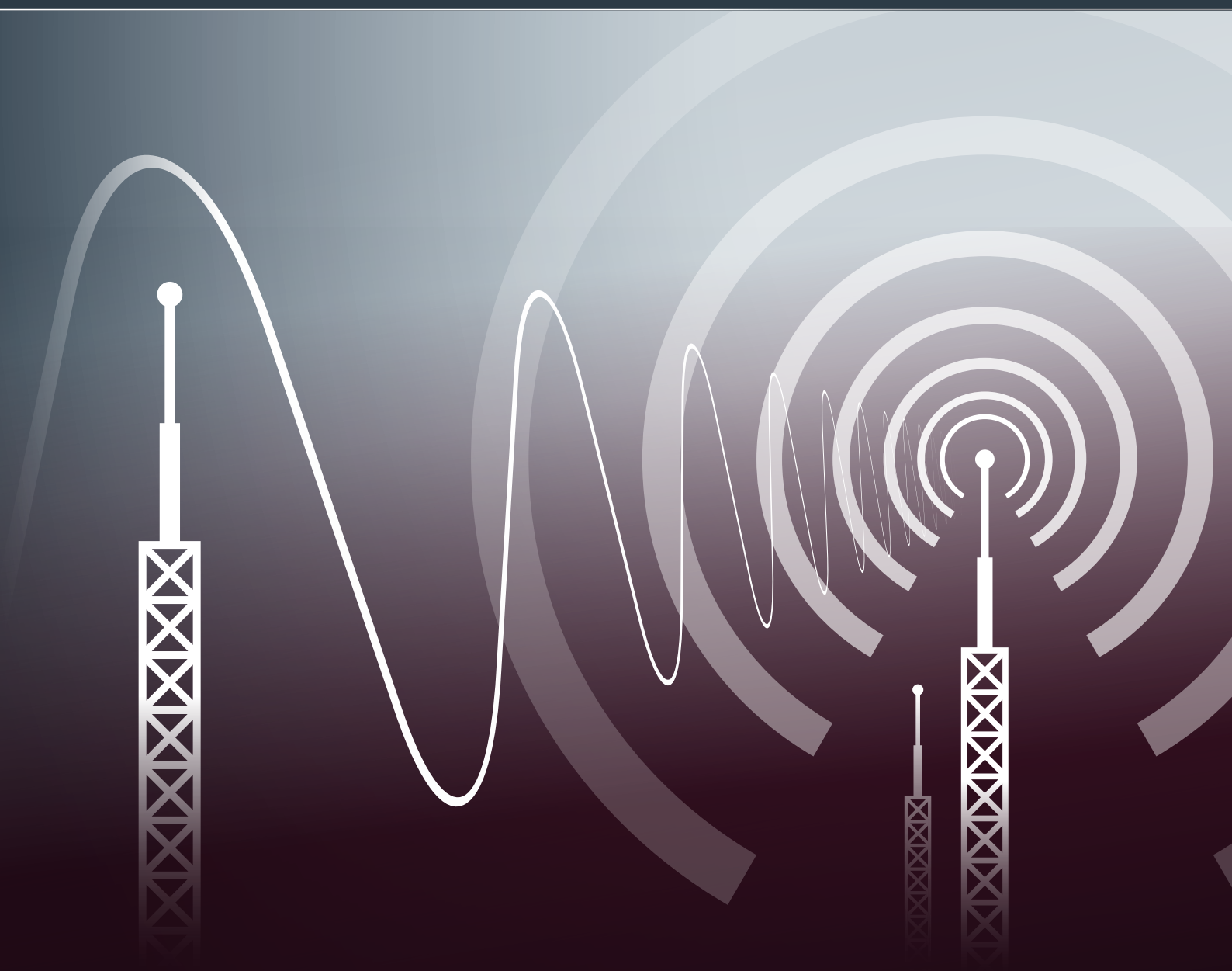
MINISTRY OF DEFENCE

Ministry of Defence

UK Defence Spectrum Management

A Consultation on: An Implementation Plan for Reform



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UK Defence Spectrum Management

A Consultation on: An Implementation Plan for Reform

This document consults on the reform of UK Defence spectrum management in 2008 - 12, and on extending market principles to the Ministry of Defence's use of the radio spectrum

Issued: 30 May 08

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Contents

Section 1

Foreword

This document consults on significant new proposals for how the Ministry of Defence manages spectrum, and identifies an initial set of frequencies to be made available for use by other parties. Its genesis is an Independent Audit of Spectrum Holdings, conducted by one of us (Cave) for Her Majesty's Treasury in 2005. This involved a review of major spectrum holdings, especially those in the public sector, aimed at releasing the maximum amount of spectrum to the market and increasing opportunities for the development of innovative new services.

The Audit undertook a preliminary examination of the situation with respect to a number of bands that the Ministry of Defence uses. It also set out series of general recommendations as to how major spectrum holdings should be managed. This involved better scrutiny of existing use of bands assigned to the public sector, longer term planning of spectrum needs, and the extension of pricing to additional bands, to create an incentive to release spectrum.

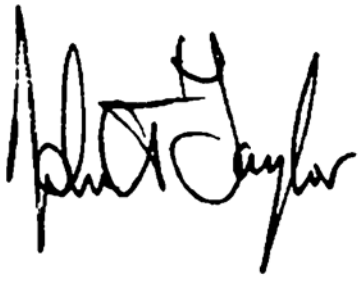
The most radical proposal was that a way should be found for public sector users to make spectrum available through sale, lease, or sharing with other organisations, including commercial bodies. Amongst other things this involved creating a legal instrument (recognised spectrum access, or RSA) by which public sector holdings can be traded. This would provide a powerful mechanism for releasing spectrum for temporary or permanent use by other organisations, for the wider benefit of British citizens and the UK economy.

The proposals in the Audit were accepted by the Government, and the UK Spectrum Strategy Committee and Ofcom have created mechanisms to put them into effect. It is crucial however for their success within the new regime to harness the knowledge,understanding and commitment of parent and future spectrum users.

This consultation document shows how far the Ministry of Defence has gone to put the ideas of the Audit into practice. As well as setting out a comprehensive new strategy for the management of the Ministry's UK spectrum use, it discloses the results of an initial set of audits of particular bands; these have identified frequencies, which might be released for trade or sharing. It is expected that this process of release will begin in the Spring of 2009. Further audits are being conducted which are likely to lead to further releases.

The Ministry has embraced the new approach to spectrum management with speed, thoroughness and imagination. In terms of spectrum management, this will place the UK at the leading edge, and Defence communities in other countries are likely to pay keen attention to what we are doing. Accordingly we look forward to the results of this important consultation process.

Professor Martin Cave



John C T Taylor
Director General Information
Ministry of Defence

Section 2

Executive Summary

2.1 This consultation seeks views on proposals to reform how the Ministry of Defence (MOD) will manage spectrum to enhance the benefits that its use generates. The MOD will take this opportunity to reform its management of spectrum for military purposes, but the details of this will be developed within the MOD through internal consultation and are not covered here except as they affect the wider community.

2.2 The proposals set out in this consultation are the MOD's response to key recommendations for it that are part of the government-wide programme to implement the market reforms to public sector spectrum management recommended by the *Independent Audit of Spectrum Holdings* (the 'Independent Audit') commissioned by HM Treasury and led by Professor Martin Cave, which was published in 2005.

2.3 The Independent Audit examined spectrum use in the public sector and made a series of recommendations for reforming the way in which public sector spectrum is managed to achieve greater efficiencies and benefits for UK citizens and consumers. The Independent Audit, along with the joint response from the Government and the Office of Communications (Ofcom) can be found together with supporting documents and information about the Government's implementation programme at www.spectrumaudit.org.uk.

2.4 Ofcom consulted last year on a new spectrum framework for the public sector (SFRPS) and published a statement on 31 January 2008 announcing its intention to make regulations to allow public bodies to hold and trade recognised spectrum access (RSA)[1]. Later this year Ofcom will publish a notice and order concerning regulations, initially for the band 406.1 to 430 MHz and possibly for the band 3400 to 3600 MHz. It will also consult on the technical conditions to be included in the RSA

2.5 The MOD is undertaking a detailed audit of the 23 bands identified and prioritised by the Independent Audit in a phased way. Information on the progress of this work is provided in section 4 and Annex A.

2.6 The MOD's audit programme has established how it uses the 406.1 to 430 MHz, 2700 to 3400 MHz and 3400 to 3600 MHz bands in the UK and the MOD is proposing to apply for RSA for parts of the band 406.1 to 430 MHz and possibly 3400 to 3600 MHz as a precursor to the early consideration of options for release and sharing commencing in March 2009. No proposal is made regarding RSA or releasing or sharing the 2700 to 3100 MHz band because the management of this band is shared. The 3100 to 3400 MHz band is not included in the MOD's immediate plans for RSA because this is an essential NATO band and heavily used in the UK. Subject to Ofcom making the necessary regulations, proposals are made to apply for RSA within a limited number of bands (in whole or in part) in a phased way that recognises the need to develop arrangements for those bands that are shared. Proposals to release and share a number of other bands (in whole or in part) in the period up to 2012 are also made.

2.7 In releasing and sharing spectrum, the MOD with other departments will seek to ensure that sufficient spectrum remains available for national security, defence and essential public services while minimising harmful interference and ensuring continued compliance with international obligations, including those dealing with international spectrum management.

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1 http://www.ofcom.org.uk/consult/condocs/sfrps/

2.8 The MOD has recently commenced a detailed assessment of the options for engaging in the market including the options for a Third Party spectrum management arrangement. In this document, in section 6, the MOD explains its conclusions to date and its engagement with experts from Partnerships UK[2] and the Government's Wider Markets team[3] to help it with the processes for an investment decision during 2008/09.

2.9 The Government undertook to publish a strategic *Forward Look*[4], assessing current spectrum use by the public sector and forecasting its future spectrum needs. The first Forward Look was published in March 2007. The next is due to be published alongside the Budget in March 2009 with further updates every two years thereafter.

What MOD is not seeking views on

2.10 This consultation includes some information on reform to the MOD's management of spectrum outside UK territory for the battle space. No proposals are made regarding battle space spectrum management and the MOD is not seeking views on this.

Is this consultation document important to you?

2.11 The consultation will enable views to be expressed on the process and overall approach that is being proposed by the MOD so that these views can be taken into account in preparing detailed arrangements for implementing the MOD's spectrum management reform and assisting Ofcom to make regulations for further consultation. This consultation and a statement, which will be published later in 2008, will also inform the next Forward Look to be published alongside the Budget in 2009.

Defence, Allies and Partners

2.12 This document discusses how the MOD proposes to reform the way it manages, exploits and acquires spectrum used for equipment test and development, training and exercising, force preparation and operational requirements within UK. The proposals will therefore be important to the defence community, the UK's Allies and its Partners.

The market

2.13 The document will be important to companies and organisations that either currently share radio spectrum with the MOD or those looking for new opportunities in the fast-growing UK information and communications technology sector, both civil and military.

Public spectrum users

2.14 Ensuring that safety and national security[5] remain paramount as the MOD reforms the way it manages spectrum is vital. Ensuring that public sector users who share spectrum with the MOD can continue to do so is also essential. This consultation is therefore important to public bodies and non-commercial organisations that share spectrum with the MOD.

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2 Information on Partnerships UK can be found at: http://www.partnershipsuk.org.uk/

3 Search for WMI at: http://www.nao.org.uk/

4 The Government's Forward Look, published March 2007, can be found at: http://www.spectrumaudit.org.uk/pdf/Forward_Look_2007.pdf

5 Inter alia, safety includes the emergency services, air space management for civil aviation and the safety and safe navigation of shipping.

Civil spectrum users

2.15 This consultation will also be important to civil users with whom the MOD shares spectrum either because they have been granted a licence to do so by Ofcom or because they are exempted from individual licensing under the provisions of the Wireless Telegraphy Act 2006 (the WT Act).

What issues are discussed?

2.16 The issues discussed in this consultation include:

- how spectrum is managed at present by the MOD
- the MOD's audit of the spectrum that it uses and assessing its future demand for spectrum
- the MOD's proposals to manage, exploit and acquire UK spectrum into the future
- MOD's relationship with Ofcom and how it proposes to manage its relationships with government departments, their agencies, other public bodies and non-public users with whom the MOD shares spectrum
- proposals for sharing and opportunities for trading. These proposals include a plan and a timeline for release of the spectrum that the MOD uses and plan for the phased application of Recognised Spectrum Access (RSA)
- relevant information on related spectrum policy issues including information on the development of spectrum policy for public services in Europe that could influence the MOD's spectrum reform process and Decisions and Directives relating to the use of certain spectrum bands
- information on relevant international spectrum policy related to the MOD's spectrum reform proposals.

Next Steps

2.17 Following the publication of this consultation the MOD plans to host an *Industry Day forum* where the issues raised by the consultation will be discussed. Following the closure of the consultation, the MOD will issue a statement later in 2008 announcing its conclusions.

2.18 Subject to satisfactory progress to define future spectrum management arrangements (e.g. rights of access and spectrum requirements, and the introduction of regulations by Ofcom by the end of 2008) the MOD would expect to apply for RSA for bands to be identified in the statement then during 2008/09 proceed to implement any reforms that it may decide to make. These reforms will include a plan and a timeline for release of the spectrum. Subsequently during the period 2009 to 2012, the MOD expects to implement further reforms that may include:

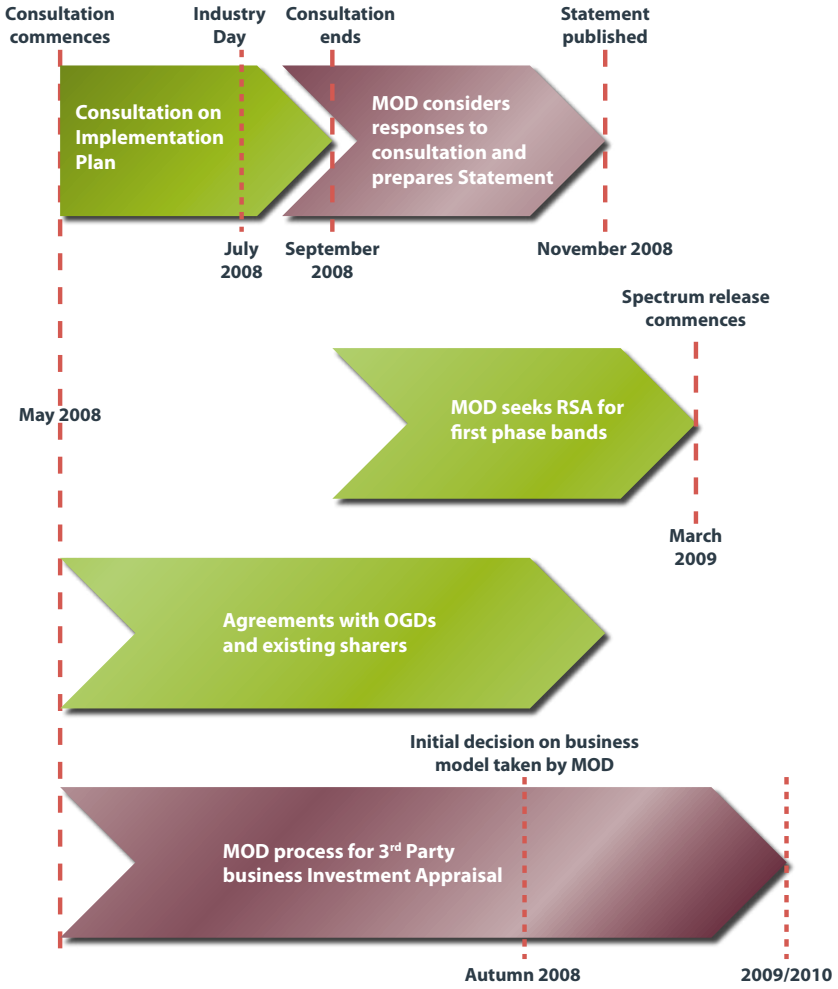
- a decision and process to launch a Third Party spectrum management arrangement
- an audit of the remaining spectrum that the MOD uses
- improvements to the way information on the MOD use of the spectrum is made available to the market
- the introduction of ways of acquiring new spectrum from the market
- the introduction of new ways of sharing through trading.

2.19 The implementation of any proposals to extend trading, liberalisation or RSA to the spectrum that the MOD uses will require Ofcom to make various regulations, for example to specify the frequency bands in which RSA will be introduced and the possible procedures for trading and conversion. As required by section 122 of the WT Act, Ofcom will publish a Statutory Notice in advance of making these regulations, giving at least one month to comment[6]. Ofcom is expected to publish a notice and order concerning regulations, initially for the band 406.1 to 430 MHz and possibly for the band 3400 to 3600 MHz. It will also consult on the technical conditions to be included in the RSA.

2.20 It is anticipated that the MOD will make decisions in respect of a Third Party during 2009. Assuming that there is a decision to proceed with appointment of a Third Party it anticipates:

- An Options Analysis being complete by November 2008
- An Initial Gate Business Case being complete by March 2009
- Formal market engagement commencing by May 2009 if the decision to pursue a Third Party approach is made by the MOD.

Figure 1. The MOD's 'Road Map' for spectrum reform



6 Spectrum Framework Review: the Public Sector Proposals to extend market mechanisms to improve how spectrum is managed and used, A Consultation by Ofcom, July 2007. http://www.ofcom.org.uk

Section 3

Introduction

The purpose of this document

3.1 This document consults on the MOD's proposals for reforming the way it manages the spectrum it uses. These reforms are a part of the Government's new framework for public sector spectrum management. It addresses the introduction of new market principles that the Independent Audit recommended, the Government has agreed, and the Office of Communications (Ofcom) is facilitating with new regulations. Much of the detail of the MOD's reform programme will depend on the outcome of ongoing discussions with Ofcom and the relevant public sector bodies about the future management of shared spectrum. Responses to the proposals made in this document and the progress of the discussions with Ofcom and the relevant public bodies will inform the MOD's spectrum management reform programme.

3.2 The MOD has management rights to around 35% of UK spectrum with as much as 99% of MOD managed bands already having some sharing within them either with other public sector users or with the commercial sector. The commitments made by the MOD to spectrum reform are set out in this section.

What are MOD's commitments on spectrum?

3.3 In October 2007 the Government published the 2007 Pre-Budget Report and Comprehensive Spending Review *Meeting the Aspirations of the British people*. Government said that the MOD will:

- "publish its plans for the release of electromagnetic spectrum to the market"
- "begin the release of the bands identified in 2008 and will release a significant proportion of its spectrum holdings during 2009 and 2010."

The 2007 Pre-Budget Report and Comprehensive Spending Review *Meeting the Aspirations of the British people* can be found at:
http://www.hm-treasury.gov.uk/.

3.4 The publication of this consultation on an implementation plan for reform as to how the MOD proposes to manage the spectrum it uses to enhance the benefits that its use generates fulfils the first of these commitments. The MOD is working with Ofcom and other government departments with the aim of being in a position, by May 2009, to begin to release and share spectrum. The MOD also aims to release a significant proportion of the spectrum it uses during 2009 and 2010 and deliver on the second of these commitments.

3.5 The MOD believes it is taking a strategic and long-term view of the promotion of the optimal use of spectrum beyond 2010 and into the future, which is consistent with and supportive of the Government's aims for spectrum and the market.

Why is the MOD proposing to reform the way it manages spectrum?

3.6 The objective of the reform that the MOD is proposing is to enhance the benefits that may be obtained from the use of the spectrum. It aims to do this by introducing new business processes to enable the introduction of market mechanisms that Ofcom is progressively applying elsewhere, which will lead to optimal use of the radio spectrum.

3.7 The proposals for reform set out in this document are the MOD's part of a Government-wide programme to implement the findings of the *Independent Audit of Spectrum Holdings* led by Professor Martin Cave, which undertook a review of major public sector spectrum use below 15 GHz. The report, which was published in December 2005, made a series of recommendations for Defence that were accepted by the Government and supported by Ofcom. Further information about the Independent Audit is given in the next section. Full details, including the joint response by the Government and Ofcom and reports on progress (*the Forward Look*), may be found at www.spectrumaudit.org.uk.

Some notes on terms and definitions used in this document

Spectrum Holdings

3.8 In the Independent Audit, the Forward Look and the Budget the term "spectrum holdings" has been used as a generic term to encompass spectrum use identified in either a licence or, potentially, through a grant of RSA. Although the emphasis of the Independent Audit and Forward Look is on spectrum release or sharing by the public sector, it is envisaged that similar processes would apply in reverse where public sector bodies seek to add spectrum through the market. In this document these processes of releasing and sharing and seeking to add to spectrum through the market are referred to as 'exploiting' and 'acquiring' spectrum. The term "spectrum holdings" is not used in this document except where reference is made to existing documents that have been published. Further discussion of the options that MOD is considering for exploiting the spectrum that it uses is provided at paragraph 5.46 et seq. Further clarification of the term "spectrum holdings" may be found in paragraph 2.8 in Ofcom's statement A Spectrum Framework Review for the Public Sector at: www.ofcom.org.uk/consult/condocs/sfrps/statement/

Spectrum trading

3.9 One of the key themes of these proposals is the introduction of spectrum trading and its application to the MOD's use of spectrum. Spectrum trading involves the transfer of rights and obligations relating to spectrum in accordance with regulations made by Ofcom. Ofcom proposes that spectrum trading will be facilitated by granting RSA to the MOD. But applying for or being granted RSA for a spectrum band does not necessarily mean that the MOD wishes to exploit it, only that it wishes to clarify its rights. Once the rights to a spectrum band have been established an investment evaluation and appraisal may be required to establish whether the MOD should exploit it.

3.10 There are various ways (or 'modes') in which spectrum can be traded. A summary of these 'modes' can be found in Annex 4 of the Spectrum Framework Review for the Public Sector at: www.ofcom.org.uk/consult/condocs/sfrps/statement/

Spectrum Usage Rights

3.11 There are references in this document to "Spectrum Usage Rights" (SURs). SURs are a way of specifying the technical terms and conditions of a spectrum licence or RSA in a way that is technology and application neutral[1].

The structure of this document

3.12 The rest of this document is arranged as follows.

- Section 4 – Spectrum Management
- Section 5 – Spectrum Sharing, Release and Acquisition
- Section 6 – Managing MOD's Spectrum in the Market
- Section 7 – Related Policy Issues
- Section 8 – Next steps
- Section 9 – Responding to this Consultation
- Annex A Supporting Technical Information
- Annex B Consultation Principles
- Annex C Consultation Response Cover Sheet
- Annex D Consultation Questions
- Annex E Glossary

1 See http://www.ofcom.org.uk/consult/condocs/surs/

Section 4

Spectrum Management

Spectrum is a valuable and finite resource

4.1 Radio spectrum is a limited resource of considerable economic and social importance and its use does not respect civil, military or other man-made boundaries. Radio spectrum is a key input and an integral component of almost all military operations and military applications make use of radio spectrum for command, control, navigation, communications and information systems, IT (wireless LAN), intelligence gathering, surveillance, reconnaissance and targeting etc. Within the UK, the MOD's spectrum supports a very wide range of vital military requirements including peacetime training and operations for UK and allied nations, use for homeland security and preparations for major operations overseas.

Spectrum has an important role in generating wealth

4.2 The importance of radio spectrum can be gauged from the fact that it has been estimated that its use underpins 3% of UK GDP and generates benefits worth over £40bn a year, a figure that has grown by about 50% in real terms since 2002[1] and is likely to be an underestimate as it does not take into account the use of spectrum for defence, commercial transport, public safety, or science purposes. Although valuing spectrum is difficult, the Independent Audit estimated in 2005 that the market value of public sector spectrum below 15 GHz ranged from £3bn to over £20bn, depending on the methodology used[2].

Radio spectrum supports many uses and users

4.3 The MOD already shares a significant proportion of spectrum with the fast-growing UK information and communications technology sector such as broadband wireless as well as a wide range of non-commercial applications, which includes safety-of-life, search and rescue, maritime and air-space management, transport infrastructure and the emergency and science services. Analysis of future demand[3] suggests that it is likely that total demand for public and private sector spectrum will exceed available supply: this will make it necessary for all users to make more efficient use of spectrum. Pressure on the MOD to release and further share spectrum is likely to continue into the future and it must reform the way it manages spectrum to meet this challenge.

Using spectrum to foster innovation and competition

4.4 Access to spectrum is key to innovation and competition in both the military and civil sectors in the fast-growing information and communications technology sector[4]. Innovation in wireless technologies is also of increasing importance to meet rising demand for both military and civil communication while on the move. Spectrum below about 15 GHz is usually regarded as constituting the most useful and valuable part of the radio spectrum as its physical characteristics mean that it can be used for a wide range of applications, including mobile at

1 http://www.ofcom.org.uk/research/radiocomms/reports/economic_spectrum_use/

2 Independent Audit of Spectrum Holdings final report, page 2: http://www.spectrumaudit.org.uk/pdf/caveaudit.pdf

3 Independent Audit of Spectrum Holdings final report: http://www.spectrumaudit.org.uk/pdf/caveaudit.pdf

4 Spectrum Framework Review: the Public Sector Proposals to extend market mechanisms to improve how spectrum is managed and used, A Consultation by Ofcom, July 2007. http://www.ofcom.org.uk

frequencies below about 4 GHz, while providing bandwidth for broadband services to make it commercially feasible to roll out national networks.

Defence Spectrum Management

4.5 This consultation considers how and when the MOD will introduce the reforms recommended by the Independent Audit to the way it will manage, exploit and acquire spectrum in the future. The MOD is taking a strategic and long-term view of the promotion of the optimal use of spectrum beyond 2010, which is consistent with and supportive of the Government's aims for spectrum and the market. This includes change to the management of spectrum for military purposes to ensure that spectrum is fully taken account of in the acquisition and through life management of applications and equipment. Details of the way the MOD manages its spectrum for military purposes are included in this consultation for information purposes only.

The MOD's spectrum management role

4.6 The MOD has had a UK spectrum management role for many years and makes decisions about how spectrum is shared and used. This spectrum management role is described below and summarised in Table 1.

Table 1. A Summary of the MOD's spectrum management role

The MOD:	
Is allocated spectrum	YES
Plans and makes frequency assignments to Defence users	YES
Advises on frequency assignments	YES
Grants licences	NO
Uses spectrum	YES

4.7 The MOD does not have the power to grant spectrum licences in the UK. Ofcom is the only body that has power to grant spectrum licences in the UK and the only body that can make exemption and trading regulations.

How does the MOD manage spectrum?

4.8 Overall UK Defence spectrum management is undertaken by the Defence Spectrum Management (DSM) team. The DSM team's remit includes the formulation of MOD spectrum policy, influencing national and international spectrum policy through engagement with other government departments (OGDs) and Ofcom and the day-to-day management the military spectrum use in the UK.

4.9 The MOD also has an overseas spectrum management role in the battle space. Battle space spectrum management is an intrinsic Joint Defence function that affects the planning of any campaign. The E3 Spectrum Management (E3SM) team provides a number of key support functions including battle space spectrum modeling and planning, which involves close liaison between the front line commands, coalition partners and host nations to ensure that spectrum conflicts do not occur. The E3SM team is also responsible for spectrum management in support of overseas training and exercises.

4.10 Each of the Front Line Commands (FLCs) – AIR, FLEET and LAND - has a frequency management resource and co-ordinates requests for access to spectrum assigns frequencies and investigates and resolves cases of interference. These functions are performed in close liaison with DSM and E3SM teams.

4.11 There are other organisations that share in the responsibility for the management of military use of spectrum. The Joint Data Link Management Organisation is one example. Another is QinetiQ who manage spectrum use on the MOD's UK firing and exercise ranges under contract to MOD. Further information is given in paragraph 4.15 below.

Implementing reform to the way MOD manages spectrum for Defence

4.12 The MOD's management of spectrum for military purposes is being reformed so that it can be governed within a common, joint framework for Defence. The MOD is considering a requirement to establish an organisation that will enable timely planning, financing, management and control of spectrum for military use and could interface with a Third Party spectrum management organisation (see section 6) and with the market. The MOD is also considering how it should change the way military spectrum users make use of spectrum and how to make them accountable for the cost of spectrum use and responsive to changes in both military and civil spectrum demand.

How the MOD spectrum is used

4.13 The MOD uses spectrum extensively for military and security purposes but, as a Crown body, is not licensed by Ofcom. How the MOD uses spectrum is set out in the UK Frequency Allocation Table (UK FAT). The MOD agrees with Ofcom the frequency bands in which it operates and the terms on which commercial users may be licensed by Ofcom in spectrum allocated to military use.

4.14 More detailed information is given in Section 5.

Other UK spectrum use by Defence

4.15 The MOD has some limited use of UK civil spectrum and either Ofcom provides the MOD with this access or MOD secures access direct with the commercial licence holder. This use includes, but is not limited to, spectrum for:

- point-to-point fixed wireless systems
- satellite communications
- non-operational use for testing and development of wireless telegraphy (radio) equipment, scientific research and experimentation and trials and demonstrations of radio apparatus and
- Community Radio stations and Restricted Service Licences.

4.16 Community Radio stations are small-scale, not-for-profit radio stations. The MOD has a small number of Community Radio stations authorised by Ofcom, which provide a service to Forces personnel, their families and MOD civilians living and working within the Forces community.[5]

Assessing the current and future demand for Defence spectrum

4.17 The Government's Response and Action Plan to the Independent Audit committed the MOD to a number of targets relating to spectrum. One of these targets was to provide an assessment of the MOD's current and future spectrum requirements.

4.18 Paragraphs A.1 et seq describe how the MOD is implementing the assessment of its current spectrum needs – the MOD's spectrum audit. Paragraphs 4.34 et seq describe how the MOD is implementing an assessment of its future spectrum requirements – the MOD's Defence spectrum demand study. Further detail of the audit and the Defence demand study is given in Annex A.

Implementing the audit of MOD's spectrum use

4.19 In January 2007 the MOD took the first step in its audit process with the completion of a scoping study by QinetiQ that identified the true extent of existing potential sources of data on MOD spectrum usage, acquired some of this data and used it to make an initial comparison of the results of the Independent Audit to assess the potential for sharing and release of the bands identified and prioritised by the Independent Audit. Information from this scoping study was used to inform the Government's Forward Look, published in March 2007. Further information and a summary of the findings and recommendations from the scoping study can be found in Annex A.

The MOD's audit roadmap

4.20 Informed by their scoping study, QinetiQ recommended that the MOD should gradually replace the spectrum management tools available across MOD and integrate the information from legacy databases currently available, over a period of time, into a new database that is compatible with many data formats (including NATO's Spectrum Management Allied Data Exchange Format (SMADEF)[6,7]). A Pilot Battle Space Spectrum Management System (PBSMS) has been developed based on commercial off the shelf software[8] and is being used to pilot the technical co-ordination of spectrum.

4.21 QinetiQ also recommended a phased approach to the remaining audit of the MOD's spectrum use and in these subsequent phases that the MOD should prioritise the various audit activities including deciding on the type of database structure and considering a data migration plan to achieve the goal to creating a data resource which would allow effective spectrum management across all MOD spectrum use.

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5 Ofcom manages the statutory framework for awarding a community radio licence and the obligations to be met by licensees are set out in the Community Radio Order 2004, which makes additions and amendments to the local radio licensing process as set out in the Broadcasting Act 1990 as amended by the Communications Act 2003. Further information on Community Radio licences can be found at http://www.ofcom.org.uk/static/radiolicensing/Community/community-main.html

6 NATO currently exchanges information concerning spectrum management using the "Spectrum Management Allied Data Exchange Format (SMADEF). This is currently being updated and enhanced to SMADEF XML. (http://nhqc3s.nato.int/ReferenceDocs.asp).

7 The data being collected for the MOD's spectrum audit is based on SMADEF XML and the structure of the PBSMS.

8 See http://www.logica.com/battlespace+systems/350234029 and http://www.atdi.co.uk/archive1.asp?NewsId=42. The MOD continues to investigate the development of other tools for battle space spectrum management including progress in NATO.

4.22 The MOD will implement these recommendations over the next three to four years. It plans to introduce new spectrum management tools and carry out a phased approach to the audit; the migration and improvement of spectrum management data and creation of a structured data resource that will allow effective spectrum management. In addition, the MOD is considering how to improve the availability of spectrum management data to its Allies and Partners, between those with whom it currently shares spectrum and to the civil spectrum market[9].

4.23 Implementing these recommendations is a significant challenge that is being addressed within the MOD's overall programme of spectrum management reform under a process-based method for effective project management PRojects IN Controlled Environments (PRINCE). Within this programme Ofcom is the principal external supplier to the MOD. This arrangement ensures that the implementation of the programme is co-ordinated fully between the MOD, Ofcom and other public bodies as required. Implementing the recommendations made by the Independent Audit and meeting the Department's Comprehensive Spending Review (CSR) 07 commitments are important enablers for this overall reform programme.

The MOD's spectrum audit

4.24 The MOD's audit is designed to capture data for systems operating or with a requirement to operate in the UK or UK territorial waters and air space[10] (including Northern Ireland) and has been programmed in line with the bands identified and prioritised by the Independent Audit (the '*Cave Bands*'). The 23 Cave Bands are covered by the first three phases of the audit. Further phases would go beyond the Cave Bands and cover all of the MOD's spectrum use. The phases of the MOD's spectrum audit are detailed in Figure 2 below.

4.25 Further details of the MOD's audit and how these affect the proposals for the exploitation of the spectrum it uses and the acquisition of new spectrum are presented in Section 5.

9 Information on spectrum use is published by Ofcom. See http://www.ofcom.org.uk/radiocomms/isu/ukpfa/intro

10 UK Airspace as defined by the relevant Flight Information Regions

Figure 2. Phases of the MOD's spectrum audit

Phase 1A (Completed)
3400 to 3600 MHz

Phase 1B (Completed)
2700 to 3400 MHz
406.1 to 430 MHz

Phase 2 (To be completed March 2009)
7900 to 8400 MHz
8500 MHz to 10.5 GHz
13.25 to 14 GHz
4400 to 5000 MHz

Phase 3 (To be completed March 2009)
137 to 154 MHz
230 to 400 MHz
400.15 to 406.1 MHz
430 to 450 MHz
590 to 598 MHz
870 to 960 MHz
960 to 1215 MHz
1215 to 1350 MHz
1375 to 1400 MHz
1427 to 1452 MHz
1559 to 1626.5 MHz
2310 to 2450 MHz
4200 to 4400 MHz
5000 to 5850 MHz
9000 to 9500 MHz
15.4 to 17.7 GHz

Phase 4 (Decision to audit to be taken in 2008)
Remaining MOD managed bands

Phase 5 (Decision to audit to be taken in 2008)
Civilian managed bands in which MOD operates

3400 to 3600 MHz

4.26 Phase 1A of the audit for 3400 to 3600 MHz was undertaken internally by the MOD and was completed in July 2007. This phase of the audit has enabled the MOD to:

- establish how the MOD uses the band 3400 to 3600 MHz by capturing relevant spectrum use data
- establish a data confidence process. An example of the data confidence matrix developed in the process is shown Figure A.3 of Annex A
- scope and define the data fields to be captured in the audit. The data fields defined are shown in Table A.1 of Annex A for information
- use the data to test and define refinements to the PBSMS tool to improve its utility.

406.1 to 430 MHz and 2700 to 3400 MHz

4.27 The first three stages of Phase 1B of the audit were completed in December 2007. How the fourth stage of the audit - information exploitation -will be developed is explained in Section 5 of this document. The four stages of Phase 1B were:

1. data capture
2. data collation
3. data cleansing[11] and improvement[12]
4. information exploitation.

Audit of the remaining 'Cave Bands'

4.28 Further information on how the remaining 20 Cave Bands are being audited is given in Annex A.

Auditing the MOD's remaining use of spectrum

4.29 The MOD's use of spectrum in the UK extends to far more that the 23 bands identified and prioritised by the Independent Audit. By reference to the UK FAT it is possible to identify that the MOD manages, shares or has some access to 186 bands, including the 23 Cave Bands. The MOD will appraise the costs and benefits of the further audits (e.g. to capture MOD's use of the bands identified in Figure 2 above in phases 4 and 5). Some of the options and factors it is likely to consider in this appraisal are summarised in the following paragraphs.

4.30 Figure 3 below outlines some of the possible options for further audits. The term "shared bands" in Figure 3 refers to non-civil bands which the MOD shares but does not manage.

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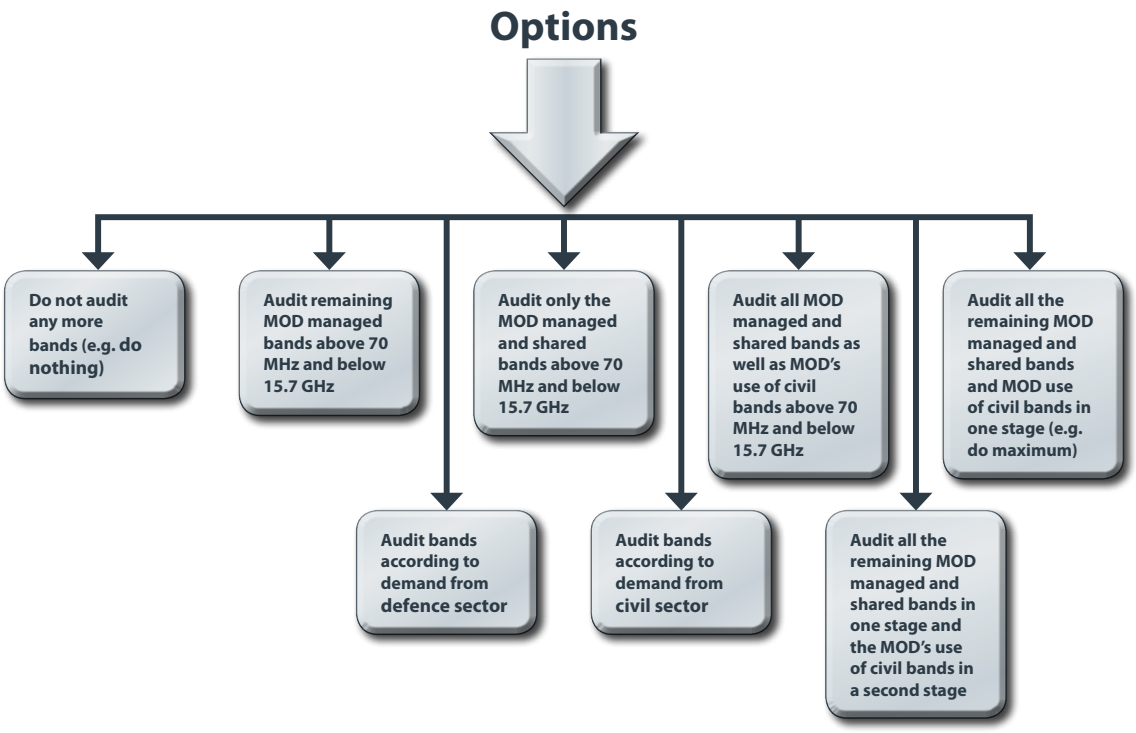
11 Data cleansing is the correction of errors in electronically held data of the technical parameters for the spectrum assignments/allocations to military equipment. This includes, inter alia: the correction of data syntax, the detection and correction of duplicate entries, the corroboration of multiple data sources to determine the providence of a record, the amalgamation of similar entries to establish a more accurate and complete record.

12 Data improvement is the addition of missing system parameters from the pre-defined data fields (Annex A) which the MOD requires to refine the efficiency and effectiveness of spectrum modelling. The system parameters added through the process of data improvement are obtained through investigation and research.

4.31 When considering the options for auditing the MOD's remaining use of spectrum the MOD is likely to take into account the following factors:

- Spectrum is treated as an asset.
  - The MOD's spectrum use is included within the Government's Resource Accounting and Budgeting (RAB) arrangements.
- Administered incentive pricing (AIP) is applied to the MOD's use of spectrum.
  - Charges already extend to many more bands than the 23 Cave Bands and they are likely to be more widely applied over time.
- The release and sharing of bands should be responsive to demand.
  - both civil and military demands for spectrum will change over time. An audit of all the MOD's spectrum use will assist with making decisions for change in general, whilst the audit of the 23 Cave Bands provides only limited opportunity for change. But the benefit of responsiveness to demand will need to be considered against the cost of providing this.
- A decision to undertake further audits must provide best value for money for Defence. The main focus of the investment appraisal will be on ensuring that requirements are based on meeting Defence outputs.
  - The appraisal will need to consider the cost to MOD of auditing compared to the potential benefits – for example from future release and lower AIP liability. Releasing spectrum also induces a risk in terms of lower capability or flexibility that will need to be recognised.

Figure 3 Some options for auditing MOD's holdings



Summary

4.32 The MOD's use of spectrum in the UK extends to far more that the 23 bands identified and prioritised by the Independent Audit. The MOD will appraise the costs and benefits of auditing all the bands it manages and uses, but would like to know whether it has identified all the options and factors (see paragraph 4.31 and Figure 3 above) needed before deciding whether or not it should do so.

Question 1.	Do you agree that the MOD has identified the options and factors that MOD should consider before deciding whether or not to extend the audit of its spectrum use?

Question 2.	Do you have any views on the priority with which MOD should audit its spectrum use?

Will MOD audit spectrum used by others?

4.33 The MOD is not conducting an audit of how spectrum is used by others, but has sought spectrum data from other users with whom the MOD shares spectrum in order to inform its proposals for spectrum reform.

Assessing demand for Defence spectrum

4.34 In the Forward Look published in March 2007 the MOD said it would provide HM Treasury with an assessment of both current and future spectrum requirements. The Forward Look also identified that in assessing any scope for action the MOD will need to take account of future uses of bands and recognised that these future uses may not as yet have been identified and quantified.

4.35 Whilst the Analysys and Mason study[13] provides information on the demand for radio spectrum in the UK for commercial services, there is no equivalent demand study for Defence. In order for the MOD to establish a coherent strategy for the sharing, release and acquisition of spectrum to meet military needs and reconcile the demand for spectrum in the UK for civil and military use, the MOD is undertaking a study of Defence spectrum demand that will inform the MODs future demand for radio spectrum in the UK and the likely costs for releasing and managing spectrum in the bands that it uses over the next 20 years to 2027.

4.36 The Defence spectrum demand study commenced in late December 2007 and is planned for completion in Summer 2008. This study was awarded to PA Consulting Group supported by: University of Surrey Department of Economics; the Cranfield School of Management Centre for Research in Economics and Finance; the Cranfield University Defence Academy; BAE Systems and Roke Manor Research. The PA Consulting Group study on UK Defence spectrum demand will complement the study undertaken by Analysys and Mason.

What are the aims of the Defence spectrum demand study?

4.37 The Defence spectrum demand study will forecast the military demand for radio spectrum in the UK between 70MHz and 15GHz in order to inform decisions on the sharing, release and acquisition of spectrum. It will improve the understanding of the Defence demand and potential uses for the UK military spectrum from an economic, market and technical perspective. The study aims to:

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13 Analysys Mason: on future commercial demand for spectrum See: http://www.spectrumaudit.org.uk/support.htm

- quantify the current demand for radio spectrum in order to determine the amount of radio spectrum required to maintain military capability and conduct operations in UK and

- inform assessments of future demand based on emerging technologies, and evolving military capabilities so that the MOD can develop strategies for spectrum management across Defence (and government).

How are Defence spectrum demands being assessed?

4.38 Assessing future Defence spectrum demands in the UK is complex and requires a significantly different methodology to that used in the commercial domain. Assessing the Defence demand for spectrum is not based on forecasts of market demand, fuelled by economic prosperity and technology. Information on how the MOD is assessing future Defence spectrum demands is given in Annex A.

Summary

4.39 Paragraphs 4.19 et seq above describe how the MOD is implementing the assessment of its current spectrum needs – the MOD's spectrum audit - and how the MOD is implementing an assessment of its future spectrum requirements – the MOD's Defence spectrum demand study. Further information on both studies is given in Annex A.

4.40 The MOD's audit of the 23 *Cave Bands* will be completed by March 2009 and proposals for the audit of the MOD's remaining use of spectrum are made in this document that could extend the MOD's audit to include around 186 bands. The MOD's Defence spectrum demand study is planned for completion in Summer 2008.

4.41 Because the MOD's audit of the *Cave Bands* and its remaining use of spectrum shared with other public bodies is not yet complete an accurate and full plan for release and sharing of the spectrum managed and used by the MOD cannot be set out with certainty, but an outline plan is given in Section 5. This plan is subject to change as information on spectrum use becomes available.

Introducing market mechanisms

4.42 The Independent Audit supported the introduction of market mechanisms into spectrum management as an effective way of allowing the optimal use of spectrum to be realised. The Independent Audit argued that it is not feasible to keep public sector spectrum, managed in a command and control way, completely distinct from the commercial side, where market mechanisms are being introduced. In meeting new spectrum demands for Defence, for example, the Independent Audit argued that market engagement will be a necessity, as that is where the majority of candidate spectrum will lie in the future and Ofcom may not hold empty 'spare' spectrum to assign administratively. In addition it said that the process of administrative assignment is unlikely to be economically optimal or the best means of exposing public sector users to the full cost of their spectrum use.

4.43 Market mechanisms such as spectrum trading do not yet apply to the MOD's use of spectrum. However, the MOD already pays an amount for some of its use of spectrum that is comparable to the fees charged to commercial users for similar spectrum and it is worth noting that many bodies regarded as 'public sector' (e.g. local authorities) already secure their spectrum in a similar way to the commercial sector. However, currently the spectrum that the MOD manages and uses is not tradable. This is a barrier to the introduction of market mechanisms to the way the MOD manages spectrum and the Independent Audit recommended, and the Government and Ofcom agreed, that market mechanisms should be comprehensively extended to public sector spectrum use.

4.44 Ofcom consulted last year on a new spectrum framework for the public sector (SFRPS) and published a statement on 31 January 2008 announcing its intention to make regulations to allow public bodies to hold and trade recognised spectrum access (RSA)[14]. Ofcom will publish a notice and order concerning regulations, initially for the band 406.1 to 430 MHz and possibly for the 3400 to 3600 MHz band. It will also consult on the technical conditions to be included in the RSA. For convenience the recommendations that are key to the reform that the MOD is introducing are reproduced in Annex A.

General approach to reform

4.45 The introduction of market mechanisms, such as administered incentive pricing, trading, liberalisation and the release of spectrum through competitive auctions is more likely to promote spectrum efficiency by allowing spectrum to be transferred to those users and applications that can generate the greatest benefits compared to the 'command and control' methods based on regulatory and administrative decisions. In implementing changes to public sector spectrum policy, the Government will ensure that sufficient spectrum remains available for national security, defence and essential public services. The MOD will seek to minimise harmful interference and ensure continued compliance with international obligations, including international spectrum management.

Reform of public spectrum use

4.46 The Government has said[15] that to maximise efficiency, market mechanisms should be brought into the management of public sector spectrum use. These include:

- Broader and deeper use of pricing for public spectrum use to increase consistency with the private sector and offer incentives, which is discussed in paragraphs 4.50 et seq below
- Introduction of trading to enable public bodies to interact with the market, facilitated through Recognised Spectrum Access (RSA) for Crown bodies, which is discussed in paragraphs 4.55 et seq below
- Increased sharing of spectrum with other public or private bodies to maximise efficiencies. This is discussed in Section 5
- The assumption, adopted by the Government in June 2006, that public bodies will acquire spectrum through the market in the future. This is discussed in Section 5.

4.47 Since the publication of the Independent Audit, the UK Spectrum Strategy Committee (UKSSC) has coordinated the change programme. Through the UKSSC the Government, in conjunction with Ofcom has taken the first steps towards establishing the conditions necessary to introduce market mechanisms to public sector spectrum use. These first steps now include a process to develop a new interdepartmental agreement that will establish:

- which public bodies will hold spectrum access rights
- arrangements for sharing spectrum data and co-ordinating the use of spectrum that is shared spectrum
- the exploitation arrangements for shared spectrum including how costs and income will be shared.

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14 http://www.ofcom.org.uk/consult/condocs/sfrps/

15 This statement is taken from the Government's Forward Look, published 2007, which can be found at: http://www.spectrumaudit.org.uk/pdf/Forward_Look_2007.pdf

4.48 These steps are set out in the Forward Look, the first in a series of biennial reports of progress towards implementing changes to public sector spectrum management as recommended by Professor Cave.

What does the MOD pay for spectrum?

4.49 The MOD has paid for the spectrum that is uses for some time; initially to cover spectrum management costs and since 1998 using AIP on a comparable basis to commercial users. The MOD currently pays approximately £50m per year in spectrum fees under section 28 of the Wireless Telegraphy Act 2006.

New framework for pricing MOD's spectrum

4.50 In November 2007 the MOD and Ofcom agreed a Memorandum of Understanding (MOU) that defines the procedures and basis for determination of spectrum fees. The principal aims of the Memorandum of Understanding are:

- to provide clarity and certainty as to the basis for and determination of fees to be paid by the MOD to Ofcom for spectrum use, in order to better enable informed spectrum management and financial decisions
- to formalise the process for the determination, adjustment and payment of spectrum fees payable by the MOD to Ofcom
- to provide an effective process for resolving issues or disputes relating to such payments.

Pricing of shared spectrum

4.51 Government policy and resource accounting principles are that public bodies should bear financial responsibility for the spectrum they use. The MOD accordingly pays Ofcom for the spectrum that it uses.

4.52 The MOD shares spectrum extensively with both public and commercial users. This sharing should be reflected in the spectrum charges the MOD pays unless the public bodies make payments to the MOD to reflect their use of the shared spectrum. The MOD is in the process of determining the extent to which other public bodies share spectrum with it and will seek to ensure through the interdepartmental machinery that the principles set out in the preceding paragraph are rigorously applied. Any disputes would be resolved through existing interdepartmental processes.

Summary

4.53 The MOD and Ofcom have reviewed the charging arrangements for the spectrum that the MOD uses and the MOD has audited the extent to which spectrum is shared. This review aims to implement charges in a structured and equitable way, including the introduction of appropriate payments by other public bodies with whom it shares spectrum. The MOD and Ofcom have agreed to a Memorandum of Understanding that includes payments by the MOD to Ofcom at AIP rates for fees calculated on a comparable basis to the charges levied on the commercial sector and determined by Ofcom.

Enabling a spectrum market - defining the rights for the MOD's spectrum use

4.54 The Independent Audit identified that many public sector bodies are not able to hold WT Act licences for spectrum because of 'Crown immunity'[16]. It identified that this raises two main issues in relation to public sector spectrum management - interference management and trading. The MOD's audit of its spectrum use has confirmed the importance of these two issues, which are discussed in the following paragraphs.

Recognised spectrum access (RSA)

4.55 RSA is a relatively new spectrum management instrument that was introduced by the Communications Act 2003[17] (the 'Communications Act') for users of spectrum who do not require to be licensed under the Wireless Telegraphy Act 2006 (the 'WT Act'). Spectrum trading consists of the transfer of rights or obligations under a licence or RSA. Without RSA, the MOD cannot engage in spectrum trading. RSA will enable the MOD to trade spectrum while also providing greater clarity and certainty about its rights and obligations, and the concomitant duty on Ofcom to take account of the MOD's use of spectrum.

Where can I find more information on RSA?

4.56 Ofcom has explained the role of RSA in promoting more efficient use of public sector spectrum. More information can be obtained on Ofcom's website at: http://www.ofcom.org.uk/consult/condocs/sfrps/statement/. In that statement, Ofcom said that it will make the necessary regulations to allow RSA to be granted to the MOD and for the MOD to trade RSA. Ofcom is understood to be planning to consult on the draft regulations shortly. The regulations will enable RSA to be granted and specify the frequency bands in which it will be available. To obtain RSA, the MOD will need to apply to Ofcom.

How will MOD apply for RSA?

4.57 Ofcom (in section 6.6 of the Spectrum Framework Review for the Public Sector - statement) concluded that phasing will enable Ofcom and the public sector bodies concerned to focus resources on the frequency bands likely to generate most benefit and to gain experience of the practical operation of the new processes before applying them more widely. The Independent Audit (recommendation 2.5) concluded that work on RSA should commence in priority bands selected on the basis of the potential gains from, and practical difficulties associated with, enhanced sharing by commercial users. The MOD is therefore proposing to adopt a phased approach in applying for RSA starting with frequency bands considered of higher priority that could generate most benefit.

Selecting the frequency bands

4.58 The MOD's audit programme, which is explained in paragraphs 4.24 et seq above, has established how Defence uses the 406.1 to 430 MHz, 2700 to 3400 MHz and 3400 to 3600 MHz bands in the UK and the MOD proposes now to apply for RSA within the 406.1 to 430 MHz and possibly within the 3400 to 3600 MHz band first as a precursor to their early exploitation. The precise details of this application will depend on progress in determining with those Departments and their agencies, other public bodies and civil users who share an interest in these bands, the arrangements for managing them and taking decisions on their exploitation. This will include consideration of the UK's obligations under international treaties. The MOD

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16 For more information on the treatment of the Crown see: http://www.ofcom.org.uk/radiocomms/ifi/licensing/licensing_policy_manual/what_is_Crown_body?a=87101

17 The relevant provisions are now contained in the Wireless Telegraphy Act 2006.

will also take into account the results of its Defence spectrum demand study, which will be available later this year.

4.59 Beyond this first phase the MOD proposes to apply for RSA in its holdings using the approach that it is taking to the audit of its current use of spectrum (see Figure 2 above) focussing initially on those bands that it may exploit.

4.60 Because the MOD has yet to decide whether to audit the spectrum it uses in addition to the 23 bands identified by the Independent Audit it is not yet able to decide whether or to what extent to propose to release these additional bands. But it is possible to give an initial indication of the additional bands and timing for RSA over the next few years.

4.61 Table 2 below summarises the frequency bands that the MOD has prioritised so far and lists the other bands that are being considered (in whole or in part) for RSA. This table also identifies spectrum within some bands where the MOD is not proposing to seek RSA. The MOD's indicative timetable for RSA (see Table 2) is subject to adjustment in the light of the results of the detailed audit, the Defence spectrum demand study and progress with the development of sharing arrangements with those Departments, their agencies and other public bodies who share spectrum with the MOD.

Table 2. MOD's timetable for applying for RSA

RSA - Likely date for application by MOD	< 1 GHz	1 – 4 GHz	4 – 10 GHz	> 10GHz
April 2008 to March 2009	406.1 – 430 MHz[1,8]	3400 – 3600 MHz[4,5]		
April 2009 to March 2010			4400 – 4500 MHz 7900 – 8400 MHz[10] 8500 – 9000 MHz[9] 9500 – 10125 MHz	10.125-10.225 GHz 10.225 – 10.5 GHz[5] 13.4– 13.75 GHz 14.62 – 15.23 GHz
April 2010 to March 2011			5300 – 5850 MHz[6] 7250 – 7300 MHz	
April 2011 to March 2012	230 – 399.9 MHz[2,3,7,8] 401 – 406 MHz	2310 – 2450 MHz		
Beyond 2012	72.8 – 74.8 MHz 75.2 -76.7 MHz 78 – 80 MHz 83.5 – 85 MHz[7] 141.9 – 143 MHz 149 – 149.9 MHz 153.5 – 154 MHz 430 – 450 MHz 870 – 872 MHz 915 - 917 MHz	1375– 1400 MHz[8] 1427 – 1452 MHz	4500 – 5000 MHz[8]	

Notes	
1	The band 406 to 406.1 MHz is limited to low power satellite emergency position-indicating radio beacons under Article 31 of the International Radio Regulations. This band cannot be released or shared. The MOD is not proposing to apply for RSA for this band.
2	The band 242.95 to 243.05 MHz is used for military distress and cannot be released or shared.
3	The band 328.6 to 335.4 MHz is managed by Directorate of Airspace Policy (DAP) and MOD. The MOD is not proposing to apply for RSA for this band.
4	The bands 3480 to 3500 MHz & 3580 to 3600 MHz have been released to Ofcom and spectrum licences have been awarded until July 2018. The MOD is not proposing to apply for RSA for these bands.
5	Emergency Services use.
6	The band 5300 to 5850 MHz is shared. The 5600 to 5650 MHz meteorological radar band used for the UK weather radar network is within this band. The MOD is not proposing to apply for RSA for those parts of the band which are shared.
7	The MOD is not proposing to apply for RSA for those parts of the 80 to 84 MHz, 235 to 328.6 MHz, 335.4 to 399.9 MHz & 3442 to 3475 MHz bands which are shared.
8	Radio astronomy use within the band. The 406.1 to 430 MHz band is shared and MOD is not proposing to apply for RSA for those parts of the band which are shared with other active services.
9	In the UK the band 8750 to 8850 MHz is allocated under the footnote provision UK2. Except by special agreement having the approval of the NFPG this frequency band, or the allocation to this radio service, is reserved exclusively for Military use in accordance with the Allocation to Services. The use of the band 8750 to 8850 MHz by the aeronautical radionavigation service is limited to airborne Doppler navigation aids on a centre frequency of 8850 MHz.
10	Met Office uses parts of the spectrum at 8160 MHz and 8212.5 MHz for the reception of satellite data. The EESS and Meteorological Satellite Service uses the bands 8025 to 8175 MHz and 8175 to 8215 MHz respectively.

Interference management

4.62 Ofcom has recognised that spectrum release combined with change of use might in certain circumstances involve a risk of interference.

4.63 The risk of interference caused by incoming use in a spectrum band that is released will be controlled by suitable conditions to be embedded in the grant of RSA. Moreover, Ofcom will have a statutory duty in exercising its spectrum management functions to take account of the recognised use by the MOD.

4.64 Ofcom has said in its SFRPS statement that it intends to include a minimum of technical restrictions in grants of RSA in order to provide maximum flexibility in use of released spectrum and that it proposes to cast RSA in the form of technology and application neutral spectrum usage rights (SURs).

Spectrum Usage Rights (SURs)

4.65 Ofcom has published several consultation documents to develop the concept and application of SURs and intends to consult shortly on the technical conditions to be included in the SUR in the 406.1 to 430 MHz band, which this document identifies as likely to be an early candidate for new sharing and release. Setting technical conditions as SURs will facilitate the exploitation of spectrum without the need to seek licence variations to accommodate changes of use. It is important, however, that the process of formulating the SURs does not cause undue delay and the MOD will work with Ofcom to secure this.

4.66 RSA will define the spectrum that the MOD will be able to trade, but will not legally constrain the MOD's own use of spectrum. This operational flexibility is especially important in the event of a national emergency. However, under normal conditions, the MOD would as far as possible aim to keep within the terms of the RSA in its use of the spectrum. Later this year Ofcom will publish a notice and order concerning regulations, initially for the band 406.1 to 430 MHz and possibly the band 3400 to 3600 MHz. It will also consult on the technical conditions to be included in the RSA.

Summary

4.67 RSA will enable the MOD to trade spectrum and provide greater clarity and certainty about its rights and obligations. The introduction of SURs will set the parameters within which the MOD will be able to exploit spectrum. These parameters will be set by Ofcom with the aim of minimising the risk of interference to other users that are licensed or recognised by Ofcom. In some cases, it might be necessary to seek variations of the RSA before trades take place, in which case the MOD will apply to Ofcom for the requisite variation. In addition, where spectrum is jointly managed with another public body or where there is a shared interest with another public body, suitable arrangements will be put in place for joint decision-making through the existing interdepartmental machinery of the UKSSC.

4.68 In the course of developing its proposals for RSA with Ofcom, the MOD has identified that there are many public bodies with whom it shares spectrum. It is not possible for the MOD to apply for RSA for all the spectrum that it shares as this requires that agreement has been reached with those bodies about the arrangements that should be in place for joint decision-making and about managing and exploiting spectrum in those bands. Work has commenced to develop these arrangements in the Spectrum Strategy Implementation Group (SSIG), which is chaired by the Department for Business, Enterprise and Regulatory Reform (BERR) and reports to the UKSSC. The MOD therefore proposes to apply for RSA for bands (in whole or in part) in a phased way that recognises that time is needed to develop the arrangements for shared bands.

Question 3. Do you agree with the phased approach to applying for RSA that the MOD is proposing?

The Legal Framework

4.69 Ofcom manages the radio spectrum within a statutory framework created by the Communications Act 2003 (the 'Communications Act') and the Wireless Telegraphy Act 2006 (the 'WT Act'). These Acts[18], which give effect to EU requirements[19], set out Ofcom's duties, functions and powers. In particular, Ofcom has a duty to secure optimal use of the radio spectrum having regard to the different needs and interests of all who may wish to use it and to have regard to the desirability of promoting its efficient management and use, economic and other benefits, innovation and competition.

4.70 The WT Act does not bind the Crown so Crown bodies like the MOD do not require authorisation to use spectrum. However, other arrangements are in place to plan and manage the spectrum used by the Crown which respects the rights of authorised non-Crown users.

Impact Assessments

4.71 The MOD has not conducted a full impact assessment for spectrum reform as this programme serves to implement the Government's overarching policy within Defence.

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18 This is a condensed account, not a comprehensive description of the legislative framework.

19 Including the Authorisation Directive 2002/20/EC and the Framework Directive 2002/21/EC

This policy has been subject to a full impact assessment, by Ofcom, which considered the range of options available for extending market mechanisms to the public sector. This is contained in Ofcom's statement "Spectrum Framework Review for the Public Sector" at: http://www.ofcom.org.uk/consult/condocs/sfrps/statement/

4.72 The MOD, itself, faces a range of options for implementing Government policy and it is important that robust analysis accompanies the decision to proceed along a given route. The Department will be completing a full investment appraisal to ensure that this requirement is met and that the most beneficial option is chosen.

Section 5

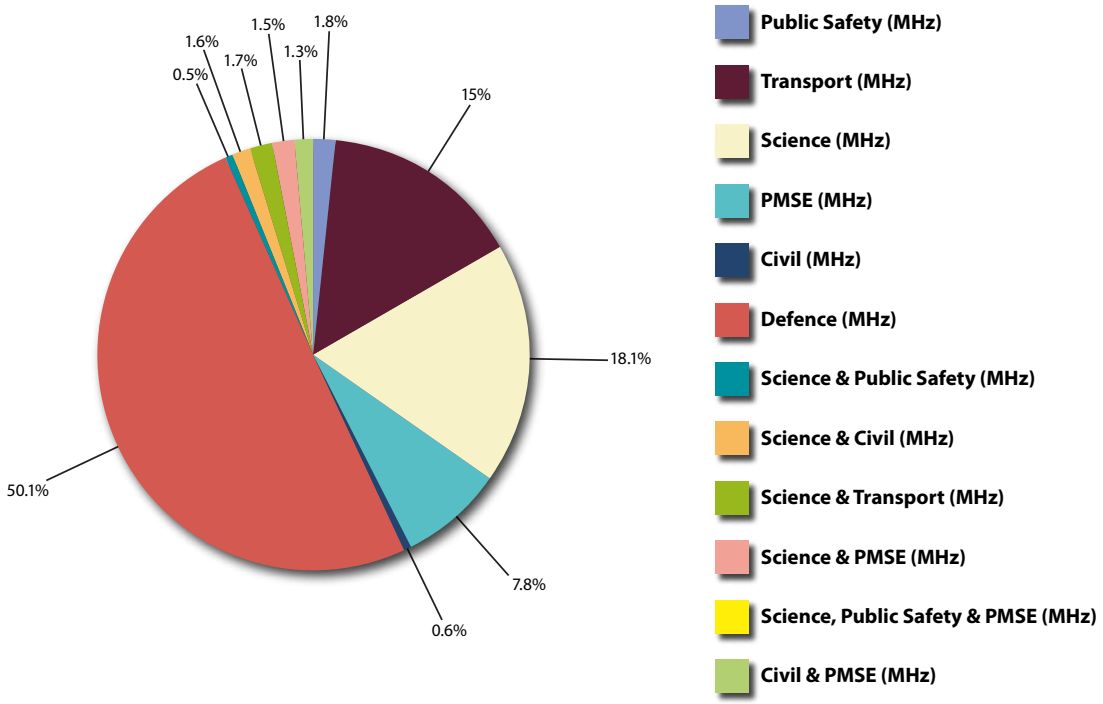
Spectrum Sharing, Release and Acquisition

How Defence Shares Spectrum Currently

5.1 The MOD shares a significant proportion of spectrum with the fast-growing UK information and communications technology sector such as broadband wireless as well as a wide range of non-commercial applications, which include safety-of-life, search and rescue, maritime and air-space management, transport infrastructure, the emergency and science services.

5.2 Sharing with (public and civil) non-military users currently takes place in as many as 99% of MOD managed bands identified in the UKFAT. Figure 4[1] illustrates how the MOD's holdings between 70 MHz and 15.7 GHz are used and shared on a percentage bandwidth basis.

Figure 4. How the MOD uses and shares spectrum (70 MHz to 15.7 GHz)



How MOD's spectrum use is identified

5.3 The MOD's spectrum use and those bands that it shares are identified in the UKFAT, which is drawn up and periodically revised by the UK SSC, a Cabinet Office committee that discusses matters relating to the use of the radio spectrum. The UKSSC is jointly chaired by the Department for Business, Enterprise & Regulatory Reform (BERR – formerly the Department of Trade and Industry) and MOD. It is open to any Government department or Devolved Administration that has an interest in spectrum.

1 Figure 4 omits Science, Public Safety and PMSE use which is 0.1%

5.4 In March 2007 the Forward Look identified the main public users of spectrum, their requirements for spectrum and plans for change. Further detail for some public users such as Emergency and Public Safety Services (E&PSS) is given below. Spectrum sharing with the sectors identified by the Forward Look includes:

- Civil Aeronautical
- Civil Maritime
- Emergency and Public Safety Services
- Programme making and special events
- Science

Civil Aeronautical

5.5 Aeronautical spectrum is allocated by the ITU on the basis of International Civil Aviation Organisation (ICAO) agreement for use on a global basis to enable worldwide interoperability. The allocated spectrum supports the necessary Communications, Navigation and Surveillance infrastructure in addition to airborne sensors and systems such as weather radar, radio altimeters and terrain warning. Equipment performance requirements, signal in-space characteristics and frequency planning criteria are governed in the main through *Standards and Recommended Practices* (SARPS) issued by the International Civil Aviation Organisation (ICAO).

5.6 Management of the aeronautical spectrum in the UK is conducted by the Civil Aviation Authority (CAA) and is linked with its activities as the aviation regulator. The CAA closely coordinates the UK aeronautical spectrum activity with that of the rest of Europe through ICAO regional arrangements and through *Eurocontrol*. These processes ensure the necessary coordination to prevent mutual interference and to harmonise assignments. In addition, depending on the organisation, the UK is represented by the Department for Transport (DfT) or the CAA in a wide range of European and global fora to develop strategy and policy for aviation to ensure a harmonised and coordinated approach; which in turn impacts on aeronautical spectrum use and requirements. The UK is a key participant in the *European Single European Skies* programme, which is aimed at coordinating and harmonising the airspace and Air Traffic Management arrangements for the region. Within this programme legislative instruments such as *Interoperability Rules* are coming into force. These are directly applicable by law and will therefore govern aeronautical spectrum use in the UK[2].

Current aeronautical use of spectrum between 1000 MHz and 10 GHz

5.7 There are a number of systems operating in this frequency range including: DME, SSR, GNSS, 23cm radar, RadAlt, MLS and weather radar. Primary radar continues to be a requirement in both terminal and en-route requirements. Changes to institutional arrangements formalising processes between MOD, the Met Office, the MCA and CAA, together with work on clearly defining radar protection criteria should also lead to improved efficiency. Work is underway to define the minimum safeguarding criteria for radionavigation. This includes civil aeronautical radar in the bands 2700 to 3100 MHz (S Band) and 9000 to 9500 MHz (X Band). This programme, a collaborative exercise between the CAA, the MOD, the MCA and the Met Office, is ongoing and decisions regarding the potential for sharing spectrum within the aeronautical radar bands cannot be made yet. For this reason these bands are identified as bands where decisions regarding RSA cannot be taken yet and no proposals are made by the MOD in this document for sharing or releasing spectrum within these bands, though it is an important topic on which further work is being undertaken.

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2 Separate regulations for rail are in place for interoperability for rail.

Civil Maritime

5.8 The ITU allocates much of the spectrum for maritime use on a global basis on the basis of the International Maritime Organisation agreement to enable worldwide interoperability, especially for distress and calling. Within the UK the Maritime and Coastguard Agency (MCA), through HM Coastguard, uses spectrum for operational communications. Professional seafarers, the RNLI and leisure craft also make extensive use of maritime frequency bands. MCA is also the national UK administration with responsibility for maritime radio communications (specifically the Global Maritime Distress and Safety System – GMDSS) and radio determination or radio navigation. Ofcom, working closely with the MCA, represents the UK in relevant European and international forums concerned with the management and use of spectrum for maritime purposes, including the ITU and the International Maritime Organisation (IMO). International agreements in IMO are made by Government (of which MCA is part).

Current civil maritime spectrum use below 1000 MHz

5.9 The band 406 to 406.1 MHz (Mobile Satellite) is identified in Table 2 of this document as a band that cannot be released or shared. This band is the primary band for Emergency Position Indicating Radio Beacons (EPIRBs) and this use is likely to continue into the foreseeable future. 406 MHz EPIRBs are a SOLAS (Convention on Safety of Life at Sea) carriage requirement.

Current civil maritime spectrum between 1000 MHz and 4000 MHz

5.10 Radar operating in the band 2900 to 3100 MHz (S Band Radionavigation) is widely used by ships because of its good performance in rain. Carriage is a requirement under SOLAS for ships over 3000 gross tonnage and IMO sees the need for this band for at least the next few decades. Shore based use is limited to four sites in the UK as S band there has limited advantages, although RACONs and radio beacons, which are associated with lighthouses and larger buoys to provide a distinct mark on a ship's radar screen are generally dual S/X band[3]. A collaborative exercise between the CAA, the MOD, the MCA and the Met Office, is ongoing and decisions regarding the potential for sharing spectrum within the radar bands cannot be made yet. For this reason this band is identified as a band where decisions regarding RSA cannot be taken yet and no proposals are made by the MOD for sharing or releasing it.

Current civil maritime spectrum between 4000 MHz and 10 GHz

5.11 The band 5470 to 5650 MHz (Maritime Radionavigation) has been previously used for radars and radar transponders. It is now little used for Maritime Radionavigation and there are currently no plans for its use as IMO has relied instead on the use of the S and X bands. (Civilian vessels are not licensed for use in this band). The band is shared by a number of services and decisions regarding the potential for sharing spectrum within the band cannot be made yet. For this reason the band is identified as one where decisions regarding RSA cannot be taken yet and no proposals are made by the MOD for sharing or releasing spectrum from within it.

5.12 Radar installations operating in the band 9300 to 9500 MHz (Radionavigation), commonly referred to as X-band radar, are a mandatory fit on SOLAS ships and are very extensively used by non-SOLAS vessels, including a very large population of leisure vessels. Bearing in mind that it is a mandatory carriage requirement for all SOLAS ships, and the very extensive use by other vessels, the band will be required for the foreseeable future. The band 9200 to 9300 MHz (Maritime Radionavigation) is used by ships for Search and Rescue Transponders (SARTS), which are carried on lifeboats and life-rafts in aid search and rescue operations following distress incidents. The band is also used by shore based radars. Overall, shore based

3 RACONs are the responsibility of Trinity House in England and Wales, the Northern Lighthouse Board in Scotland, and the Commissioners of the Irish Lights in the island of Ireland.

'X band' radar is used at 128 sites in the UK including three operated by HM Coastguard. There are additionally 93 RACONs (of which 79 are dual band) operating in the 9300 to 9500 MHz band. Because of the safety-critical nature of these applications, sharing in them requires particular care to ensure that safety remains paramount. The scope for release of the aeronautical and maritime radar bands is being studied in an ongoing collaborative exercise between the CAA, the MOD, the MCA, the Met Office. Further details may be found at http://www.spectrumaudit.org.uk/band.htm. For this reason, this band is identified as one where decisions regarding RSA cannot be taken yet and no proposals are made by the MOD for sharing or releasing spectrum within this band.

Emergency and Public Safety Services (E&PSS)

5.13 Radio communications are essential to the effective and efficient operation of emergency and public safety services (E&PSS). Radio provides vital links for dispatching resources, coordinating responses to emergencies, providing support at incidents and protecting the lives of operational personnel. Policy responsibility and sponsorship of the civil emergency services is shared between a number of departments including Home Office (for police), Department of Communities and Local Government (for fire in England[4]), Department of Health (for the ambulance services) and the Department for Transport for Coastguard and for search and rescue. (The Maritime and Coastguard Agency (MCA) provides maritime search and rescue (SAR) and in some specific areas, inland SAR, using mainly dedicated maritime VHF frequencies). The Scottish Executive has similar responsibilities in respect of services in Scotland. These and the other interested departments and bodies listed below provide advice to Ofcom on the management of relevant spectrum through the Public Safety Spectrum Policy Group (PSSPG).

5.14 The management and use of E&PSS spectrum is one of the most complex and involves numerous government departments and all the nations and regions and local authorities. In certain bands the MOD shares E&PSS spectrum. Figures 5 & 6 below illustrate the complex management and use of E&PSS spectrum.

4 The Fire Services Act refers to satisfactory communications as being an essential part of delivering statutory obligations.

Figure 5. Government Departments and other public sector bodies with responsibilities for E&PSS Spectrum

Figure 6. The managers and users of E&PSS spectrum (Nations, Regions and Authorities)

E&PSS spectrum use below 1000 MHz

5.15 The MOD and the E&PSS share a number of bands below 1000 MHz. These bands are:

- 70.5 to 71.5 MHz
- 80 to 84 MHz
- 153 to153.5 MHz
- 154 to 156 MHz
- 235 to 328.6 MHz
- 335.4 to 399.9 MHz
- 406 to 406.1 MHz

5.16 These bands are part of the collaborative exercise between the MOD, the PSSPG, Ofcom and the public bodies involved to establish an agreement for sharing and exploitation, which is ongoing, and decisions regarding the potential for sharing or releasing spectrum within these bands cannot be made yet. For this reason these bands are also identified as bands where decisions regarding RSA cannot be taken yet and no proposals are made by the MOD for sharing or releasing spectrum within these bands.

E&PSS spectrum between 1000 MHz and 15 000 MHz

5.17 The MOD and the E&PSS share two bands between 1000 MHz and 15 GHz. These bands are:

- 1790 to 1798 MHz (paired with 2302 to 2310 MHz)
- 2310 to 2380 MHz
- 3442 to 3475 MHz
- 4800 to 4900 MHz
- 10.25 to10.27 GHz
- 10.36 to 10.46 GHz

5.18 These bands are part of the collaborative exercise between the MOD, the PSSPG, Ofcom and the public bodies involved to establish an agreement for sharing and release, which is ongoing, and decisions regarding the potential for sharing or releasing spectrum within these bands cannot be made yet. For this reason these bands are also identified as bands where decisions regarding RSA cannot be taken yet and no proposals are made by the MOD for sharing or releasing spectrum within these bands.

Table 3. Spectrum available for emergency services use

Lower Band Edge	Upper Band Edge	Comments
70·50000	71·50000	
80·00000	81·50000	
83.50000	84.00000	
86·30625	86·31875	UK - Land Search & Rescue
138·08750	138·11250	
138·28750	138·31250	
143·00000	144·00000	
146·00000	148·00000	
147·46875	147·48125	UK - Land Search & Rescue
152·00000	153·01250	
152·83750	152·86250	Scotland - Land Search & Rescue
153·03750	153·06250	

Lower Band Edge	Upper Band Edge	Comments
154·00000	156·00000	
155·34375	155·35625	England and Wales - Land Search & Rescue
158·63750	158·66250	UK - Land Search & Rescue. Till end 2009
158·64375	158·65625	UK - Land Search & Rescue. From 2010
166·09375	166·10625	England and Wales – NHS ambulance service.
166·19375	166·20625	England and Wales – NHS ambulance service.
166·26875	166·41875	England and Wales – NHS ambulance service.
166·43125	166·44375	England and Wales – NHS ambulance service.
166·45625	166·61875	England and Wales – NHS ambulance service.
166·74375	166·75625	England and Wales – NHS ambulance service.
166·79375	166·80625	England and Wales – NHS ambulance service.
168·31250	168·83750	
170·89375	170·90625	England and Wales – NHS ambulance service.
170·99375	171·00625	England and Wales – NHS ambulance service.
171·06875	171·21875	England and Wales – NHS ambulance service.
171·23125	171·24375	England and Wales – NHS ambulance service.
171·25625	171·41875	England and Wales – NHS ambulance service.
171·54375	171·55625	England and Wales – NHS ambulance service.
171·59375	171·60625	England and Wales – NHS ambulance service.
173·98750	174·41250	
380·00000	385·00000	PSSPG
390·00000	395·00000	PSSPG
410·00000	412·00000	PSSPG
420·00000	422·00000	PSSPG
450·00000	453·00000	
453·26875	453·28125	England and Wales
453·31875	453·33125	England and Wales
453·36875	453·38125	England and Wales
455·87500	456·00000	
457·00000	457·25000	
457·47500	457·50000	
459·49375	459·50625	

Lower Band Edge	Upper Band Edge	Comments
459·50625	459·51875	
459·53125	459·54375	
459·76875	459·78125	England and Wales
459·81875	459·83125	England and Wales
459·86875	459·88125	England and Wales
460·50000	460·75000	
462·50000	462·75000	
464·00000	466·06250	
466·08750	467·25000	
469·87500	470·00000	England and Wales
862·00000	863·00000	
1668·00000	1670·00000	
1677·00000	1685·00000	
1698·00000	1700·00000	
1790·00000	1798·00000	
2302·00000	2310·00000	
2310·00000	2320·00000	For wideband mobile emergency services (subject to MOD restrictions).
2320·00000	2360·00000	For wideband mobile emergency services (subject to MOD restrictions).
2360·00000	2380·00000	For wideband aeronautical mobile emergency services (on a temporary basis and subject to MOD restrictions).
3442·00000	3475·00000	Airborne video links within areas agreed by the MOD and below 3000 feet altitude.
4800.00000	4900.00000	For mobile emergency services (within the M25 orbital road only).
8340·00000	8360·00000	For mobile emergency services (within the M25 orbital road only).
8400·00000	8460·00000	
10·250	10·270	For mobile emergency services (subject to MOD restrictions).
10·360	10·400	For mobile emergency services (subject to MOD restrictions).
10·400	10·460	For mobile emergency services (subject to MOD restrictions).

Lower Band Edge	Upper Band Edge	Comments
24·050	24·150	
50·200	50·400	Paired with 51·2-51·4 GHz – for mobile Emergency Services.
51·200	51·400	Paired with 50·2-50·4 GHz – for mobile Emergency Services.

Science Services

5.19 The Science Services comprise the Radio Astronomy; Space Research; Earth Exploration Satellite (EESS); Space Operations; Meteorological Aids, and Standard Frequency and Time Services. The frequency allocations for these services comprise a number of bands within the range 9 kHz to 200 GHz. Between 70 MHz to 15.7 GHz the EESS community and the MOD share a number of bands. The two largest users of spectrum within the science services community are radio astronomy and meteorological services respectively.

Radio astronomy

5.20 Radio astronomy is a passive service involving the detection and analysis of extremely low signals from distant cosmic sources. Ofcom has made regulations to introduce Recognised Spectrum Access (RSA) for radio astronomy has said that it will consult on making this tradable.

5.21 The MOD shares a number of bands with the radio astronomy community. The shared use of spectrum and arrangements for its release and sharing are part of the collaborative exercise between the MOD, The Dept. For Innovation, Universities and Skills (DIUS), Ofcom and the radio astronomy community. This exercise, which is ongoing, is considering an agreement that will establish a basis for managing shared spectrum use and decisions regarding the potential for sharing or releasing spectrum within these bands based on existing sharing arrangements, which have worked well for some years, but with the MOD managing shared bands. For this reason the MOD believes that a decision for the MOD to apply for RSA for the bands identified in Table 2 above can be made, but no proposals are made for new sharing or releasing spectrum within these bands. Radio astronomy interest in MOD managed bands is identified in Table 4:

Table 4. Radio Astronomy bands

Radio Astronomy bands with some protection but no coordination or exclusions (See note below)			
Frequency Band	Allocation Status	Protection Category	Radio astronomy sites
406.1-410 MHz	Primary	C	Cambridge, Darnhall, Defford, Jodrell Bank, Knockin, Pickmere.
1380-1400 MHz	Secondary	C	Cambridge, Darnhall, Defford, Jodrell Bank, Knockin, Pickmere.
4825-4835 MHz	Secondary	C	Jodrell Bank
4950-4990 MHz	Secondary	C	Cambridge, Darnhall, Defford, Jodrell Bank, Knockin, Pickmere
4990-5000 MHz	Primary	C	Cambridge, Darnhall, Defford, Jodrell Bank, Knockin, Pickmere
Radio Astronomy bands with No protection			
Frequency Band	Allocation Status	Protection Category	Radio astronomy sites
232-236 MHz	Footnote	Footnote	Jodrell Bank
326.5-328.5 MHz	Footnote	D	Cambridge, Jodrell Bank
1350-1380 MHz	Footnote	D	Cambridge, Darnhall, Defford, Jodrell Bank, Knockin, Pickmere
4600-4825 MHz	Footnote	D	Cambridge, Darnhall, Defford, Jodrell Bank, Knockin, Pickmere
4825 – 4835 MHz	Footnote	D	Cambridge, Darnhall, Defford, Jodrell Bank, Knockin, Pickmere
4835 – 4950 MHz	Footnote	D	Cambridge, Darnhall, Defford, Jodrell Bank, Knockin, Pickmere

Note:
Category of protection:

C All practicable measures will be taken to protect the radio astronomy services from harmful interference when planning assignments within the band.

D No protection can be afforded to the radio astronomy service in the band.

Meteorological service

5.22 The meteorological service provides essential real time data on weather conditions, weather forecasting and long-term research into climate change. The Met Office manages these services and also provides important data for military users via the MOD. Meteorological information is also essential for the operations of all the other public sector users referred to elsewhere in this document.

Current Meteorological Service use of spectrum

5.23 The principal frequency bands allocated to the meteorological service and shared with the MOD are listed below. Further details on how these bands are used can be found in the Government's Forward Look at http://www.spectrumaudit.org.uk/band.htm.

Current Met Office use of spectrum below 1000 MHz

- 137 to 138 MHz[5]
- 153 to 154 MHz
- 400.15 to 406 MHz
- 915 to 921 MHz

Current Met Office use of spectrum between 1000 MHz and 4000 MHz

- 1270 to 1295 MHz
- 1400 to 1427MHz
- 2700 to 3400 MHz

Current Met Office use of spectrum above 4000 MHz

- 5600 to 5650 MHz
- 8175 to 8215 MHz
- 9300 to 9500 MHz

Changes to Meteorological Services spectrum management

5.24 The Independent Audit recommended that the budget for spectrum charges for the bands used by the Met Office should be transferred from the MOD to the Met Office to be managed there. It further suggested that the MOD and the Met Office might wish to review the use of these bands before this transfer takes place. The Met Office and MOD undertook to review how the budget for spectrum charges could be treated. Discussions have taken place between the Met Office and the MOD regarding spectrum budgets. Further work needs to be done, but initial conclusions are that changing the current arrangements now, whilst improving transparency would incur additional administrative costs with marginal impact on the efficient use of spectrum. The budget arrangements will therefore remain unchanged during the period covered by CSR07, but will be kept under review.

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5 The Met Office does not currently use the 137 to 138 MHz band and is unlikely to do so in the future. There is, however, significant amateur and educational use of this band for MetSat reception.

5.25 A Memorandum of Understanding (MoU) between the MOD and the Met Office defining the scope of spectrum management cooperation is under development with the aim of identifying improvements in management efficiency. It had not been possible to conclude this arrangement during 2007, but the MOD and the Met Office will conclude an agreement by the end of 2008.

5.26 No immediate changes will be made to the current fund holding arrangements for meteorological bands. The MOD will seek RSA for bands shared with the Met Office and the MoU arrangements will be developed to underpin the Met Office's use of bands shared with the MOD. The MOD will however keep the issue of fund holding under review as it implements reforms in spectrum management. In the meantime, significant efficiency targets, such as the introduction of new technologies that will allow release of spectrum, are already imposed by the Public Weather Service (PWS).

Earth Exploration Satellite Services (EESS)

Background

5.27 Spectrum for EESS is allocated on a worldwide basis and is used primarily by satellites observing the Earth's atmosphere and surface remotely. EESS play a central role in understanding the Earth's environment, by providing accurate, continuous, simultaneous measurements of the Earth's atmosphere, oceans, ice sheets, land surface and interior. Such measurements are often the only means to identify and monitor changes in the natural environment on both regional and global scales - particularly those caused by human activity such as deforestation, atmospheric pollution, sea level rise, ozone depletion, and melting sea ice and glaciers.

5.28 Reliable global access to key frequency bands is essential to forecasting and monitoring global climate changes, particularly related to human induced climate change. There are three main types of EESS allocation in the Radio Regulations:

1 Passive

2 Active

3 Telemetry, Telecommand and Control and data communications.

UK interests

5.29 The UK invests heavily in EESS, primarily through the UK Natural Environment Research Council (NERC), which has recently established two centres devoted to EO (Earth observation) science and technology respectively, as well as supporting EO research and development within UK academia. Other key public stakeholders are the Met Office and DEFRA.

5.30 NERC are responsible for the UK's contribution (c. £43M pa) to the EO element of the European Space Agency (ESA). This gives the UK a direct input into guiding and delivering future EO satellite missions, which are both shaped by and shape environmental policy. UK industry is involved in many technical developments within the EO area, such as sensors, instrumentation, ground segments, and data exploitation software.

5.31 EO features prominently in the research and monitoring activities of other nations, with whom the UK and other European countries collaborate by exchanging EO data and by forming partnerships to develop mutually beneficial EO missions. Indeed, much of the science undertaken by UK environmental scientists relies on access to data originating from non-European sources, particularly the US. Consequently, the choice of frequency bands for most

of the EO data used by the UK is out of the direct control of the UK. The UK has an EO satellite receiving station at Dundee University, funded by NERC, which downloads data from a wide variety of EO satellites, including those operated by Europe and the US. The Met Office operates satellite receiving equipment at Exeter that receives many of the satellites transmissions that are received at Dundee. There are other significant satellite reception facilities, such as that operated by QinetiQ at West Freugh.

Interference and sharing

5.32 The frequencies used in EO are dictated by physical properties of the Earth's surface and/or atmosphere. This can sometimes lead to conflicts with other users of the radio spectrum, who may also wish to avoid certain parts of the spectrum for the same reason, e.g. atmospheric attenuation. Reliable access to the frequencies used by EESS is required over all parts of the Earth, so that measurements can be made globally. However, disruption to measurements over regional areas can seriously degrade the usefulness of the data to the global community as a whole.

5.33 In common with other passive uses of spectrum, there is a high susceptibility to interference, including interference due to out of band emissions from adjacent band services. Radio interference to passive bands can result in unpredictable background noise, which is inherently difficult to detect and can in turn become ingested into numerical forecast models. UK science and research data depends on access to spectrum nationally and globally that is sufficiently clear from interference to allow reliable and accurate observation. The Met Office receives a significant proportion of its data and products from satellite operators such as EUMETSAT and NOAA, who also provide raw and processed data from satellites for dissemination to the global meteorological community for regional and global scientific studies.

Summary

5.34 A review of the future management of spectrum used for Earth Exploration Satellite Services has been initiated. Initial discussions have taken place between the Met Office and the MOD in bands where there are just UK Met Office interests. Further work is necessary in this area but initial conclusions are that changing current arrangements would improve transparency, but would incur additional administrative costs with marginal impact on the efficient use of spectrum. For this reason the MOD believes that a decision for the MOD to apply for RSA for the bands that are shared can be made, but no proposals are being made for sharing or releasing spectrum within these bands.

5.35 In other bands shared between the MOD and other EESS users no decisions regarding RSA can be taken until the review of the future management of spectrum for EESS has been completed. Therefore, no proposals are made by the MOD for sharing or releasing spectrum within these frequency bands.

Table 5. EESS Allocations in MOD Managed Spectrum (includes UK2, UK4 and UK5 allocations)

Lower (MHz)	Upper (MHz)	Service description	RR Article 5 footnotes
401	403	EES* (active) (primary) (E-S)	
432	438	EES (active) (secondary)	5.279A
1215	1300	EES (active) (primary)	5.331, 5.332
1525	1535	EES (secondary)	5.341, 5.342, 5.350, 5.351, 5.352A, 5.354
2025	2070	EES (E-S , S-S)(primary)	5.392
2200	2245	EES (S-E , S-S)(primary)	
3100	3300	EES (active)(secondary)	5.149
5250	5350	EES (active) (primary)	5.448A
5350	5460	EES (active) (primary)	5.448A
5460	5470	EES (active) (primary)	5.448B
5470	5570	EES (active) (primary)	5.448B, 5.451, 5452
8025	8175	EES (primary) (s-e)	5.462A
8175	8400	EES (primary) (s-e)	5.462A
8550	8650	EES (active) (primary)	5.469A
9500	9800	EES (active) (primary)	5.476A, 5.479
13250	13400	EES (active) (primary)	5.498A, 5.499
13400	13750	EES (active) (primary)	5.499, 5.500, 5.501, 5.501B
13750	14000	EES (secondary)	5.499, 5.500, 5.501, 5.502, 5.503

* Earth Exploration Satellite

Other users who share spectrum with the MOD

5.36 In addition to those users and sectors who share spectrum with the MOD identified above there are a number of others that were not identified or whose use of shared spectrum was not dealt with in the Forward Look. During the audit the MOD has identified the following sectors:

Programme Making and Special Events (PMSE)

5.37 The programme making and special events (PMSE) sector comprises a wide variety of different spectrum users with various uses. They include gathering news, making outside broadcasts, making programmes in studios, supporting local entertainment and events, and use in community bodies such as schools and churches. Spectrum is used for many different pieces of equipment, including wireless cameras as well as wireless microphones. Other uses include in-ear monitors used for on-stage performances, talkback systems in studios, and audio links from studios to outside broadcasts. The PMSE sector currently accesses spectrum between 47MHz

and 48 GHz. It usually shares this access with a number of (primary or secondary users). A list of bands used for PMSE in the range 70 MHz to 15.7 GHz is given in Table 6 below.

Table 6. PMSE Bands (70 MHz - 15.7 GHz)

MOD	PMSE
406.1 – 430 MHz	425.3125-425.5625 MHz and 427.7625-428.0125 MHz
3400 – 3600 MHz	3400-3440 MHz and 3500-3580 MHz
10.255 - 10.5 GHz	10.3-10.36 GHz
5300 – 5850 MHz	5472 – 5588 MHz, 5682.5 – 5702.5 MHz, 5705 – 5725 MHz, 5732.5 – 5752.5 MHz, 5770 – 5790 MHz, 5795 – 5815 MHz
2310 – 2450 MHz	2390 – 2450 MHz
72.8 – 74.8 MHz	74.68125 – 74.71875 MHz
75.2 – 76.7 MHz	75.2625 – 75.3 MHz
78 – 80 MHz	78.18375 – 78.25875 MHz
430 – 450 MHz	442.2625 – 442.5125 MHz and 446.425 – 447.5125 MHz

5.38 PMSE currently uses a number of bands managed by the MOD, access to which has historically been agreed by Ofcom and the legacy regulator (the Radiocommunications Agency).

5.39 The MOD expects there to be keen interest from the sector in continued use of spectrum for PMSE. The MOD proposes to continue to allow use of the spectrum that it manages for as long as possible and the MOD will take the longer-term use of its holdings by PMSE into consideration.

5.40 The MOD wishes to give the PMSE sector the assurance that spectrum access will be addressed as soon as practicable. This requires MOD to put in place new arrangements for the management of spectrum that it uses and for RSA to be established.

Amateur and Amateur Satellite use

5.41 Radio Amateurs are duly authorised persons who use radio for the purpose of self-training, intercommunication and technical investigations solely with a personal aim and without pecuniary or commercial interest. More than 63,000 people currently hold Amateur radio licences within the UK, many of whom communicate with fellow Amateurs at home and abroad using a broad range of technologies.

5.42 Radio Amateurs have had access to a significant number of bands between 135.7 kHz and 250 GHz for many years. The frequency bands and other technical parameters for Amateur and Amateur-satellite use are specified in the licence granted by Ofcom. Amateurs do not have individual frequency assignments. Operation outside the standard Amateur radio licence terms of the licence (e.g. for repeaters, beacons) may be permitted by a Notice of Variation, which is issued by Ofcom.

5.43 Whilst radio Amateurs enjoy primary use (and in a few cases, exclusive use) in a limited number of bands, the majority of bands in which they operate are shared on a secondary[6]

6 See ITU-R Radio Regulation 5.28.

basis. In many cases these bands are managed by the MOD. The basis for sharing between the MOD and radio Amateurs is a regular dialogue with the Radio Society of Great Britain, the representative body for radio Amateurs, on radio spectrum matters and it is expected that this constructive relationship will continue.

Bands that are shared by the MOD and radio Amateurs

5.44 The details the MOD managed bands that are shared with radio Amateurs are provided in Annex A Table A.2

Implications of the proposals in this document for radio Amateurs:

5.45 In bands that radio Amateurs share on a secondary basis, their freedom to operate could be affected by an increase in spectrum use by primary users, whether civil or military. This is because they are required to avoid interfering with, and have no protection from, primary users. However, the proposals in this document are not expected to have an effect before 2012 on bands shared with Amateurs. In the longer term, the MOD hopes that its current good working relationship with the RSGB will continue into the future through any potential changes in spectrum usage.

How Defence Plans to Exploit Spectrum in the Future

Trading

5.46 This section discusses the processes for the MOD to acquire, release and share spectrum through the market.

Acquisition of spectrum by public bodies

5.47 The Independent Audit recommended that there should be a presumption that new public sector spectrum needs should be met through the market in all but exceptional cases. How the MOD proposes to acquire spectrum from the market is explained below.

Trading with commercial parties

5.48 The release and sharing of public sector spectrum through spectrum trading will be governed by regulations to be made by Ofcom. Ofcom intends to consult on these shortly as foreshadowed in the policy statement on its Spectrum Framework Review for the Public Sector (SFRPS) at http://www.ofcom.org.uk/consult/condocs/sfrps/ and will include details of the process.

5.49 Procedures for departments and other public bodies to make joint decisions on release or sharing of spectrum in which more than one such body has an interest will be determined by interdepartmental arrangements that are currently discussed under the auspices of the UKSSC.

How Defence Plans to Acquire Spectrum in the Future

5.50 This section discusses how the MOD will seek to acquire new spectrum to support its UK requirements into the future from other public sector bodies and commercial users and the processes for this. The Independent Audit recommended that there should be a presumption that new public sector spectrum needs should be met through the market in all but exceptional cases. Government is considering the framework for public sector bodies, and the MOD will need to consider how it could interact with the market. Further information on how the MOD could interact with the market to acquire spectrum is given in Section 6 of this document.

5.51 Before seeking to acquire spectrum from the market the MOD will make an appraisal of the benefit to Defence of doing so using the Government's and the MOD's established methods for investment appraisal.

5.52 For the MOD the appropriate investment appraisal framework supplements the Treasury's "Green Book - Appraisal and Evaluation in Central Government".

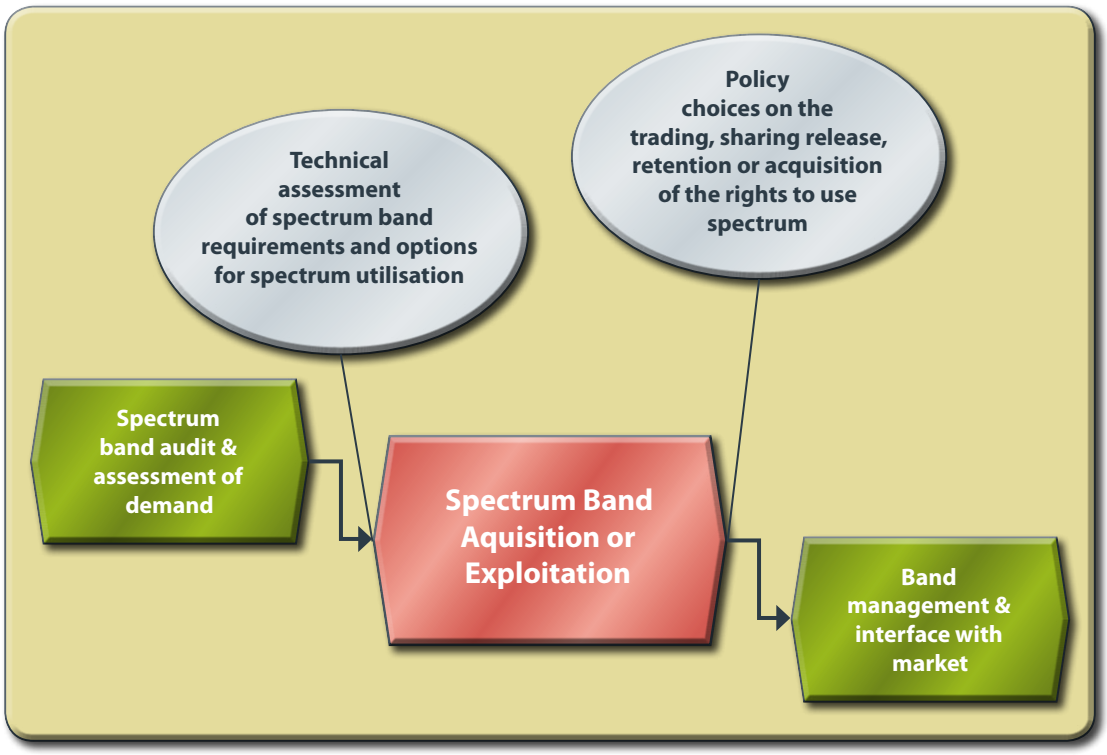
5.53 In addition to the process of appraisal it may be necessary to undertake an Impact Assessment (IA). An IA is intended to ensure that thorough consideration is given to the consequences of policy choices relating to the exploitation of spectrum.

Investment appraisal

5.54 Figure 7 below shows a simplified overview of the process that the MOD will follow from the completion of an audit of the use of a spectrum band to the application of day-to-day band management and, where appropriate, engagement in the spectrum market to acquire (or exploit) spectrum. The simplified overview of the process identifies a requirement for two phases of analysis. In the first phase a technical assessment of spectrum use and the future demand for UK military spectrum is made and options for spectrum utilisation are developed. In the second phase policy choices are developed and assessed. The assessment identifies whether additional spectrum needs to be acquired (or whether spectrum can be exploited) to supplement (or release or share) the existing spectrum holding.

5.55 The costs and effectiveness of policy choices for a spectrum band must be appraised and evaluated and, where appropriate, an Impact Assessment of policy proposals undertaken. Additionally, Ofcom will undertake its own Impact Assessments as required by section 7 of the Communications Act 2003 for any proposal that would be likely to have a significant effect on businesses or the general public or to involve a major change in its activities.

Figure 7. Spectrum appraisal overview



Plan for Releasing and sharing Spectrum

5.56 In October 2007 the Government published the 2007 Pre-Budget Report and Comprehensive Spending Review Meeting the Aspirations of the British people. Government said that the MOD will:

- publish its plans for the release of electromagnetic spectrum to the market

and that it

- will begin the release of the bands identified in 2008 and will release a significant proportion of the spectrum that it uses during 2009 and 2010.

5.57 The following paragraphs set out the MOD's plans for the release of spectrum from 2008 to 2012.

What constrains the release of MOD's spectrum?

5.58 In this document the MOD has identified that the spectrum considered in its audit supports a very wide range of vital military operations, a wide range of non-commercial and safety of life applications as well as civil use by the fast-growing information and communications technology sector and that greater efficiency in these spectrum bands is key to innovation and competition in both the civil and military sectors. One example of constraint on the scope for the MOD to release spectrum is where it already shares spectrum with other users. Another example is where spectrum is NATO-managed or harmonised.

MOD Spectrum released since 2007

5.59 In 2007 the MOD released spectrum to Ofcom for programme making and for emergency services in the band 8400 to 8500 MHz. This year the MOD has released spectrum for GSM-R[7] in the bands 876 to 880 MHz / 921 to 925 MHz and has agreed to share the 5300 MHz EESS band for Compact Active Transponders once constraints are fully defined. It will be for Ofcom to determine how licences in the 8400 to 8500 MHz band will be awarded and the licensing of the 5300 MHz band.

What are the MOD's plans for releasing and sharing spectrum?

5.60 MOD has initiated a programme of work to identify which spectrum can be released and when. The release of priority bands will begin in March 2009 with further bands to follow. Decisions to release and share spectrum will be taken after the MOD has appraised the options open to it. These options may include releasing and sharing spectrum:

- Nationally
- Nationally, but with certain geographical restrictions
- Regionally or locally to specific areas
- In the Nations. With the cessation of operations in Northern Ireland for example the MOD's requirements for spectrum have changed

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7 GSM-R. See ECC/DEC/(02)09. ECC Decision of 15 November 2002 on free circulation and use of GSM-R mobile terminals operating within the frequency bands 876 to 880 MHz and 921 to 925 MHz for railway purposes in CEPT countries, enlarging the field of application of ERC/DEC/(95)01. (http://www.erodocdb.dk/doks/doccategoryECC.aspx?doccatid=1#1916)

- On a time-shared basis
- By frequency.

5.61 When the MOD appraises the options for exploiting spectrum it will take into account the results of its spectrum audit, the Defence demand study and any other spectrum demand requirements that it considers relevant, alongside responses to this consultation. Where spectrum is shared with other public sector bodies, it will consult them through appropriate Government mechanisms. The MOD will comply with the Government's requirements to ensure that sufficient spectrum remains available for national security, defence, emergency and essential public services, seek to minimise harmful interference and ensure continued compliance with national and international obligations, including those dealing with international spectrum management.

The need for a "pilot" trial

5.62 The MOD proposes to launch a 'pilot' trial that would enable it to commence releasing and sharing spectrum and to gain experience of engaging with the market. The services of a Third Party spectrum management organisation might be retained for a limited period to assist in running the pilot. This Third Party would facilitate trades and sharing arrangements. The MOD would identify the band(s) and provide information on use and the Third Party would seek market opportunities and carry out transactions on behalf of MOD, but would not actually hold the spectrum rights.

5.63 Discussions on the development of Third Party arrangements are already being held at SSIG and UKSSC. The UKSSC has the scope to act for Government to take decisions and to agree the arrangements, but equally there should be nothing stopping OGDs and other public bodies from contracting separately if they wish.

What transactions will be allowed?

5.64 The sharing and release of spectrum can be temporary, in which case the spectrum band would revert to the MOD after a specified period of time (sometimes referred to as 'leasing'), or permanent ('disposal') and can involve the entire spectrum band or part of it sub-divided by frequency, geographical coverage or time, (referred to as 'sharing'). The term "spectrum trading" is generic and encompasses all of these. The modes of trading that are allowed will be specified by Ofcom in trading regulations but, within the scope of the regulations, it will be for the MOD to decide whether to trade and, if so, what form particular transactions should take. When the MOD applies for RSA for a spectrum band that does not necessarily mean that it wishes to exploit the holding, only that it wishes to clarify its rights.

Release and sharing during 2008 - 2009

406.1 to 430 MHz

5.65 The study by QinetiQ in 2007 found evidence of scope for further use of spectrum in this band. Assignments have been made on a national basis, which does not always reflect current military use. It is considered that the pattern of military use could be satisfied if certain assignments were made locally, thus leaving scope for sharing or release in other geographic areas subject to suitable safeguards to minimise interference. Ofcom is considering how spectrum usage rights should be defined to protect existing users and expects to consult on this shortly.

5.66 Further improvement of the MOD's audit planned for 2008/09 will determine the areas where spare capacity is available. The MOD plans to publish further information in its statement in November, but the MOD believes that it may be possible to commence releasing and sharing,

at least on a regional basis, spectrum within the 406.1 to 430 MHz band in March 2009. The Defence demand study will provide the MOD with further information on the options for sharing and release, e.g. whether spectrum that can be exploited should be leased or traded.

2700 to 3400 MHz

5.67 The use of this band is identified in the *Forward Look* in section 6.1.2, which can be found at: http://www.spectrumaudit.org.uk/pdf/Forward_Look_2007.pdf

5.68 Detailed analysis by QinetiQ has shown that the band is more congested than was apparent to the Independent Audit team. The MOD's audit of this band has shown that 3100 to 3400 MHz is the most heavily congested in terms of the number of assignments made in it. For this reason the MOD is not proposing to release or share the 3100 to 3400 MHz band at this time.

5.69 The MOD's use of the 2700 to 3100 MHz band is shared. For this reason the MOD is not proposing to release or further share the 2700 to 3100 MHz band at this time.

3400 to 3600 MHz

5.70 Essential NATO use of this band extends from 3400 MHz to 3410 MHz and there is some residual MOD requirement for spectrum around 3500 MHz, in total amounting to around 14% of the 3400 to 3600 MHz band although new airborne data links are being considered for assignment in this area of spectrum. The QinetiQ study concluded that, based on current usage, this band is likely to be suitable for band sharing. It is to be noted that parts of the band have already been released to Ofcom for Fixed Wireless Access (until 2018) and that significant use is made of the band for Programme Making and Special Events (PMSE) and by the Emergency Services. There is also a secondary allocation to radio Amateurs in the band 3400 to 3475 MHz.

5.71 Now that the MOD has completed its detailed audit of this band options for the early release and sharing are being considered. These options include:

- MOD does not seek RSA for the band but releases spectrum to Ofcom
- MOD applies for RSA for the all band except the 2x20 MHz released in 2003 for Fixed Wireless Access and commences the release and sharing of the remaining 160 MHz.
- MOD applies for RSA for all the band except the 2x20 MHz released in 2003 for Fixed Wireless Access and the E&PSS spectrum and commences the release and sharing of the remaining 125 MHz.
- MOD applies for RSA for 3400 MHz to 3410 MHz for NATO use and other parts of the band that it requires and commences the release and sharing of the remainder of the band.

5.72 The MOD is cognisant of recent decisions at the ITU and in Europe to make this band widely available for new broadband services[8]. The MOD plans to complete its investment appraisal for exploiting this band by the end of 2008 and will publish further information in its statement in November. The MOD believes that it may be possible to release or share a significant proportion of this band, at least on a regional basis, commencing in March 2009. The Defence demand study will provide the MOD with further information on the options for sharing and release, e.g. whether spectrum that can be exploited should be leased or traded.

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8 See Section 7 of this consultation.

Release and sharing during 2009 - 2010

5.73 A number of bands that are included in the second and third phases of the MOD's spectrum audit, which is due to be completed by the end of 2008, have been identified for possible release and sharing. These bands have not been considered in detail yet, but will form part of the MOD's continuing work programme. The MOD's indicative timetable for release and sharing (see Table 7) is subject to adjustment in the light of the results of the detailed audit, the Defence spectrum demand study and progress with the development of sharing arrangements with those Departments, their agencies and other public bodies who share spectrum with the MOD.

4400 to 4500 MHz

5.74 This is an essential NATO harmonised band for fixed, transportable and mobile systems and consequently would be difficult to share. It is currently used in the UK for fixed links between military establishments and contains many wideband high capacity links for tactical area communications systems. The NATO vision for this band is to serve the growing needs of wideband data links for Unmanned Aerial Vehicles (UAVs). The MOD will complete the detailed audit of this band in March 2009 and it may be possible to commence the release or sharing, at least on a regional basis or time-shared basis, of new spectrum by March 2010. The Defence demand study will provide the MOD with further information on the options for sharing and release, e.g. whether spectrum that can be exploited should be leased or traded.

7900 to 8400 MHz

5.75 The bands 7250 to 7750 MHz (down-link) and 7900 to 8400 MHz (up-link) are used for military fixed-satellite communications and are the primary link to UK forces operating overseas. The band 7300 to 7750 MHz is already extensively shared by civil fixed links. This allocation is an essential NATO harmonised band and many partner countries have similar arrangements. The audit of these bands will be completed by March 2009 and it may be possible to commence the release or sharing, at least on a regional basis or time-shared basis, of a significant proportion of these bands by March 2010. The Defence demand study will provide the MOD with further information on the options for sharing and release, e.g. whether spectrum that can be exploited should be leased or traded.

8500 MHz to 10.5 GHz

5.76 This NATO harmonised band is used for a variety of military mobile radars, normally as part of larger weapons systems. A 500 MHz sub band from 9000 MHz to 9500 MHz is shared with civil radars including local coverage at airfields and the majority of maritime navigation radars. Because the sub-band 9000 MHz to 9500 MHz is shared no decisions can be taken yet regarding the sharing or release of this sub-band.

5.77 The audit of the MOD's use of 8500 MHz to 10.5 GHz will be completed by March 2009 and it may be possible to commence the release or sharing of spectrum that is not currently shared, at least on a regional basis or time-shared basis, of a significant proportion of this band by March 2010. The Defence demand study will provide the MOD with further information on the options for sharing and release, e.g. whether spectrum that can be exploited should be leased or traded.

13.4 to 13.75 GHz

5.78 This band is an essential NATO band used for land, naval and airborne radars. It is widely used in the UK for these purposes. Assignments have been made to MOD establishments and ranges for the development and use of low-level air defence, surveillance and navigation radars.

5.79 The audit of the MOD's use of this band will be completed by March 2009 and it may be possible to commence the release or sharing, at least on a regional basis or time-shared basis, of a significant proportion of new spectrum by March 2010. The Defence demand study will provide the MOD with further information on the options for sharing and release, e.g. whether spectrum that can be exploited should be leased or traded.

Release and sharing beyond 2010

5.80 A number of bands have been identified for possible release or sharing beyond April 2010 as shown in Table 7. Proposals are made in this document regarding auditing other bands that could be considered for release or sharing beyond 2011. The MOD is considering, at least on a regional basis or time-shared basis, releasing or sharing a significant proportion of its holdings after April 2011. The Defence demand study will provide the MOD with further information on the options for sharing and release, e.g. whether spectrum that can be exploited should be leased or traded.

Summary

5.81 In this Section the MOD has identified spectrum that it currently expects to be able to make available to the market . In publishing these proposals, the MOD's aim is to give the market more clarity than before about likely future opportunities to obtain access to new spectrum, including the relative priority of releasing different bands. The MOD will make further information available when it publishes a statement later in the year.

5.82 The bands that the MOD has identified for release or sharing are identified in Table 7 below. The MOD plans to complete its investment appraisal for exploiting bands planned for release and sharing during 2008 - 2009 by the end of 2008. Further information on planned releases beyond April 2009 will be published in the MOD's November statement.

Question 4.	Do you agree with the MOD's plans for releasing and sharing the spectrum it uses?
Question 5.	Do you agree with MOD's priorities for releasing and sharing spectrum?
Question 6.	Do you agree with MOD's outline timetable for initial spectrum releases?
Question 7.	Do you agree that MOD has correctly and fully identified the factors and options that should be considered before deciding to release and acquire spectrum in the market?
Question 8.	Do you agree that MOD has correctly and fully identified the factors and options that should be considered before deciding the best means with which to interact with the market?
Question 9.	Can you identify any different approaches for the MOD to manage the spectrum it uses and engage with the market to deliver better value for money for defence and the taxpayer?

Table 7. Plan for the release of spectrum

Date when new sharing and release may commence within the bands identified in this table	< 1 GHz	1 – 4 GHz	4 – 10 GHz	> 10GHz
April 2008 to March 2009	406.1 – 430 MHz[1,8]	3400 – 3600 MHz[4,5,7]		
April 2009 to March 2010			4400 – 4500 MHz 7900 – 8400 MHz[10] 8500 – 9000 MHz[9] 9500 – 10125 MHz	10.125-10.225 GHz 10.225 – 10.5 GHz[5] 13.4– 13.75 GHz 14.62 – 15.23 GHz
April 2010 to March 2011			5300 – 5850 MHz[6] 7250 – 7300 MHz	
April 2011 to March 2012	230 – 399.9 MHz[2,3,7,8] 401 – 406 MHz	2310 – 2450 MHz		
Beyond 2012	72.8 – 74.8 MHz 75.2 -76.7 MHz 78 – 80 MHz 83.5 – 85 MHz[7] 141.9 – 143 MHz 149 – 149.9 MHz 153.5 – 154 MHz 430 – 450 MHz 870 – 872 MHz 915 - 917 MHz	1375– 1400 MHz[8] 1427 – 1452 MHz	4500 – 5000 MHz[8]	

Notes

1 The band 406 to 406.1 MHz is limited to low power satellite emergency position-indicating radio beacons under Article 31 of the International Radio Regulations. This band cannot be released or shared. The MOD is not proposing to apply for RSA for this band.

2 The band 242.95 to 243.05 MHz is used for a military distress and cannot be shared or released.

3 The MOD is not making proposals for the band 328.6 to 335.4 MHz, the management of which is shared.

4 The bands 3480 to 3500 & 3580 to 3600 MHz have been released to Ofcom and spectrum licences awarded until July 2018. The MOD is not making proposals for these bands.

5	Emergency Services use.
6	The band 5300 to 5850 MHz is shared. The 5600 to 5650 MHz is used for meteorological radar for the UK weather radar network. The MOD is not making proposals for these shared bands.
7	The MOD is not making proposals for the bands 80 to 84 MHz, 235 to 328.6 MHz, 335.4 to 399.9 MHz & 3442 to 3475 MHz, which are shared with E&PSS.
8	Radio astronomy use within the band. The 406.1 to 430 MHz band is shared and MOD is not proposing to apply for RSA for those parts of the band which are shared with other active services
9	In the UK the band 8750 to 8850 MHz is allocated under the footnote provision UK2. Except by special agreement having the approval of the NFPG this frequency band, or the allocation to this radio service, is reserved exclusively for Military use in accordance with the Allocation to Services. The use of the band 8750 to 8850 MHz by the aeronautical radionavigation service is limited to airborne Doppler navigation aids on a centre frequency of 8850 MHz.
10	Met Office uses parts of spectrum at 8160 MHz and 8212.5 MHz for the reception of satellite data, The EESS and Meteorological Satellite Service bands use the 8025 to 8175 MHz and the 8175 to 8215 MHz bands

Section 6

Managing MOD's Spectrum in the Market

Introduction

6.1 The Independent Audit suggested that there might be merit in the creation of a Third Party intermediary to deal with the commercial side of public sector spectrum engagement with the market, and further said it was keen to encourage this. Respondents to the Independent Audit's[1] consultation were largely supportive of this idea, as long as it did not simply mean an additional layer of bureaucracy in spectrum management.

6.2 This section deals with MOD's engagement with the market, and specifically, the potential to work with a Third Party.

Decisions MOD needs to make concerning possible use of a Third Party

6.3 There are four top-level questions to be addressed concerning the potential use of a Third Party to enable the MOD to engage with the market:

1. Does the MOD need a Third Party?
2. What would a Third Party be required to do?
3. How would a Third Party operate?
4. How would the MOD establish a Third Party?

6.4 No decisions have yet been taken in respect of these four questions. The steps leading to decisions are described later in this section.

Views sought through this consultation

6.5 The remainder of this section sets out, at a high level, some of the options to be considered against each of the four top-level questions identified above and some of the issues that are expected to influence decisions the MOD may take. The main steps by which these decisions will be made are also set out.

6.6 Through this section of the consultation the following questions are being asked:

- Should particular options be considered, or discounted, and if so why; either in respect of options already identified in this section, or additional options, not identified?
- Should particular issues be considered when evaluating options, and if so why; either in respect of issues already identified in this section, or additional issues, not identified?
- Is the scope of decisions required against each of the four questions at paragraph 6.3 above, as indicated in this section, sufficient and, if not, how and why it should be extended?

1 http://www.spectrumaudit.org.uk/Consultation.htm

Does the MOD need a Third Party spectrum management organisation?

6.7 The MOD has several options for making better use of spectrum (though in all cases it would continue to be a major user of spectrum). It could, for instance :

- cease to hold and manage spectrum and hand spectrum to Ofcom; or
- continue to hold spectrum and reform Defence-related spectrum management by establishing an organisation to manage, exploit and acquire spectrum on the commercial market; or
- continue to manage and use spectrum and reform Defence-related spectrum management for military use of spectrum whilst using a Third Party to manage, exploit and acquire spectrum on the commercial market.

6.8 The Independent Audit recognised that a possible barrier to the public sector engaging with the market, for example in negotiating access to bands on a shared basis, was the lack of commercial expertise and motivation in public sector bodies.

6.9 The Audit, therefore, suggested that there might be merit in the creation of a Third Party.

6.10 It is recognised that it may be appropriate to establish particular arrangements to expedite the trading of initial specific releases of spectrum whilst establishing different arrangements to support ongoing market engagement. See paragraph 5.62 - 5.63

What would a Third Party be required to do?

6.11 This will need to be defined in terms of:

- Activities
- Scope of spectrum to be managed
- Anticipated volumes of trading and leasing
- Whether the Third Party's role is confined to the MOD or also covers other public bodies

Activities

6.12 Possible activities for the Third Party include:

- **Facilitating trades and identifying market opportunities**, including short-term transactions. The Third Party may be able to address possible market failure, for example by providing market knowledge and identifying market opportunities.
- **Negotiating specifics of sharing arrangements**, through a database or directly in more detail for more complex arrangements. This could include pre-emption arrangements where needed. The Third Party could interact with the market directly to encourage sharing.
- **Band management**. More in-depth spectrum management including making assignments and managing interference.
- **Information collection** about spectrum assignments and usage may be a valuable role for a Third Party, helping to reduce search and transaction costs for both Crown and non-Crown spectrum users.

- **Monitoring of usage** over time, perhaps building up a picture of use and therefore highlighting areas of low intensity/no use.

- **Administering a charging regime for sharing**, collecting charges from users to benefit the organisation permitting this use.

- **Informing revisions of AIP rates**. Ofcom may wish to take into account spectrum values revealed by the work of the Third Party.

6.13 The Third Party would not itself have any power to set or vary technical parameters in RSAs or licences where these were necessary to give effect to any sharing arrangements that the Third Party negotiated on the MOD's behalf. That would remain a function of Ofcom and it would be necessary to apply to Ofcom for changes to RSA or licence terms or conditions to be made. Also, any spectrum trades that the Third Party negotiated would need to be carried out in accordance with regulations made by Ofcom.

Scope of spectrum to be managed

6.14 The role of the Third Party will depend on the scope of spectrum it is required to manage and, for example the extent to which it is required to address complex sharing arrangements. Four categories of spectrum are identified below:

- Those bands that are used and managed exclusively by the MOD (currently defined in the UKFAT as UK2 bands and used exclusively by MOD).

- Those bands that are managed exclusively by the MOD that include existing shared (permitted) use. The MOD has full management rights for these holdings, but cannot take decisions to exploit these without considering those who share the holdings.

- Those bands that are jointly managed by the MOD and OGDs where decisions over ownership and exploitation must be agreed between departments.

- Spectrum that is not managed by the MOD, but where the MOD has access and use (e.g. the MOD is the sharer).

6.15 All of the above are subject to :

- **Regulatory constraints**. Some spectrum is identified specifically for the provision of services where radio communications is prioritised (e.g. for distress, safety and emergency communications, regularity of flight, ship movement etc). Other spectrum may be subject to other international treaty obligations such as the NATO agreement, the EC Consolidated Treaties, the International Law of the Sea and the Chicago Convention etc. There are also frequency bands that are identified for particular communications technologies such as International Mobile Telecommunications (IMT).

- **Technical constraints**. Some spectrum is subject to technical constraints to ensure that it remains available to the space, science and broadcasting communities. In some cases, underpinned by formal agreements, similar technical constraints may also exist between neighbouring countries to ensure that key national uses of spectrum can be protected. In many instances these technical constraints are enforced through international processes and obligations to monitor the use of the spectrum.

Anticipated volumes of trading

6.16 It will be important to develop estimates of the volumes of trading that a Third Party would be expected to undertake and the profile over time as this is significant in determining a viable business model.

6.17 Section 5 contains the MODs proposals for applying for RSA and for sharing and releasing spectrum to 2012 and beyond.

Whether the Third Party's role is confined to the MOD or also covers other public bodies

6.18 Whilst this consultation concerns the MOD, it is recognised that decisions across wider Government may result in a number of possible models for Third Parties, for example:

- MOD and other public bodies each appoint their own Third Party
- One Third Party for all public sector spectrum exploitation and acquisition
- Multiple Third Parties each serving one or more public bodies
- Multiple Third Parties each serving a particular sector.

How would a Third Party operate?

6.19 The definition of how a Third Party would operate will need to address at least the following:

- Legal entity / commercial structure
- Powers
- MOD obligations
- OGD obligations
- MOD customer function
- Governance arrangements
- Performance measures and benchmarks
- Risk transfer
- Payment mechanisms
- Incentivisation mechanisms
- Term of appointment
- Termination, transition and exit

6.20 In all cases this will be subject to:

- conformance with procurement rules, competition and State Aid law
- any potential conflict of interest being properly and appropriately addressed.

How would the MOD establish a Third Party?

6.21 This question will need to be addressed once firmer answers are developed to the previous three questions (paragraph 6.6). This is reflected in the approach set out under next steps later in this section.

6.22 At this stage it is recognised that it may be necessary to establish certain conditions during the early stages of establishing the Third Party and the related market, migrating to different conditions as both become more mature.

Next steps

6.23 It is anticipated that decisions in respect of the four questions identified in paragraph 6.3 above will be addressed through a MOD Initial Gate Business Case (IGBC) and endorsed by the MOD through its own approval processes prior to formal market engagement. Assuming that there is a decision to proceed with appointment of a Third Party, it is recognised that there will be further refinement of the detail supporting these decisions as the project proceeds.

Key steps

6.24 Options analysis

- **Informed by:**
  - Work already underway within MOD
  - The responses to this Consultation
  - The outputs of the audits and demand study
- **Leading to:**
  - Whether a Third Party is needed and if so why
  - What the Third Party would be required to do
  - How the Third Party would operate

6.25 Initial Gate Business Case (IGBC)

- **Informed by:**
  - Outputs from options analysis above
  - Review by stakeholders of outputs from the options analysis
  - Soft market testing on outputs of the options analysis
  - Planning to define how the Third Party would be established
  - Definition of obligations and implications for MOD
  - Definition of obligations and implications for other stakeholders

- **Leading to:**
  - Initial Gate Business Case in conformance with MOD and HMT guidance.

Timescales

6.26 Timescales are anticipated as:

- Options Analysis being complete by November 2008
- IGBC being complete by March 2009
- Formal market engagement commencing by May 2009 if the decision is to pursue a Third Party approach is taken.

Summary

6.27 In this section some of the main high level options have been set out for consideration against each of the four top-level questions identified above and some of the issues that are expected to influence decisions that the MOD may take. Also set out are the main steps by which these decisions will be made.

6.28 Through this consultation the following questions are being asked:

Question 10.	Which options (from paragraph 6.7) should be considered, or discounted, and if so why; either in respect of options already identified in this section, or additional options, not identified?

Question 11.	Which issues relating to this section, should be considered when evaluating options, and if so why; either in respect of issues already identified in that section, or additional issues, not identified?

Question 12.	Is the scope of decisions required against each of the four questions at paragraph 6.3, as indicated in this section, sufficient and, if not, how and why it should be extended?

Section 7

Related Policy Issues

National

7.1 Government policy is to support the development of an efficient and thriving spectrum market in the UK and to promote spectrum access opportunities for the commercial sector by securing direct participation and active engagement by public sector bodies in that market while ensuring that national security and public safety remain paramount. This will be taken forwards in parallel with the UK's upcoming spectrum commitments for the London 2012 Olympic Games and Paralympic Games. Ofcom is responsible for spectrum planning for the London Games. It published a discussion document in November 2007 on its approach and the requirements for spectrum for the Games. Responses to that document will feed into a draft spectrum plan, which Ofcom will publish for consultation after the Beijing Games. That document will set out any implications for use of spectrum managed by MOD, which, as a potential user and supplier of spectrum for the Games, is closely involved in Ofcom's work.

International

WRC-07

7.2 The World Radio Conference in 2007 (WRC-07) made a number of changes to the way spectrum is managed internationally. The MOD will take these changes into consideration as it develops its plan for sharing and releasing spectrum. These changes include the following:

Earth Exploration Satellite (EESS) and Radiolocation

7.3 WRC-07 agreed additional primary allocations at 9300 MHz and 9800 MHz for EESS. The additional allocations will support new EESS applications. Protection of the Radionavigation service and the upgrade of Radiolocation services in the bands 9000 to 9200 MHz and 9300 to 9500 MHz was agreed. The outcome will provide protection to Radiolocation services against new EESS allocations and any other new applications in the band.

7.4 WRC-07 also considered regulatory measures to protect the Earth exploration-satellite service (passive) from unwanted emissions from active services in bands including 1350 to 1400 MHz, 1427 to 1429 MHz and 1429 to 1452 MHz. New levels for the unwanted emissions falling within the 1400 to 1427 MHz passive band were agreed.

Radio astronomy

7.5 WRC-07 changed the way that compatibility between the radio astronomy service and the active space services is managed including the threshold levels used for coordination.

7.6 The changes that were made affect a number of bands including:

- 137 to 137.025 MHz
- 137.025 to 137.175 MHz
- 137.175 to 137.825 MHz
- 137.825 to 138 MHz

- 387 to 390 MHz
- 400.15 to 401 MHz

IMT systems

7.7 WRC-07 considered the additional spectrum requirements for IMT-Advanced systems in bands below 1 GHz and for future IMT-Advanced systems in bands above 1 GHz. WRC decided that the band 3400 to 3600 MHz be identified for mobile IMT systems on a country by country basis, from 2010. As the UK is identified by this multi-country provision, the MOD will take this into account when it considers its plan for release and sharing spectrum.

Europe

7.8 The Radio Spectrum Policy Group is currently developing an Opinion[1] on best practices regarding the use of spectrum by some public sectors. The request for the Opinion was accepted at the RSPG#14 meeting. The Opinion is focussed on the following public sectors:

- Defence;
- Emergency and public safety service; and
- Public transport.

EU competence does not extend to Defence but it was decided to include it in the scope of the Opinion because it is such a substantial user of spectrum.

7.9 The objective of the Opinion is to identify means to encourage a more efficient use of spectrum by public sector bodies, with a view to assisting spectrum management authorities in ensuring that public sector bodies fulfil their duties more effectively and that scarce radio frequencies are not under-utilised.

7.10 In parallel to a decision by the WRC 07 for a multi-country allocation for the 3400 to 3600 MHz band (see paragraph 7.7 above), there have been changes to the European regulatory position around the 3400 to 3600 MHz band. CEPT (European Conference of Postal and Telecommunications Administrations) approved an ECC Decision on the availability of frequency bands between 3400 to 3800 MHz for the harmonised implementation of Broadband Wireless Access systems (BWA)[2]in March of 2007. As the work leading up to this Decision was undertaken under an EC Mandate, this has resulted in discussion on amendments to Community Law for BWA type services. As a result European Member States have recently agreed an EC Decision on the "harmonisation of the 3400 to 3800 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community". This EC Decision has now completed its consultation process, via Member States[3]. The MOD understands that the Decision will appear in the Official Journal of the European Communities (OJEC) in May 2008. That will be the date the Decision comes into force.

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1 http://rspg.groups.eu.int/doc/documents/meeting/rspg15/rspg08_212_introduc_PUS.pdf

2 ECC/DEC(07)02 refers

3 The Decision became Community Law in May 2008 and requires that no later than six months after entry into force of the Decision, that Member States designate and make available, non exclusively, the 3400 to 3600 MHz band for terrestrial electronic communications networks.

7.11 Further information on the Decision can be found at:
http://ec.europa.eu/information_society/policy/radio_spectrum/activities/rsc_work/meetings_2008/index_en.htm

and

http://www.erodocdb.dk/Docs/doc98/official/pdf/

and

http://ec.europa.eu/information_society/policy/radio_spectrum/activities/rsc_work/mandates/index_en.htm

Section 8

Next Steps

8.1 Following the publication of this consultation the MOD plans to host an ***Industry Day forum*** in July where the issues raised by the consultation will be discussed. Following the closure of the consultation, the MOD will issue a statement later in 2008 announcing its conclusions.

8.2 Subject to satisfactory progress of discussions between the public sector bodies concerned, including Ofcom, to define future spectrum management arrangements, rights of access and spectrum requirements, and the introduction of regulations by Ofcom by the end of 2008, the MOD would expect to seek a grant of RSA for bands identified in the statement and proceed during 2008/09 to implement any reforms that it may decide to make. During the period 2009 – 2012.

8.3 The implementation of any proposals to extend trading, liberalisation or RSA to the spectrum the MOD uses will require Ofcom to make various regulations, for example to specify the frequency bands in which they will be introduced and the possible procedures for trading and conversion. As required by section 122 of the WT Act, Ofcom will publish a Statutory Notice in advance of making these regulations, giving at least one month to comment[1]. Ofcom will publish a notice and order concerning regulations, initially for the band 406.1 to 430 MHz and possibly for the band 3400 to 3600 MHz. It will also consult on the technical conditions to be included in the RSA.

8.4 It is anticipated that decisions in respect of a Third Party (see paragraph 6.3) will be addressed through an MOD Initial Gate Business Case (IGBC) and endorsed by the MOD through its own approval processes prior to formal market engagement. Assuming that there is a decision to proceed with appointment of a Third Party, it is recognised that there will be further refinement of the detail supporting these decisions as the project proceeds. The following is anticipated:

- Options Analysis being complete by November 2008
- IGBC being complete by March 2009
- Formal market engagement commencing by May 2009 if the decision is to pursue a Third Party approach is taken.

1 Spectrum Framework Review for the Public Sector , . http://www.ofcom.org.uk

Section 9

Responding to this Consultation

How to respond

9.1 MOD invites written views and comments on the issues raised in this document, to be made by 5.00 pm on 5 September 2008.

9.2 MOD strongly prefers to receive responses as e-mail attachments, in Microsoft Word format, as this helps us to process the responses quickly and efficiently. Please can you send your response to jim.nixon374@mod.uk

9.3 Responses may alternatively be posted or faxed to the address below, marked: "**UK DSM Implementation Plan Consultation - Response**".

Mr J. Nixon
Head of Defence Spectrum Management
4th Floor Zone B Desk 17
MOD Main Building
Whitehall
London SW1A 2HB

Tel: 020 7218 3194
Fax: 020 7218 7833

9.4 Note that the MOD does not need a hard copy in addition to an electronic version. Also note that MOD will not routinely acknowledge receipt of responses.

9.5 It would be helpful if your response could include direct answers to the questions asked in this document, which are listed together at Annex D. It would also help if you can explain why you hold your views, and how MOD's proposals would impact you.

Further information

9.6 If you have any questions about the issues raised in this consultation, or need advice on the appropriate form of response, please contact Steve Jones on 020 7218 1509 or Jim Nixon on 020 7218 3194.

Industry Day Forum

9.7 Application to attend the Industry Day Forum in July 2008 should be posted or faxed to the address below, marked: "**UK DSM Implementation Plan Consultation – *Industry Day Forum***" no later than **Friday 27 June 2008**. Please note that places are limited.

Mr J. Nixon
Head of Defence Spectrum Management
4th Floor Zone B Desk 17
MOD Main Building
Whitehall
London SW1A 2HB

Fax: 020 7218 7833

Confidentiality

9.8 All comments will be treated as non-confidential unless respondents specify that part or all of the response is confidential and should not be disclosed. Please can you place any confidential parts of a response in a separate annex, so that non-confidential parts may be published - if required - along with the respondent's identity.

9.9 The MOD would be grateful if you could speed up its response-handling processes by completing a response cover sheet (see Annex C) to indicate whether or not there are confidentiality issues. The cover sheet can be downloaded from MOD's website from the page where this consultation document appears.

9.10 Please also note that copyright in responses will be assumed to be relinquished unless specifically retained.

Next steps

9.11 These have been set out in Section 8.

MOD's consultation processes

9.12 MOD is keen to make responding to consultations easy, and has published some consultation principles (see Annex B) which it seeks to follow, including on the length of consultations.

Annex A

Supporting Technical Information

Summary of findings and recommendations from QinetiQ's scoping study for the MOD's spectrum audit

A.1 The scoping study conducted by QinetiQ has been used by the MOD to help determine the most cost effective and beneficial approach to the audit of its holdings. Some of the key findings of this scoping study are summarised below.

1. There is no single spectrum register, nor any combination of existing registers currently existing in MOD which accurately describes the technical characteristics of the frequency bands and the usage data required to identify potential spatial or temporal spectrum availability.

2. An integrity check of the data held within the databases showed that there is a lack of correlation between entries both within and between databases.

3. There is no established process in MOD to monitor spectrum usage for the purposes of UK spectrum management. There is also no process and historically there has been no strong incentive for users to maintain a consolidated accurate spectrum register of technical and usage parameters.

4. Defence spectrum users maintain records for their own purposes, but there is no process or incentive to feed the data back to a central database. Most Defence users were not aware of spectrum management practices or tools, or the need for spectrum efficiency, as their main driver was only to provide a service to their specific end user.

5. Security implications placed restrictions on working practices of the Independent Audit. As a consequence the number of assignments identified by the scoping study in one test case was almost double that assumed by the Cave Audit.

6. The bands 3400 to 3600 MHz and 406.1 to 430 MHz are the two bands which appear to offer the most promise for sharing. QinetiQ recommended that further audit work should focus on key data not available to the scoping study about systems operating in these two bands.

7. Priority bands 2700 to 3400 MHz and 4400 to 5000 MHz show less promise for sharing than anticipated by the Independent Audit, although some spatial sharing may be possible in band 2700 to 3400 MHz.

Auditing the remaining 20 Cave Bands

A.2 The audit of the remaining 20 Cave Bands is being tackled in phases. The bands to be audited in these phases is identified in Figure 2. The contract to deliver on Phases 2 and 3 of the MOD's audit was awarded to Logica with support from QinetiQ and ATDI in early April 2008. This consortium will deliver cleansed and Improved data for the Phase 2 Bands by 1st August 2008, cleansed and improved data for Phase 3A (Bands up to 2450 MHz) by the end of November 2008 and cleansed and improved data for Phase 3B (Bands above 4200 MHz) by the end of March 2009. As a consequence it is not possible to give an accurate picture of the MOD's use of spectrum in these 20 Cave Bands in this document. The MOD will consider what further information can be released when it publishes a statement later in the year.

A.3 Phases 2 & 3 of the audit amount to a significant amount of data manipulation so to be credible this work must adhere to clearly defined processes to ensure that:

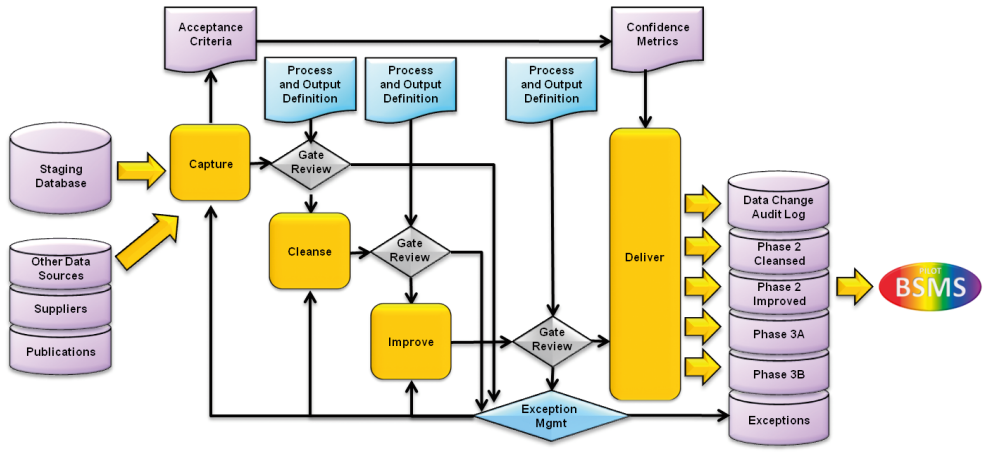
a. Good engineering practice is employed and appropriate standards are adhered to.

b. Any data cleansing and improvement is done in a controlled manner, with full traceability, enabling the mapping of each delivered data element back to its initial source.

c. An audit trail of all project activities exists.

A.4 The processes being adopted by the Logica led consortium are shown in Figure A.1 below:

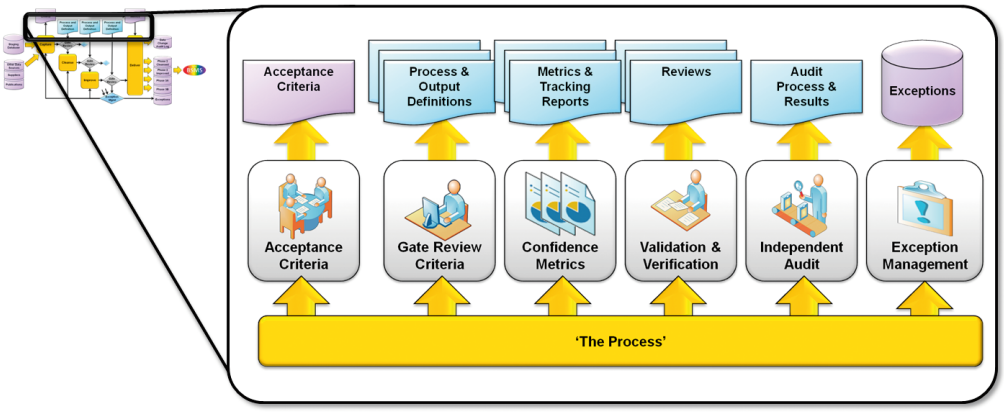
Figure A.1: Spectrum Data Refinement Method



Source: Logica's Defence Spectrum Audit (Phase 2 & 3) Quality Plan

A.5 Whilst structured and repeatable processes should lead to good quality data, complete confidence in the delivered cleansed and improved product is only guaranteed if a rigorous quality assurance regime is also implemented. Consequently, all processes have clear and agreed output definitions which are applied at the gate reviews to ensure that the process has completed its aims. This will also be supplemented by an independent Data Assurance team conducting quality audits of the data. The overarching and integrated data assurance structure is shown in Figure A.2 below.

Figure A.2: Overarching & Integrated Data Assurance



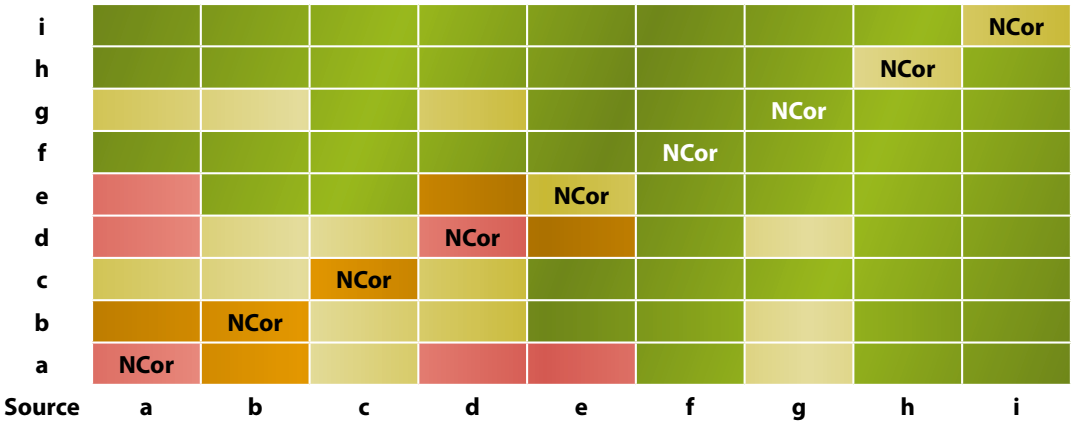
Source: Logica's Defence Spectrum Audit (Phase 2 & 3) Quality Plan

A.6 In summary, the data audit will provide a single, improved spectrum data repository covering spectrum usage across the key bands under consideration for exploitation. This repository will be a living data source describing MOD spectrum use into the future.

A.7 This consolidated repository will first allow the MOD to understand and increase its effectiveness in managing its internal spectrum usage. Secondly, it will underpin decision making on release of spectrum, thereby enabling the MOD to maximise the value of the spectrum it uses.

A.8 A confidence matrix was used to identify the need for data cleansing, bench-marking for quality and accuracy and improvement. An example of a data confidence matrix is shown in Figure A.3 below

Figure A.3 Example audit data confidence matrix



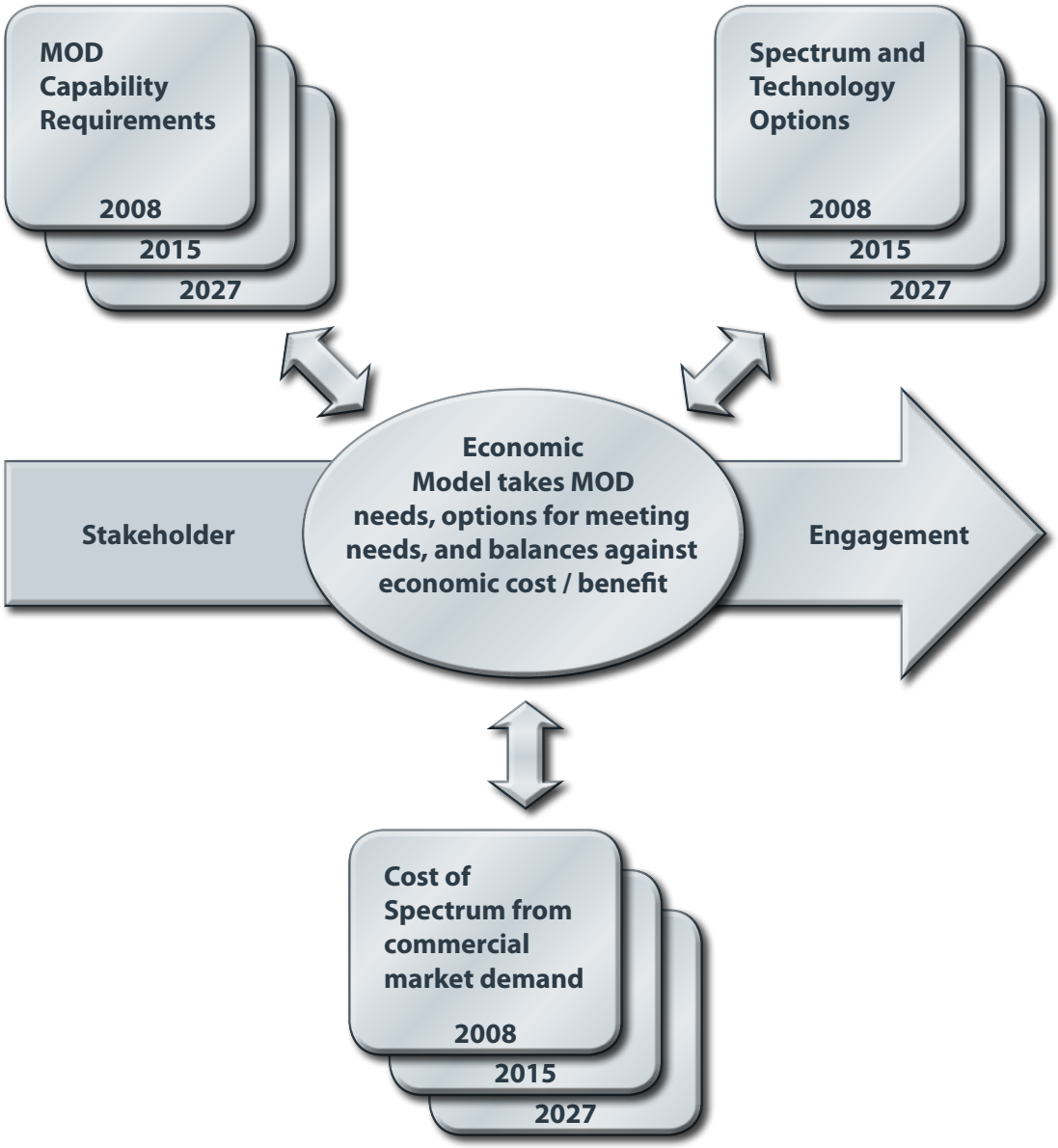
How are Defence spectrum demands being assessed?

A.9 PA Consulting Group has suggested that the military requirement needs to be analysed in terms of military capability needs and how these may evolve with time.

A.10 The Defence spectrum demand study differs from current spectrum audit work in that the demand study aims to assess the future demand for spectrum rather than identify the spectrum in which current equipment exists. Defence spectrum demand is related to how much radio spectrum is required to maintain military capability. Determining where equipment that uses spectrum is used for training, testing and trials, and for UK based operations, and identifying the scale of use in each location will give an understanding of the Defence demand.

A.11 The Defence spectrum demand study is considering the current and proposed use of the bands identified and prioritised by the Independent Audit (the 23 Cave bands). It will identify options for release of spectrum, balanced against the maintenance of military capability. It will also consider how to assess the opportunity cost for Defence spectrum users. The economic modelling around which this activity is based will aim to balance the military requirement against the economic cost, to propose an optimum outcome. It is necessary throughout the study to engage with Defence stakeholders both to obtain information on military needs and to provide information on the impact of applying market mechanisms to military spectrum. The overall approach to the study adopted by PA Consulting Group is illustrated in Figure A.4 below.

Figure A.4. Overall approach to the Defence spectrum demand study



(Source: PA Consulting Group)

Gathering information on Defence demand

A.12 To prepare informed assessments of demand PA Consulting Group has analysed the existing MOD databases for a description of predominant uses by band and has identified the key Defence stakeholders. Each of these key stakeholders has been introduced to the major equipment types or capabilities which dominate each Cave band and additional detail for each equipment and capability has been identified. Each of these key stakeholders has confirmed the existence, life span, or replacement of each major equipment type or has articulated how a particular capability has been met (often with a variety of systems). Broad spectrum related characteristics have also been captured to inform frequency band, transceiver range, interference, scale and scope of use.

A.13 The stakeholders representing the users have historically not been asked to estimate or account for bandwidth used in specific locations or by specific equipment. However, quantifying the scale of demand requires context and it is important to recognise that whilst equipment may have a capability to use a specific bandwidth to meet military requirements, UK demand should be articulated by how much of the bandwidth is needed in UK to train, trial, or conduct UK based operations. It is also important to understand where - geographically - the bandwidth is required, and the technical characteristics of the equipment so that frequency re-use and channel separation can be assessed.

What are the key Defence capabilities supported by UK spectrum?

A.14 Essentially the key Defence capabilities supported by UK radio spectrum and identified by PA Consulting Group are:

- Tactical Voice Communications (VHF)
- Tactical Data Communications (VHF/UHF)
- Air Ground Air Voice and Data Communications (UHF)
- Personal Management Radios (UHF)
- Tactical Data Links (Ground to Air) (UHF)
- Air Navigation Aids (UHF)
- Air Surveillance and Control Systems
- Tactical Surveillance Radar
- Maritime Air Defence Radar
- Weapon Guidance Radar
- Maritime Navigation Aids
- Satellite Communications
- Unmanned Aerial Vehicles

What is the model for defining Defence spectrum demand?

A.15 PA Consulting Group's approach to the context for defining Defence spectrum demand is to identify current military scenarios (to be known as 'current demand vignettes' so as not to confuse these with the Strategic Scenarios used to determine military tasks - and relevant for considering how spectrum demand will change in the future as the strategic scenarios change). These vignettes represent current military capabilities, defence and military units and types of locations that have a discrete radio spectrum demand. The aggregation of these vignettes either as multiples of a single vignette or by grouping different vignettes, gives an estimate of radio spectrum demand across geography, or by capability.

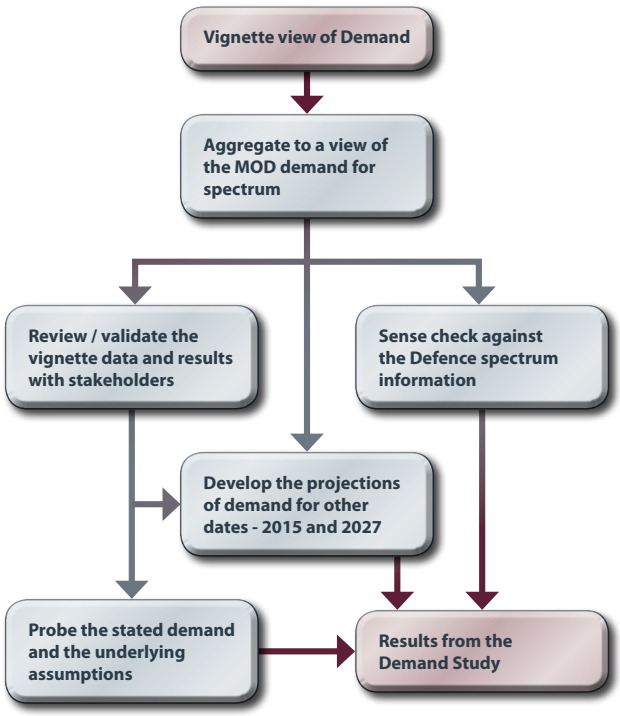
A.16 These vignettes are being used to highlight exceptions; unique capabilities, locations, or equipment that is not covered by initial data capture. The vignettes have been developed by PA Consulting Group around current known defence and military units and locations. However, PA Consulting Group has kept the vignettes as generic as possible to allow consolidation, recognising that they need to be indicative so that sites with multiple functions (represented by multiple vignettes of the same or differing nature) can be estimated effectively.

A.17 In developing the vignettes a number of exceptions and issues for debate and further analysis have been identified. These include issues such as responsibility for spectrum acquisition by industry where a Third Party exists for provision of military capability, and the requirement for spectrum demand and management in inter-departmental activities (such a police, security services and defence).

How will Defence demand be analysed?

A.18 The data set out in the vignettes will give a mix of descriptive and quantitative information about the MOD's current demand for spectrum. PA Consulting Group has identified five major steps in getting from the vignettes to the final results; these are detailed in Figure A.5 below.

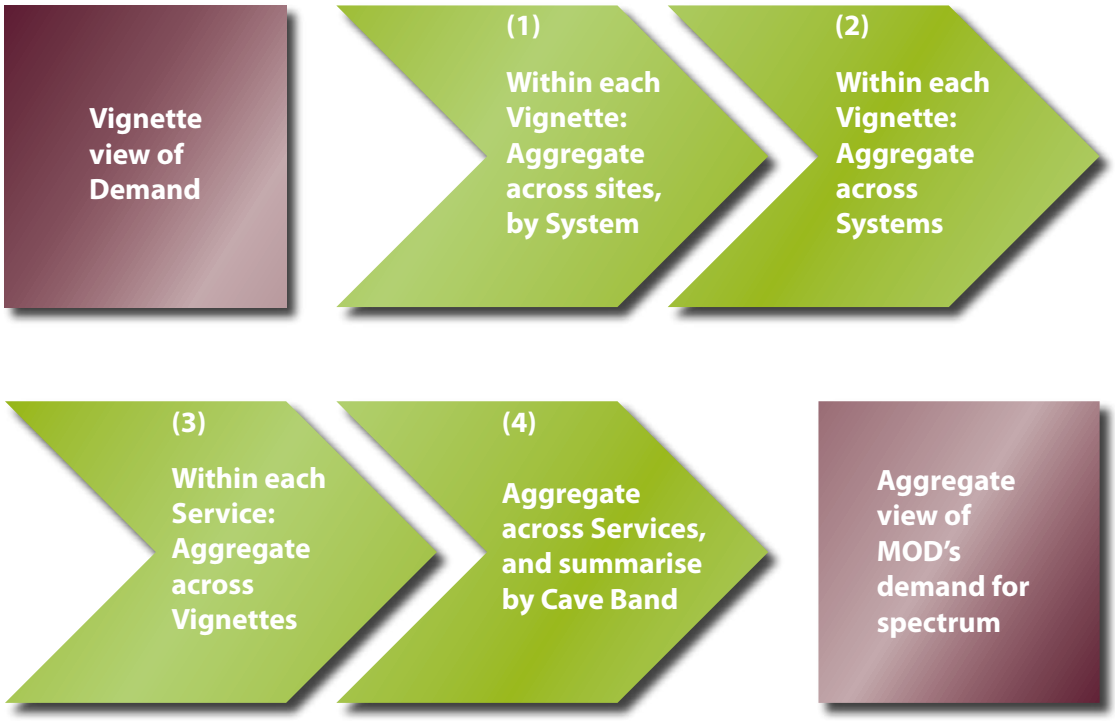
Figure A.5 Vignettes View to Final Results



(Source: PA Consulting Group)

A.19 Four steps are used to convert the vignette view of demand into an aggregate view of the MODs demand for spectrum. These are shown in Figure A.6 below.

Figure A.6 Aggregate View of MOD's Demand for Spectrum



Source: PA Consulting Group

A.20 In the process of phase 1A of the audit the data fields to be captured were defined. Table A.1 lists these data fields and describes how these are defined.

Table A1. Data fields captured by the audit

Data Field	Definition
Source	The source of the information input to the fields of this data
Emission Class	The classification of the emission designated by its type of main carrier modulation, the nature of the signals modulating the carrier and the type of information to be transmitted (and optionally the details of the signal and the nature of multiplexing). Note: the "Emission Code" is a combination of the "Necessary Bandwidth" and the "Emission Class"
System Name	The name of the system associated with this station.
Receiver Sensitivity	The minimum signal level required for acceptable receiver performance
Power Type	The type of power categorised in Transmitter Power
Maximum Transmitter Power	The maximum transmitter power this equipment is capable of producing

Data Field	Definition
Minimum Pulse Duration	The minimum characteristic Pulse Duration (PD) of the equipment at the half-power (-3 dB) points. If there is only one PD for the system then enter the same value for Minimum Pulse Duration & Maximum Pulse Duration.
Maximum Pulse Duration	The maximum characteristic Pulse Duration (PD) of the equipment at the half-power (-3 dB) points. If there is only one PD for the system then enter the same value for Minimum Pulse Duration & Maximum Pulse Duration.
Minimum Pulse Repetition Rate	The minimum pulse repetition rate (PRR) of the equipment. If there is only one PRR for the system then enter the same value for Minimum Pulse Repetition Rate & Maximum Pulse Repetition Rate.
Maximum Pulse Repetition Rate	The maximum pulse repetition rate (PRR) of the equipment. If there is only one PRR for the system then enter the same value for Minimum Pulse Repetition Rate & Maximum Pulse Repetition Rate.
Security Classification	The security classification of the data
Special marking - National Caveat	A special marking used to provide additional protection to certain types of UK Classified material.
Operating Unit	The lowest formation or unit that is operating the system. (eg Battalion or Squadron identity)
Station EIRP	The max EIRP radiated from the transmitter antenna for this station. EIRP is the sum of the power supplied to the antenna and the gain, relative to an isotropic antenna, of the antenna expressed in dBW.
Transmitter Location	The name of the Polygon or Single Point (described in the Coordinates Table) within which or at (respectively) the transmitter is located. In the Coordinates Table, polygon points are described in a clockwise direction and it is assumed that the last point is connected to the first point to complete the boundary of the polygon. It contains also the terrain elevation, in metres above mean sea level (MSL) of this point. If the antenna installed at this point is located on a structure such as a tower or a building, the site elevation is specified as the ground elevation at the base of the structure.
Receiver Location	The name of the Polygon or Single Point (described in the Coordinates Table) within which or at (respectively) the receiver is located. In the Coordinates Table, polygon points are described in a clockwise direction and it is assumed that the last point is connected to the first point to complete the boundary of the polygon. It contains also the terrain elevation, in metres above mean sea level (MSL) of this point. If the antenna installed at this point is located on a structure such as a tower or a building, the site elevation is specified as the ground elevation at the base of the structure.
Aircraft Height	The height that an aircraft's assignment is valid to.

Data Field	Definition
Antenna Motion Type	The type of motion of the antenna
Antenna Direction	For a directional antenna (ie Antenna Motion Type = "DIR"), equal to antenna bore site which is the azimuth angle, referenced to true North, for the face of an antenna aligned in the direction of maximum antenna gain. For any other Antennas, leave blank.
Maximum Antenna Gain	The maximum antenna gain with reference to an isotropic source in the direction of maximum radiation.
Antenna Height Above Ground	The distance between the antenna's feed point and the terrain. In the case where the antenna is mounted pointing vertically to a reflector on the same structure, enter the height of the reflector above ground.
Antenna Polarisation	The type of polarisation of the antenna
Assignment Constraints	Any constraints stipulated on the assignment granted to this station.
Assignment Minimum Frequency	The lowest frequency (band edge) of the frequency band assigned. If a single frequency is assigned then enter the same value for Assignment Minimum Frequency & Assignment Maximum Frequency
Assignment Maximum Frequency	The highest frequency (band edge) of the frequency band assigned. If a single frequency is assigned then enter the same value for Assignment Minimum Frequency & Assignment Maximum Frequency
Assignment Polygon/Single Point	The name of the Polygon or Single Point (described in the Coordinates Table) within which or at (respectively) the assignment is valid. In the Coordinates Table, polygon points are described in a clockwise direction and it is assumed that the last point is connected to the first point to complete the boundary of the polygon. It contains also the terrain elevation, in metres above mean sea level (MSL) of this point. If the antenna installed at this point is located on a structure such as a tower or a building, the site elevation is specified as the ground elevation at the base of the structure.
Co-Site Requirement	An indication whether or not Co-Site calculations should be used for this assignment polygon/single point.
Duplex Frequency Separation Type	The type of frequency separation required between the transmit and the receive radio frequencies for an equipment capable of operating in the duplex mode. If no separation required then enter "Minimum".
Duplex Frequency Separation	The required (exact or minimum) offset frequency separation between the transmit and the receive radio frequencies for an equipment capable of operating in the duplex mode. If no separation required then enter "0".

Data Field	Definition
Frequency Separation	The minimum required frequency separation between the equipment for which the assignment is being made and any other transmission
Number Of Relevant Harmonics	The number harmonics that should be taken into consideration when doing co-site calculations
Minimum Intermediate frequency	The lowest intermediate frequency (IF) used to demodulate the incoming signal. If there is only one IF for the system then enter the same value for Minimum Intermediate Frequency & Maximum Intermediate Frequency.
Maximum Intermediate frequency	The highest intermediate frequency (IF) used to demodulate the incoming signal. If there is only one IF for the system then enter the same value for Minimum Intermediate Frequency & Maximum Intermediate Frequency.
In Service Date	The date the system reaches operational status (as a type of system as a whole, not just at this location). It equates to the Initial Operating Capability (IOC) Date signed off by the IPT responsible for the system. (In SMADEF-XML it is equivalent to the Stage 4 Start Date).
Out of Service Date	The date the system's operational status ends (as a type of system as a whole, not just at this location) and it is taken out of service. (In SMADEF-XML it is equivalent to the Stage 4 Termination Date). This date may be an estimate.
Spurious Emissions	Name of the Spurious Emissions Set that is described in the Spurious Emissions Table
Government Department	The Government Department
Responsible Organisation	The organisation that is responsible for requesting assignments for this system. It will usually be the Integrated Project Team (IPT) responsible for the system but could be other organisations such as Air Command or QinetiQ.
Tuning Step	The minimum increment between tuneable frequencies of the system
Minimum Transmitter Frequency	The lowest frequency which the transmitter is capable of being tuned to.
Maximum Transmitter Frequency	The highest frequency which the transmitter is capable of being tuned to
Necessary Bandwidth	The necessary bandwidth for the emission class identified in the Emission Class field
Operating Component	The Component to which the Operating Unit belongs
Priority	The priority the spectrum manager assigns to an assignment request

Data Field	Definition
Station Name	The name for the station. (A station is one or more transmitters or receivers or a combination of transmitters and receivers, including the accessory equipment necessary at one location for carrying on a radio communication service).
Assignment ID	Unique identifier for the Station. Enter the DSM Serial Number from the DSM Database.
Hours of Operation	The average number of hours (whole number) the equipment operates in a 24 hr period
Minimum Antenna Frequency	The lowest frequency which the antenna is capable of transmitting/receiving (Band edge not centre frequency)
Maximum Antenna frequency	The highest frequency which the antenna is capable of transmitting/receiving (Band edge not centre frequency)
Ant Gain XPD	The antenna's cross-polarization discrimination which is the measure of discrimination to oppositely polarized electromagnetic waves (e.g. the discrimination that a vertically polarized antenna has to horizontally polarized radio waves or the polarization orthogonal to a specified reference polarization). When plotted along with the principal plane pattern of the antenna on a relative dB scale, cross-polarization discrimination is simply the difference between the co-polarized level and the cross-polarized level in any given direction.
Antenna Pattern	The antenna pattern polarisation
Antenna Rotation Rate	The rotation rate of the antenna. (Antenna Motion Type Must Be Rotating)
Antenna Type	The type of antenna
Assignment Effective date	The date from which the assignment is operational or effective.
Assignment Expiration date	The date when an assignment, allotment, Spectrum Supportability request or Host Nation Declaration, will expire.
Assignment Location	The name of the city, base, or geographical area applicable to the assignment. The entry should be spelled the same as that in the postal code directory or applicable gazetteer. After being entered the first time, all future entries for that same location should be spelled the same.
Assignment Purpose	The purpose of the assignment. (this must be unique to each distinct network of assignments - eg the barracks security networks at military bases cannot all have the "Assignment Purpose" of "Barracks Security" as they are distinct networks. They must have unique names)
Assignment Protection Radius	The radius of the required circle around your system within which other systems must be prohibited from using this system's assigned frequencies. Equates to the Coordination Limit in PBSMS.

Data Field	Definition
Hop Dwell	The length of time a frequency hopping spread spectrum system dwells on a frequency;
Hop Rate	The rate at which a frequency hopping spread spectrum system hops from one frequency to another frequency
Hop Set Freq Blocking Indicator	Indication if a frequency hopping transmitter is capable of blocking frequencies
Hop Set No Of Freqs	The number of frequencies contained in a hop set for a frequency hopping spread spectrum system
Hop Set Highest Freq	The highest frequency contained in a hop set for a frequency hopping spread spectrum system
Hop Set Lowest Freq	The lowest frequency contained in a hop set for a frequency hopping spread spectrum system
Type Of Spread Spectrum	The type of spread spectrum techniques employed by the equipment
Radome Losses	The signal losses associated with the antenna's radome
Station Class	The code representing the station class associated with the assignment. The source of each code/definition is either the preface to the ITU BR-IFIC (code "ITU" in the last column), or has been agreed by the SMADEF-XML CCB (code "INTL"). These extended codes from "INTL" MUST NOT be used for data to be submitted to ITU.
Minimum Antenna Gain	The minimum antenna gain, with reference to an isotropic source, in the direction of maximum radiation
Maximum Antenna Gain	The maximum antenna gain, with reference to an isotropic source, in the direction of maximum radiation
Antenna Gain Front To Back	The ratio of the main beam (measured in the direction of maximum radiation) to the back lobe (Measured at 180 degrees from the main beam)
Antenna Minimum Horizontal Beam width	The minimum horizontal angular beam width (measured in degrees at the half-power (-3 dB) points) of space, earth or terrestrial station antennas (including experimental) employing earth or space station techniques
Antenna Maximum Horizontal Beam width	The minimum vertical angular beam width (measured in degrees at the half-power (-3 dB) points) of space, earth or terrestrial station antennas (including experimental) employing earth or space station techniques
Antenna Minimum Vertical Beam width	The minimum vertical angular beam width (measured in degrees at the half-power (-3 dB) points) of space, earth or terrestrial station antennas (including experimental) employing earth or space station techniques

Data Field	Definition
Antenna Maximum Vertical Beam width	The maximum vertical angular beam width (measured in degrees at the half-power (-3 dB) points) of space, earth or terrestrial station antennas (including experimental) employing earth or space station techniques
Minimum Receiver Tuning Frequency	The lowest frequency which the receiver is capable of being tuned to.
Maximum Receiver Tuning Frequency	The highest frequency which the receiver is capable of being tuned to
Comments	Any additional comments required to clarify the dataset.
Owner Country	The country that is operating the equipment associated with this assignment
Spectrum Resource	Name of the Spectrum Resource Set that is described in the Spectrum Resource Table. The Spectrum Resource Set is then a list of frequency blocks that the transmitter is capable of operating in. (It is possible for a transmitter to have a single frequency range with a min & max or a number of distinct frequency blocks over which it can operate, each with its own minimum and max frequency). There must be at least one block defined.
Requestor Post Title	The post title of the individual who requested the assignment
Requestor Phone Number	The phone number of the individual who requested the assignment
Requestor e-mail	The e-mail of the individual who requested the assignment
Requestor Name	The name of the individual who requested the assignment
Date Last Reviewed	The date that the dataset was last reviewed. (if the data has been updated by an automatic data feed from another electronic source then the 'Date Last reviewed' field from that source (if it is more recent) should be translated to this field not the date that the automated data feed took place)
Date For Next Review	The date before which this data set should be reviewed

Shared spectrum use

A.21 Details of the frequency allocations for Amateurs is provided below in Table A.2. This table is reproduced from Annex F of the UK FAT, which can be obtained at http://www.ofcom.org.uk/radiocomms/isu/ukfat/ukfat07.pdf

Table A2. Amateur full licence - frequency band designations

Frequency Bands (in MHz)	Status of allocations in UK to the Amateur Service	Status of allocations in UK to the Amateur Satellite Service	Maximum Peak Envelope Power level in Watts (and dB relative to 1 Watt)	Bands that are shared with the MOD
0.1357-0.1378	Secondary. Available on the basis of non-interference to other services inside or outside the UK.	Not allocated	1W (0 dBW) e.r.p.	Yes
1.810-1.830	Primary. Available on the basis of non-interference to other services outside the UK	Not allocated	400W (26 dBW)	
1.830-1.850	Primary	Not allocated	400W (26 dBW)	
1.850-2.000	Secondary. Available on the basis of non-interference to other services inside or outside the UK	Not allocated	32W (15 dBW)	Yes
3.500-3.800	Primary. Shared with other services	Not allocated	400W (26 dBW)	Yes
7.000-7.100	Primary	Primary	400W (26 dBW)	
7.100-7.200	Secondary. Available on the basis of non-interference to other services inside or outside the UK	Not allocated	400W (26 dBW)	
10.100-10.150	Secondary	Not allocated	400W (26 dBW)	Yes
14.000-14.250	Primary	Primary	400W (26 dBW)	
14.250-14.350	Primary	Not allocated	400W (26 dBW)	
18.068-18.168	Primary	Primary	400W (26 dBW)	
21.000-21.450	Primary	Primary	400W (26 dBW)	

Frequency Bands (in MHz)	Status of allocations in UK to the Amateur Service	Status of allocations in UK to the Amateur Satellite Service	Maximum Peak Envelope Power level in Watts (and dB relative to 1 Watt)	Bands that are shared with the MOD
24.890-24.990	Primary	Primary	400W (26 dBW)	
28.000-29.700	Primary	Primary	400W (26 dBW)	
50.00-51.00	Primary. Available on the basis of non-interference to other services outside the UK	Not allocated	400W (26 dBW)	
51.00-52.00	Secondary. Available on the basis of non-interference to other services inside or outside the UK	Not allocated	100W (20 dBW)	Yes
70.00-70.50	Secondary. Available on the basis of non-interference to other services inside or outside the UK	Not allocated	160W (22 dBW)	Yes
144.0-146.0	Primary	Primary	400W (26 dBW)	
430.0-431.0	Secondary	Not allocated	40W (16 dBW) e.r.p.	Yes
431.0-432.0	Secondary. Not available for use; within 100km radius of Charing Cross, London (51°30'30''N, 00°07'24''W)	Not allocated	40W (16 dBW) e.r.p.	Yes
432.0-435.0	Secondary	Not allocated	400W (26 dBW)	Yes
435.0-438.0	Secondary	Secondary	400W (26 dBW)	Yes
438.0-440.0	Secondary	Not allocated	400W (26 dBW)	Yes
1240-1260	Secondary	Not allocated	400W (26 dBW)	Yes
1260-1270	Secondary	Secondary. Earth to space only	400W (26 dBW)	Yes

Frequency Bands (in MHz)	Status of allocations in UK to the Amateur Service	Status of allocations in UK to the Amateur Satellite Service	Maximum Peak Envelope Power level in Watts (and dB relative to 1 Watt)	Bands that are shared with the MOD
1270-1325	Secondary	Not allocated	400W (26 dBW)	Yes
2310-2400	Secondary	Not allocated	400W (26 dBW)	Yes
2400-2450	Secondary. Users must accept interference from ISM users.	Secondary. Users must accept interference from ISM users.	400W (26 dBW)	Yes
3400-3475	Secondary	Not allocated	400W (26 dBW)	Yes
5650-5670	Secondary	Secondary. Earth to space only	400W (26 dBW)	Yes
5670-5680	Secondary	Not allocated	400W (26 dBW)	Yes
5755-5765	Secondary. Users must accept interference from ISM users	Not allocated	400W (26 dBW)	Yes
5820-5830	Secondary. Users must accept interference from ISM users	Not allocated	400W (26 dBW)	Yes
5830-5850	Secondary. Users must accept interference from ISM users	Secondary. Users must accept interference from ISM users. Space to Earth only.	400W (26 dBW)	Yes
10000-10125	Secondary	Not allocated	400W (26 dBW)	Yes
10225-10450	Secondary	Not allocated	400W (26 dBW)	Yes
10450-10475	Secondary	Secondary	400W (26 dBW)	Yes
10475-10500	Not allocated	Secondary	400W (26 dBW)	Yes
24000-24050	Primary. Users must accept interference from ISM users	Primary. Users must accept interference from ISM users	400W (26 dBW)	

Frequency Bands (in MHz)	Status of allocations in UK to the Amateur Service	Status of allocations in UK to the Amateur Satellite Service	Maximum Peak Envelope Power level in Watts (and dB relative to 1 Watt)	Bands that are shared with the MOD
24050-24150	Secondary. May only be used with the written consent of Ofcom. Users must accept interference from ISM users	Not allocated	400W (26 dBW)	
24150-24250	Secondary	Not allocated	400W (26 dBW)	
47000-47200	Primary	Primary	400W (26 dBW)	
75500-75875	Secondary	Secondary	400W (26 dBW)	
75875-76000	Primary	Primary	400W (26 dBW)	
76000-77500	Secondary	Secondary	400W (26 dBW)	
77500-78000	Primary	Primary	400W (26 dBW)	
78000-79000	Secondary	Secondary	400W (26 dBW)	Yes
79000-81000	Secondary	Secondary	400W (26 dBW)	Yes
122250-123000	Secondary	Not allocated	400W (26 dBW)	
134000-136000	Primary	Primary	400W (26 dBW)	
136000-141000	Secondary	Secondary	400W (26 dBW)	
241000-248000	Secondary	Secondary	400W (26 dBW)	
248000-250000	Primary	Primary	400W (26 dBW)	

Recommendations of the Independent Audit - MOD

A.22 The Independent Audit examined spectrum use in the public sector and made a series of recommendations for reforming the way in which public sector spectrum is managed to achieve greater efficiencies and benefits for UK citizens and consumers. The recommendations that are relevant to the MOD's reform of spectrum management are reproduced below. The Independent Audit, along with the joint response from the Government and the Office of Communications (Ofcom) can be found together with supporting documents and information about the Government's implementation programme at www.spectrumaudit.org.uk.

Recommendation 2.1: The Audit recommends that there should be a presumption that new public sector spectrum needs should be met through the market in all but exceptional cases.

Recommendation 2.2: The Audit recommends that, where there is an exceptional case where new spectrum needs cannot be met through the market, a process should be followed for assessing, through UKSSC, and against set criteria, the case for administrative assignment. Where this case is met Ofcom should be directed to make that spectrum available. Any costs involved should be met by the body or bodies responsible for generating the need.

Recommendation 2.3: Public sector spectrum should be considered for its trading potential and in principle be made tradable on a comparable basis to commercially held spectrum. Decisions will need to be made on a case-by-case basis depending on the suitability for trading of each RSA agreed.

Recommendation 2.4: Income generated from spectrum trading activities (including short term leasing and sharing arrangements) can be retained by departments, subject to capping arrangements. Departments should discuss this treatment with their Treasury spending team.

Recommendation 2.5: Ofcom should work with key public sector spectrum users to introduce RSA, beginning with priority bands where there is most necessity for usage to be recognised. Charges should be attached, based on AIP. The presumption should be that RSA should be tradable and convertible unless there is a good case otherwise.

Recommendation 3.1: AIP (Administered Incentive Pricing) is, and is likely to remain, a fundamental element in recognising the value of public sector spectrum use and encouraging improved spectrum efficiency. AIP should be extended to a wider range of public sector spectrum bands and uses

Recommendation 3.3: To formalise the application and enforcement of AIP fees for spectrum held by Crown bodies, pricing should be attached to public RSA on the same basis as AIP pricing attaches to commercial WT licences. Until RSA are agreed, and in anticipation of the implementation of AIP changes recommended in this report, there should be a clear route for resolution of any disagreements over pricing levels (through the UKSSC structure). Government should also make a clear commitment to the principle of paying AIP charges on its spectrum holdings as requested by Ofcom, calculated on a comparable basis to commercial sector charges.

Recommendation 3.4: In future sharing or leasing arrangements should preferably be managed by the primary user (or a Third Party acting on its behalf), who would also receive payment direct from the secondary user. Where Ofcom manages the secondary use through granting licences or RSA, fees set in regulations should be linked directly to Ofcom receipts from the sharers, or to a sharing algorithm where that is not possible. The position on delegating charging functions should be clarified by Ofcom.

Recommendation 3.5: Where the MOD has partial use in a band used extensively for commercial services, the MOD should negotiate with and pay charges to the primary user directly where possible. If this is not legally or practically feasible the MOD should pay for its use to the extent that it restricts the scope and value of commercial activity. The RSA should be classified if necessary, for use by Ofcom and MOD only.

Annex B

Consultation Principles

B.1 MOD will apply the following five principles to this consultation:

During the consultation

B.2 The MOD will hold an industry day to explain its proposals shortly after publishing the consultation document.

B.3 The MOD will be clear about who it is consulting, why, on what questions and for how long.

B.4 The MOD will make the consultation document as short and simple as possible and will try to make it as easy as possible to give us a written response.

B.5 12 weeks are allowed for responses.

B.6 If you have any comments or complaints about the consultation process itself, please contact:

Sarah Wallis, External Relations Unit (ERU,) DGMO DOMD-Devolution 1, Directorate of Organisation and Management Development, Ministry of Defence, Level 6, Zone I Main Building, Whitehall, LONDON, SW1A 2HB

Telephone: (020) 7218 2564 Email: DGMODOMD-Devolution1@mod.uk

After the consultation

B.7 MOD will look at each response carefully and with an open mind, will give reasons for its decisions and will give an account of how the views of those concerned helped shape those decisions.

Welsh language

B.8 Os ydych eisiau copi o'r ddogfen hon yn Gymraeg, cysylltwch â Steve Jones (020 7218 1509; steve.jones740@mod.uk). *If you require a copy of this document in Welsh, please contact Steve Jones (020 7218 1509; steve.jones740@mod.uk).*

Annex C

Consultation Response Cover Sheet

C.1 In the interests of transparency, the MOD will publish all consultation responses in full on its website, http://www.mod.uk/DefenceInternet/AboutDefence/CorporatePublications/ConsultationsandCommunications/PublicConsultations/, unless a respondent specifies that all or part of their response is confidential. The MOD may refer to the contents of a response when explaining its decision, unless specifically asked not to.

C.2 The MOD has produced a cover sheet for responses (see below) and would be very grateful if you could send one with your response. This will speed up its processing of responses, and help to maintain confidentiality by allowing you to state very clearly what you don't want to be published. The MOD will keep your completed cover sheets confidential.

C.3 The quality of consultation can be enhanced by publishing responses before the consultation period closes. In particular, this can help those individuals and organisations with limited resources or familiarity with the issues to respond in a more informed way. Therefore, MOD will assume that it may publish all responses upon receipt unless respondents have stated otherwise on the response cover sheet.

C.4 The MOD strongly prefers to receive responses in the form of a Microsoft Word attachment to an email. The website therefore includes an electronic copy of this cover sheet, which you can download.

C.5 Please put any confidential parts of your response in a separate annex to your response, so that they are clearly identified. This can include information such as your personal background and experience. If you want your name, contact details, or job title to remain confidential, please provide them in your cover sheet only so that the MOD does not have to edit your response.

Cover sheet for response to UK DSM - A Consultation on: An Implementation Plan for Reform

Basic details

To (MOD contact):	Jim Nixon (jim.nixon374@mod.uk)
Name of respondent:	
Representing (self or organisation/s):	
Address (if not received by email):	

What do you want MOD to keep confidential

Details	Is this to remain confidential?	
Name/contact details/job title	Yes/No	
Organisation	Yes/No	
Whole response	Yes/No	
Part of the response. If there is no separate Annex, which parts?	Yes/No	Please List the parts that are to remain confidential
If you want part of your response, your name or your organisation to be confidential, can MOD still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?	Yes/No	

Annex D

Consultation Questions

Question 1.	Do you agree that the MOD has identified the options and factors that MOD should consider before deciding whether or not to extend the audit of the spectrum it uses?
Question 2.	Do you have any views on the priority with which MOD should audit its spectrum use?
Question 3.	Do you agree with the phased approach to applying for RSA that the MOD is proposing?
Question 4.	Do you agree with the MOD's plans for releasing and sharing the spectrum it uses?
Question 5.	Do you agree with MOD's priorities for releasing and sharing spectrum?
Question 6.	Do you agree with MOD's outline timetable for initial spectrum releases?
Question 7.	Do you agree that MOD has correctly and fully identified the factors and options that should be considered before deciding to release and acquire spectrum in the market?
Question 8.	Do you agree that MOD has correctly and fully identified the factors and options that should be considered before deciding the best means with which to interact with the market?
Question 9.	Can you identify any different approaches for the MOD to manage the spectrum it uses and engage with the market to deliver better value for money for defence and the taxpayer?
Question 10.	Which options (from paragraph 6.7) should be considered, or discounted, and if so why; either in respect of options already identified in section 6, or additional options, not identified?
Question 11.	Which issues relating to section 6 should be considered when evaluating options, and if so why; either in respect of issues already identified in that section, or additional issues, not identified?
Question 12.	Is the scope of decisions required against each of the four questions at paragraph 6.3, as indicated in section 6, sufficient and, if not, how and why it should be extended?

Annex E

Glossary

AIP	Administered incentive pricing – setting charges for spectrum to reflect the value of the spectrum in order to promote efficient use of the spectrum.
Allocation	Used of a frequency band. Entry in the table of frequency allocations of a given frequency band for the purpose of its use by one or more terrestrial or space radio communications services or the radio astronomy service under specified conditions. This term is also applied to the frequency band concerned.
Assignment	Used of a radio frequency or radio frequency channel. Authorisation given by an administration for a radio station to use a radio frequency or radio frequency channel under specified conditions.
BERR	Department for Business, Enterprise & Regulatory Reform (formerly the Department of Trade and Industry).
CAA	Civil Aviation Authority – the independent statutory regulator responsible for regulating aviation, including economic and safety aspects.
Command and control	A way of managing the radio spectrum in which the regulator makes all the key decisions including what the piece of spectrum is to be used for and who can use it.
Communications Act	The Communications Act 2003, which sets out Ofcom's powers, functions and duties.
Concurrent	(Of *spectrum trading*) a transaction in which rights and obligations are transferred while continuing to be rights and obligations of the transferor, cf outright.
CSR	Comprehensive spending review. Part of the Government's framework for setting public expenditure.
DCLG	Department of Communities and Local Government.
DoH	Department of Health.
DfT	Department for Transport.
E&PSS	Emergency and public safety services.
Exemption	Exemption regulations made by Ofcom allow anyone to use specified radio equipment without the need to have a *WT licence*.
FWA	Fixed Wireless Access – means of connecting to homes and offices using wireless as opposed to copper wires or fibre optics.
GHz	Gigahertz – unit of frequency equal to one thousand *MHz*.

Harmful interference	*Interference* that creates danger or a risk of danger or degrades, obstructs or repeatedly interrupts a transmission or broadcast.
Harmonisation	The identification of common frequency bands throughout a region (eg Europe) for a particular application and, in some cases, technology.
Hz	Basic unit of frequency – one hertz is equivalent to one cycle per Second.
Interference	Unwanted disturbance caused in a radio receiver or other electrical circuit by electromagnetic radiation emitted from an external source.
ITU	International Telecommunication Union - the United Nations agency for information and communication technology responsible for developing and publishing the *International Radio Regulations*.
Market mechanisms	Approach to managing spectrum where key decisions, e.g. on acquiring or disposing of spectrum and what service to provide are made by spectrum users rather than by the regulator.
MCA	Maritime and Coastguard Agency – an executive agency of the *DfT*.
MHz	Megahertz – unit of frequency equal to one million *Hz*.
MOD	Ministry of Defence.
NPIA	National Policing Improvement Agency.
Opportunity cost	The cost of a decision or choice in terms of the benefits which would have been received from the most valuable of the alternatives that was foregone.
Outright	(Of *spectrum trading*) a transaction in which the transferred rights and obligations pass to the transferee and are no longer rights and obligations of the transferor, cf concurrent.
Partial	(Of *spectrum trading*) a transaction in which some of the rights and obligations are transferred while others are kept by the transferor, cf total.
PMSE	Programme Making and Special Events – a class of radio application that supports a wide range of activities in entertainment, broadcasting, news gathering and community events.
PSSPG	Public Safety Spectrum Policy Group.
PSSTG	Public Spectrum Safety Test Group.
Radio Regulations	International Radio Regulations made by the *ITU*, which have the status and force of a treaty, allocate frequencies globally to various applications and deal with cross-border *interference*.
Radio spectrum	The portion of the electromagnetic spectrum below 3000 *GHz* that is used for radiocommunications.

RSA	Recognised Spectrum Access - a spectrum management instrument created by the *Communications Act to complement WT licences*.
RNSS	Radionavigation satellite service.
Spectrum	The electromagnetic *spectrum* ranging from visible light to x-rays and gamma rays.
Spectrum liberalisation	Removal of restrictions from *WT* licences and *RSA* to allow holders greater flexibility to change how they use spectrum.
Spectrum trading	Ability of spectrum users to transfer rights and obligations under *WT licences* to another person in accordance with regulations made by Ofcom. Trades may be total, partial, outright or concurrent.
SSIG	Spectrum Strategy Implementation Group. Inter-departmental committee leading on spectrum reform. A sub-committee of the UKSSC.
Standardisation	Development of an open standard for a particular type of equipment.
STFC	Science and Technology Facilities Council, formerly the Particle Physics and Astronomy Research Council.
SUR	Spectrum usage rights – a way of formulating the terms and conditions in a *WT licence* or *RSA* in a way that is independent of technology or service.
Total	(Of *spectrum trading*) a transaction in which all of the rights and obligations are transferred from transferor to transferee, cf partial.
UKFAT	The UK Frequency Allocation Table. This identifies responsibilities for the management of frequency bands or services showing whether they are managed by Ofcom, the MOD or another Government department or Agency. It also includes the *ITU* Table of Frequency Allocations contained in the current *Radio Regulations*. It is published by Ofcom on behalf of the National Frequency Planning Group, a sub-committee of the UKSSC.
UKSSC	Cabinet Office committee that discusses matters relating to the use of the radio spectrum, including by government departments and other public sector bodies.
VHF	Very high frequency (30-300 *MHz*).
WRC	World Radiocommunication Conference - conference of the *ITU* that revises or amends the International *Radio Regulations*.
WT Act	The Wireless Telegraphy Act 2006, which sets out the statutory framework for management of the radio spectrum consolidating a number of older Acts dating back to 1949.
WT licence	Licence granted by Ofcom to authorise installation or use of radio equipment as required by section 8(1) of the *WT Act*.
WT Register	Register maintained by Ofcom containing information about grant, renewal, transfer, revocation or variation of *WT licences* and *RSA*