COMMERCIAL RADIO

Memorandum by the Minister of Posts and Telecommunications

1. At its meeting on 5 March, the Committee on Broadcasting invited me to submit to the Cabinet my draft White Paper on commercial radio, drawing attention to its main proposals.

THE NATIONAL COMMERCIAL SERVICE

2. The draft White Paper proposes that there should be a national commercial programme as well as up to 60 local commercial stations. The BBC would be required to relinquish the medium frequency (mf) channel on which it is now broadcasting Radio 1. The majority of the Broadcasting Committee favoured this proposal, but support for it was not unanimous. The arguments for it are:

i. Competition between the BBC and commercial radio will be better balanced at four channels to two (three national and one local for the BBC, one national and one local for IBA) rather than five channels to one.

ii. The national service can be established more quickly. Without it there is some danger that there might be little commercial radio on the air at the end of this Parliament.

iii. An early and satisfactory agreement with the Musicians' Union on needle-time is more likely, since the profits of the national channel can be used to provide live employment for musicians.

iv. Commercial radio will be able more quickly and more certainly to afford a good central news service.

3. There may be opposition to this proposal for a national channel from the following sources:

i. The BBC will protest strongly, arguing that the removal of Radio 1 will involve a damaging reorganisation of all their radio services, and that with a reduced coverage a national commercial channel could be accommodated on medium frequencies alongside Radio 1. On the other hand, the BBC had only three channels before the pirates, to which is now added the network of local stations, and the White Paper proposes to extend these to medium wave; Radio 1 and 2 are already amalgamated for 9 to 10 hours
outside peak listening time, and for all but 6 to 8 hours each day the local stations also relay mostly Radio 1 and 2. I do not believe either that it is necessarily desirable for the BBC to provide out of the licence fee a channel for non-stop 'Pop', the extent of which must make it hard for the IBA to insist on a public service content in commercial radio.

ii. The Newspaper Publishers Association contend that a national channel would draw off advertising revenue from the already hard-hit national Press. On the other hand, the total revenue of commercial radio, national and local, is expected to build up to only £10 million to £15 million per annum over a 3-year period after 1973; total Press advertising is about £225 million and national Press advertising £110 million; national newspapers will have the opportunity to invest in local stations, and to bid for contracts to sell advertising time for the national channel.

iii. Some of those hoping to own local commercial stations will argue that a national service will siphon off too much advertising revenue. On the other hand, an income approaching £15 million should suffice to support both; local companies will, moreover, be programme suppliers to the national station.

iv. Some of our supporters might criticise the IBA control of the national channel as being public authority rather than private enterprise broadcasting. On the other hand, private enterprise will be involved in supplying programmes and selling advertising for the national channel, and the local companies will be private enterprise on the ITV model.

THE AUTHORITY

4. The majority of the Committee considered that, if there was to be a national service, there should be an Authority other than the ITA; although others considered that it would still be unnecessary. I believe that the ITA would treat radio as a matter of secondary concern, and that a second Authority is essential, with or without a national channel, if commercial radio is to be vigorously developed. There was also some doubt whether the new Authority should be financed initially by advances from the National Loans Fund, to be repaid as soon as the system became profitable. In my view, we cannot be sufficiently certain that the IBA would be able to raise the money on the market without a Treasury guarantee.

BBC LOCAL STATIONS

5. The Broadcasting Committee agreed that the BBC should be allowed to continue with its 20 local stations.

CROSS-SUBSIDISATION

6. A view was expressed in the Broadcasting Committee that there should be no cross-subsidisation. I believe that some element of cross subsidy will be necessary in commercial radio as it has been in commercial TV, if a local service of a good standard is to be extended outside the conurbations, and so richer franchises should contribute more than their share to common expenses.

C J C
DRAFT WHITE PAPER

AN INDEPENDENT SERVICE OF RADIO BROADCASTING

INTRODUCTION

1. It is now some 16 years since the Television Act 1954 established the Independent Television Authority as a public corporation to provide television services and so ended the monopoly of broadcasting which the BBC had hitherto held. Despite the controversy aroused at the time by the 1954 Act, there are few who would now wish to see the monopoly restored in television. The competing services of television - the one publicly financed, the other from the sale of advertising time - maintain a general level of quality which certainly bears comparison with that achieved elsewhere. The widespread ownership of television sets in the United Kingdom, and the intensive use made of them are evidence of the success of the system in meeting the demands of viewers. It is now generally accepted as desirable, moreover, that there should be more than one source of programmes, particularly in news and current affairs since this is such an influential medium. For those who work in television there are seen to be major advantages in the existence of more than one source of employment. The case which is now largely accepted for competition in television is no less strong in radio.

2. The proposals which follow, have been arrived at after extensive consultations with the broadcasting authorities, with newspaper interests, trade associations concerned with advertising, representatives of local authorities, with trade unions, with guilds concerned with programme production and with many other bodies and individuals interested in the subject of radio from the technical, commercial or social point of view. There has been great divergence in the opinions expressed, but of the widespread interest in the subject there can be no doubt, nor in the consensus of opinion with which the government warmly associates itself, that radio financed from advertisements must offer a truly public service. There would be no place for a system of broadcasting which did little more than offer a vehicle for carrying advertisements.
3. In extending to the listener the advantages of choice between different sources of radio broadcasting, the Government is anxious both to safeguard the high quality of much of the BBC's present radio output, and to ensure that the new service also maintains high standards not least in the provision of news and news commentary programmes, which are necessarily a larger ingredient in radio even than in television.

THE INDEPENDENT BROADCASTING AUTHORITY

4. The Government proposes to establish an Independent Broadcasting Authority (IBA) to provide and answer for the new radio service. It will supervise programme standards, and control the amount, incidence, and nature of the advertising. Although there are attractions at first sight in entrusting this task to the ITA, the Government has concluded that a separate body is desirable. Independent radio will to some extent compete with independent television for advertising, and the ITA would thus be faced with conflicting duties. In this situation and given the dominant position of television, radio might come to be regarded as merely incidental and secondary. If the new service is to be developed vigorously and the variety of opportunities in local radio are to be fully explored, a new Authority is therefore desirable. The IBA will, like the BBC and the ITA, be independent of Government in the conduct of its day-to-day affairs, including all matters of programme content. Similarly, the Minister of Posts and Telecommunications will lay its Annual Report before Parliament.

5. As in the case of the ITA, the Members of the IBA will be appointed by the Minister of Posts and Telecommunications; and will comprise a Chairman, Members for Scotland, Wales and Northern Ireland, and at least four other Members. The Government envisages that the IBA will need to appoint advisory committees to advise it on particular aspects of its programming, and generally, on the programming policies of the stations. The IBA will be required to involve local authorities and other local organisations in this system of advisory committees. The IBA will also have a duty, similar to that imposed on the BBC and ITA to share masts and sites, and the BBC and the ITA will be put under a reciprocal duty.
6. In deciding upon the division of frequencies and the allocation of responsibilities between the BBC and the IBA the Government has considered a wide range of proposals. From the outset the Government has taken the view that, despite the shortage of frequencies, the BBC should be enabled to continue to broadcast Radio 3 and Radio 4 on mf and vhf. Radio 3 broadcasts mainly serious music with some drama, poetry and further education; Radio 4 is principally a speech network providing news, current affairs, drama, and talks. Both provide to minority audiences services of a very high quality. It has, however, been accepted that the English regional variations on Radio 4 would cease with the coming of BBC local radio, thus releasing a number of medium frequencies.

7. The Government accepts the BBC's view that it ought to be comprehensive in its programming, appealing at some point to a wide range of tastes rather than existing in a "cultural ghetto". One of the justifications of a broadcasting service financed by licence fee must be its ability to provide high quality programmes for small minorities, but this is not to say that it should be confined to such material. It is argued by some that the introduction by the BBC of streamed programmes in radio broadcasting reduces the force of the argument for comprehensiveness, since there is then less opportunity of leading the listener on from light to more demanding programmes. Nonetheless it seems right that the BBC should be enabled to maintain contact with all tastes and that, as in television, there should be no sharp differentiation between the functions of the two services in terms of highbrow and lowbrow. Although a higher proportion of the BBC's programmes should be directed towards minorities, both the IBA and the BBC should compete with a balanced output of programmes.

8. There are differences of view as to whether this competition should be indirect between national stations on the one hand and local on the other, or whether the BBC and IBA should compete directly both at local and national level. Those favouring the former view point to the disadvantages of financing from a national licence fee BBC local services which are not available to all, to the desirability of local stations being locally owned and controlled, and to the real competition which must inevitably exist between successful local and national stations. Since the latter still retain all but a small fraction of those at present listening to radio.
9. The Government has, however, concluded that it would be wrong to confine the BBC to national broadcasting and the IBA to local. It is desirable particularly in the larger towns and cities that there should be competition between local stations in the provision of local news and information. It is argued moreover on behalf of the BBC local stations that they provide services to relatively small minorities in the communities they serve of a kind which a commercial station could not finance. The BBC also regard local radio as the principal growth point in radio broadcasting and would not wish to be excluded from it. The Government has decided therefore to confirm the provisional authority granted to the BBC in August to provide local radio services from 20 stations already in being, or in course of provision and shortly to come into service. They are: Leicester, Sheffield, Liverpool, Nottingham, Brighton, Stoke-on-Trent, Leeds, Durham, Bristol, Manchester, London, Oxford, Birmingham, Medway, Tees-side, Solent, Newcastle, Humberside, Blackburn and Derby. The 20 BBC stations will have a coverage on vhf of approximately 65 per cent by day and night, and it is proposed also to provide them with mf back up. This would be provided initially in the main conurbations. It might eventually achieve a coverage approaching 50 per cent by day. It would be the intention in the longer term to enable the BBC, if they then wished, to extend their local radio services. In the absence of BBC local stations in Scotland, Wales and Northern Ireland, the national versions of Radio 4 will continue in these countries.

10. A network of up to 60 stations is proposed for the IBA. These can be accommodated on vhf with a coverage of 65 per cent by day and night and on mf with a coverage approaching 70 per cent by day but only 25 per cent by night. It will be essential for the IBA stations if they are to be available to as many people as possible within a reasonable period that they should start both on mf and vhf. In order to provide this mf support for both the IBA and the BBC local stations it will be necessary to supplement the frequencies already assigned to this country, by proposing under Article 8 of the Copenhagen Convention and Article 9 of the International Telecommunication Union Radio Regulations the use of further mf channels. Within a few years there is the possibility therefore of up to 60 IBA stations with a coverage approaching 70 per cent of the population and 20 BBC stations with a coverage of up to 65 per cent,
both being transmitted on vhf and mf. It should be noted, however, that the allocation of medium frequencies in the European Broadcasting Area is to be reviewed and that local stations cannot necessarily count on the use of as many medium frequency channels after 1976. There may however be room ultimately for more stations in the vhf band.

11. As in local broadcasting, the Government is similarly persuaded of the case for an element of competition in the provision of national services. It is proposed, therefore, that the IBA should transmit a national service on the mf channel (1214 kHz 247m) now used by Radio 1. The coverage of this service will be extended along the lines already planned by the BBC so as to reach some 95 per cent of the population by day and 40 per cent by night. It has been suggested by the BBC that sufficient medium frequencies might be available to accommodate a further national service in addition to the frequencies needed for the BBC and IBA local stations. Technically such a possibility can be said to exist, if it is assumed that agreement will be secured from foreign governments to virtually all the proposals, which it is intended to make under the Copenhagen Convention and the ITU Radio Regulations, and if it is further assumed that the same opportunities for broadcasting at high power on the medium wave will remain after the review to which reference has been made in para 10. Both of these are inevitably uncertain assumptions. An even more serious disadvantage of such an attempt to find room for a further national mf service is that even if possible, it would involve a reduction in the coverage either of the IBA national service or of its local service. By day the coverage of the former would be reduced to about 85 per cent. By night the figure would be as low as 32 per cent. Alternatively the effect would be to reduce by an even larger margin the mf coverage attainable by the IBA local service both by day and by night. Such an arrangement would therefore mean that a substantial proportion of the population would only be able to receive three out of the seven radio services, which would then be provided by the broadcasting organisations. In the Government's view it would be wrong to add in this way to the services available in areas of dense population at the expense of other areas.
12. The coverage of the two IBA services, even without the reductions rejected in the previous paragraph, will compare unfavourably particularly after dark with that of the BBC's three national services. Further attempts will therefore be made to find additional medium frequencies in order to extend the after dark coverage of the two new services.

13. There will of course be no question of the BBC having to abandon its comprehensive role. In addition to the three national networks, which constituted its entire radio output before the advent of the pirates, it will have its local stations. These stations, which originate their own material for 6 to 8 hours, carry Radio 1 and 2 for most of the rest of the day. Radio 1 which is the vehicle for pop and Radio 2, which specialises in sweet music, are already amalgamated for 9 or 10 hours of the day. There is thus considerable scope for a more intensive use of the frequencies employed and there will continue to be adequate opportunity for the BBC to broadcast pop and sweet music. By the amalgamation of Radio 1 and 2 throughout the day, the BBC will save £1.3m a year. If this takes place towards the end of next year, the income from the recently increased licence fee should balance with estimated expenditure until March 1975.

14. For the IBA the advantages of possessing a national programme are considerable. It will enable the new Authority to establish its service quickly and to become at an early stage a well-founded competitor for the BBC. It is envisaged that this national service would be under the direct control of the IBA. It might commission much of its material from local stations and from programme suppliers. The sale of advertising might be undertaken on its behalf by one or more private companies, selected on a competitive basis. It is envisaged that the profits of the channel would be devoted to providing a central service of national and international news, to meeting the necessary costs of the Authority, and to underpinning the quality of the commercial service as a whole. The profits of the national channel would also be devoted by the IBA to providing opportunities for live music; the Government recognises that radio, which depends to a large extent today on recorded music, must help to enlarge the opportunities for the employment of musicians. Some anxiety has been expressed lest such a national service should prove too strong a commercial competitor for the IBA local stations.
some extent, however, the two should draw on different kinds of advertising, and the IBA would ultimately have it in its power to regulate the relative attractiveness to advertisers of the two services. Alternatively, it may be that local radio will in due course prove, as it has done in some other countries, far more popular than national radio programmes. At the outset, however, the national programme should help to provide a reasonable balance between the radio services of the IBA and the BBC. BBC radio will have three national programmes and a local network, and the IBA one national programme and a local network with a somewhat larger coverage.

15. The precise number and disposition of their local stations will be a matter for the new Authority. The stations should, however, serve recognisable communities. There will thus be great variations in the size of population covered. Stations to serve the big conurbations will be among the first to be provided; but the IBA will be encouraged to experiment in the early stages with the establishment of relatively small stations in order to determine the minimum size of community capable of sustaining a worthwhile local radio station. There are various possibilities for linking small stations in a joint operation which may merit investigation. The IBA stations must be firmly rooted in their locality, and this should be reflected in the choice of station operators and subsequently in the output. The stations will be linked by a network in order to exchange news, music and other programmes. Most of the material thus received would however be recorded and used at the discretion of the local station and with local linking. It is not envisaged that the local stations would switch over to a sustaining service for any significant periods. A major ingredient of the output of the stations will be local news and information. In the longer term, if more frequencies become available, it may be possible in the conurbations to provide specialist radio stations of the kind found in the United States. But with the possible exception of London, frequencies cannot in the near future be found for more than one independent station in each locality.

16. A central news company, which should probably be owned by the Authority, is envisaged to supply both the national and local services. This would not necessarily provide complete programmes to the local companies as does Independent Television News; it may be thought advisable in the different circumstances of radio to allow greater
flexibility in the use of its material. It should however be a source of national and international news which will set a standard for the local companies in their treatment of local news. There is one other possible arrangement in relation to the central news company, to which the Government will give further consideration. There would be attractions in providing two competing independent stations in London from the outset, one specialising in music, and the other in news and talk programmes. This latter station could then also act as the central news company. There are, however, considerable doubts as to whether a suitable frequency can be found for a second London service.

THE FINANCIAL ARRANGEMENT FOR IBA STATIONS

17. The income for the new radio stations will be derived from spot advertising between the programmes or during natural breaks within programmes. No other kinds of advertising such as sponsored programmes will be permitted.

18. The speed with which the new service is able to develop will depend upon its ability to attract listeners. Estimates of potential revenue are certain to vary widely. To be worthwhile, the service cannot be provided on the cheap. But the Government believes that independent radio will attract sufficient revenue to provide an alternative service of high quality. In the largest conurbations the local stations may attract a very substantial income. In such cases the form of contract should ensure that after approved programme costs have been met, revenue is thereafter divided in prescribed proportions between the company and the Authority. Cross-subsidisation has proved necessary in independent television and the Government foresees a similar need in commercial radio. There will be no question of allowing large and easy profits although the terms of the contracts must be such as to attract broadcasters of ability.

The contracts with the IBA should ensure that the excess revenue from the potentially more profitable franchises is used for the good of the system as a whole.

19. Each local radio company will be given the right and duty to provide the local programmes and to sell advertising time in its local service. Each will also be appointed for an initial term of three years; and, the Authority will be entitled to grant, at the end of the first and each subsequent year, extensions for a further year.
The same company will not necessarily be precluded from providing service at more than one place. Equally, there will be no bar on the minority participation by an investor in a number of local companies; but he will not be allowed an excessive aggregate interest. The Authority will be expected to aim at a wide diversity of ownership.

20. The Government has considered with care a variety of representations from those who believe that independent radio may be injurious to their existing businesses. In particular attention has been paid to its possible effect on the press. Even at its most successful, radio will, however, be a relatively small contender for advertising. The Government believes that future developments in independent television could have a larger effect on the press, and that in their timing this effect must be borne in mind. Such evidence as there is does not suggest either that the impact of independent radio will necessarily be damaging to local newspapers. None the less the Government accepts the case for giving special consideration to the local and provincial press. It believes moreover that provided safeguards can be secured against the risks inherent in an undue concentration of the means of communication, the existing media - and in particular, the local press and the television company - can make a valuable contribution to the operation of an independent radio service. Accordingly, the Government proposes that:

- local newspapers with a significant circulation in the transmission area of a given local station should have the right to acquire an interest in it, whether or not they formed part of the company awarded the contract;
- where a local newspaper has a monopoly in an area it will not be allowed to acquire a controlling interest;
- television companies will be allowed shareholdings but not controlling interests.

21. At times since the coming of television it has seemed that radio would be almost completely superseded. It is now clear that radio has an unmatched flexibility and immediacy, which will guarantee it a continuing place as an important medium of communication. Public demands on radio may have changed. People
probably now listen to radio for shorter periods at a time, and more often while doing something else, but there is evidence from a number of countries of a renewed growth in radio listening. The Government believes that this new element of competition will add to the vitality of our broadcasting services. The arrangements proposed in this White Paper will enable the new service to make a worthwhile contribution, particularly in exploring the possibilities of local radio, and will encourage the BBC to add further to its formidable record of achievement in radio.

Revised draft 5 March 1971
FREQUENCY PLANS FOR INDEPENDENT BROADCASTING

1. Only the Authority responsible for planning the system will be able to decide where it wants the stations and how many it will need. Until these requirements are known frequency planning must, to a large extent, be hypothetical.

2. Any plan for expanding radio services is limited by the radio frequencies that can be made available and these are always in short supply. Three frequency bands are used for domestic sound broadcasting in the European Broadcasting Area*: the low frequency (If) band (also known as the long-wave band) the medium-frequency (mf) band (also known as the medium-wave band) and the very-high-frequency (vhf) band (also known as Broadcasting Band II). The use of frequency channels in the If and mf bands is regulated by the European Broadcasting Convention (Copenhagen, 1948) and the Copenhagen Plan annexed to it; the use of the vhf band is regulated in accordance with a Regional Agreement for the European Broadcasting Area (Stockholm, 1961). Notes on frequency planning standards appear at Appendix B.

3. **Low-frequency band**

   The If band contains only 15 separate frequency channels, one of which is assigned to the United Kingdom and is used by the BBC for Radio 2 transmissions from Droitwich. In this band signals are reliably transmitted for relatively long distances by day and night and the band is therefore well suited to the transmission of nation-wide services. It would not be possible to use any of the other 14 If channels for a national commercial service in the United Kingdom without causing harmful interference to the country authorised to use it; it would also be wasteful to use an If channel for local services.

4. **Medium-frequency band**

   The mf band contains 121 separate frequency channels, all of which are used intensively in the European Broadcasting Area for domestic broadcasting and to a lesser extent for external broadcasting, i.e., the broadcasting of programmes intended to be received in countries other than those in which they originate.

* Europe, together with those African and Asian countries bordering the Mediterranean, plus Jordan and Iraq.
5. The medium frequency channels assigned for United Kingdom use by the Copenhagen Convention, 1948, are intensively used by the BBC for three of their four national services, and in 1966 the Government of the day stated in a White Paper (cmd 3169, December 1966) that:

“No general service of local sound broadcasting which would be available during the hours of darkness as well as in daylight can be provided only on medium wavelengths allotted to the United Kingdom”.

This statement was based on the assumption that the main mf services would be maintained in their then existing form. On this basis it is still true today, but it is nevertheless possible (subject in some cases to negotiation with other administrations in the European Broadcasting Area) to re-deploy certain of the medium frequency channels the BBC use and to make some available for other purposes. Thus, as the BBC themselves envisaged - though as part of their plans for a general service of BBC local radio with medium frequency back-up - it is proposed to close down the alternative versions of Radio 4 that are provided in various parts of England, and provide a common Radio 4 service for the whole of the country (services to Wales, Scotland and Northern Ireland would not be affected). The combined English programme will then be accommodated with some improvement of coverage, on three frequency channels instead of the six at present used. Thus three channels will become available for other uses. A fourth, can be found by confining the Radio 3 mf service to a single channel at negligible cost in Radio 3 coverage.

6. One of the channels thus freed will be used to augment our external broadcasting services. Another will be used to improve the coverage of the IBA national service based on the frequency at present used for the BBC's Radio 1 (see para 11 of the White Paper). The two remaining channels will contribute towards the provision of mf back-up for local radio. However, even with the addition of the International Common Frequencies which the UK is entitled to use it would not be possible to provide a general service of day and night time back-up for the two local services (BBC and IBA) envisaged.

7. To provide medium frequencies for further local stations, after the fullest use has been made of those already available to the United Kingdom, the Government intends to make proposals, by means of the procedure provided in Article 8 of the Copenhagen Convention, and Article 9 of the Radio Regulations (edition of 1968) of the
International Telecommunication Union, for the use of the frequencies assigned to other countries in the European Broadcasting Area in cases where it seems likely that medium frequency channels for additional local radio stations could be provided in the United Kingdom, without causing harmful interference to those countries at present authorised to use them. Decisions to establish stations at particular places, or using particular frequencies under these procedures, cannot be made firm until the procedures have been completed.

8. Local stations operating on frequencies assigned to other countries will generally have a smaller useful service area at night because of interference from the stations overseas and might, in some cases, have to be operated on lower power at night to avoid harmful interference to the services in other countries. Nevertheless, the addition of a substantial number of local radio stations operating on other countries' frequencies should permit of the technical realisation of an independent local station network of up to 60 stations covering up to 70 per cent of the population by day and 25 per cent by night, and also provide scope for MF back-up for BBC local radio extending eventually to perhaps 50\% of the population by day. The coverage of the local stations will depend very much upon the sites chosen for them and the population coverage figures quoted above are therefore necessarily very approximate.

9. The International Telecommunication Union proposes to hold an international conference to review and revise the Copenhagen Convention and Plan for the use of low and medium frequencies in the European Broadcasting Area. The present proposal by the Administrative Council of the ITU is that the first phase of such a conference should take place in 1974. The working assumption is, therefore, that a new Convention and Plan will come into force, by about 1976. Changes - which might be extensive - to our national deployment of medium frequency channels might then be needed.

10. Very high frequencies

The BBC is providing 20 local stations in England in a part of the VHF band, recently made available for broadcasting, lying between 95 and 97.5 MHz. By making a modest reduction in the total coverage of the present 20 BBC local stations and rearranging some of the frequencies it appears possible to accommodate them and, in addition, some 60 independent stations. These would mainly use lower power than the BBC stations and be intended to
serve individual towns or cities and their immediate environs. In
spite of the greater number of stations in the IBA network, its total
coverage would be only about the same as that of the BBC network ie
about 65 per cent of UK by day and night.

11. To achieve greater coverage for both BBC and independent local
radio stations in vhf will require additional frequency channels.
The Government will therefore be considering whether additional space
in the very high frequency band between 97.6 and 100 MHz, at present
used for mobile radio services, could be freed for broadcasting. This
may, even in the longer term, be difficult but if all or part of
this additional space were to become available for broadcasting and
was not required for other purposes (eg the Open University), it
could be used to improve and extend the local broadcasting services.
FREQUENCY PLANNING STANDARDS

1. This appendix outlines the reception standards which have been used in formulating the frequency plans described in the main paper and in the preceding appendix.

Medium Frequency Band

2. During daytime a mf signal is propagated by a stable "ground wave" which travels over the surface of the earth and has a range which is determined by various factors such as frequency (signals on lower frequencies reach farther than those on frequencies at the upper end of the band), ground conductivity (signals travel better over ground with a good conductivity or over sea water), and the power of the transmitter.

3. Beginning about one hour before sunset, changes in the ionosphere start to affect the propagation of mf signals and in addition to the ground wave, sky wave propagation takes place. That is to say, signals leaving the transmitter in a skyward direction are reflected back towards the earth again and strong but variable signals may appear on the ground, at places up to many hundreds of kilometres from the transmitter. The effect reaches a maximum at about midnight and then gradually dies away, becoming almost negligible by about one hour after sunrise. The sky wave from a transmitter can have two effects: first, it can interfere with the ground wave from the same transmitter, causing the signals towards the limits of the service area to fade at night; and secondly, it can cause interference, at great distances, to the reception of other signals in the same frequency channel.

4. In the absence of interference from other transmissions, the service range of a broadcasting transmitter is the distance from the transmitter at which the strength of the signal has fallen to the lowest level that gives sound of a satisfactory quality from the listener's receiver. However, such is the intensive use of the mf channels in Europe, some 1440 stations, including 450 of 10 kW power or above, being operated on the 121 channels available, that the service range of almost every transmitter at night is limited by interference from other transmitters using the same channel. The service range is then the distance from the transmitter at which the strength of the wanted signal is sufficiently in excess of the strength of the interfering signal to give a quality of sound satisfactory to the listener. Even in daytime, if transmitters using the same frequency channel are closely spaced on the ground, the service range of each of them may be limited by interference from the other.
5. The quality of service provided by a mf broadcasting station to an individual listener depends upon many factors, the most important being:

(i) Effective power of wanted-signal transmitter.
(ii) Frequency of wanted-signal transmitter.
(iii) Distance between receiving site and transmitter.
(iv) Nature of the intervening terrain.
(v) Propagation characteristics by day and night.
(vi) The nature (i.e., factors i to v above) of any other transmissions on the same frequency channel.
(vii) The nature of any transmissions on adjacent frequency channels (which may also cause interference in certain circumstances, particularly with receivers having poor selectivity).

6. Given all this data it is possible to estimate for any given receiving site the ratio of the strength of the wanted signal from a defined transmitter to that of any interfering signal on the same, or an adjacent frequency channel. However, the quality of reception judged by the listener is still subject to two variable factors:

(viii) The quality of the listener's receiving installation.
(ix) The subjective judgment of each individual listener taking into account his personal tastes and the character of the programme material to which he is listening.

7. When planning new stations it is clearly necessary to adopt certain standards which, in relation to items viii and ix, must be arbitrary. The Copenhagen Convention and Plan gives no guidance on this point but in recent years following a great deal of work and discussion the International Consultative Committee on Radiocommunications (CCIR) technical consultative committee of the International Telecommunication Union - has made recommendations for mf broadcasting which may be summarised as follows:

(i) Minimum signal strength giving satisfactory service in the absence of interference - 1 milli volt per metre (mV/m).
(ii) The radio-frequency protection ratio (ratio of wanted-signal strength to interfering signal strength) for a non-fading signal on the same frequency - 100:1.
(iii) Radio frequency protection ratio for a fading signal on the same frequency (midnight median value) - 100:1.
(iv) Radio frequency protection ratio for non-fading signal on an adjacent channel - 4:1.
8. In the area surrounding a transmitter, the field strength, in mV/m decreases as the distance from the transmitter increases. Without interference, the service area of a transmitter is considered to be the area over which a signal strength of at least 1 mV/m is available. If a co-channel interfering signal is present of strength 0.1 mV/m, then the service area of the transmitter would be reduced to that over which the signal strength was at least 10 mV/m (100 x 0.1); with an interfering signal field strength of 1 mV/m (which could be experienced by day if co-channel transmitters were too closely spaced, or at night from very powerful distant transmitters) then the service area would be that over which the signal strength is at least 100 mV/m (100 x 1).

9. These figures relate to a good standard of service in which the interfering programme would be just audible during quiet intervals in the wanted signal. Many people will argue that this is a better standard than is really necessary, and indeed at international frequency planning conferences it is not uncommon to accept a protection ratio of about 50:1. A value of about 30:1 is considered to be the lowest value that could be accepted in places where the need for new services is pressing, and this is the value of protection upon which the coverage estimates for medium frequency local radio are based in the body of this paper. Many more people, living outside the service area calculated on this basis will receive signals from local Mf stations well above the usable limit of 1 mV/m, but with a protection ratio of less than 30:1. Within the service area as so defined people receiving stronger signals will get a better quality of service with protection ratios greater than 30:1.

10. Very-high-frequency band
Signals from a vhf transmitter are stable up to and somewhat beyond horizon distance from the transmitting aerial. At greater distances, signals become weaker and vary in strength (fade). The signals do not vary appreciably between day and night so that the coverage of a vhf station remains constant throughout the 24 hours. Apart from this, the problems which arise in planning a vhf service are similar to those for an Mf service but, since the vhf signal is frequency-modulated, the recommended service standards are different. Those recommended by the CCIR are:
(i) Minimum signal strengths giving satisfactory service in the absence of interference from other transmissions:
   in rural areas: 0.25 mV/m
   in urban areas: 1 mV/m
   in large cities: 3 mV/m
(These standards allow for the varying incidence of interference from motor cars, electrical machinery etc, in different types of environments).
(ii) Protection ratio for interference from a stable signal on the same frequency: 60:1.
(iii) Protection ratio against fading interference (exceeded for 99% of the time): 25:1.
(iv) Protection ratio against interfering signals on:
   the adjacent channels: 4:1
   the next-but-one channels: 2:1
   the next-but-two channels: 1:2
   the next-but-three channels: 1:10

11. The plan for the existing BBC local stations is based on a signal strength limit of 0.25 mV/m but in the revised plan for a total of about 80 stations a number of these would have a poorer grade of service. The requirements at iv above place severe limitations on the frequency channels that may be used to serve adjacent or overlapping areas. However, where these conditions are met some interference may be experienced from neighbouring channels if receivers are used having a lower selectivity than that upon which the CCIR recommendation above was based.

12. Furthermore, receivers using transistors are subject to overloading in the presence of a strong local signal, which then interferes with wanted signals that are well spaced from it in frequency. This effect must be minimised by carefully siting the transmitter so that relatively few listeners are within its strong signal range.