims of PERME's work planned for JTTRE and gave an outline of the programmes. Mr Stutchbury offered their services for solvent swelling tests on propellant samples and a possibility of some GPC work as neither could be performed at JTTRE. He also expressed sufficient interest in our proposed tests to consider including a few samples of DRC's systems in with the UK's ones.

An item of particular interest to me, as Liaison Officer, was the extent of backing I might have from here on the safety aspects and transporting of UK propellant across Australia. I gave them a copy of the handling instructions PERME had written for JTTRE and said that I was anxious to comply with their own regulations as well as ours. In this respect there appears to be little problem as WSRL accept the PERME Safety Certificates issued on our materials. Mr Wilkie also agreed to liaise with the RAAF for our transport. Hazardous cargoes such as propellants cannot be flown in civil aircraft and road transport is very costly due to the distances involved. These latter points preclude the possibility of using the hot/dry site at Cloncurry for propellants work. Mr Wilkie stated that he should be visiting JTTRE in June/July 1979 and would look into safety requirements. WSRL also offered to dispose of our propellant once it had been tested and this seems preferable to inexperienced staff at JTTRE attempting this.

Mr Wilkie outlined a Canadian-Australian proposed trial on CRV-7 rocket motors for JTTRE. This is being organised through the TTCP and whereas the task is unclassified the results, when obtained, are to be "Canadian-Australian Eyes Only". It is however anticipated that the results will be made available to the TTCP and hence the UK should see them.

This work which is primarily an exposure of rocket motors filled with an HTPB propellant will also include samples of propellant for testing. All will be exposed at the Cowley Beach site and returned to DRC where the motors

will be inspected before static firing. The propellant blocks will be tested in tension at -40°C, +20°C and +60°C at DRC and the residues tested for plasticiser content, antioxidant content and binder sol. As this is a large trial, involving 66 live motors, with twice yearly withdrawals for the first three years it was suggested that use be made of the transport arrangements for this trial for moving the UK propellant.

I was introduced to Dr B H James of the Propellants and Polymers Group, who outlined briefly the work of this group. The majority of the work done is involved with propellants and the polymer side is mainly in an advisory capacity as a result of previous work on the development of specialised rubbers and foams used in weapons systems. A similar picture to that which was painted at MRL was discussed in as much as many of the propellants are made to "recipes" provided by others. This is as a result of Australia purchasing foreign equipment and then manufacturing additional ammunition. A reasonable amount of development is involved here as allowance has to be made for differences in raw materials and technologies. WSRL do also develop their own propellants for their own Australian requirements. Although WSRL also encounter the various problems associated with purchasing foreign equipment it appeared to restrict them far less in their attitude and approach to work than it did at MRL.

I was introduced to Mr G V Hart, Principal Officer of the Central Test House, AEL. He outlined the wide range of test and calibration facilities that were available, including environmental, mechanical, electrical, metrology, metallurgy, non-destructive testing, all of which are common services to DRC Groups. The Central Test House maintains a wide range of Physical Standards for the establishment and can calibrate instruments used in the establishment against these standards. To assure the integration into the international range of measurements and assurance with the national laboratories of other countries the laboratory has been registered with the National Association of Testing Authorities (NATA). Links have been established with the National Standards Laboratories (Australia) and also with the National Physical Laboratory (GB) and the Bureau of Standards (US).

I was shown round some of the testing and calibration facilities available and offers were made to make these facilities available if required after materials had been exposed at JTTRE. Whether such an offer is taken up remains to be seen, JTTRE is geographically far from Adelaide and if materials had to be transported that far test originators may well decide to have their samples returned to the UK. It was also pointed out that there is a strong possibility that the UK would have to pay for work done at the Central Test House. This would, I expect, be determined as and when the occasion arose and in return for information DRC may well be prepared to collaborate in joint programmes of work.

The various offers of assistance and facilities made to me during my visit to DRC were much appreciated and tended to contrast with MRL. I have since recommended to Mr Barnett that when he visits other establishments in Australia he should consider visiting DRC because of the interest shown when I was there.

8 CONCLUSIONS

The opportunity to meet all the people involved in the various aspects of JTTRE and its programme of work has been very much appreciated. This can only help to maintain and improve relations now that personal contact has been made.

The various detailed discussions on all aspects have smoothed out minor problems, created fresh ideas and, in the case of DRC, provided valuable contacts for future work.

Overall JTTRE appears to be settling into its newly formed state well and, of particular interest to PERME, runs the Joint Programme items competently. The use made of the resources at the Cowley Beach and other former TTE sites is more uncertain. The revised management arrangements for JTTRE appear to be working well and increase the UK involvement in the organisation.

Recommendations have been made for future reference when recruiting UK staff to JTTRE.

9 ACKNOWLEDGEMENTS

I would like to express my thanks to all my hosts during this visit who made it both interesting and enjoyable. My particular thanks go to BDRSS who produced the detailed itinerary waiting for me on arrival in Australia and to Mr A R Marchant who devoted much time to me during my week at Innisfail.

REPORT DOCUMENTATION PAGE

(Notes on completion overleaf)

Overall security classification of sheet ..... UNCLASSIFIED .....

As far as possible this sheet should contain only unclassified information. If is is necessary to enter classified information, the box concerned must be marked to indicate the classification eg (R),(C) or (S)).

1. DRIC Reference (if known)	2. Originator's Reference	3. Agency Reference	4. Report Security Classification
	PERME MEMO 69		R UKEB

5. Originator's Code (if known)	6. Originator (Corporate Author) Name and Location
7281400E	Propellants, Explosives and Rocket Motor Establishment Waltham Abbey Essex

5a. Sponsoring Agency's Code (if known)	6a. Sponsoring Agency (Contract Authority) Name and Location

7. Title

VISIT TO AUSTRALIA 18 NOVEMBER - 15 DECEMBER 1978

7a. Title in Foreign Language (in the case of translations)

7b. Presented at (for conference papers). Title, place and date of conference

8. Author 1. Surname, initials	9a Author 2	9b Authors 3, 4...	10. Date	pp	ref
Howes E A			11.1979	24	-

11. Contract Number	12. Period	13. Project	14. Other References

15. Distribution statement

Descriptors (or keywords)

JTTRE, Organisation theory

(TEST)

Abstract

An account is given of a visit made by the author to Australia in November/ December 1978. The places visited were the Materials Research Laboratories, Melbourne, the Joint Tropical Trials and Research Establishment, Innisfail, the British Defence Research and Supply Staff and the Services Laboratories and Trials Division, Canberra, and the Defence Research Centre, Salisbury. The running of JTTRE since its formation and the input from the other establishments visited was discussed.