NATS Response to Ofcom's Second Consultation (issued 22 December 2009) on Applying Spectrum Pricing to The Aeronautical Sector

NATS recognises that Ofcom invested considerable effort in analysing and responding to responses to the July 2008 Consultation "Applying spectrum pricing to the Maritime and Aeronautical sectors". We have already welcomed the fact that Ofcom is now proposing not to implement AIP for spectrum used by aeronautical navigation and surveillance systems but instead have proposed[1] that Government should undertake a new strategic management role for bands allocated for these services.

The reduced scope of the current consultation allows NATS to be more specific in our response to the December 2009 consultation document.

In summary, while NATS supports greater efficiency in the use of spectrum, NATS does not believe that the introduction of Administered Incentive Pricing (AIP) for spectrum used for Aeronautical VHF Communications purposes as proposed will accelerate the delivery of spectrum efficiencies to be achieved through the completion of the change to 8.33 kHz, or impact change in technology and/or procedures. Furthermore, NATS is not convinced that the VHF band will be subject to excess demand in the UK following the completion of the 8.33 programme.

This note sets out NATS' arguments in more detail. NATS responses to the questions raised in the Ofcom consultation document are included at Attachment 1.

AIP Will Not Incentivise the Completion of the 8.33 Programme

The main currently available route to greater efficiency in use of VHF spectrum is via greater use of 8.33 kHz channel spacing compared to existing 25 kHz channels. The proposed AIP fees are aimed at incentivising the use of 8.33 kHz channels. NATS fully supports the transition to 8.33 kHz channel spacing. Indeed NATS has been active since the early 1990's in the preparation of international standards, implementation of the existing 8.33 Implementing Rule (Commission Regulation 1265/2007) and the planning for the completion of the 8.33 transition.

NATS has already taken steps, and made the necessary investments – see details below, to make greater use of 8.33 kHz channels. However NATS is unable to complete the transition to 8.33 kHz at all flight levels until there is a European rule that mandates aircraft equipage. The UK's international obligations are therefore currently blocking the completion of the change to 8.33 kHz channel spacing in the UK. European States are currently developing a revision of the 8.33 kHz Implementing Rule (Commission Regulation 1265/2007) to mandate 8.33 kHz below FL195. However this revision is not expected to be agreed until 2011 and the earliest dates for mandatory equipage are expected to be 2012 for new aircraft and 2018 for all aircraft to be 8.33 compliant. The introduction of AIP within the UK at this time will therefore not provide a further incentive or allow the rate of 8.33 kHz channel conversions to be accelerated.

It is NATS view that Ofcom's AIP proposals are not proportionate to the costs minimised and therefore appear to be merely prescriptive. NATS therefore considers that as AIP will be unable to achieve its objective, AIP should not be introduced for VHF communications spectrum at this time.

The current situation is:

- NATS En-Route Ltd (NERL) has invested and upgraded its entire VHF communications infrastructure to be capable of 8.33 kHz operations as soon as aircraft equipage rates permit.

- NERL has completed the conversion to 8.33 kHz channel spacing in accordance with Commission Regulation 1265/2007 for all VHF communications in sectors above Flight Level 195, except where the geographic coverage area requires offset carrier operation within a 25 kHz channel. Currently 22 of NERL's 124 VHF assignments are for 8.33kHz channels. (approx. 17%)

[1] Ofcom consultation of 13 August 2009 on applying spectrum pricing to the maritime sector

- The Majority of NERL's customers are equipped with 8.33 kHz capability, a recent analysis above FL195 by Eurocontrol indicated that 99.7% of flights were 8.33 kHz compliant, this figure includes State and military aircraft that are exempt from the IR.

- Commercial aircraft equipage rates allowed NERL to initiate a project in 2009 to convert channels in airspace below FL195, where routes and aircraft equipage permits - e.g. airspace sectors where all aircraft are climbing to, or descending from, above FL195 and are therefore equipped. This activity is beyond the requirements of the existing Implementing Rule and is planned to increase the number of 8.33 channels to 35% and to be completed in 2014.

- However Airport VHF services are currently unable to transfer to 8.33 kHz channels due to certain aircraft equipage limitations. Airports have to be able to receive all aircraft including the small number of commercial aircraft that only operate below FL195 as well as General Aviation (GA) aircraft. The one exception to this is that one 8.33kHz channel has been implemented at London Heathrow for departure ATIS.

AIP fees will be recovered by NERL through en-route charges, which are functions of aircraft weight and distance flown. The vast majority of 'Chargeable Service Units' are recovered from major commercial operators who are already compliant with the 8.33 kHz requirement. Operators who do not fly above FL195 and are not 8.33 kHz compliant, are generally operating smaller aircraft over shorter distances and as a result, the AIP fees passed on to these operators will be so diluted that there will be no economic incentive to upgrade the non-compliant aircraft. AIP as proposed will not therefore incentivise greater 8.33 kHz compliance. One option is to reconsider how to incentivise more precisely those aircraft which are not 8.33 kHz capable.

NATS proposes that if Ofcom intends to proceed with AIP, the phase-in of AIP fees should be delayed and brought into line with the dates for mandatory equipage below FL195 in the forthcoming revision of Commission Regulation 1265/2007. Furthermore, NATS proposes that ANSPs that have implemented 8.33 kHz capable ground equipment, but are unable to convert to 8.33 kHz channels purely as a result of insufficient aircraft equipage levels should not be penalised by having AIP fees for 25kHz frequency assignments levied on them.

Further detail on the Status and history of the 8.33 kHz programme is included at attachment 2

AIP Impact on International Standards and Procedures

NATS does not believe that the application of AIP at a UK level will have any significant impact on technology or procedures used by the international aviation community. Technology/procedure changes require international agreement that will need approval at the ICAO Council where the aviation industry has little if any influence on such matters. State input to ICAO to achieve the highest practicable degree of uniformity in standards, and procedures to improve the efficiency in the use of spectrum is more likely to yield the desired results.

Excess Demand in 8.33 kHz **VHF Environment**

NATS has reservations on the methodology and validity of the data presented in Annex 6, which suggests up to 1700 assignments within each 50km square against a band capacity of 720, 25kHz channels. If this level of congestion was experienced in reality, serious interference between services would be experienced, which is not the case.

The Consultation Document does not present any analysis that indicates the VHF band with an 8.33 kHz channel plan will remain over demanded within the UK. Even with the limited 8.33 kHz conversions that have taken place to date, new 8.33 kHz assignments are readily satisfied, although 25kHz assignments remain problematic. Eurocontrol simulations undertaken in support of the 8.33 kHz Business Case which is currently being developed, indicate that following the completion of the 8.33 kHz project in 2018, (in line with current expectations for the revised 8.33 kHz Implementing Rule), that it will be possible to satisfy 100% of VHF frequency requests from 2018 until at least 2024 (the simulation end date). If the band is not over demanded in an 8.33 kHz environment, the criteria at section 5.18 – 5.19 of the consultation document are not satisfied suggesting a zero opportunity cost and no case for the implementation of AIP.

Demand for VHF Frequencies within the UK is unlikely to grow at the same rate as over the last decade. SESAR (the Single European Sky research project to develop future ATM tools) is not proposing any technological developments to VHF voice signal structures that could reduce bandwidth requirements. The SESAR operations concept will however increase the use of datalink communications which is expected to lead to significantly fewer ATC tactical interventions, thereby reducing the number of VHF voice communications per aircraft movement. SESAR operations concepts are therefore expected to reduce the upward pressure on the demand for VHF spectrum use, although it is currently too early to quantify the voice to datalink transition. It is clear however, that VHF voice communication will continue to be required in the SESAR Operational concept.

NATS Ability to use Fewer VHF Frequencies

NATS' duty is to provide the ATM services necessary to meet traffic demand in a safe, expeditious and cost effective manner. The provision of these air traffic services demands the use of VHF radio communications. The technical specifications for both the equipment and the protection criteria used in the assignment of frequencies are standardised by international agreement through ICAO. The number of frequencies used to provide an air traffic service is a function of the traffic demand and airspace complexity. UK airspace is one of the most complex and most densely used in the world, reflecting the fact that UK airspace forms the European gateway to the North Atlantic as well as the number of major airports, including 5 in the London area.

NERL is economically regulated and is subject to financial penalties for aircraft delay which is attributable to NERL. NERL has therefore implemented the current airspace sectorisation and number of frequencies to provide adequate airspace capacity to safely handle expected 2013 peak traffic levels without operators incurring unacceptable delay. Reducing the number of frequencies assigned to NERL would compromise NERL's ability to respond to future traffic growth and impact delay performance.

In order to provide a safe operation in controlled airspace, each operational unit has to be able to continue to provide safe services at all times on a 24/7 basis, including whilst in degraded or contingent modes of operation such as equipment failures or emergency situations. Radio Frequency Interference (RFI) to VHF communications services is a significant issue and one which is increasing in occurrence. Experience is that RFI is almost a daily occurrence on frequencies used by NATS. The only mitigation to maintain a safe operation in the presence of RFI is to use an alternative frequency. The ability to manage these contingency situations therefore requires a small margin in terms of the number of frequencies available. NATS already ensures that these are kept to the minimum necessary.

Within the constraints of the current concept of air traffic operations, there are no obvious opportunities for NERL to change its behaviour and use fewer frequencies in the provision of its services without eroding operational performance or growth, safety and contingency margins. NERL therefore strongly believes that the financial dis-benefit (to NERL and the wider air transport industry) through the erosion of performance and margins outweighs any benefit which may accrue from a small number of channels being released.

The biggest improvement in spectrum efficiency before SESAR concepts are implemented will be achieved through the completion of the conversion to 8.33 kHz channel spacing at all flight levels.

The major opportunity in the future that may enable NATS to use fewer frequencies will be the SESAR operational concepts which are being developed based on planned 4 Dimensional trajectories. These concepts, which are expected to be implemented from 2020 onwards, are intended to systematically reduce conflicts and increase predictability, thereby leading to reduced controller tactical intervention by VHF voice communications. However this R&D work is still at an early stage and it is impossible to be more definite about the consequences for spectrum use. To quantify future spectrum requirements, SESAR Project (15.1.6) is specifically addressing spectrum issues.

Impact on Safety.

NATS notes with some concern the Ofcom position that it is a matter for CAA regulatory action if there are unintended safety consequences arising from AIP, such as the potential removal of VHF communications equipment by aircraft operators who are not mandated to carry it. Internationally, the UK has been proactive in improving aviation safety and Ofcom's proposal that the CAA take regulatory action following any adverse consequences is not consistent with the UK's previous proactive stand on safety.

It is NATS' view that Ofcom's proposal which requires another regulator (the CAA) to resolve any adverse issues arising from Ofcom's implementation of AIP is inconsistent regulation.

The ability to be able to communicate with an aircraft is fundamental to being able to exercise control. Incursion into Controlled Airspace by GA aircraft is one of the major safety risks faced by NATS. Achieving the highest levels of safety demands best practice to be employed which may require more than meeting minimum regulatory requirements. In addition to internal safety initiatives, NATS has made considerable investments to reduce the incursion risk, examples of which include the implementation of the London Lower Airspace Radar Service (LARS), the Controlled Airspace Incursion Tool and most recently the participation in the development of a GPS based airspace incursion warning tool aimed at General Aviation (AWARE). Any reduction in the carriage of VHF communications capability would devalue the benefits of previous investments by NATS.

Density Based Tariffs

NATS supports the principle of density based tariffs, but requests that additional work is undertaken to re-evaluate the areas, noting that the numbers of assignments suggested in each of the 50km squares in Annex 6, do not appear viable. As previously noted, Annex 6 suggests that there may be up to 1700 assignments in a 50km square against a capacity of 720, 25kHz channels. The level of assignments suggested would indicate a failure of the frequency planning process and if correct would manifest itself by interference between services, which is not the case. It is suggested that the result may be influenced by the inclusion of a number of 8.33kHz assignments within the COM 2 data which would tend to increase the apparent demand.

The aviation objective is to move forward with the 8.33 kHz programme and this will significantly change the density gradients. It would appear inappropriate to proceed into the future with the density maps based on the previous 25 kHz channel spacing environment. NATS therefore requests that the analysis is extended to develop demand maps appropriate to an 8.33 kHz Channel spacing environment, and this should be expected to modify the geographic price variation areas.

Business Radio Model

NATS does not agree with Ofcom's proposal to use the existing Business Radio Model as the basis for Aeronautical AIP. The Business Radio model is two dimensional for the purpose of licensing services in an area close to the earth's surface. The aeronautical requirement is to communicate with aircraft in flight which is three dimensional as the aircraft may be at a considerable height above the earth's surface.

To maximise the efficient use of spectrum requires that the use of a frequency for one purpose minimises the area in which the frequency cannot be used for other purposes. In the aeronautical environment, the height of the aircraft is the most significant factor in defining the volume within which a frequency cannot be reused. If the objective of AIP is to promote spectrum efficiency, NATS proposes that AIP should incentivise the reduction of the maximum height of the Designated Operational Coverage.

AIP Fee Structure

In the response to the 2008 consultation, NATS identified that not all aeronautical uses had the same impact and that a single licence fee for all VHF services was inappropriate. It is noted that Ofcom has addressed this comment in the current consultation and have proposed a granular fee structure based on service type. NATS agrees with the concept, but notes that there some errors and inconsistencies within the proposal. NATS therefore offers a revised fee table at Attachment 3 for consideration.

ACC Services

NATS notes that the AIP proposal is to charge the same AIP fee for high level and low level ACC use. As NATS notes above, the impact on reuse is strongly dependent on the height of the aircraft transmitter and NATS therefore suggests that an intermediate fee be implemented for Area control functions for use below Flight Level 245 at £4,950, being one half of the proposed ACC fee of £9,900. This would equate to the ICAO ACC/L designation, the lower operational ceiling providing an incentive for limiting the height of the designated operational coverage where operational use permits.

Approach Services (APP)

NATS does not agree with the Ofcom proposal to implement a fixed fee of £9,900 for all Approach services. Many of these services have a limited circular Designated Operational Coverage with ceilings of up to 10,000 feet. The manner in which these APP services are planned and implemented limits the impact of these services in terms of frequency denial to other users. The protection criteria allow reuse of a frequency for APP applications within the UK. One example is the reuse of frequency 128.850 MHz at Southampton and Durham Tees Valley. NATS therefore proposes that in cases where the DOC ceiling is at or below 10,000 feet, these APP assignments should attract a fee of £2,600.

Broadcast Services (VOLMET ATIS)

A particular issue relates to ground broadcast types of service such as ATIS or Volmet in which there is no aircraft transmission. As a result, these services have smaller areas of impact and are more spectrally efficient than two way communications involving an aircraft transmitter. Frequencies serving these functions are planned using a minimum ratio of signal strength between the wanted and unwanted signals, rather than line of sight criteria. This permits reuse of a frequency within the UK.

A particular example is the frequency 133.675 MHz which within the UK supports both an ACC operation within Scotland and an ATIS at Manston in Kent, under the fee structure contained within the current AIP proposal, this would recover £19.8k for the single 25 kHz channel within the UK.

It is NATS view that it is inappropriate that broadcast service should be charged at the same rate as an air-ground-air channel and NATS therefore proposes that these broadcast services should be charged on a comparable basis to an airfield Tower service i.e. £2,600 pa compared with the £9,900 proposed in the consultation document.

Departure ATIS

There are two distinct types of ATIS service that are used to support traffic arriving or departing from an airfield. The departure ATIS is only used when the aircraft is on the ground within the environs of an airfield and therefore the function of the Departure ATIS is comparable with an Aircraft Surface movement control and should be charged at a similar rate ie £350 pa compared with the £9,900 proposed in the consultation document.

Summary

As made clear above, NATS believes that AIP will not achieve its stated objectives. Should Ofcom nevertheless decide to introduce AIP NATS considers that the start should be delayed to coincide with the expected future requirement to equip for 8.33 below FL 195. Further it is NATS' understanding that if Ofcom implements AIP, fees will be charged from the date of renewal of WT Act licences following the implementation of AIP and that fees will not be applied retrospectively from the date of implementation. It is also our understanding that licence fees will be based on use of a frequency and the bandwidth occupied, and not on the number of transmitters used to maintain the service.

NATS would welcome the opportunity to continue the dialogue with Ofcom to resolve the issues raised within this response.

NATS Response to Consultation Questions

Question 1: *Do you consider that our proposed fee rates for licences in the aeronautical VHF frequencies are appropriate?*

NATS does not believe that AIP will incentivise the transition to 8.33 kHz channel spacing. This requires further regulatory action at a European level and AIP is inappropriate at this time.

NATS considers that, subject to certain amendments proposed in Attachment 3 of the NATS response, the ratio between the fees for different services is appropriate to their spectrum use and denial to other aeronautical users.

Question 2 *In devising our revised proposals, have we identified all of the aeronautical uses of VHF communications frequencies which require a distinct approach to fee setting, as set out in tables 5 and 6?*

NATS confirms that the list, subject to certain amendment [see attachment 3], is satisfactory.

Question 3: *Do you agree with our proposal not to charge any fees for Fire assignments?*

YES

Question 4: *Do you agree with our proposal to set a £75 fee for licences in any of the sporting frequencies?*

NATS notes that setting a £75 annual licence fee for the sporting frequencies does not provide any incentive for sporting users to change to 8.33 kHz channel spacing.

NATS would welcome clarification from Ofcom as to how it intends to encourage sporting users to migrate to 8.33 kHz equipment and release the additional channels. Or does Ofcom intend these remain 25 kHz assignments?

Question 5*: (From Annex 4) Do you agree with our proposal to set an annual fee of £19,800 per ACARS or VDL assignment, with no variation related to the number of transmitters?*

Question 5: *(From Chapter 7) Do you agree with our proposal to set an annual fees of £9,900 and £19,800 per channel respectively for ACARS or VDL assignments, with no variation related to the number of transmitters used in such channels?*

NATS notes that the Question 5 taken from Annex 4, differs from Question 5 as stated below paragraph 7.18 of the consultation document.

NATS notes that ACARS uses VDL Mode 2, so NATS is confused at the logic of separating ACARS and VDL Fee structures proposed in the Table 5 of the consultation Document. NATS requests that Ofcom clarifies its intentions in respect of their proposals for VHF data services.

NATS agrees with the principle of a single licence fee per assignment for all VHF communication services, with no variation related to number of transmitters used.

Question 6 *Do you consider that our proposed general approach to phasing in fees for use of the aeronautical VHF communications channels are appropriate? If there are particular reasons why you consider that any user or group of users would need longer phasing-in periods, please provide any supporting evidence for us to consider. Specifically, do you have any evidence for us to consider that would support either of Options 1 and 2 for the highest proposed fee in this sector?*

As stated in the body of the NATS response, we do not believe that AIP is able to incentivise the early adoption of 8.33 kHz channel spacing throughout UK airspace as further progress is blocked due to lack of a European Regulatory mandate for aircraft equipage below flight level 195. If AIP is implemented, then the phase-in should be aligned with the timescales for mandatory equipage to be set in the forthcoming European Implementing Rule.

As ANSPs are unable to change to 8.33 until aircraft equipage permits, NATS therefore proposes that where 8.33 channel spacing is prevented by aircraft capability, ANSPs who have implemented equipment that is capable of 8.33 operation, should only be charged the 8.33 kHz AIP fee.

Question 7 *Do you have any further quantified information to contribute to the analysis of financial impacts of the proposed fees on particular spectrum users, as set out in Annex 5? We would like to publish all responses, but will respect the confidentiality of any material which is clearly marked as such.*

NATS suggests that this question should refer to Annex 8, and not Annex 5 as stated (Annex 5 is the Glossary).

NATS has no further information on the financial impact analysis

Question 8: *Do you consider that our assessment of the impacts of our proposals has taken full account of relevant factors? If you consider that there is additional evidence that would indicate particular impacts we should take into account, we would be grateful if you could provide this.*

NATS is not persuaded that Ofcom has taken sufficient account of the operational, safety and regulatory constraints, at both national and international levels, on greater spectrum efficiency. In addition, since we believe that AIP will not incentivise behaviours in the way that Ofcom hopes, we consider that the benefits have been over-stated. It is NATS' view that greater benefits, with less cost to the aviation industry, are likely to come from intensified international efforts to coordinate approaches to the introduction of new technology and new concepts of operation.

Brief on Status and History of 8.33

Background

Radio communication systems for aircraft are used primarily for the purpose of air traffic control (ATC). Communications for air traffic control use the Very High Frequency (VHF) band between 118 and 137 MHz. The same frequency can be reassigned many times provided that there are no interference problems.

The VHF Communication band was initially subject to 100 kHz channel spacing, however with the growth in demand for frequencies, the 100 kHz channels were divided into 50 kHz and were further divided into 25kHz channels in 1974 as technology permitted.

With the continued increase in demand for air transport, in the late 1980's the UK CAA (of which NATS was part at that time) proposed further division of the 25kHz channels, at the time suggesting 12.5 kHz which would permit a further division to 6.25kHz. Internationally it was agreed that the division should be to 8.33 kHz to retain the ability for multi-carrier offsets. In 1994, ICAO standardised the channel split from 25 to 8.33 kHz.

8.33 kHz in The European Region

The EUROCONTROL Agency (European Organisation for the Safety of Air Navigation) was invited to manage the implementation programme of 8.33 kHz in the EUR Region on behalf of ICAO. Both NATS and the CAA support this programme and are represented at the 8.33 kHz Programme Steering Committee, which is managed by EUROCONTROL.

The introduction of 8.33 kHz in the European Region has been phased as aircraft operators are required to equip before ground equipment can be converted.

Within the ICAO EUR Region:

- 8.33 kHz was introduced above FL245 from October 1999.
- 8.33 kHz operations were extended to above FL195 from 15 March 2007.

The European Commission has included the 8.33 kHz work within its responsibility and as such provides the legislation authority (through the EUROCONTROL 8.33kHz Steering Committee) to enforce the future expansion of 8.33kHz.

The first change under this authority was the European Commission Implementing Rule Regulation No 1265/2007 dated 26th October 2007, to legislate the conversion from 25 kHz to 8.33 kHz of ground radio equipment. This came into force in July 2008.

NATS and 8.33 kHz expansion

NATS (NERL) has already upgraded all of its communications infrastructure to be capable of 8.33 kHz operation and has successfully converted 22 channels from 25 kHz to 8.33 kHz in airspace above FL195 to release additional aeronautical VHF spectrum capacity in accordance with the 8.33 implementing rule.

NATS has been unable to convert all high level sectors as large geographic areas necessitate the use of offset carrier transmitters which can only be supported within a 25kHz channel.

Due to aircraft equipage constraints, communications services at airports where NATS is the ANSP continue to use 25 kHz channels. The one exception to this was an innovative approach by NATS and CAA that has permitted the implementation of a single 8.33 kHz channel for the Heathrow departure ATIS.

A new NERL project was approved at the end of 2009 to extend conversion activities below FL195 in Area and Terminal airspace where existing aircraft 8.33 kHz equipage rates permit. This project anticipates the interim milestone which NERL expects to be included in the revised Implementing Rule. It is planned that this project will increase NERL's 8.33 Channels to 35% of the total number of frequencies and will be completed by 2014. Until the revised Implementing Rule takes effect, proposed for 2018, NATS will be limited in its ability to proceed beyond this level of conversions.

NATS objective is to increase the availability of new aeronautical VHF channels to facilitate future growth in UK and wider European air transport capacity and achieve further reductions in air traffic control delays for airlines and other airspace users. Conversion to 8.33 kHz channel spacing will be undertaken wherever this can be achieved without compromising operational safety or where we are required to continue with support of 25 kHz spaced services under governmental agreements (e.g. Air Traffic Control services to MoD).

Future Planning

The EUROCONTROL 8.33 kHz Steering Committee is currently addressing the Regulatory Approach and Business Case for the completion of 8.33 kHz expansion and the amendment of the EC Regulation 1265/2007. The amendment of the EC Regulation will be subject to formal consultation and approval by Member States.

The current timescales proposed for completion of the 8.33 kHz programme are:

- Forward Fit Phase starting from 2012 to ensure all new radios comply,
- Interim Phase by 2014 to ensure a given number of conversions have taken place,
- Final Phase by 2018 to ensure 8.33 kHz spacing of all possible voice channels.

These phases and timescales are subject to confirmation in the amended Regulation.

NERL has made provision is its Long Term Investment Plan for future 8.33 kHz conversion activities in other areas of UK airspace by 2018 in accordance with what we expect to be in the amended Regulation.

NATS Proposed Modifications to table of service groupings

This table contains NATS proposals for amendments to the granularity that better match with use / coverage / impact on reuse. Costs have been included based on the Ofcom tables with proposed new groupings. It is assumed that the all costs are based on 25 kHz installations and that 8.33 kHz installations would only be charged at a third of the costs indicated.

	Year 1	**Year 2**	**Year 3**	**Year 4**	**Thereafter**
Fire and Distress frequencies	£ zero	£ zero	£ zero	£ zero	£ zero
Sporting[1] frequencies (generally unpowered flight)	£75	£75	£75	£75	£75
Offshore mobile[1] stations	£75	£75	£75	£75	£75
Aerodrome surface movement (Departure ATIS, GMC/GMP, OPC[2] and AS) and Offshore fixed[1] units	£350	£350	£350	£350	£350
Aerodrome air traffic services ≤ 10000 feet (TWR, AFIS, APP and A/G) and ground broadcast[3] (VOLMET and Arrival ATIS)	£400	£800	£1300	£1900	£2600
~~Approach services (APP), Automatic Terminal Information Services (ATIS),~~ Air traffic services > 10000 feet ≤ 24500 feet Area control service[4] (ACC/L and APP) and Aircraft Communications Addressing and Reporting System (ACARS)[2]~~, and VOLMET~~ *(Alt. phasing option in brackets)*	~~£1500 *(£1000)*~~ £750 *(£500)*	~~£3000 *(£2000)*~~ £1500 (£1000)	~~£5000 *(£3000)*~~ £2500 (£1500)	~~£7200 *(£6000)*~~ £3600 (£3000)	~~£9900 *(£9900)*~~ £4950 (£4950)
Air traffic services > 24500 feet (Area control service[5] (ACC/U))	£1500 *(£1000)*	£3000 *(£2000)*	£5000 *(£3000)*	£7200 *(£6000)*	£9900 *(£9900)*
VHF digital links (VDL)[2] per frequency *(Alt. phasing option in brackets)*	£3000 *(£2000)*	£6000 *(£4000)*	£10000 *(£6000)*	£14400 *(£12000)*	£19800 *(£19800)*

[1] Sporting, Offshore mobile and Offshore fixed do not seem to have an incentive to change to 8.33 kHz with these proposed fees.

[2] OPC and VDL Mode 2 are in general used for commercial type operations with a very limited amount of ATC operations provided on contract through VDL Mode 2. ACARS uses VDL Mode 2 and therefore is difficult to separate from OPC and VDL.

[3] The ≤10000 feet option plus Ground Broadcast takes into account the actual area sterilised by further co-frequency use.

[4] The > 10000 feet ≤ 24500 feet option will capture the TMA which in general can be reused in the UK.

[5] The > 24500 feet will capture en-route ACC frequencies which are operated by NERL and MoD. In general, these sterilise most of the UK.