



**British  
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL

# The MOD Depleted Uranium Programme Independent Review Board: Closure Report

Chemical and Biological Hazard Programme

Commissioned Report CR/07/065N





BRITISH GEOLOGICAL SURVEY

CHEMICAL AND BIOLOGICAL HAZARDS PROGRAMME

COMMISSIONED REPORT CR/07/065N

# The MOD Depleted Uranium Programme Independent Review Board: Closure Report

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B Smith

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Chairman DUIRB October 2003 to March 2007

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120mm Depleted Uranium APFS  
Munition in Flight.

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# Executive Summary

This closure report was prepared by the MOD's Depleted Uranium Independent Review Board (IRB; see Appendix A for membership) and summarises the review board's general observations in respect of MOD's depleted uranium research programme and the associated independent review process.

The report starts by providing an introduction to MOD's research programme on the health and environmental consequences of depleted uranium (DU), membership of the IRB, the operation of the review process as implemented by the IRB and its terms of reference. These explanatory sections are then followed by brief summaries outlining the contribution of the IRB, its general conclusions in respect of the research programme and then recommendations in respect of continuing research needs and the independent review process.

The Board concludes that the MOD has taken substantive steps, through its research programme, to demonstrate a commitment to its investigation of DU and to further our knowledge of the impact of DU on man and the environment. Additional knowledge has been generated under virtually all of the research topics and there now exists a substantive body of work that will be eventually made more widely available to those interested in the wide variety of issues associated with the military use of DU. The board felt of particular note within this context was the development of probabilistic modelling of uranium biokinetics and the study of DU corrosion rates.

In terms of future research needs the IRB emphasises the need to: undertake and then publish results from the radiochemical analysis of a limited number of DU samples; incorporate and review the results of the NERC research programme; seek further opportunities for urine sampling and analysis to better constrain data on DU intake; continue to press for the exchange of relevant data and analyses with other international bodies and to continue to progress and populate the proposed DU literature data base. The Board also asks the MOD to encourage: the publication of work undertaken in this research programme in peer reviewed journals and that lessons learnt in respect of the assessment of the health and broader environmental impacts of DU based munitions be applied at an early stage in the development of alternative military technologies.

The IRB set high standards in undertaking its reviews of technical content, scientific rigour and document quality. As a consequence it recognises that this inevitably introduced some delays into the Dstl research team's planned schedules. However, the Board believes its efforts have helped to target the work at relevant subjects and ensured the quality of the output, in terms of the validity of the conclusions and presentational standard, met an appropriate level. This view has been supported by feedback to the IRB from the Dstl. However, it is for the MOD customer to judge the IRB's effectiveness within this context and to consider when it is most appropriate to use the IRB 'mechanism' in future programmes.

From the perspective of methodologies and processes employed by the IRB during its reviewing of the MOD programme it feels that any future review board should be formed at an earlier stage in the process so that it can have a greater influence, if required, in the development rather than just the implementation phase of a given research programme. It found face to face meetings with the Dstl staff, and periodic workshops particularly worthwhile during the course of the review process.

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# 1 Introduction

Publication of this document represents the closure of the activities of the MOD's Depleted Uranium (DU) Research Programme Independent Review Board (IRB), which was established in October 2003 to demonstrate the MOD's commitment to transparency and openness in its DU research programme. The IRB has provided a scrutiny and validation function with respect to the unclassified research proposals and deliverables arising from the unclassified elements of the research programme.

This closure report sets out the purpose of the MOD's DU research programme and the aims and functions of the IRB, as agreed in its Terms of Reference (TOR), and then describes the extent to which the IRB has achieved them. It sets out the IRB's observations regarding the way in which the research programme has been conducted and the extent to which the objectives of the unclassified research programme have been achieved. It also identifies those issues that the IRB thinks remain to be addressed. Finally, it provides recommendations on the process of using an IRB, should the MOD wish to use such a body again in the future.

# 2 Background

The MOD published its proposals for a DU research programme in March 2002 in recognition of its commitment to address veterans' and public concerns relating to the health and environmental implications of the military use of DU. The programme was developed on the basis that, wherever possible, the MOD would seek to use independent laboratories to conduct the research and independent reviewers to assess proposals and peer review deliverables.

Prior to its publication the MOD sought comments on its proposal document from other Government departments, The Royal Society, the Research Councils, United States of America (USA) Government departments and veterans' representatives.

To demonstrate its commitment to transparency and openness, some elements of the programme were placed with the Natural Environment Research Council (NERC), which took responsibility for placing and reviewing research to investigate DU transport mechanisms and processes and an independent Depleted Uranium Oversight Board (DUOB), which took responsibility for a programme of work on health screening for DU exposure.

For those elements of the work programme managed in-house, the MOD established two review bodies: (i) the Defence Scientific Advisory Council Depleted Uranium Programme Review Body (DSAC DURB), was responsible for review of the classified research task proposals and deliverables and (ii) the Independent Review Board (IRB), was responsible for review of the unclassified research task proposals and deliverables.

In order to ensure the demonstrable independence of the IRB the MOD sought nominations from the Chief Executives of the Research Councils for individuals with the abilities, experience and qualities needed to serve on an independent review board. The Royal Society and The Royal Academy of Engineering were requested to propose a further independent panel to review the nominations and make recommendations for appointment.

Following the nomination and recommendations process, an independent review board, composed of ten members was formed. The membership of the IRB is detailed in Appendix A.

An overarching contract was placed with the MOD's own research laboratory (Defence Science and Technology Laboratory, Dstl) to manage the delivery of the research programme to be reviewed by the IRB. The stated objective of the contract placed with the Dstl was 'to provide the MOD with research and technology services that would deliver an agreed programme of research on DU that was demonstrably transparent in terms of both the research and its outcomes (where this would not be detrimental to future operations) and in which all research proposals and deliverables had been subjected to scrutiny and comment by independent reviewers'.

### 3 The research programme for review by the IRB

The purpose of the proposed programme of work set out in the MOD's proposal document was to provide the MOD with research on DU that would enhance the understanding of the environmental and health implications of the military use of DU. This programme was designed to establish an independently validated DU database that would provide the foundation for robust environmental and human health risk assessments for both past and future testing and operations during which DU has been, or is deployed.

The outline research requirements relevant to the work of the IRB, which accompanied the request for contract action, provided to the Dstl by the MOD, are at Appendix B to this report (those requirements relevant to the work of the NERC, the DUOB and the DSAC DURB are not included in the Appendix). In defining the research requirements the MOD chose not to be overly prescriptive to allow flexibility and innovation in the Dstl response. Changes were subsequently made to some of these tasks and some were conducted in parallel programmes to those reviewed by the IRB.

### 4 The IRB Terms of Reference

At the first meeting of the IRB, held on 23 October 2003, the terms of reference of the IRB were discussed and agreed. The full TORs are reproduced as Appendix C to this report. The aims and functions of the IRB were agreed to be:

- to agree the TORs of the DU research programme IRB;

- to act as a source of independent advice to the MOD on the scientific integrity, quality and value for money of unclassified research proposals submitted to meet the requirements of the MOD's DU research programme;
- to act as a source of independent advice on the scientific integrity and quality of unclassified deliverables emanating from the MOD's DU research programme;
- to advise on the adequacy of the arrangements to involve independent laboratories where this is practicable;
- to review and provide written comment on unclassified proposals and deliverables associated with the MOD's DU research programme;
- to meet, as and when required, to discuss unclassified proposals for research and research deliverables and to agree a consensus view to be reported to the MOD;
- to provide the MOD customer for the DU research programme with written minutes and recommendations arising from the proceedings of the IRB;
- to provide suggestions for future research where it is considered to be necessary.

## 5 Operation of the IRB

The elements of the DU research programme reviewed by the IRB delivered:

- eight research proposals
- fourteen research reports, of which:
  - the Dstl produced 6
  - the Health Protection Agency (HPA, formerly the National Radiological Protection Board) produced 4
  - the British Geological Survey (BGS) produced 2
  - Serco Assurance (Serco) produced 2
- six letters examining the way forward and possible changes to agreed research tasks
- twelve summary customer reports

Three additional reports directly related to the research programme were produced in parallel programmes (1 x HPA, 1 x BGS and 1 x Serco). These were not formally reviewed by the IRB but constituted the subject of summary customer reports.

Some contracts had been let, and started, before the IRB began its work (e.g. the terrestrial and marine corrosion programmes).

With specific reference to the TORs the IRB;

- met, as and when required, between October 2003 and March 2007. A total of 26 review meetings were held with a good attendance record. Members also

participated in three, 2-3 day Workshops set up as part of the wider research programme.

- carried out its work in the ways intended by acting as a source of independent advice to the MOD on the proposals, activities and deliverables of the research programme, including the use of independent laboratories and experts.
- reviewed a number of documents including research proposals, internal and external reports of independent research suppliers and customer reports. Most of these were reviewed by the IRB more than once and written comments on proposals and deliverables have been provided.
- made suggestions for further research within the context of the ongoing projects.
- provided the MOD customer with written minutes of the meetings along with recommendations.

The IRB review process was focussed and facilitated by the use of a review form which consisted of two components; a comments sheet and a scoring form. An example of the review form as used for the review of research proposals is reproduced as Appendix D along with an example of the form used for the review of deliverables.

Prior to meetings, the document(s) to be reviewed, along with a dedicated review form, was sent to each of the IRB members by the IRB Programme Manager (IRB PM). The completed review forms were returned to the IRB PM and, after consolidation, a consolidated review form was returned to the IRB members. The consolidated form was then used as the basis for document review at the formal review meeting. High and medium level comments were always considered. The consolidated comments were amended if appropriate and subsequently communicated to the Dstl research project manager through the MOD research programme customer.

Following the initial meetings, the IRB agreed that the Dstl research team should attend meetings for an informal, preliminary discussion with the IRB, to clarify points or respond to specific questions, prior to the commencement of the formal IRB meeting. The face to face discussions with the authors of the documents proved to be highly valuable, enabling a constructive relationship to be established with the Dstl research project team. The IRB appreciated the positive way in which the Dstl research project team received, and responded to, the IRB's concerns and comments.

During the closed, formal meeting proceedings the IRB members discussed the document(s) submitted for review, focussing on the concerns and issues raised by the consolidated comments. A consensus view regarding the research proposal or deliverable was then agreed and a suitable recommendation was then made in writing to the MOD customer for the DU research programme.

The IRB thought that the DU Workshops organised by the MOD, to which the IRB members were invited, provided excellent background for the IRB and an opportunity to interface with the researchers working in areas covered by the NERC, the DUOB, the DSAC DURB and also those involved in international DU programmes (United Nations Environment Programme (UNEP) and USA representatives).

The secretariat support given to the IRB was excellent, both in terms of support to the organisation, conduct and recording of meetings and in providing scientific and technical clarification of many issues. This made a significant contribution to the IRB's ability to carry out its work effectively.

In retrospect, members of the IRB felt that they could have been of greater assistance to the research programme as a whole, if a better interface with those research activities being undertaken outside of the IRB's review responsibilities (e.g. with the NERC research programme) had been established. Members also felt that the bigger picture was lost at times because of the inherent focus of some of the submitted documents and proposals.

The IRB felt that an equal degree of scrutiny may not have been applied as the programme drew to a close because of a 'rush' to complete reviews of a large number of documents being delivered within the final few months of the programme. The IRB believes, however, that all work items and reports did receive adequate scrutiny.

## 6 IRB Contribution

The diversity of appropriate experience and technical expertise that was represented on the IRB was well fitted to its objectives and defined terms of reference. The IRB's wide breadth of expertise also added to the scientific expertise from which the MOD DU research programme was able to draw and as a consequence added to MOD's ability to act as an intelligent customer for the work that was proposed, accepted and conducted. The IRB also feels that its role of independent commentator and peer reviewer should facilitate public confidence in the research programme outcomes.

The IRB was established after the contract with the Dstl had been let. Therefore, it was not involved in the defining of the research requirements and in some cases contracted work had already begun (e.g. corrosion studies at Eskmeals and Kirkcudbright firing ranges, which had been carried into the DU research programme as ongoing projects). This reduced the IRB's ability to have an impact on the design and implementation of the research activities.

The IRB's initial work was to review research proposals. For each research item proposal, the IRB examined the proposed tasks for content, structure, balance and realism, and in many cases recommended the introduction of review and hold points so that the need for, and value of, further work could be assessed.

In its deliberations, the IRB tried to distinguish between gaps in knowledge and those gaps, which, if filled, would be likely to alter the current perspective on the short term and long term effects of DU on military and civilian personnel. This affected the degree of support that was given to proposals for further work.

The IRB adopted a structured and critical approach to its review activities. This together with the wide range of expertise available within the IRB meant that, it was able to review at both a high level of technical detail and more generally for readability and clarity. A further consequence of this approach was that it allowed comment to be made

on the value and suitability of the programme outputs for publication in the open literature.

The IRB was able to apply a rigorous review to improve quality. This was facilitated by the ability to reach a consensus view in spite of there being a divergence of views on some issues. The review of deliverables by all IRB members eliminated the ‘technical specialist only’ perspective.

Each of the research items reviewed by the IRB involved the production of both detailed technical and summary customer reports. The summary customer reports were prepared by the Dstl specifically for MOD use. The reports concluded with recommendations on whether or how to take the topics further (that is, after the formal DU Research Programme finished). In cases where the IRB had reviewed the work done under the proposal, the IRB agreed with the final recommendations in the customer reports. These recommendations included keeping abreast of the literature, for example on health effects of uranium, (as opposed to MOD commissioning work specific to DU). In another case, some carefully specified and rigorous analytical work on DU metal used in UK munitions was recommended to be taken to completion.

The initial review of research proposals by the IRB assisted in better targeting of the programme and the introduction of hold points in some research tasks added value by allowing changes to be made when appropriate. In reviewing documents, the IRB addressed the likely readership, beyond the MOD and considered where journal publication was merited.

The IRB set high standards in undertaking its reviews of technical content, scientific rigour and document quality. As a consequence it recognises that this inevitably introduced some delays into the Dstl research team's planned schedules. Although the IRB requirements have lengthened the timescale needed to complete the work, the Board believes its efforts have helped to target the work at relevant subjects (e.g. by refocusing the radiochemical analysis work) and ensured the quality of the output, in terms of the validity of the conclusions and presentational standard, met an appropriate level. This view has been supported by feedback to the IRB from the Dstl. However, it is for the MOD customer to judge the IRB’s effectiveness.

The IRB felt that it was constrained in its review of some areas because of limited access to reports and data from USA government and military sources. However, the IRB acknowledges that the Dstl were constrained in providing access to some reports and data provided to them under government to government agreements.

## 7 IRB Conclusions

The MOD has taken substantive steps, through its research programme, to demonstrate a commitment to its investigation of DU.

In terms of environmental impact, the continued development of techniques such as inductively coupled plasma mass spectrometry (ICP-MS), as used in some of Dstl's work items, means that the presence of even minute amounts of DU can be identified in the

presence of natural uranium. Whilst this aids the study of DU in the environment it also means that its presence can be detected at concentrations well below those which may constitute harm to ecosystems, man and controlled waters. As a consequence of this, its detection in the environment by such sensitive analytical techniques should not necessarily trigger the instigation of remedial measures.

Further knowledge under the various topics has been generated and/or documented; knowledge gaps have been identified; and a significant body of work accomplished and recorded that will eventually be made widely accessible to support the MOD and others in issues surrounding the military use of DU. In particular, the programme has produced important new information in the areas of probabilistic modelling and on DU corrosion rates.

The final full research reports, deliverables and customer reports have been endorsed by the IRB as publishable at an appropriate level.

What was achieved is regarded by the IRB as well in balance with the level of funding allocated. However, the IRB was generally unable to comment on the value for money on a task by task basis due to a lack of information on possible outcomes of specific tasks.

The IRB is of the view that the outcomes from the elements of the DU research programme which it reviewed do not change the tenor of the assessments made by The Royal Society [in *The Health Hazards of Depleted Uranium Munitions: Part I*, 2001, ISBN 0854033540; and *Part II*, 2002, ISBN 0854035745] before the programme started, but, together with work completed elsewhere, the work has added considerable robustness to the approach used in The Royal Society assessments.

## 8 Recommendations for future work

The MOD should continue the radiochemical analysis of a limited number of DU samples. The results should be reviewed in comparison with other previous analyses and the outcome published.

When the NERC work has completed the MOD should review the output across both programmes. In particular, consideration should be given to whether more work is needed on the atmospheric transport, biological solubility and fate of impact and combustion aerosols.

The MOD should seek opportunities for further urine sampling, where few examples of DU intake have been found to date, and should consider how data compares with modelling predictions.

The MOD should continue to press for the exchange of relevant data and analyses with appropriate authorities in the USA.

The MOD should progress and populate the database proposed under the DU Literature task.

The outcomes from this and other parallel DU research programmes should be brought together in a summary report.

Wherever possible the MOD should encourage the publication of the work undertaken in this research programme in appropriate peer reviewed journals. This represents the only route by which MOD will fully realise the true benefits of this research programme.

Alternative materials to DU, for military use, should also be subjected to environmental and health impact reviews prior to, during and after their development. It should not be simply assumed that the health and environmental impacts of new, previously used and/or tested systems will be less than those associated with DU use.

## 9 Process recommendations

The MOD should consider when it is appropriate to use the IRB ‘mechanism’ in future programmes (e.g. when there is a public interest, etc.)

When the IRB mechanism is appropriate, the Review Board should be established earlier in the programme to enable the Board to influence the proposals for research.

Face to face meetings between reviewers and research suppliers are highly beneficial.

Programme review meetings (e.g. workshops) are very beneficial and a good mechanism for keeping in touch with developments in parallel programmes. Good interfaces need to be established to get the maximum benefit from programmes.

In the management of any future IRBs, periodic programme review sessions should be facilitated to ensure that the ‘big picture’ does not get obscured by the detailed work.

## 10 Acknowledgements

The IRB wishes to gratefully acknowledge the excellent support given to the Board by Alan Evans throughout the duration of its activities. His efforts have enabled the IRB to be effective and efficient and his patience in attending to our needs as members is to be highly commended.

The IRB also wishes to thank the members of the Dstl research team for the constructive approach they took towards the IRB’s extensive review of their work and to the positive way in which they responded to the IRB’s concerns and comments.

# Appendix A

## Composition of the MOD DU Research Programme Independent Review Board

Title	Forename	Surname	Company/University	Expertise
Professor	Barry	SMITH	British Geological Survey (Board Chairman)	Geochemist
Professor	Denis	HENSHAW	University of Bristol	Health effects of internal alpha emitters
Professor	David	EDMONDS	University of Leeds	Physical metallurgist
Professor	Tony	GODDARD	Imperial College of Science and Technology	Nuclear safety ; air pollution
Professor	Francis	LIVENS	University of Manchester	Radiochemist
Professor	Nicholas	PRIEST	Middlesex University	Radiobiologist / Ecologist
Professor	Gregg	BUTLER	Independent Consultant (to Jan 2006)	Nuclear fuel cycle
Dr	Michael	BAILEY	National Radiological Protection Board	Internal dosimetry
Dr	Kay	SIMPSON	Independent Consultant	Uranium nuclear fuels
Mr	Stan	GORDELIER	UKAEA (to Jan 2005) Independent Consultant (from August 2005)	Nuclear technology
Dr	Chris	LEACH	MOD Programme Customer (Observer)	
Mr	Charles	WILLIAMS	MOD Veterans' Policy Unit (Observer)	
Mr	Alan	EVANS	Dstl (Secretariat support)	

# Appendix B

## **UK MOD DU RESEARCH PROGRAMME OUTLINE REQUIREMENTS**

### **RESEARCH ITEM 1**

TITLE – RADIOCHEMICAL ANALYSIS OF DEPLETED URANIUM

REQUIREMENT – To;

- Carry out a detailed radiochemical analysis of the depleted uranium used in UK 120mm munitions to identify uranic and trans-uranic composition.
- Review the results of the radiochemical analysis and compare and contrast the results with those provided by the supplier of the raw material.
- Assess any additional risk to health posed by any unexpected trans-uranic material identified by the radiochemical analysis.

### **RESEARCH ITEM 2**

TITLE –DEPLETED URANIUM HAZARDS REFERENCE DOCUMENT

REQUIREMENT – To conduct parallel reviews of depleted uranium hazard literature (both classified and unclassified) by;

- Obtaining and reviewing Information on uranium and depleted uranium hazards published in the available source literature.
- Comparing and contrasting published depleted uranium hazard assessments based on information relating to depleted uranium's radiological and chemical toxicity, and extrapolations from uranium hazard data.
- Identifying areas where the quality of source information gives rise to uncertainties in the hazard assessments and define any new work that would give increased confidence in hazard assessments.

### **RESEARCH ITEM 3**

TITLE – CORROSION OF DEPLETED URANIUM

REQUIREMENT – To;

- Identify and characterise real depleted uranium corrosion environments.
- Conduct experimental work to compare and contrast corrosion and dissolution rates of unfired depleted uranium in ground, marine and controlled laboratory environments.
- A review of the literature relating to the bioavailability of the corrosion products of depleted uranium identifying any gaps in understanding.
- Review available data to establish if there is any evidence to justify determining the relative and actual corrosion and dissolution rates for both fired and unfired depleted uranium.
- Subject to the review indicating a requirement to conduct research using fired depleted uranium, obtain fired depleted uranium and conduct experimental work to compare and contrast its corrosion and dissolution rates in ground, marine and controlled laboratory environments

### **RESEARCH ITEM 4**

TITLE – DEPLETED URANIUM CONTAMINATION AT THE FIRING POINT

REQUIREMENT – To;

- Conduct a review of available data to establish the extent to which gun barrels used to fire depleted uranium munitions have become contaminated and to assess the hazard to health imposed by such contamination.
- Subject to the above assessment concluding that gun barrel contamination poses an unacceptable hazard to health, carry out work to establish the contamination mechanism.
- Assess the environmental consequences of gun barrel contamination.
- Assess the nature and extent of any contamination released into the environment, at the firing point, when using contaminated barrels to fire either depleted uranium or non-depleted uranium munitions.

### **RESEARCH ITEM 5**

TITLE – IMPACT EFFECTS

- Liaise with the US depleted uranium research community to identify collaboration opportunities.
- Participate in US firing tests whenever an opportunity arises.
- Review available US and UK test firing data relating to impact effects and compare and contrast the findings with particular emphasis on an assessment of the relevance of the US data to UK DU usage.

#### **RESEARCH ITEM 6**

TITLE – DEPLETED URANIUM TRANSPORT MODELLING

REQUIREMENT – To;

- Review existing methodologies for modelling uranium and depleted uranium transport in the environment and compare and contrast published transport model results.
- Assess the relevance of geochemical models of radioactive material transport to the transport of depleted uranium in the environment and compare and contrast conventional and geochemical models and recommend the most appropriate for DU transport modelling.
- Identify where transport parameter values are uncertain and define the work needed to obtain the parameters required to increase confidence in model predictions.
- Subject to the outcome of the above work, determine those transport parameters required to increase confidence in transport model predictions.

#### **RESEARCH ITEM 7**

TITLE – FATE OF DEPLETED URANIUM

REQUIREMENT – To:

- Continue ongoing studies of depleted uranium corrosion and dissolution in the marine environment.
- Review the available literature on the corrosion and dissolution of DU in the marine environment and compare and contrast published findings.
- Assess the implications of depleted uranium entering the marine environment on marine life and the food chain and identify any gaps in understanding.

#### **RESEARCH ITEM 8**

TITLE – ENVIRONMENTAL IMPACT OF DEPLETED URANIUM

REQUIREMENT – To;

- Obtain and review the available information relating to the monitoring of UK and US depleted uranium test ranges and all sites where depleted uranium has been used in combat.
- Collate the available monitoring information, determine its value for assessing depleted uranium exposure in real events, identify what, if any, significant gaps in knowledge are preventing robust predictions of exposure based on monitoring data and, if appropriate, what research would be needed to increase confidence in exposure prediction.
- Obtain, review and collate any new information coming from the monitoring of depleted uranium test sites and combat zones and determine its value for assessing exposure of military personnel and civilians.

#### **RESEARCH ITEM 9**

TITLE – HEALTH EFFECTS

REQUIREMENT – To;

- Review the available literature relevant to the effects of depleted uranium exposure by inhalation on neurocognitive functioning, pulmonary loading and transport to and uptake by the pulmonary lymph nodes, identify any uncertainties in understanding, determine if a scoping study on the dissolution rate of depleted uranium in lung fluids is needed to increase understanding and, if so, define a suitable study programme.
- Subject to the outcome of the above work, conduct a scoping study on the dissolution of depleted uranium aerosol in lung fluids.

#### **RESEARCH ITEM 10**

TITLE – BIOKINETIC MODELLING FOR DEPLETED URANIUM

REQUIREMENT – To;

- Review work being done by the National Radiological Protection Board and others on biokinetic modelling related to uranic materials and assess its relevance to depleted uranium.

#### **RESEARCH ITEM 11**

TITLE – POST DEPLOYMENT MONITORING OF DEPLETED URANIUM

REQUIREMENT – To;

- Assess the ability of instrumentation to locate depleted uranium penetrators and contamination in different depths of water and soil.
- Continue with in depth examination of accessible DU strike zones in the British Sector in Kosovo if monitoring data indicates that this is necessary.
- Continue with monitoring the living and working areas of UK service and civilian staff serving in Kosovo if monitoring data indicates that this is necessary.

**RESEARCH ITEM 12**

TITLE – DEPLETED URANIUM LITERATURE

REQUIREMENT – To;

- Monitor and review future MOD depleted uranium research activities.
- Undertake a review of the scientific rigour of available historical and newly published depleted uranium literature and reports produced by reputable scientific bodies.
- Undertake a review of historical and newly published DU literature and reports produced by veteran and opposition groups.
- Maintaining and updating the DU database.

# Appendix C

## **TERMS OF REFERENCE OF THE MOD DU RESEARCH PROGRAMME INDEPENDENT REVIEW BOARD**

### **1. Title:**

The title of the body shall be the Depleted Uranium (DU) Research Programme Independent Review Board.

### **2. Background:**

The DU Research Programme Independent Review Board has been established to demonstrate the MOD's commitment to transparency and openness in its DU Research Programme. In fulfilling its role the independent review board shall be required to provide a scrutiny and validation function with respect to the unclassified research proposals and deliverables arising from the unclassified element of the MoD's DU research programme.

### **3. Aims and Functions:**

- 3.1 To agree the Terms of Reference of the Depleted Uranium (DU) Research Programme Independent Review Board.
- 3.2 To act as a source of independent advice to the MoD on the scientific integrity, quality and value for money of unclassified research proposals submitted to meet the requirements of the MOD's DU research programme.
- 3.3 To act as a source of independent advice on the scientific integrity and quality of unclassified deliverables emanating from the MOD's DU research programme.
- 3.4 To advise on the adequacy of the arrangements to involve independent laboratories where this is practicable.
- 3.5 To review and provide written comment on unclassified proposals and deliverables associated with the MOD's DU research programme.
- 3.6 To meet, as and when required, to discuss unclassified proposals for research and research deliverables and to agree a consensus view to be reported to the MoD.
- 3.7 To provide the MOD Customer for the DU research programme with written minutes and recommendations arising from the proceedings of the independent review board.
- 3.8 To provide suggestions for future research where it is considered to be necessary.

### **4 Frequency:**

The frequency of the DU Research Programme Independent Review Board meetings will be determined at the inaugural meeting and will take into consideration the requirements of the research programme. When necessary, meetings will be arranged and held subsequent to the submission and review of unclassified research proposals and programme deliverables at a time and date to be agreed between the board chairperson and the board members.

It is expected that the review board will be required to contribute to the review process on an average of two days per month during the first year of the programme, one day per month during the second year of the programme and two days every six months during the final year of the programme.

### **5 Membership:**

The DU Research Programme Independent Review Board shall consist of the following:

Independent Chairperson  
Nine Independent Members

Dstl shall provide the Secretariat for the independent review board. The Secretariat shall consist of the Programme Manager and a Minutes Secretary.

The following may attend the independent review board meetings, as observers or to provide specialist advice, at the invitation of the Chairperson:

Defence Scientific Advisory Council Chairperson  
MOD Programme Customer  
Dstl Technical Specialists

## **6 Remuneration:**

Board members shall be eligible for remuneration at agreed daily rates, chargeable to the nearest half day. Expenses involved in reviewing submissions and attending meetings shall be paid on the basis of MoD agreed travel rates and receipted expenses.

## **7 Roles:**

### **Board members:**

Board members shall;

1. Agree Terms of Reference for the Board;
2. Provide independent and objective advice on unclassified research proposals and deliverables relevant to the MoD's DU research programme;
3. Review and provide written comment on unclassified research proposals and deliverables relating to the DU research programme;
4. Contribute to meetings of the independent review board.
5. Undertake all activities in accordance with the "Guidelines for Operating Firewall"

### **Chairperson:**

In addition to responsibilities as a board member the chairperson shall;

1. Agree meeting dates and arrangements with the Dstl Programme Manager;
2. Agree an agenda for meetings of the independent review board with the Dstl Programme Manager;
3. Chair meetings of the independent review board;
4. Agree and approve minutes and recommendations arising from meetings of the independent review board.
5. Act as a link with other relevant review bodies and report back to the IRB.

### **Dstl Secretariat:**

The Dstl Secretariat shall:

1. Provide management, secretarial and administrative support to the independent review board.
2. Work with the Chairperson to agree meeting dates and arrangements;
3. Issue research proposals and deliverables to board members for review;
4. Collate written responses arising from the review process;
5. In consultation with the Chairperson, prepare and issue meeting papers (calling notices, agendas, etc.) to board members;
6. In consultation with the Chairperson, make arrangements for all meetings of the independent review board;
7. Arrange for the preparation of minutes and other documents arising from board meetings;
8. With the Chairperson's approval submit records of the board's meetings and proceedings to the MOD programme Customer.

# Appendix D

## DEPLETED URANIUM RESEARCH PROGRAMME PROPOSAL REVIEW FORM

<b>Reviewer:</b>	<b>Proposal Number:</b>	<b>Version:</b>
<b>Short Title:</b>	<b>Date of Review:</b>	

<b>Potential Conflicts of Interests:</b>
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Please categorise your comments using the following scale:

Low – editorial/minor content correction; of minor significance to the proposal/report intent;

Medium – taking on board these comments would significantly improve or add value to the proposal/report;

High – comments that refer in a significant way to the scientific integrity and quality of the proposal/report

<b>Page</b>	<b>Paragraph Figure/ Table</b>	<b>Category (L – Low; M - Medium, H – high)</b>	<b>Comment (with rationale)</b>	<b>Proposed change (if appropriate)</b>

Page	Paragraph Figure/ Table	Category (L – Low; M - Medium, H – high)	Comment (with rationale)	Proposed change (if appropriate)

<i>GENERAL COMMENTS</i>

**EVALUATION FACTORS**

Factor	Issue to be addressed	Reviewer Assessment			Comment
		Yes	No	Insufficient information to assess	
Applicability to the requirement	Is the requirement understood?				
Clarity of objectives	Are the objectives clearly defined?				
	Are the objectives relevant?				
Clarity of deliverables	Is there a clear and logical programme plan leading to clearly defined deliverables?				
Feasibility of achieving proposed objectives	Are the proposals for addressing technical problem areas feasible?				
	Does the work breakdown structure demonstrate that the scope of the work is understood?				
	Does the statement of work reflect work breakdown structure?				
	Are the tasks clearly defined and logical?				
	Is the Gantt Chart logical and the schedule realistic?				
	Does the background technology provide confidence that the technical objectives can be achieved?				
Proposed milestones	Are milestones adequately defined?				
	Are the milestone achievements measurable?				
Confidence in ability to deliver	Is the proposed organisation logical?				
	Are responsibilities for delivery clearly defined?				
	Do the proposed team members have the appropriate experience and are they competent to deliver?				
	Does past performance demonstrate appropriate corporate experience?				
	Are the programme and technical risks understood?				
	Do the proposed monitoring and control procedures demonstrate an appropriate level of programme management activity?				

Factor	Issue to be addressed	Reviewer Assessment			Comment
		Yes	No	Insufficient information to assess	
Collaboration and independents	Has due consideration been given to the benefits of collaboration and the use of independents?				
	Is any proposed collaboration adding value?				
	Are the benefits of collaboration clearly explained?				
	Have independents been engaged where appropriate?				
Cost realism	Is there a realistic allocation of resources to tasks?				
	Is the cost/pricing model realistic?				
	Is the cost/price commensurate with the proposed level of activity?				
Cost reasonableness	Is the cost estimating methodology appropriate?				

**DEPLETED URANIUM RESEARCH PROGRAMME DELIVERABLE REVIEW FORM**

Please add additional rows to the following tables using the MS Word Table "Insert Rows" function if they are needed

<b>Reviewer:</b>	<b>Deliverable Reference:</b>	<b>Version:</b>
<b>Deliverable Title:</b>		<b>Review Date:</b>

<b>Potential Conflict of Interests:</b>
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Please categorise any specific comments using the following scale:

**L** (Low) - editorial/minor content correction: of minor significance to the deliverable content

**M** (Medium) - taking on board these comments would significantly improve or add value to the deliverable

**H** (High) - comments that refer in a significant way to the scientific integrity and quality of the deliverable

<b>SPECIFIC COMMENTS</b>				
<b>Page No</b>	<b>Paragraph Table/Figure</b>	<b>Category (H, M or L)</b>	<b>Comment (with rationale)</b>	<b>Suggested change (if appropriate)</b>

GENERAL COMMENTS

**EVALUATION FACTORS**

Please tick the appropriate box A,B,C,D or E where:

A - Strongly agree

B - Agree

C - Borderline

D - Disagree

E - Unable to comment

NA – Not applicable

	A	B	C	D	E	NA	Comment
<b>Scope</b>							
The scope of the deliverable is clear							
The scope is consistent with the proposal							
The work is within the stated scope							
<b>Objectives</b>							
The objectives are stated							
The objectives are consistent with the proposal							
The objectives have been addressed							
The objectives have been met							
<b>Main Text</b>							
The background to the work is clearly explained							
The case for carrying out the work has been justified							
Previous supporting work has been adequately described							
The work carried out has been adequately described							
<b>Data (if relevant)</b>							
The data is clearly presented							
Errors/confidence levels are quantified							
The data analysis is appropriate							

The data analysis is sound							
<b>Conclusions (if relevant)</b>							
The conclusions are clearly set out							
The conclusions are supported by the work presented							
The correct conclusions have been drawn							
<b>Recommendations(if relevant)</b>							
The recommendations are supported by the work							
The recommendations are justified							
Recommendations for further work are supported							
<b>General</b>							
The deliverable is scientifically robust against the contract let							
The quality of the science is acceptable							
The deliverable is of an acceptable standard against the contract let							
The work is consistent with other reported work							
The deliverable is fit for purpose (judged against deliverable type)							
The work was adequately reviewed before submission							
The work is considered value for money							
The work has made a contribution to the advancement of the understanding of DU issues							
<b>Open publication (if relevant)</b>							
The deliverable is suitable as is							
The deliverable needs rewriting							
Recommended journal/publication or type							