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**FORWARD LOOK**

# A Strategy for Management of major Public Sector Spectrum Holdings

MARCH 2007

UK SPECTRUM STRATEGY COMMITTEE

IN CONSULTATION WITH 'OFCOM'

# Forward Look 2007

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TABLE OF CONTENTS

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## Forward Look 2007

## *A Strategy for Management of Major Public Sector Spectrum Holdings*

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### Foreword by the Joint Chairmen of the UK Spectrum Strategy Committee

Professor Martin Cave's *Independent Audit of Spectrum Holdings* recommended that the Government should introduce fundamental changes to the way public sector spectrum holdings are managed. The Government accepted the Audit's recommendations and committed to a long-term work programme that would increase efficiency of use of spectrum for essential public services such as defence, aeronautical and maritime navigation, and the emergency services. The Government remains of the view that to maximise efficiency, market mechanisms should be brought into the management of public sector spectrum holdings. This includes:

- Introduction of trading to enable public bodies to interact with the market, facilitated through Recognised Spectrum Access (RSA) for Crown bodies
- Increased sharing of spectrum with other public or private bodies to maximise efficiencies
- Broader and deeper use of pricing for public spectrum holdings to increase consistency with the private sector and offer incentives
- The assumption, adopted by the Government in June 2006, that public bodies will acquire spectrum through the market in the future

Since the publication of Professor Cave's Report in December 2005, the UK Spectrum Strategy Committee (UKSSC) has coordinated the change programme. Through the UKSSC[1] the Government, in conjunction with the Office of Communications (Ofcom) has taken the first steps towards establishing the conditions necessary to introduce market mechanisms to public sector spectrum holdings.

[1] Further details of the UKSSC committee structure is included at Annex A

These steps are set out in this 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.

The upcoming second Comprehensive Spending Review (CSR) will enable the setting of targets for spectrum use and release from 2008/09 onwards. Suitable budgets for spectrum use, charges, procurement and trading will be set in the CSR to provide the medium term framework to allow Departments and other bodies to begin to interact more fully with the private sector. The CSR will also be used to define the rules for dealing with the proceeds from interaction with the market as an incentive to further action by Departments.

In the longer term, 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. This will be taken forwards in parallel with our continuing international obligations on spectrum and upcoming spectrum commitments for the London 2012 Olympic Games and Paralympic Games. The public sector will source its spectrum needs from the market, with exceptions where objectively justifiable for reasons of safety and security. Public sector organisations will establish internal trading bodies with the necessary technical, commercial and financial expertise to enable them to interact effectively and efficiently with the market.

The Government supports and will continue to support interaction between public and private bodies to develop new technologies, methodologies and strategies to facilitate and promote these changes.

David Hendon
Department of Trade & Industry
Joint Chairman UKSSC

John Taylor
Ministry of Defence
Joint Chairman UKSSC

## 1. Executive Summary

The Government welcomed Professor Martin Cave's report *The Independent Audit of Spectrum Holdings*, published in December 2005, which reviewed the use and management of public sector spectrum holdings. In March 2006 the Government published its detailed response to the Audit, including an Implementation Plan. The Government agreed that there is scope for more effective use of public sector spectrum holdings and that this could be achieved, in conjunction with other measures, through the introduction of spectrum trading and increased sharing with other users. A commitment was given to work with Ofcom to enable this. The Government also stated its support for greater consistency in spectrum pricing across the public sector. 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. It will also seek to minimise harmful interference and ensure continued compliance with international obligations, including international spectrum management.

The Government undertook to publish a strategic Forward Look, assessing current spectrum use and forecasting future needs, commencing in March 2007 and every two years thereafter. This publication is the first such 'Forward Look'. Within the following pages there are updates on the specific activities to which the Government committed in March 2006. Much progress has been made. We have implemented the recommended changes in official committees and reviewed the resources needed to deliver spectrum management efficiencies in the longer term. We have a better understanding of the scope for early release or sharing of spectrum in a number of key bands and what needs to be done to enable this. In particular we have identified shortfalls in the way that spectrum is assigned and have commenced a project to improve this and make more information available publicly. Ofcom is meanwhile developing proposals for market based spectrum management tools that are essential to the reforms, including AIP and RSA for public sector users.

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## 2. Introduction and background

The radio spectrum is a key resource for many new and developing technology based industries. Ofcom research[2] has shown that uses like mobile communications and broadcasting that are directly dependent on spectrum account for about 3% of the economy.

In March 2001, the Chancellor of the Exchequer and Secretary of State for Trade and Industry jointly commissioned Professor Martin Cave to lead an independent *Review of Radio Spectrum Management*. The review, published in March 2002, recommended significant changes to the management of spectrum including the use of market based methods as the primary means of allocating the scarce spectrum resource. The Government broadly accepted these proposals which were later incorporated into the relevant provisions of the Communications Act 2003.

Ofcom is now well advanced in its programme of major reforms of spectrum management in the commercial sector. These were set out in its November 2004 *Spectrum Framework Review* and associated Implementation Plan published in January 2005.

Spectrum is also an essential input into numerous public services – from defence to the emergency services, and from scientific research to transport. The Government re-confirms its earlier commitments that vital public services such as public safety, emergency and defence will continue to be guaranteed access to spectrum to meet their essential needs. But given the importance of spectrum to the UK economy as a whole, we intend to ensure that the public sector makes efficient use of its allocations.

In December 2004, the Chancellor commissioned Professor Cave to carry out a further study, this time into improving the efficient management of radio spectrum used for public sector applications. The final report of the

[2] See: http://www.ofcom.org.uk/media/mofaq/rcomms/ddr/

*Independent Audit of Major Spectrum Holdings* was published in December 2005. It proposed the extension of market principles to spectrum used by the public sector as the best means of ensuring improved and continuing efficiency. A number of specific recommendations were made and these were accepted in the Government Response published[3] in March 2006. This set out an Implementation Plan for each of the Audit's recommendations. In December 2006 the Government published[4] an update on the progress.

One of the Independent Audit's recommendations was the publication of a "Forward Look" for public sector spectrum every two years to include, for each major public sector user, a description of current spectrum use; changes to be made to allocations; changes to spectrum management; and quantitative predictions and justifications for future spectrum needs. The Government accepted this recommendation and undertook to publish the first Forward Look in March 2007.

This first edition provides a further update on progress against the Government's Implementation Plan published in March 2006. Some of the more fundamental reforms set out in the plan will only be realised in the longer term and will be reported on in subsequent editions. This first Forward Look is not intended as a comprehensive blueprint for future public sector spectrum management nor is it a complete list of bands that will become available for sharing or release before the next formal report in 2009. Rather it reports on the positive progress made since the Government Response of March 2006 and confirms the areas where early action has already begun. In particular:

- Agreement between Ofcom and Government on the general principles for defining spectrum usage rights and obligations for public sector users, in particular Crown bodies, which are not subject to conventional licensing. These will be subject to public consultation by the summer of 2007;

[3] http://www.spectrumaudit.org.uk/pdf/governmentresponse.pdf
[4] http://www.spectrumaudit.org.uk/pdf/cave_progress_rpt.pdf

- Execution of a study looking at the application of Administered Incentive Pricing (AIP) to public sector spectrum holdings;
- Detailed audits of key MOD bands and commencement of work to improve assignment data to increase efficient use and identify areas of spare capacity
- Initiation by the CAA of a review of navigation aids aimed at reducing unnecessary duplication of systems;
- Commencement of theoretical modelling and practical tests to determine scope for bandsharing in key bands.

Reforms in the management of public sector spectrum holdings are being considered within the context of departmental budgets and are featuring as appropriate within bilateral discussions between departments and HM Treasury. This is particularly important in regard to departmental settlements under the current Comprehensive Spending Review (CSR) and is discussed in the next chapter.

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## 3. Comprehensive Spending Review (CSR)

On 19 July 2005 the Chief Secretary to the Treasury announced that the Government would launch a second Comprehensive Spending Review (CSR), reporting in 2007, to identify what further investments and reforms are needed to equip the UK for the global challenges of the decade ahead.

A decade on from the first CSR, the 2007 CSR will represent a long-term and fundamental review of government expenditure. It will cover departmental allocations for 2008-09, 2009-10 and 2010-11, with allocations for 2007-08 held to the agreed figures already announced at the 2004 Spending Review. As part of its preparations for CSR07, the Government is taking forward a comprehensive and in-depth value for money programme across all departments.

As part of the published response to the Independent Audit, the Government committed that Departments would submit to HM Treasury assessments of spectrum holdings and proposals for release by the end of 2006. These assessments and the forecasts of future needs contained in this Forward Look will inform the discussions between Departments and HM Treasury on setting targets and budgets for spectrum holdings in the CSR. The aim of these targets will be to provide effective incentives for the management of public sector spectrum holdings over the CSR period.

The three years covered by the CSR represent a crucial period for the development of the spectrum market, and will see the first stages of sharing, release and trading of those bands identified by the Independent Audit as having the most scope for more efficient use. Setting of spectrum targets in departmental budgets will help drive this agenda forward.

To inform the CSR, HM Treasury will agree with Departments the framework for the treatment of any gains from trading or leasing of public sector spectrum holdings.

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## 4. Role of OFCOM

Ofcom is the independent regulator responsible for management of most civil spectrum in the UK including a large number of assignments for public sector applications. The Ministry of Defence (MOD) in the main manages the spectrum not managed by Ofcom.

Ofcom's strategy for managing the UK's civil radio spectrum was set out in some detail in its Spectrum Framework Review (SFR) statement published in June 2005[5]. This placed an emphasis on market-based mechanisms as the primary means of allocating the resource amongst competing demands. Ofcom therefore has an important role in assisting the realisation of similar improvements in public sector spectrum efficiency as recommended by the Independent Audit and accepted in the Government Response.

The Government records its appreciation of the assistance provided by Ofcom to the UKSSC in developing the Government Response and recognises the continued close collaboration between Ofcom and departments in the preparation of this first Forward Look. Ofcom is particularly well placed to provide specialist advice and has the necessary powers to establish the regulatory framework required to help the public sector improve the efficiency with which it manages its own spectrum holdings. For example by introducing regulations that enable sharing and trading by the public sector directly with commercial users. In that regard, Ofcom has been working on a number of initiatives in support of the Government's Implementation Plan.

### Administered Incentive Pricing (AIP)

Administered Incentive Pricing (AIP) is a spectrum management tool used by Ofcom to simulate market conditions by signalling to spectrum users the opportunity cost that their use imposes on other spectrum users. AIP is intended to ensure that decisions by spectrum planners and users reflect the value the spectrum has – not just to themselves but also to other users. AIP

[5] See: http://www.ofcom.org.uk/radiocomms/sfr/

has been used since the late 1990s and Government has agreed that public sector spectrum users will pay AIP on a comparable basis to the private sector; the MOD and other public sector bodies already pay AIP for some of their spectrum use. The Independent Audit recommended a broader and deeper application of AIP to public sector spectrum holdings and to the key bands allocated to aeronautical and maritime services (most of which are shared between civil and MOD use).

The Government accepted the Independent Audit's recommendations and charged Ofcom with conducting a study into the application of AIP to aeronautical and maritime sectors. Building on the study Ofcom, in conjunction with the CAA and MCA, will consult on the initial application of AIP to aeronautical and maritime services. The study, conducted by consultants Indepen and Aegis, is nearing completion and will be published in due course on Ofcom's website[6].

Ofcom will work with the CAA and MCA to develop proposals to discuss with stakeholders in advance of formal consultation. In parallel the MOD, MCA and CAA are developing an agreement on the management arrangements in shared bands (for example radar bands) with a view to promoting spectrum efficiency and bandsharing opportunities while meeting the essential safety and operational needs of each sector.

### Recognised Spectrum Access (RSA)

Recognised Spectrum Access is a new spectrum management concept provided for by the Communications Act 2003. It is an alternative to conventional licensing and offers protection to the use of frequencies where such use cannot be described within the terms of a licence. For example RSA is suitable for passive or "receive only" systems, where the corresponding transmissions emanate from outside the UK. Similarly, certain public sector organisations that use spectrum, in particular Crown bodies such as government departments and agencies are not licensed by Ofcom, which

[6] Ofcom's website is www.ofcom.org.uk

makes it difficult for them to engage in spectrum trading and band sharing. RSA provides a means of remedying this by providing a basis for such bodies to share and lease spectrum and so is central to achieving the aims of the response to the Independent Audit. As described in more detail below, Ofcom is in the process of introducing RSA in the public sector and of making the necessary regulations under the Wireless Telegraphy Act 2006.

### *RSA for radio astronomy*

Section 6.5 concerns Science Services including radio astronomy and other passive applications. Ofcom has made regulations to introduce RSA for radio astronomy and these came into force in March. Ofcom plans to make further regulations on trading of radio astronomy RSA when decisions, referred to in chapter 3 above, have been taken by HM Treasury on the treatment of gains in the public sector.

### *RSA for Government bodies*

Ofcom is making good progress towards introducing Crown RSA (CRSA) for Government departments and executive agencies that use spectrum but, because of their Crown status, cannot be licensed. It has produced guidance for the Government to clarify how CRSA would operate to facilitate trading and sharing and is discussing with departments and agencies various related issues including the bands in which CRSA should initially be introduced and practical band management arrangements in spectrum shared by public sector bodies. Subject to progress of these discussions, Ofcom expects to publish a consultation document by the summer 2007.

### Bandsharing

A programme of theoretical modelling and practical testing is now underway to identify opportunities for sharing in certain public sector spectrum bands. The current work focuses on aeronautical, maritime and MOD radar bands,

however, it is recognised that there is also likely to be scope for sharing in other bands. The Public Safety Spectrum Testing Group (PSSTG) is leading this work with participation from the public sector, for example the CAA, MCA and MOD as well as from industry.

Significant work has already been completed[7] and a project plan outlining work planned for 2007 was published[8] recently. In late 2007, once necessary testing and analysis has been carried out, criteria determining where and how sharing could be possible will be published. This will allow potential sharers to assess opportunities and where appropriate to conduct further tests and enter negotiations with the relevant public sector organisation(s) when the necessary regulatory framework is in place. The sensitivity of radar equipment and its use for safety of life and national security purposes will be reflected in the criteria for bandsharing by non-radar radio systems.

### International Work (ITU)

Radio spectrum is allocated within the context of internationally agreed Radio Regulations published by the International Telecommunication Union (ITU), as amended from time to time through Final Acts of a World Radio Conference (WRC).

Ofcom is responsible, under general directions issued by the Secretary of State for Trade and Industry in December 2003, for representing the UK in international spectrum management meetings, including conferences of the ITU. Ofcom is required to clear official UK policy lines with government in advance of such conferences and this is done formally through the UKSSC. The terms of reference of UKSSC are given in Annex B and a brief explanation of the role of each of its subordinate groups is given in Annex C.

[7] See: http://www.spectrumaudit.org.uk/bandsharing.htm
[8] See: http://www.spectrumaudit.org.uk/pdf/20070301Bandsharing%20plan.pdf

Many public sector applications, including for example safety critical services for aeronautical and maritime navigation are, under the Radio Regulations, subject to specific international agreements concerning the availability and protection of particular frequencies. Any change to the management of spectrum for these services within the UK needs to take full account of the UK's international treaty obligations.

In late 2007 the ITU will hold a World Radio Conference (WRC-07). Preparations for the UK input to WRC-07 are underway within the International Frequency Planning Group (IFPG), a sub group reporting to UKSSC (see Annex A). The IFPG is chaired by Ofcom and includes representatives of interested government departments plus external stakeholders. There are a number of agenda items at WRC-07 that are of particular relevance in the context of current public sector spectrum allocations in the UK and proposed reforms in their future management. For example, the WRC-07 will be examining a range of frequency bands with a view to identifying spectrum for future generations of mobile radio ("IMT-advanced"). Some of the bands under consideration in the preparations for the WRC-07 are used by public services.

A further WRC-07 agenda item addresses the future communications needs of the aeronautical community, including the requirements of aeronautical telemetry systems. The focus of attention is on frequency bands already allocated to aeronautical services, including radionavigation services. Another agenda item addresses upgrading the radiolocation service to primary allocation status in the bands 9000-9200 MHz and 9300-9500 MHz and extending by up to 200 MHz the existing primary allocations to the Earth exploration-satellite service (EESS) (active) and the space research service (SRS) (active) in the band 9500-9800 MHz.

WRC-07 will also be considering the case for expanding the international frequency allocations for short-wave (high frequency) broadcasting with

potential impact on defence, aeronautical and maritime use of this frequency range. However the high-frequency range of the spectrum has not featured in the Independent Audit and is not considered in this Forward Look.

Other issues under consideration at WRC-07 could have some impact, directly or indirectly, on public sector spectrum use but overall, it is not expected that the outcome of WRC-07 will have significant effect on the implementation of the recommendations of the Independent Audit in the UK.

### International work (EU)

The Radio Spectrum Policy Group (RSPG) of the European Union, in developing its work programme for 2007 and beyond, has considered the possibility of developing an Opinion on public sector spectrum use. The decision to proceed with this activity will not be taken until May 2007, when there should be more clarity about the scope and potential output of this work. However the UK has already indicated its interest in contributing to the development of an RSPG Opinion, based on the recommendations of the Independent Audit and the Government's Implementation Plan. Given the international nature of aeronautical and maritime services, and the international cooperation in the field of defence, the UK sees considerable benefits in encouraging parallel developments in other countries.

### Preparing for the London 2012 Olympic Games and Paralympic Games

In October 2004 the Secretary of State for Trade and Industry provided to the International Olympic Committee (IOC), as part of London's bid, guarantees that the required spectrum would be allocated for the organisation of the 2012 Olympic Games and Paralympic Games. The Government further intends, in partnership with the London Organising Committee of the Olympic Games and Paralympic Games (LOCOG), to ensure that innovation is at the heart of the 2012 Olympics.

Ofcom is responsible for the detailed planning of spectrum for the London Games. It is working closely with the Government and other stakeholders, including LOCOG and the Olympic Delivery Authority (ODA), to identify the spectrum requirements and agree a strategy for ensuring sufficient spectrum is available. A new sub group of UKSSC, the Spectrum Planning Group for the Olympic Games and Paralympic Games (SPGOG), was established in January 2007. A brief description of the role of this new group is included within Annex C. Chaired by Ofcom, the group includes representation from all major stakeholders including LOCOG, ODA and relevant government departments and agencies. Ofcom intends to publish a consultation in summer 2007 on a draft spectrum plan for the London Games.

To minimise disruption to existing private and commercial users, it is intended that the requirements for the Games will wherever possible be met from within MOD bands. Indeed, many programme making and special events (PMSE) assignments, especially video links, already share MOD bands. It may not be possible to satisfy the needs of the Games from MOD bands in all instances and this will not become clearer at least until after the consultation referred to above. However, any strategy to utilise MOD bands for the London Games clearly has implications for the spectrum management reforms discussed here and this will be taken into account as the work develops.

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## 5. Progress to date against Key Implementation Targets

The Implementation Plan published in March 2006 in response to the Independent Audit outlined a programme of work to improve the management of public sector spectrum holdings. Many of the specific actions have been delivered or are on track for delivery. A summary of progress to date is provided in the tables below; further detail is included in chapters 4 and 6.

### Progress against published targets for 2006

| | Published Target | Progress to date |
|---|---|---|
| 1 | **Ofcom** will aim to clarify how Recognised Spectrum Access (RSA) will operate for Crown bodies, to facilitate trading and sharing. | Ofcom provided clarification on the operation of RSA for Crown bodies to the Government in late 2006. Ofcom is working with Crown bodies to determine their requirements and expects to publish proposals for RSA for Crown bodies by summer of this year. |
| 2 | **MOD** will identify key spectrum bands for trading and sharing, and develop specific proposals for action in these bands. | MOD has completed the first stage of a comprehensive internal spectrum audit. Completing the audit process for all MOD spectrum is expected to take until mid 2008. A number of opportunities have already been identified for sharing or release of spectrum including at UHF and S bands. Further detail is included in the MOD section of this document. |
| 3 | **MOD** will submit to HM Treasury a detailed assessment of spectrum holdings and specific proposals for release, together with an appraisal of any significant costs involved in implementation. | MOD has identified significant potential opportunities for spectrum release (see chapter 6). By May 2008 the MOD will publish a detailed implementation plan setting out which spectrum can be released and when. |

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| 4 | **UKSSC** will adopt the presumption that public bodies will acquire spectrum through the market, subject to agreed criteria for exemptions. | The UKSSC has adopted this presumption. Public sector bodies are now required to acquire any additional spectrum that they require through the market, save in exceptional circumstances. |
| 5 | **Ofcom** expects to publish regulations on the first public sector RSA for radio astronomy by September 2006. | The regulations entered into force on 8th March 2007. |
| 6 | **Ofcom** and **CAA** will seek to address issues in the 590-598 MHz band. | Ofcom and CAA have been working to resolve issues in this band (Channel 36 in the UHF broadcasting band). Channel 36 is being dealt with as part of Ofcom's digital dividend review (DDR) consultation. |
| 7 | **Ofcom** will initiate a study into pricing levels for aeronautical radar spectrum in the first half of the year and expects to complete it by early 2007. | In June 2006 Ofcom contracted consultants *Indepen-Aegis* to conduct a study into the application of AIP to aeronautical and maritime radio applications. Ofcom expects to publish the study in due course on its website (www.ofcom.org.uk) |
| 8 | **CAA** will initiate a review, with **MOD** and **Ofcom**, of navigation aids, including radar and landing systems, by November 2006. | CAA has initiated a review of navigation aids. |
| 9 | **Ofcom**, in conjunction with **CAA**, will review candidate aeronautical bands for the initial application of spectrum pricing. | Ofcom and CAA have begun this process which will be informed by the *Indepen-Aegis* study and the subsequent public consultation. |
| 10 | **MCA**, with assistance from **Ofcom**, will review candidate maritime bands for the initial application of spectrum pricing. | Ofcom and MCA have begun this process which will be informed by the *Indepen-Aegis* study and the subsequent public consultation. |
| 11 | **UKSSC** will establish new radar and band sharing subgroups, to better co- | The UKSSC has established new bandsharing and radar subgroups. Details of the UKSSC committee |

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| | ordinate spectrum management. | structure are given at Annex A, and an overview of the remit of each sub group is given at Annex C. |
| 12 | **UKSSC** will agree the criteria for safety authorisation of new band sharing techniques. | The Public Safety Spectrum Testing Group (PSSTG) - the UKSSC subgroup tasked with this, has conducted several scoping trials and made significant progress. It was not, however possible to conclude definitive safety criteria in 2006 due to the technically challenging and resource intensive nature of the task. See chapter 4. |
| 13 | **UKSSC** will take responsibility for resolving disputes on pricing levels | The UKSSC has taken responsibility for resolving pricing disputes. |
| 14 | **MOD** will establish the Spectrum Acquisition Authority in April 2006 to improve internal co-ordination of MoD spectrum. | The MOD has established the Spectrum Acquisition Authority. See chapter 6. |
| 15 | **Ofcom** will commission and publish a study examining the market demand for spectrum | It was decided that carrying out a study so soon after that commissioned by the Independent Audit would not represent good value for money and to defer this work. Ofcom recognises the importance of understanding changing market developments and will review spectrum demand on an ongoing basis. |

Progress against published targets for 2007

| | **Published Target** | **Progress to date** |
|---|---|---|
| 16 | **HM Treasury** will discuss specific spectrum targets with relevant departments, including the **MOD**, on the basis of assessments provided by departments in 2006. | Specific and demanding targets for the release of spectrum will form part of departments' settlements in the Comprehensive Spending Review. |
| 17 | **HM Treasury** will agree with departments the framework for | HM Treasury is in discussion with departments, and is awaiting further |

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| | the treatment of gains from trading or leasing of public sector spectrum. | identification of what spectrum can be released from departments before finalising the framework. |
| 18 | **Ofcom** will work with the relevant Crown bodies to introduce RSA in key spectrum bands as required. | Ofcom is developing proposals for the application of RSA to Crown bodies and is working with the MOD and others on these. Ofcom expects to publish a consultation document by the summer. |
| 19 | **MOD** will deliver the first efficiency savings in bands where there are no significant obstacles to release or sharing. | The MOD is conducting a programme of work to identify which spectrum can be released and when. The release of priority bands will begin during 2008 with further bands following in 2009 and 2010. See chapter 6. |
| 20 | **UKSSC** expects to establish a third party band manager to promote commercial access to public sector spectrum holdings | This issue is still under consideration in context of work on establishing Crown RSA. Some initial work has been completed in respect of identifying issues related to emergency & public safety spectrum. See section 6.4.3 |
| 21 | **Ofcom** expects to address issues relating to how payments for secondary use should be handled. | Ofcom will review, with relevant departments, the handling of secondary payments. As stated in the Government Response to the Independent Audit, where possible payments for secondary use will be made to the primary user (i.e. not to Ofcom). Detailed discussions are underway between CAA, MCA and MOD with regard to the apportionment of AIP in shared aeoronautical and maritime bands. |
| 22 | **Ofcom**, in conjunction with **MCA**, will consult on the initial application of AIP to maritime bands. | Ofcom, in conjunction with the MCA, will develop proposals for consultation. Meanwhile, MCA has established a Maritime Radio Spectrum Users' Group (MRSUG) to coordinate pre-consultation dialogue. |
| 23 | **Ofcom**, advised by **CAA** and **DfT**, will consult on proposals | Ofcom, advised by CAA, will develop proposals for consultation. |

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| | for the application of pricing to aeronautical spectrum. | |
| 24 | **UKSSC** will publish the first Forward Look for public sector spectrum in March 2007. **DTI** will co-ordinate the production of the UKSSC Forward Look. | DTI has coordinated this first edition of the biennial Forward Look with all relevant Whitehall departments and agencies. The next edition is scheduled for publication in March 2009. |
| 25 | **UKSSC** will review progress in implementing changes to public sector spectrum management, as outlined in this response, and report on progress in the Forward Look in March 2007. | This first edition of the Forward Look reports on progress to date. Further updates on progress on any major reforms outlined in the March 2006 Implementation Plan will in the meantime be published at www.spectrumaudit.org.uk |
| 26 | **Ofcom** will compile and maintain information about public sector spectrum use and tradability within the UK Frequency Authorisation Plan. | Ofcom will compile and add information about public sector spectrum use and tradability to the UK Frequency Authorisation Plan. This is an iterative process and will include outputs from the MOD's internal band audits (see chapter 6) |

Progress towards published targets from 2008 onwards

| | **Published Target** | **Progress to date** |
|---|---|---|
| 27 | **Ofcom**, **CAA** and **MCA** expect, subject to the outcome of consultations, spectrum pricing will be applied in selected aeronautical and maritime navigation bands | Work is on track. |
| 28 | **CAA** will formally report on the review of aeronautical navigation aids, and determine a UK position for international negotiations by June 2009. | CAA expects to meet this target. |
| 29 | **Ofcom** expects to undertake a review of AIP levels. This will include the current differential | Ofcom expects to commence this review in the 2008/09 financial year. |

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| | between ‘fixed’ and ‘mobile’ prices. | |
| 30 | **Ofcom** expects to continue to progress its programme of spectrum awards and to review options for the 1.4 and 1.5 GHz bands. | Ofcom is continuing its programme of awards, including that for 1452 to 1492 MHz on which it is consulting with a closing date of 12 April 2007. |
| 31 | **UKSSC** will publish the second Forward Look for public sector spectrum in 2009. This will include a report on progress in implementing changes to public sector spectrum management. | It is expected that the second edition of the Forward Look will be published in March 2009. |
| 32 | **Ofcom** will clear with UKSSC, the UK proposals for WRC11 and associated international forums, and set these in the context of the efficiency savings recommended by the Audit. | Ofcom expects to clear with UKSSC, proposals for WRC11 and associated international forums, and set these in context of the efficiency savings recommended by the Independent Audit. |
| 33 | **HM Treasury** will commission a review of the impact of market mechanisms on public sector spectrum management to report in 2012. | HM Treasury intends to commission this review in 2012 as planned. |

## 6. Forward Look

Recommendation 2.6 of the Independent Audit stated:

*UKSSC should produce a 'Forward Look' for public sector spectrum, every two years, including, for each of the public sector spectrum users who attend UKSSC: description of current spectrum use; changes to be made to allocations; changes to spectrum management; and quantitative predictions and justifications for future spectrum needs.*

The Government accepted this recommendation and this chapter addresses the specific issues that it refers to. The sections below provide a brief commentary on use of the spectrum by each of the major categories of public sector identified in the Independent Audit. The bands discussed are limited to those within the ranges identified in the Independent Audit and in context of:

- The current use of spectrum;
- Current planned changes to allocations;
- Where appropriate, proposed changes to spectrum management; and
- An indication of likely drivers of future spectrum requirements.

The Independent Audit provided a valuable initial indication of those areas of spectrum estimated by the Audit Team to have the most potential for future sharing or release. This section describes further work that is being undertaken following publication of the Government Response, to build on the initial assessments of the Independent Audit through a programme of more detailed analyses to fully inform final decisions on the scope for efficiency gains. Most notably MOD, supported by Ofcom and independent consultants, has commenced its own series of detailed audits in a number of candidate bands. Early results are discussed below but this is a long-term programme to bring about progressive improvements in spectrum utilisation and further results will be reported in future editions of this Forward Look commencing 2009. Progress in specific areas will in the meantime also be published periodically at www.spectrumaudit.org.uk

## 6.1 Ministry of Defence

MOD currently has management rights to 35% of the spectrum bands listed in the UK Frequency Allocation Table (UKFAT). For many years the major challenge facing Government and regulators has been the need to reconcile the increasing demands for both military and civil spectrum. Shared use of common frequency bands by military and civil users has therefore been steadily increasing over recent years. In the UK around 99% of MOD managed bands have some form of sharing within them, either with other public sector users or with the commercial sector.

Nevertheless, there continues to be strong demand from civil users for spectrum for mobile and broadband applications, particularly in the UHF bands. The current Ofcom spectrum awards programme for example includes a number of frequency bands that are a consequence of recent agreements with MOD on sharing, release, or in some cases protection criteria for adjacent band services:

- 412 to 414 MHz and 422 to 424 MHz
- 872 to 876 MHz and 917 to 921 MHz
- 1452 to 1492 MHz
- 1781.7 to 1785 MHz and 1876.7 to 1880 MHz
- 2010 to 2025 MHz; 2290 to 2302 MHz and 2500 to 2690 MHz
- 10.125 to 10.225 GHz and 10.475 to 10.575 GHz
- 28 GHz / 32 GHz / 40 GHz

To date, agreements to share or release military spectrum have been considered on a case-by-case basis in response to specific proposals. The MOD does not have a comprehensive database of its current frequency assignments to fully characterise military use, which means that any assessments for compatibility with proposed new services often results in extended timescales to allow necessary research into current use before decisions are reached. Sharing criteria are nevertheless very often conservative.

The main reasons that the MOD has made limited progress to date in the further extension of sharing or release of its spectrum holdings has been the lack of suitable in-house resources to conduct this extensive work, along with difficulties in recruiting the expertise necessary to lead an auction-based review of spectrum holdings. To this end, in late 2006, Ofcom made such expertise available on secondment to the MOD to lead its *Cave Implementation Team* and the MOD are now recruiting the key financial and commercial support posts as a priority, as these will clearly be crucial to meeting the demanding timescales set out below.

### 6.1.1 Current military use of spectrum

Much of the detailed technical assignment and coordination of frequencies is carried out by local MOD personnel, as this is often the most operationally efficient and flexible means of meeting user requirements. This does not however always result in the most efficient overall utilisation of spectrum particularly as many of the bands are allocated nationally.

Delegation of assignment planning to local level has resulted in some instances where spectrum is under utilised in significant geographic areas. It also means that no single spectrum register, nor any combination of existing registers, currently exists in the MOD to accurately describe the technical characteristics of systems and the usage data required to identify potential spatial or temporal spectrum availability. There is also currently little incentive for users to offer, or be directed to offer, assignment information for registration centrally.

#### *Improving MOD assignment records*

A comprehensive and accurate database of assignments is an essential precursor to improving the efficient management of MOD radio spectrum holdings. Work commenced in mid 2006 on a programme that is intended to lead to the creation and ongoing maintenance of a central system for storage,

management and retrieval of assignment records for MOD bands. This is expected to improve the re-use of frequencies and hence increase efficiency in the technical assignment of MOD services, and will also enable faster and more accurate identification of opportunities to share or release surplus capacity whilst recognising the enduring outputs of MOD in its Public Service Agreement (PSA). By May 2008, MOD will complete a database of spectrum use of the bands identified by the Independent Audit.

*Prioritising bands for detailed audit*

It was clear at the outset that the collection, collation and verification of assignment data for all MOD spectrum holdings (representing some 35% of available UK spectrum bands) would be a very significant challenge that could only be fully completed in the longer term and subject to availability of sufficient resources. Decisions also need to be made on database design taking into account the interaction required with other Government Departments and Agencies. The MOD therefore decided, with agreement of HM Treasury, to prioritise the activities with a view to completing detailed audits in a small number of key bands. The purpose of this was threefold. It would:

- Attempt to confirm possible early gains in those bands identified within the Independent Audit as having potential for early release or sharing;
- Provide a better understanding of the scope of work and the resources needed to complete a series of ongoing detailed audits;
- Inform decisions on likely format and management of any future central assignment database

The bands identified, in consultation with Ofcom and subsequently agreed between MOD and HM Treasury, as priority candidates for the first phase of detailed audit are:

- 406.1 to 430 MHz

- 2.7 to 3.4 GHz
- 3.4 to 3.6 GHz
- 4.4 to 5 GHz
- 7.9 to 8.4 GHz
- 8.5 to 10.5 GHz
- 13.25 to 14 GHz

### 6.1.2 Potential for changes to allocations following first phase detailed audit

MOD has initiated a programme of work to identify which spectrum can be released and when. The release of priority bands will begin during 2008 with further bands following in 2009. A significant proportion of the MOD's spectrum holdings will be released during 2009 and 2010. To date, this programme has examined the first three bands:

**406.1 to 430 MHz:** An independent audit by QinetiQ found evidence of inefficient utilisation of spectrum in this band. Allocations 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 allocations were made regionally, thus leaving scope for third party access in other geographic areas subject to suitable safeguards to minimise mutual interference. Further work will determine the areas where spare capacity is available. MOD will complete the audit of this band by the end of the year.

**2.7 to 3.4 GHz:** The Independent Audit identified this radar band as having potential opportunities for both geographic release of spectrum, and for increased sharing as a result of technological developments on both commercial communications systems and radar systems. Subsequently more detailed analysis by QinetiQ has shown that the band is more congested than was apparent to the Independent Audit team although there may be scope for efficiency gains nearer the top of the band where only a very limited number of systems are operating. The PSSTG is providing the focus for a project to carry out practical field trials to determine the sharing potential between radar

and a number of wireless communication technologies. MOD will complete the detailed audit of this band by the end of the year.

**3.4 to 3.6 GHz:** There is currently limited use of this band by MOD systems (which includes NATO use) 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 2017) and that significant use is made of the band for Programme Making and Special Events (PMSE). Further detailed analysis of the band has been prioritised. MOD will complete the detailed audit of this band in summer 2007 with a view to determining early release for other band sharing applications.

The remaining bands have not to date been considered in detail but will form part of the continuing work programme:

**4.4 to 5 GHz**: This is a NATO (Type 1) harmonized band and consequently would be extremely 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 QinetiQ study recommended that further research in this band should be a low priority. MOD will complete the detailed audit of this band in spring 2008.

**7.9 to 8.4 GHz**: The bands 7250-7750 MHz (down-link) and 7900-8400 MHz (up-link) are used for military fixed-satellite communications and are the primary link to UK forces operating overseas. This allocation is a harmonised NATO band and many partner countries have similar arrangements. The audit priority for this band is low and MOD will complete it in spring 2008.

**8.5 to 10.5 GHz**: This NATO harmonized band is used for a variety of military mobile radars, normally as part of larger weapons systems. A 500 MHz sub-

band from 9000 - 9500 MHz is shared with civil radars including local coverage at airfields and the majority of maritime navigation radars. The audit priority for this band is low and MOD will complete it in spring 2008.

**13.25 to 14 GHz**: A NATO band described as essential for land, naval and airborne radars. 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. The audit priority for this band is low and MOD will complete it in spring 2008.

### 6.1.3 Changes to spectrum management – improving assignment records

The first phase of the detailed audit provided useful information about options for future collection of spectrum data and the conduct of further phases of investigation. A number of scenarios have been identified for future management of this data ranging from improvements to existing databases through to a fully integrated single database and associated spectrum management tools. No final decision has been reached yet and any proposals will need to be fully analysed in terms of user requirements and in consideration of Ofcom's proposals for Crown RSA (see chapter 4). But it is likely that any final solution will be implemented through a gradual migration to new recording systems coordinated with a phased programme of data collection, verification and cleansing. In addition to reducing the risk in such a major undertaking, it is considered that a phased approach is the best means to avoid delaying any opportunities for early efficiency gains through timely introduction of opportunities for sharing or release of spectrum in priority areas.

### 6.1.4 Future MOD spectrum needs

The MOD will publish a detailed implementation plan by May 2008, including plans for future military spectrum requirements and plans for the sale of those bands that can be released.

Military requirements for electronic communications are increasing. This is due in summary to:

- Introduction of network enabled force structures for increased information transfer to, from and between personnel;
- The need for more agile and responsive capability requiring improved situational awareness and positioning information;
- Increased training and exercises within the UK to maintain operational capabilities;
- The need to increase deployments to counter increased terrorist threats.

The challenge is clearly to meet corresponding demands for increased bandwidth within existing allocations through improvements in spectrum management efficiency. The Government believes that with a combination of investment in more efficient technologies and appropriate regulatory incentives, this can be achieved consistent with a policy to share or release capacity for non-military applications. However, it should be noted that in order to achieve effective defence capability, some military applications use the spectrum in what would be deemed an inefficient manner in civil terms.

The detailed audits of the key frequency bands below 10 GHz discussed in section 6.1.2 above identified factors that will drive demand for additional spectrum capacity in the short to medium term but also those that will assist in reducing overall bandwidth. These factors are identified below.

*Factors driving demand for increased MOD capacity below 10 GHz*

There are a number of current procurement programmes, and previously planned enhancements to military communication capabilities, that will see the introduction of a number of replacement radio networks for voice and data in the next seven years. These are intended to improve military capability through higher data rate, increased resilience and greater flexibility but will

require correspondingly more spectrum than the systems that are being replaced.

Within the NATO band **225 to 400 MHz** these include:

- Replacement of the current *Ptarmigan* battle space trunked radio system, which will be phased out in the period up to 2015 and is being progressively replaced by the *Cormorant* mesh network.
- The introduction of *Falcon* from 2010, also replacing *Ptarmigan* but providing further resilience and mobility;
- Replacement of the current *Clansman* system by *Bowman*;
- Introduction by the United States of high data rate military satellite communications (SATCOM).

Within the range **4.4 to 5 GHz**:

- Introduction of long-range bearer services;
- Command and control data and imaging links for latest generation Unmanned Aerial Vehicles (UAVs) for surveillance activities;

Within the range **7.7 to 8.4 GHz**:

- Introduction of additional satellite uplinks (7.7 to 8.4 GHz) to meet increasing demand for higher data rate communications beyond line of site (BLOS).

Within the range **8.5 to 10 GHz**:

- Introduction of Synthetic Aperture Radar (SAR) sensors to UAVs in response to advances in technology that have provided products at lower cost and with reduced weight;

*Factors limiting future MOD demand below 10 GHz*

Amongst the factors that will assist in providing increased capacity within a reduced overall bandwidth are:

- Improved accuracy in the spectrum assignment process, including improvements in databases and other spectrum management tools as discussed in section 6.1.1 above. The most significant efficiency gains are expected in bands below 450 MHz where improved planning resolution will enable tighter re-use of frequencies.
- The introduction of improved data and information management is being investigated and may be able to reduce spectrum demand.
- The concept of convergence of network and spectrum management together with the introduction of quality of service management should reduce peak data-rate needs and is being considered in the research community.
- Introduction of spectrum agile RF equipment and waveforms, including adaptive radio and radar, should enable greater freedom of operation in harsh interference environments.

### 6.1.5 Summary

The MOD has initiated a programme of work to identify which spectrum can be released and when. This programme has examined first the 3.4 to 3.6 GHz, 2.7 to 3.4 GHz and 406.1 to 430 MHz bands and is in the process of identifying spectrum which can be freed and released to the market during 2008.

The MOD will complete the audit of 3.4 to 3.6 GHz in summer 2007, and of 2.7 to 3.4 GHz and 406.1 to 430 MHz by the end of 2007 and the remainder of the 23 priority bands identified by the Independent Audit.

By May 2008 the MOD will complete a database of spectrum use of the bands identified by the Independent Audit and will publish a detailed

implementation plan setting out plans for the sale of those bands that can be released, and including plans for future military spectrum requirements. The release of priority bands will begin during 2008 with further bands following in 2009. A significant proportion of the MOD's spectrum holdings will be released during 2009 and 2010.

## 6.2 Civil Aeronautical

Aeronautical spectrum is allocated by the ITU 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 Practises* (SARPS) issued by the International Civil Aviation Organisation (ICAO).

### 6.2.1 Current civil aeronautical spectrum use

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, the CAA represents the UK 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 influence aeronautical spectrum use in the UK.

### 6.2.2 Potential for changes to civil aeronautical allocations

Continued growth in air traffic is expected to be accompanied by a corresponding increase in aeronautical communications and increased pressure on spectrum. Increased capacity would have to be met through

more efficient use of existing allocations and there are a number of such initiatives that will continue to be supported by the CAA within the international aeronautical community. In the area of VHF communications for example, demand for frequencies to support airspace restructuring and developing airports has continued to grow at a rate which cannot be met through the traditional use of 25 kHz channel spacing. Recognising this issue, Europe embarked on a programme in 1998 to introduce 8.33 kHz channel spacing in the VHF communications band. Initially implemented to provide communications coverage above 24500 ft in core Europe, this has been expanded to further States including the UK and will be, with effect from March 2007, applied to airspace above 19500 ft. Whilst this will help meet demand, research has shown that it will not meet demand across Europe and a further phase is being developed to ultimately apply 8.33 kHz spacing throughout the region; a formal decision on this is expected in May 2007.

Analysis has shown that even this work to improve spectrum efficiency will not support aeronautical communications requirements post 2020. As a result, parallel work is being conducted in both Europe and the USA to identify a suitable technology to support the future communications infrastructure. This work will ultimately lead to a global decision within ICAO on what this future communications system will be. In the context of the spectrum management reforms being introduced in the UK, the significant issue is what spectrum will be necessary to support the system. Within the ongoing work, activity is underway to assess and identify which aeronautical bands could meet this requirement. The aim is to utilise existing aeronautical spectrum using innovative design and technology applications to enable sharing with existing aeronautical systems. In particular, consideration is being given to potential sharing in L-band but significant further work will be necessary to demonstrate feasibility.

In Secondary Surveillance Radar (SSR), the continuing introduction of Mode S further enhances the use of **1030 and 1090 MHz** to meet growing demands on the surveillance infrastructure. Although there are further developing technologies, ICAO has determined that 1090 MHz will also support global

initial applications of *Automatic Dependent Surveillance – Broadcast* (ADS-B). Primary radar continues to be a requirement in both terminal and en-route requirements. Changes to institutional arrangements formalising processes between MOD, MCA and CAA, together with work on clearly defining radar protection criteria should also lead to improved efficiency.

### 6.2.3 Changes to civil aeronautical spectrum management

Aviation must continue to strive for spectrally efficient technical hardware solutions as well as ensuring that the institutional management arrangements deliver the best practices, recognising at all times that safety must be paramount. A particular development in the area of spectrum management is the work to introduce throughout the European region, a web based frequency planning and coordination tool known as SAFIRE. This aims to provide a significantly more efficient process in terms of international coordination thereby contributing to spectral efficiency. It is anticipated that this system will become operational mid 2007.

Beyond this, the UK, within its international obligations for maintaining interoperability within the global aviation community, has limited scope for unilateral action in regard to changes to the management and use of aeronautical allocations since as noted earlier most aeronautical spectrum is allocated globally by the ITU. Airborne use of spectrum also poses particular challenges to the re-use of frequencies due to the extended range of transmissions involved. One area identified by the Independent Audit where the UK could make potential efficiency savings is in the radionavigation bands. The Government, in its response, undertook to begin work as soon as possible to determine whether sharing between aeronautical radar and other services is technically feasible.

As noted in chapter 4 above, work is already underway on a programme of theoretical work, supported by practical field tests, to define the minimum safeguarding criteria for radionavigation. This includes civil aeronautical radar in the bands **1.215 to 1.35 GHz**; **2.7 to 3.1 GHz** (S Band) and **9 to 9.5 GHz** (X

Band). This programme, a collaborative exercise between the CAA, other public sector radar users, plus Ofcom and industry representatives, is intended to determine generic radar protection criteria by autumn 2007. The further intention is that final bandsharing criteria will be published in spring 2008, against which industry will be able to assess the potential for sharing spectrum within the aeronautical radar bands.

Any future sharing of radar bands will be subject to an open and transparent awards process. The availability of a benchmark for assessment of third party proposals for sharing, plus the introduction of AIP, will however provide the incentive for improving efficiency in the management of these valuable areas of spectrum.

### 6.2.4 Future civil aeronautical spectrum needs

Aviation uses a wide range of navigation systems to meet the necessary performance requirements throughout the different phases of flight and to ensure the appropriate level of redundancy. This inevitably creates a significant demand for spectrum. The key principles governing navigation systems policy are:

- Must support area and terminal navigation in controlled airspace
- Must provide reversionary capability in the event of failure
- Must provide a navigation reference to allow operation by diverse aircraft types regardless of airspace structure

Whilst the UK is a key participant in developing regional and global policy on navigation, it cannot easily act in isolation concerning the navigation infrastructure as it would undermine the ability to discharge international obligations. Furthermore, if the UK proceeded with uncoordinated mandatory requirements for navigation systems, it could result in restricting access to UK airspace, which would have a subsequent impact on the UK economy. A very

significant proportion of users would need to be equipped for a new system in order for it to be operationally viable.

The Government acknowledges the impact of legacy systems on spectrum requirements but also recognises that the economic cost and scale of achieving migration into new technologies on a regional and global basis is a significant obstacle. The Government nevertheless remains of the view that there is scope for rationalisation of navigation systems subject to the need to assess the safety implications and to fully understand the impact of removing existing systems.

A global navigation satellite system (GNSS) is an ICAO goal but a capability to revert to conventional (non satellite) navigation systems, for example VHF omni-directional range (VOR) and distance measuring equipment (DME) is considered necessary and this will continue to place demands on spectrum. The extent to which this reversionary capability has to perform will require careful assessment but the functionality will continue to need to meet safety and performance requirements consistent with ICAO policy that air traffic control should not be expected to provide navigational assistance.

With growing commercial interest in the introduction of Unmanned Aerial Vehicles (UAVs), there will be a need to consider the spectrum requirements necessary to support the command and control systems necessary for their operation. This will be pursued further once the operational requirements have been developed.

## 6.3 Civil Maritime

The ITU allocates much of the spectrum for maritime use on a global basis to enable worldwide interoperability, especially for distress and calling. Within the UK the Maritime and Coastguard Agency (MCA) manages spectrum used by HM Coastguard for operational communications. Both professional seafarers 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". MCA works closely with Ofcom and represents the UK in relevant international forums concerned with spectrum management including the ITU and the International Maritime Organisation (IMO).

Historically, before the widespread introduction of satellite communication, most of the spectrum allocated globally for distress and safety, search and rescue (SAR) and emergencies has been in the lower order bands below 400 MHz. The use of these bands remains an essential requirement for maritime communication. Indeed, there is expected to be increased demand for maritime data transmission in the HF bands. As noted in chapter 4, WRC-07 will be considering the case for expanding international allocations for short-wave (high frequency) broadcasting with potential impact on maritime and other public sector users. However, the high-frequency range of the spectrum has not featured in the Independent Audit and consequently is not considered further in the following section. The Government nevertheless acknowledges the importance of HF to all the sectors covered in this Forward Look and relevant departments will engage fully with Ofcom, through IFPG, to agree UK policy as part of the preparations for WRC-07.

### 6.3.1 Current civil maritime spectrum use above 400 MHz

The band **406 to 406.1 MHz** (Mobile Satellite) 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. They are also widely used by non-SOLAS craft, aircraft and persons.

Six 25 kHz channels and four 12 ½ kHz channels are permitted in the band **457 to 468 MHz** (Mobile) to be used for on board communications. They may not be available for use in all territorial waters and tend to become congested in ports where ships overhear one another. There is a growing requirement for internal wireless communications on ships in line with the increasing land based use of wireless systems.

Deep-sea ships rely heavily on *Inmarsat* services operating in the bands **1530 to 1545** and **1626.5 to 1646.5 MHz** (Mobile Satellite). These bands are not exclusive to the maritime mobile service but, by footnote in the ITU Radio Regulations, communications of the GMDSS have priority access. SOLAS generally requires carriage of some form of satellite communication equipment for voyages outside of the A2 sea area (150 NM from shore). These bands are likely to be required for the foreseeable future.

Satellite position fixing systems operating in the band **1559 to 1610 MHz** (Radionavigation Satellite) such as GPS have become essential for navigation of both SOLAS and non-SOLAS ships. Carriage of a receiver is a SOLAS requirement and the band is likely to be required for the foreseeable future. The band is not exclusive to maritime and the satellite systems are designed to be multi-modal.

S Band radar operating in the band **2900 to 3100 MHz** (Radionavigation) is widely used by larger 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 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.

The band **5470 to 5650 MHz** (Maritime Radionavigation) has been previously used for radars and radar transponders. It is now little used 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).

X band radar operating in **9300 to 9500 MHz** (Radionavigation) is widely used by SOLAS ships and very extensively by non-SOLAS including leisure vessels. It is a carriage requirement for all SOLAS ships and the use of the band is likely to be required for the foreseeable future.

The band **9200 to 9300 MHz** (Maritime Radionavigation) is not used by ships (apart from those in distress using Search and Rescue Transponders - SARTS), but used by some shore based radars of which there are 8 in the UK. Overall shore based 'X band' radar is used at 128 sites in the UK including three by HM Coastguard. There are additionally 93 racons (of which 79 are dual band).

### 6.3.2 Potential for changes to civil maritime allocations

Most maritime spectrum is, as previously noted, allocated globally by the ITU. The UK therefore, within its international obligations for maintaining interoperability within the global maritime community and ensuring safety of life at sea, has limited scope for unilateral action in regard to changes to the management and use of these allocations. One area where there is expected to be an increasing demand is in the high-frequency (HF) bands to meet increasing requirements for data services. This part of the spectrum is outside the scope of this Forward look, but as noted in chapter 3, will feature in the agenda of WRC-07 and hence be included within the necessary discussions between Ofcom and Government during development of the relevant UK policy position.

One area identified by the Independent Audit where the UK could make potential efficiency savings is in the radionavigation bands. The Government, in its response, undertook to begin work as soon as possible to determine

whether sharing between maritime radar and other services is technically feasible.

### 6.3.3 Changes to civil maritime spectrum management

As noted in chapter 4, work is already underway on a joint programme of theoretical work, supported by practical field tests, to define the minimum safeguarding criteria for radionavigation. This exercise includes maritime radar in the bands **2.9 to 3.1 GHz** (S Band) and **9.3 to 9.5 GHz** (X Band). The programme, a collaborative exercise between MCA; other public sector radar users; Ofcom, and industry representatives is intended to determine generic radar protection criteria by autumn 2007. It is further intended that final band sharing criteria will be published in spring 2008, against which industry will be able to assess the potential for sharing spectrum within the maritime radar bands.

The availability of a published official benchmark for assessment of third party proposals for sharing, plus the introduction of AIP and potential for trading will provide the necessary incentive for improving efficiency in the management of these valuable areas of spectrum. It should be noted that any future sharing of radar bands by services meeting the safeguarding criteria will also necessarily be subject to an open and transparent awards process.

### 6.3.4 Future civil maritime spectrum needs

Current activities in the maritime industry are directed towards development of suitable solutions for e-navigation, a requirement for ships to be permanently on line to shore networks. This will require access to additional satellite spectrum in ocean areas and VHF/UHF spectrum in coastal areas.

E-navigation will not be an alternative to the use of radar on board ships, for which no alternative has been proposed at the present time.

In the future, use is envisaged of the European Satellite Navigation System GALILEO, which is designed for every phase of marine navigation: ocean, coastal, port approach and port manoeuvres, under all weather conditions.

In addition to the potential increase in demand for HF spectrum for data requirements noted in section 6.3, it is expected that the use of low power licence exempt bands will increase for onboard voice and data.

## 6.4 Emergency and Public Safety Services (E&PSS)

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) and Department of Health (for the ambulance services). The Scottish Executive has similar responsibilities in respect of services in Scotland. These and other interested departments provide advice to Ofcom on the management of relevant spectrum holdings through the *Public Safety Spectrum Policy Group* (PSSPG). An overview of the role of PSSPG is included within Annex C.

### 6.4.1 Current emergency service and public safety spectrum use

Until recently most emergency service radio communication requirements have been satisfied through self-provided individually maintained schemes using spectrum allocations set aside for their exclusive use. Much of this spectrum has previously been managed within the public sector. (Until 2003 for example, the Home Office carried out the detailed management of most major E&PSS bands although as explained below this is now the responsibility of Ofcom).

The decision to outsource the core mobile voice and data communications facilities of the police service plus increasing use of public telecommunication networks means that there has been a significant reduction in self provided systems and a corresponding decrease in demand for associated frequency assignments. There remains however a small number of specialist facilities that continue to be self-provided either because there are no commercially available alternatives or because of the specific operational nature of the application.

### 6.4.2 Potential for changes to E & PS allocations

The migration of police mobile and hand portable radio communications to the new national digital network provided by O2 Airwave will be completed in Great Britain in July 07. Similarly the ambulance and fire services in Great Britain are due to complete their migration to the Airwave service in December 08 and June 09 respectively.

Once migration to the Airwave service is fully complete, some sub-bands previously used for self provided mobile radio networks are to become available for reallocation. These sub-bands are contained primarily within the frequency bands listed below:

- 70.5 to 71.5 MHz
- 80 to 84 MHz
- 138 to 141.9 MHz
- 143 to 144 MHz
- 146 to 149 MHz
- 152 to 153 MHz
- 153 to153.5 MHz
- 154 to 156 MHz
- 156.8375 to 174 MHz
- 235 to 328.6 MHz
- 335.4 to 399.9 MHz
- 450 to 470 MHz

PSSPG will, in consultation with users, determine the residual radio spectrum that will need to be repackaged and retained for specialist applications that cannot migrate to Airwave or be provided by another existing commercial network or through self provision. This will allow the scope for releasing or sharing any remaining spectrum to be assessed.

### 6.4.3 Changes to management of E & PS spectrum holdings

The procurement of a common outsourced mobile radio service to meet the primary voice and data requirements of police, plus a number of unrelated changes in the machinery of government and departmental responsibilities, resulted in the detailed management of the frequency assignments identified in 6.4.2 above being transferred from the Home Office to the Radiocommunications Agency in 2003. Ofcom now manages these bands, apart from in Scotland where the Scottish Executive maintains a technical assignment capability for emergency and some public safety services north of the border.

Ofcom works closely with sponsoring departments, through the PSSPG, to agree the general policy for access to spectrum set aside for E&PSS. A small, dedicated Ofcom team is currently responsible for E&PSS frequency assignment planning and processing licence applications from users although this arrangement is under review.

Chapter 8 of the Independent Audit, and the associated Recommendation 8.1 set out a number of suggestions for improving the functioning of the PSSPG. Amongst the recommendations was the suggestion that PSSPG should consider whether it, or a contracted party, should act as a band manager for public sector spectrum. In 2006, Ofcom and PSSPG jointly commissioned consultants Mott MacDonald to carry out a preliminary study to report on the issues that would need to be addressed before establishing a third party band manager for E&PSS spectrum.

In light of this initial study, the PSSPG is currently considering options for the future management of E&PSS spectrum holdings involving the use of market mechanisms to secure the best possible use of the spectrum and maximise opportunities for commercial bandsharing while safeguarding the continuing operational effectiveness of E&PSS services. The PSSPG will report on proposals with firm options and resource requirements to UKSSC by autumn

2007 and the Government will decide the future arrangement by the end of 2008.

Three generic categories of E&PSS spectrum use can be identified as follows:

- Public Provision
- Airwave
- Self-assigned locally coordinated channels

## Public Provision

The E&PSS services already make use of public service providers for certain 'non critical' aspects of the communication requirements. The networks can be made secure, however the resilience of these systems need to be improved considerably to enable guaranteed communication in adverse circumstances. Commercial provision of mobile broadband tailored to meet the requirements of the individual E&PSS services offers the most appropriate solution.

## Airwave

The current national Airwave service contract provides highly secure and resilient voice and data communications to meet the primary mobile requirements of police, and shortly fire and ambulance services. The first police contract for the service will expire in 2016 and to ensure adequate time for planning and continuity of communications, a decision is required by the end of 2009 regarding the successor to the present Airwave service. Amongst the considerations for any replacement service will be the need for higher data rates and the extent to which some applications can be provided through existing public networks.

### Self-assigned locally coordinated channels

It is currently anticipated that there will remain for the foreseeable future a number of critical E&PSS applications that rely on access to a limited amount of dedicated spectrum for local assignment and coordination including:

- Transportable Video links
- Speed detection and road safety cameras
- Specialist communication devices

In most instances, these requirements are by agreement presently met through sharing arrangements in MOD bands. Geographical restrictions protecting established military use places severe limits on E&PSS in some areas. All such sharing arrangements are nevertheless under review as part of the MOD's detailed audit of its bands referred to in section 6.1, and with a view to:

- Reviewing current sharing agreements between military and civil emergency services;
- Improving day to day coordination and spectrum assignment planning;
- More accurate apportionment of costs between departments through a review of AIP, improving incentives for efficiency;
- A better balance between spectrum bandwidth and infrastructure

### 6.4.4 Future spectrum needs for E&PSS

The independent study carried out by consultants Mott MacDonald referred to in section 6.4.3 above, included a detailed audit of existing E&PSS bands. In summary, the study concluded that:

- In the short term (2 to 3 years), following decommissioning of legacy equipment and migration of associated voice and data requirements to

the Airwave service, spectrum will be available in most existing E&PSS bands below 470MHz for release and re-allocation;

- In the medium term (5 to 10 years), the number of core E&PSS users will grow in addition to those organisations within the scope of the Civil Contingencies Act 2004. This, and the increased range of broadband data applications, will place additional demands on spectrum generally. It is expected that this will be partly offset by improvements in technology including use of ubiquitous wireless communication devices.

The scope for any release of existing bands below 470 MHz, including the timetable, will be published together with plans for future management of E&PSS spectrum holdings on the www.spectrumaudit.org.uk website by end 2007.

## 6.5 Science Services

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. The two largest users of spectrum within the science services community are radio astronomy and meteorological services respectively. Under ITU Radio Regulations all emissions are prohibited in most of the passive bands used by radio astronomy and meteorological services.

### Radio astronomy

Radio astronomy is a passive service involving the detection and analysis of extremely low signals from distant cosmic sources. The increase in use of radio spectrum generally means that levels of electromagnetic emissions from this use are increasing and there is an increasing risk that this will compromise radio astronomy observations. Ofcom has made regulations to introduce Recognised Spectrum Access (RSA) to provide greater security about the quality of the spectrum used for radio astronomy and plans to make this tradable once arrangements are in place to provide effective incentives by allowing PPARC to retain sufficient revenue from the proceeds.

The Government welcomes these developments, which will provide an enhanced level of security for radio astronomy whilst also providing incentives for temporal or geographic sharing or other suitable leasing arrangements that are compatible with scientific objectives.

### Meteorological service

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.

The remainder of this section on science services deals exclusively with the Met Office use of spectrum. The Met Office's use of the spectrum falls into three main categories:

- Passive sensors
- Active sensors
- Other

### Passive use:

This is primarily by satellites observing the Earth's atmosphere and surface remotely. Reliable global access to key frequency bands is essential to forecasting and monitoring global changes, particularly related to anthropogenic climate change.

In common with other passive uses of spectrum, there is a high susceptibility to interference including disturbance due to out of band emissions from adjacent band services. Interference to passive bands can result in corrupt data which is inherently difficult to detect and can in turn become ingested into numerical forecast models. The integrity of UK meteorological data depends on access to spectrum that is sufficiently clear of emissions from interference to allow reliable and sufficient observations[9].

### Active use:

This includes the use of weather radars, wind profilers, ocean buoys and radiosondes.

[9] Impact on UK from pollution of spectral wavebands used for meteorological observation, Met Office, July 2006

Other use:

The Met Office receives a significant proportion of its data and products from satellite operators such as EUMETSAT and NOAA who all require reliable access to the spectrum to receive raw data from satellites and to disseminate processed data and products. Commercial satellite broadcast operators using the C-band and Ku-band are increasingly being used to distribute the data.

### 6.5.1 Current Meteorological Service use of spectrum

The principal frequency bands allocated to the meteorological service and referred to in the Independent Audit are:

**137 to 138 MHz**: used for meteorological satellite automatic picture transmissions (APT). The Met Office does not currently make use of these transmissions and has no plans to do so in the future. There is a significant amateur use, however.

**153 to 154 MHz**: used for meteorological aids, currently including ocean buoy and data telemetry. It may be possible to investigate alternatives.

**400.15 to 406 MHz band**: used for radiosondes by the Met Office, the MOD and some research organisations. It is also used for collecting ocean buoy data by satellite. There are a number of other applications currently sharing the band such as transmitters used in tracking bird migration and ultra low power medical implant devices. The Met Office is therefore not the exclusive user of this band. Further, radiosondes from elsewhere in Europe can fly over the UK and vice versa, which needs to be taken into consideration in considering possible alternative uses of the band. Radiosondes could be adversely affected if high power transmissions take place in the adjacent MOD band 406.1 to 410 MHz band which is one of those identified for release/sharing.

**915 to 921 MHz**: used for wind profilers

**1270 to 1295 MHz**: used for wind profilers

**1400 – 1427MHz**: a passive band used for measuring soil moisture and ocean salinity from orbit with significant recent investment in space-borne instrumentation requiring continued protection from active transmissions.

**2700 to 3400 MHz** (S-band) used for meteorological radars: Although the Met Office does not currently operate in this band, it is expected this band may need to be used in the future where the capability to detect widespread rainfall at extreme range over the ocean is required, such as in the Shetlands and also if the incidence of extreme rainfall events increases in the future. This is due to the lower rainfall attenuation at S-band compared with C-band.

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**8175 to 8215 MHz**: used for direct reception from polar orbiter meteorological satellites. This will become increasingly important with the next generation of polar satellites.

**9300 to 9500 MHz** (X-band) used for meteorological radars. The Met Office does not currently operate radars at these frequencies and is unlikely to do so in the future.

### 6.5.2. Potential for changes to Meteorological Service allocations

The Met Office is currently carrying out work to review meteorological service requirements in the band **400.15 to 406 MHz**. This includes UK trials of more spectrally efficient digital radiosondes plus participation in formal discussions about the potential for more efficient use of this band with representatives of other members of the World Meteorological Organisation (WMO). It is becoming clear from these discussions that it is unlikely that Metaids usage of this band could be reduced below 3 MHz in total for the foreseeable future. The Met Office is in the meantime already working with Ofcom with the objective of releasing half of the 400.15 to 406 Metaids band in the UK. This is subject to international agreement and that of the other UK users of this band.

The Met Office will continue to review its requirements for the use of the 400 MHz Metaids band. It is likely that increasing use of wind profilers will mean that in the longer term the radiosonde network could be reduced, although two observing stations would remain because of international observation commitments and the need to validate remotely sensed observations such as those from satellites, and to carry out inter-comparison trials.

### 6.5.3 Changes to Meteorological Services spectrum management

The Independent Audit recommended[10] 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 and to report back on the outcome in this Forward Look.

Initial 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. An existing Memorandum of Understanding (MoU) between the MOD and the Met Office defining the scope of spectrum management cooperation is also currently under review with the aim of identifying improvements in management efficiency. It is expected that Met Office will conclude agreement with MOD on a revised MoU by the end of 2007.

No immediate changes will be made to the current fund holding arrangements for meteorological bands. The Government will however keep the issue of fund holding under review as the wider reforms in spectrum management are implemented. In the meantime, significant efficiency targets, such as the

[10] Recommendation 9.3, p79, Independent Audit of Spectrum Holdings, December 2005

introduction of new technologies that will allow release of spectrum, are already imposed by the Public Weather Service (PWS).

### 6.5.4 Future spectrum needs for Meteorological Services

Continued meteorological service access to key global passive bands is essential to forecasting and the monitoring of climate change. A series of international meetings have been taking place involving the main National Meteorological Services, including the Met Office and NOAA in the USA, and the main agencies involved with developing and operating the satellite remote sensing systems such as NASA, ESA, and EUMETSAT to determine the requirements for passive band allocations at frequencies between 300 and 3000 GHz.

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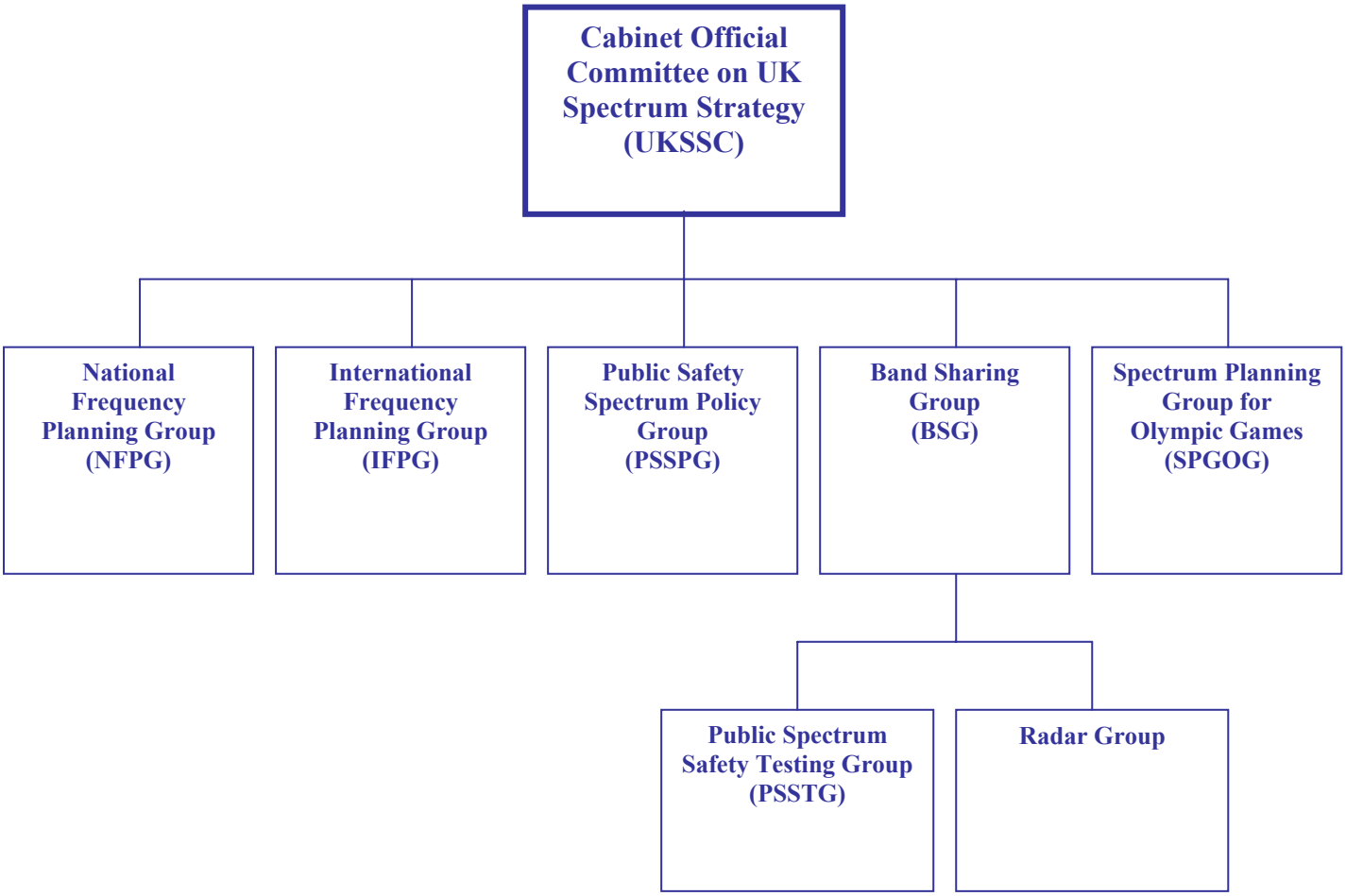
## 7. Glossary

| | |
|---|---|
| AIP | Administered Incentive Pricing |
| CAA | Civil Aviation Authority<br>http://www.caa.co.uk/ |
| CEPT | The European Conference of Postal and Telecommunications administrations |
| CA | Communications Act 2003<br>http://www.opsi.gov.uk/acts/acts2003/20030021.htm |
| DCMS | Department for Culture, Media and Sport<br>http://www.culture.gov.uk/ |
| DME | Distance Measuring Equipment |
| DTI | Department of Trade and Industry<br>www.dti.gov.uk |
| ETSI | European Telecommunications Standards Institute<br>http://www.etsi.org/ |
| GBAS | Ground Based Augmentation System |
| GHz | Gigahertz (frequency of one thousand million Hertz) |
| GNSS | Global Navigation Satellite Systems |
| GSM | The Global System for Mobile Communications |
| HMT | HM-Treasury<br>http://www.hm-treasury.gov.uk/ |
| ICAO | International Civil Aviation Organisation |
| IFPG | International Frequency Planning Group |
| ILS | Instrument Landing System |
| ITU | The International Telecommunication Union<br>www.itu.int/ |
| kHz | kilohertz (frequency of one thousand Hertz) |
| LOCOG | London Organising Committee for the Olympic Games and Paralympic Games<br>http://www.london2012.com/en |
| MCA | Maritime and Coastguard Agency<br>http://www.mcga.gov.uk/ |
| MHz | Megahertz (frequency of one million Hertz) |
| MLS | Microwave Landing System |
| MoD | Ministry of Defence<br>http://www.mod.uk/ |
| MoU | Memorandum of Understanding |

| | |
|---|---|
| NATS | National Air Traffic Services Ltd<br>http://www.nats.co.uk/ |
| NFPG | National Frequency Planning Group |
| NPIA | National Policing Improvements Agency<br>http://police.homeoffice.gov.uk/police-reform/policing-improvement-agency/ |
| Ofcom | The Office of Communications<br>www.ofcom |
| PMSE | Programme making and special events |
| PPARC | Particle Physics and Astronomy Research Council<br>http://www.rcuk.ac.uk/links/pparc.htm |
| PSSPG | Public Safety Spectrum Policy Group |
| PSSTG | Public Spectrum Safety Testing Group |
| RA | Radiocommunications Agency |
| RRC | Regional Radio Conference |
| RSA | Recognised Spectrum Access |
| SE | Scottish Executive<br>www.scotland.gov.uk/ |
| SES | Spectrum Efficiency Scheme<br>http://www.ofcom.org.uk/research/technology/spectrum_efficiency_scheme/ |
| SOLAS | International Convention for the Safety of Life at Sea |
| SPGOG | Spectrum Planning Group for Olympic Games |
| UAV | Unmanned Aerial Vehicle |
| UKSSC | UK Spectrum Strategy Committee |
| VOR | VHF omni-directional radio range |
| WRC | World Radio Conference<br>http://www.itu.int/ITU-R/conferences/wrc/index.asp |
| WT Act | Wireless Telegraphy Act 2006<br>http://www.opsi.gov.uk/acts/acts2006/ukpga_20060036_en.pdf |

CABINET OFFICIAL COMMITTEE ON UK SPECTRUM STRATEGY

## UKSSC – STRUCTURE OF SUBORDINATE GROUPS




**March 2007**

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CABINET OFFICIAL COMMITTEE ON UK SPECTRUM STRATEGY

## UKSSC TERMS OF REFERENCE

a). To draw up policies and strategic plans for the future allocation of the spectrum in such a way as to meet the needs of users in both public and private sectors and in industry, with emphasis on the provision of vital services and the generation of national wealth;

b). To oversee the management and regulation of the radio spectrum, to ensure that agreed plans are correctly implemented, that efficient use is made of available capacity, and that spectrum is used to the best national advantage;

c). To determine positions in line with national interests to be taken by the UK in international fora.

Note: The UKSSC is jointly chaired by DTI and MOD and membership is open to senior representatives of all interested Whitehall departments and agencies. By agreement, a representative of Ofcom is also generally in attendance.

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CABINET OFFICIAL COMMITTEE ON UK SPECTRUM STRATEGY

## SUBORDINATE UKSSC GROUPS

### International Frequency Planning Group (IFPG)

Coordinates departmental interests in proposals for, and results of, the work of the International Telecommunication Union (ITU) and other specialist agencies, and in the deliberations of any other international organisations, in the field of radio frequencies. The IFPG membership extends beyond Government to include Ofcom, major operators, broadcasters, industry and other relevant interests.

### National Frequency Planning Group (NFPG)

Responsible for maintaining the UK Frequency Allocation Table (UKFAT). It works mainly by correspondence, updating UKFAT following proposals from relevant Government departments. NFPG agreement is sought before the UK administration commits itself to all ECC Decisions. Membership of NFPG is limited to Government and Ofcom.

### Public Safety Spectrum Policy Group (PSSPG)

Advises UKSSC and Ofcom on the broad spectrum requirements to meet the current and future essential needs of UK emergency service and public safety (E&PSS) users. Sets policy and advises Ofcom on access to E&PSS spectrum. Identifies surplus E&PSS spectrum and recomends timing and manner for release. Membership is limited to relevant Government departments and Ofcom. PSSPG is independently chaired.

### Spectrum Planning Group for Olympic Games (SPGOG)

Supports Ofcom in meeting its responsibility to organise a full spectrum plan for the 2012 London Games - addressing uses that fall both within and without the

Government guarantees – and to arrange all the spectrum licences in hgood time in support of the plan. SPGOG includes representation from all relevant Government departments, agencies, the London Organising Committee for Olympic Games (LOCOG), the Olympic Delivery Authority and Ofcom.

### Band Sharing Group (BSG)

Oversees the implementation of the spectrum management reforms in the public sector as set out in the Government's Implementation Plan. Responsible for creation of the biennial Forward look. Oversees and directs the work of the subordinate Public Safety Spectrum Testing Group (PSSTG) and Radar Group, agreeing priorities with each group in accordance with the strategy set out in the Forward Look. Membership is limited to Government departments, agencies and Ofcom

### Public Safety Spectrum Testing Group (PSSTG)

Agrees suitable specifications for a test programme to be carried out on the use of bandsharing technologies designed to permit sharing between radionavigation devices and communications systems. Responsibility for developing methodologies and test plans on systems that use spectrum with a public safety or security implication. The PSSTG reports to the Bandsharing Group (BSG). Membership is limited to interested Government departments, agencies and Ofcom.

### Radar Group

Responsible for carrying out a review of navigation aids and landing systems to consider whether any rationalisation of multiple allocations is feasible. The Radar Group reports to the Bandsharing Group (BSG). Membership is limited to interested Government departments, agencies and Ofcom.

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