1946.

THE PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA

TWELFTH REPORT

of the

PARLIAMENTARY STANDING COMMITTEE ON BROADCASTING

relating to

FREQUENCY MODULATION BROADCASTING, TELEVISION BROADCASTING AND FACSIMILE BROADCASTING.

Canberra, 17th June, 1946.

MEMBERS OF THE PARLIAMENTARY STANDING COMMITTEE

ON BROADCASTING

(Seventeenth Parliament)

Chairman	Senator Stanley Kerin Amour (a)
Vice Chairman	The Honourable Josiah Francis, M.P. (b)

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Senator Richard Harry Nash (c)	Cyril Chambers, M.P. (b)
	The Honourable James Allan Guy, M.P. (b)
	David Oliver Watkins, M.P. (b)

(a) Appointed 30th September, 1943.

(b) Appointed 14th October, 1943.

(c) Appointed 14th September, 1944.

NOTE:- The late Senator Richard Darcey ceased to be a member of the Committee when his term as Senator expired on 30th June, 1944. Senator the Honourable Allan Nicoll MacDonald resigned from the Committee on 20th July, 1944. They were succeeded by Senators Hays and Nash.

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FREQUENCY MODULATION BROADCASTING, TELEVISION BROADCASTING AND FACSIMILE BROADCASTING.

In July 1941 a Joint Committee of the Commonwealth Parliament was appointed to inquire into and report on broadcasting, and among the suggestions in its report, presented in March 1942, were recommendations that a Parliamentary Standing Committee on Broadcasting should be constituted and that frequency modulation, television and facsimile services should not be introduced in Australia until further consideration had been given to those innovations by the suggested Standing Committee.

2. Parliament accepted those recommendations by making appropriate provision in Parts IV and V of the Australian Broadcasting Act, which came into operation in July 1942.

3. Owing to the effect of the war on world development of the services in question, it was not opportune to deal with these matters until a suitable time after the cessation of hostilities. They were formally referred to us by the Postmaster General in November 1944 in the following terms:-

> "In view of the developments which are likely to take place in the post-war period in new forms of broadcasting, particularly with respect to television and frequency modulation, it is desirable that investigations should be made for the purpose of determining in what manner, and to what extent, these new features should be incorporated in the domestic broadcasting system of the Commonwealth of Australia.
>
> As you are aware, section 103 of the Australian Broadcasting Act provides that licences for facsimile, television or frequency modulation services may not be granted except on the recommendation of the Parliamentary Standing Committee on Broadcasting.
>
> In these circumstances, and in pursuance of the provisions of section 85 of the Act, I accordingly refer the matter to the Standing Committee for investigation and report."

4. In order to afford the groups of interests concerned adequate time for collection and study of data bearing on these subjects, for collaboration among themselves on certain aspects affecting them jointly, and for subsequent preparation of well-considered submissions, we gave several months' notice of our intention to hear evidence, with the result that a number of the interested parties voluntarily sent representatives abroad to acquire first-hand information of the latest developments. We are indebted to these and other witnesses for the amount of research which they have undertaken and the valuable, though in some aspects conflicting, information which they have placed at our disposal, not only for the purpose of striving to safeguard their own particular interests, but also as a public-spirited gesture of their eagerness to assist in the tendering of well-informed advice.

FREQUENCY MODULATION BROADCASTING

Abbreviations

5. AM means amplitude modulation; FM means frequency modulation; VHF means very high frequency.

/Definitions

Definitions

6. In an explanation which avoids technical phraseology, the meaning of the terms - frequency, amplitude and modulation - has been demonstrated by the effect of plucking one of the strings of a piano, thereby making it vibrate back and forth. The number of times it vibrates per second as its frequency, expressed as so many cycles (that is, vibrations) per second. The distance the string moves back and forth is the amplitude. If something is done to increase or decrease the amplitude while the string is vibrating, that would be modulating (or varying) the amplitude. In radio broadcasting the difference between FM and AM is that FM varies the frequency of the vibrations transmitted from the station to convey speech or music; AM varies their amplitude.

7. The receivers for these two types of transmission differ inasmuch as the FM receiver is made sensitive to changes in frequency and is not affected by changes in amplitude, whereas the AM receiver is sensitive to changes in amplitude and not frequency.

General Advantages of FM

8. A special feature of FM is the claim that reception is less susceptible than AM to extraneous noise.

9. Another feature of FM is that a higher quality of reproduction is experienced if the equipment through which the service is given is suitably designed. This is how an American writer describes FM:-

> "A pianist plays a Mozart piece. The wobbling waves carry it out from the antenna tower. Each note as it sifts through the loud speaker is sharply separated and crystal pure in its full dynamic range - though the piano, with its wide range and subtle tonalities, is one of the least satisfactory instruments in ordinary broadcasting. When you move to the porch the illusion of a piano playing in the next room is so strong that it requires a mental effort to remember that you are listening over the radio. A steel guitar solo comes over without any 'mushing' of its peculiar twangy vibrato. An announcer whispers into the microphone, and you start as if someone had whispered at your elbow".

10. The outstanding advantage of FM, however, lies in the number of additional stations and the improvement of broadcasting service in rural districts which it makes possible, due to the fact that FM can be advantageously operated only at very high frequencies, in which extensive channel sharing without interference is feasible, thereby releasing for AM rural district service the radio channels in the medium range of frequencies on which city stations are at present operating the AM system.

Limitations of the Present Australian System

11. In Australia, as in most other countries, the standard frequencies used for domestic broadcasting are those between 550 and 1,500 kilocycles per second. This group of vibrations, known as the medium frequency band, was allotted to broadcasting by international agreement. In the allocation of these frequencies to stations, there must be sufficient separation to prevent interference. It has been found that a separation of 10 kilocycles in this band is essential, which means that only 96 channels have been available. Hence, in order to provide for the 129 stations operating in Australia, it has been necessary to have recourse to shared-channel working, a procedure which restricts the satisfactory service areas of the channel-sharing stations on account of the reflection of their programmes from the sky back to earth at night in areas at some distance

/from

from their transmitters. The potential interference of this reflection (which is known as the "indirect ray" or "sky wave") is minimised by wide geographical separation of the stations affected.

12. This "sky wave", however, is advantageous to stations which have the exclusive use of a channel because, in addition to their primary service area (that is, the area in which reception is free from perceptible interference and fading, day and night), it enables them to have a secondary service area (that is, the area in which reception, although not sufficiently strong during the day time to be reliable, is strong enough at night time to be reasonably satisfactory, and in which fading, though present, is usually not severe).

13. At an international conference in 1939 it was agreed to extend the medium frequency band to 1,600 kilocycles, thereby making provision for ten additional channels. It has not yet been practicable to take advantage of these extra channels in Australia because of the number of receivers still in use which are incapable of responding to transmissions at frequencies between 1,500 and 1,600 kilocycles. This difficulty will gradually disappear as new receivers become available.

14. Of the 129 Australian stations, 36 are in capital cities, enabling metropolitan listeners (who comprise 60% of the population) to have a very much greater variety of programmes than most country listeners. In some country areas listeners have to rely on secondary service only, and in other areas in central and northern Australia (where the cost of providing a reliable service in the medium frequency band would be prohibitive) listeners rely upon transmissions from one or other of four national stations which operate on high frequency (short wave) bands.

15. Recent Post Office surveys show that a considerable number of new transmitters will be required to ensure that almost all listeners will have a reliable service from at least one national station. In addition, however, bearing in mind that listeners in capital cities and Newcastle are now being provided with two national programmes, it has been suggested that the same dual facility, with a corresponding increase in the number of transmitters, should be afforded to all listeners in view of their contribution to the maintenance of the national service.

16. As radio channels in the medium frequency band are not available for these additional national stations or for additional commercial stations for which many applications have been made, it is necessary to consider which of two alternatives is preferable, - more extensive channel-sharing in the medium frequency band, or the allocation of channels in the very high frequency band (between 30 and 300 megacycles per second), where many additional stations could be provided for in either AM or FM service.

Summary of Witnesses' Submissions

17. The Federation of Commercial Stations has devoted a considerable portion of its evidence to renewal of representations unsuccessfully made to our predecessors to secure higher operating power for such stations in the medium frequency band. The Federation's earlier submissions on this aspect had been rebutted in evidence tendered on behalf of the Post Office, in consideration of which the Standing Committee of the previous Parliament, in its First Report dated 2nd February, 1943, agreed that it was generally desirable to resist claims from commercial stations for increased power. We are advised that this aspect of the subject is outside the scope of our terms of reference, and we are therefore unable to re-open that particular question.

/18. Other

18. Other considerations traversed in the Federation's evidence are summarised as follows:-

(1) The occasions on which atmospheric noise at present interferes with reception to such an extent that the set is not usable are comparatively few. The more powerful AM stations are close to the larger centres of population. Hence, the majority of the people are being provided with just as much a noise-free service as they would receive from FM.

(2) The Federation is anxious to participate in pioneering work, but issues a warning against precipitate adoption of any new system. It would be unwise to assume that the experimental phase has already reached its climax. The Standing Committee's investigations may to some extent be premature.

(3) There is ample room in the present medium frequency band for many additional stations without disturbing the investments of present-day listeners.

(4) In America one of the aims of FM is to provide for 3,000 additional stations, but the United States have a population of 150,000,000 against Australia's 7,100,000 people.

(5) No additional station licences should be granted unless guarantees are given that the stations can be maintained satisfactorily from the economic standpoint and that they can provide programmes at least equal to the standards of existing stations. It is not suggested that the aim should be to protect the vested interests of established stations. Additional licensees should be required to show that they are prepared to make some positive contribution as a public utility in the public interest. The paramount consideration should be the interests of listeners. The stage has been passed when commercial stations can be operated solely to satisfy sectional interests. To obtain a satisfactory return on their investment, station licensees must make their audience-appeal as broad as possible. Service to the public is the concept that must be the guiding principle.

(6) FM is not in the public domain as regards patents. Prior to any move to introduce FM in Australia, the patent position should be investigated to determine what royalties would have to be paid for the right to instal transmitters and use receivers.

(7) The advantages of FM are counteracted by limitations in range of service. The generally accepted standard range of FM is that of the visual range; fading is experienced where the horizon commences. The service is also affected by the presence of tall buildings and any irregularity between the transmitter and the receiver.

(8) In Australia it would be too costly to provide FM transmitters at intervals of, say, 50 miles to give the same day and night service as is being provided by the present AM stations.

(9) In January 1945 there were 53 FM stations and 912 AM stations in America. The FM stations are in large cities; FM has not yet been applied to rural areas in that country.

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(10) High tone fidelity in FM covers a 15,000 cycle sound band. The facilities made available by the Post Office for transmission between studio and transmitter and for relays between stations provide only for a range of 5,000 cycles. The whole of the recorded music available to stations is of 5,000 cycle quality, and if these recordings were used in the FM system there would be horrible distortion. Thus, in the first instance, FM broadcasting would have to be confined to studio broadcasts by "live" artists.

(11) The average listener is not aware that he is only obtaining a 5,000 cycle response. Many thousands of sets today require replacement, but the listeners are quite satisfied so long as they are actually working and so long as they can hear descriptions of races, the news and the latest popular recordings.

(12) Unless receivers were manufactured to provide for high quality reception, the entire purpose of FM from a technical standpoint would disappear.

(13) There have been differences of opinion among experts in America as to the frequencies which should be allotted for FM. In the allocation of FM frequencies in that country, the Federal Communications Commission has had the advantage of access to military and naval information not available to laymen. Reservations have been made for non-commercial educational institutions.

(14) The allocation of frequencies in Australia should be determined in collaboration with leading engineering consultants.

(15) FM licences in the initial developmental period should be confined to existing AM licensees in order to prevent a major breakdown in the economic structure of the industry, thereby protecting the existing programme standards in the interests of the listening public.

(16) An exclusively FM broadcaster must be prepared to budget initially for at least two years' losses. The most practical method of introducing FM would be simultaneous broadcasting of existing stations' programmes by AM and FM.

(17) If FM stations were operated concurrently with AM stations, the installation and operating costs would be less than for exclusively FM stations. Existing AM licensees could build an FM station more cheaply than newcomers, by using the same studio and personnel. During the developmental period, when FM receivers in the hands of the public would be few and advertising revenue insufficient to cover costs, existing station licensees could offset FM expenses against profits from AM operation.

(18) The high fidelity production of FM might induce advertisers to patronise FM in preference to AM transmission, just as they pay extra for colour in newspaper advertising.

(19) FM would not be given a fair trial if experiments were confined to the national service. Commercial stations should be allowed to participate in such experiments and should receive protection for their investments by being granted preference in the allocation of licenses.

19. Following are the principal points elaborated in the evidence tendered individually by representatives of commercial stations in which certain capital city daily newspapers are financially interested:-

(1) The change-over to FM should be gradual during a period of years to allow for existing receivers to be replaced by dual sets which will respond to either AM or FM transmission.

(2) As the economic life of a receiver is 5 to 7 years, it is probably justifiable to assume that at least 80 per cent. of existing civilian receivers are now obsolescent in view of the small number placed on the market since 1940.

(3) The law which limits control by one company to four stations in one State should not be applied to FM transmitters, so that metropolitan stations may operate stations in country districts as relay units in a chain service.

(4) A technical advisory committee should be set up in each State to deal with the number and power of FM stations to be authorised and with the allocation of licences to operate them. These committees should include radio engineers independent of those of the Post Office.

(5) In America shared-channel working in the AM system has been fully exploited. There are 86 clear channel stations, - the only ones providing a secondary service at night. About 900 other stations sharing channels have their service areas restricted by interference, in spite of stipulations requiring reduced operating power at night and notwithstanding the use of directional aerials costing as high as £100,000 intended to prevent the stations from radiating their programmes in one another's directions.

(6) An AM station may be heard for, say, 100 miles, but the reception is often accompanied by static and man-made noises, whereas the service area of an FM station may be 55 to 60 miles but within that area reception is noiseless. In the middle of Sydney very few Sydney stations can be heard without noise; if they were operated on FM, reception would be free from noise.

(7) Once the people of Australia have had an opportunity of hearing FM they will be convinced of its marked superiority over AM.

(8) The cost of establishing FM would be more than justified in view of the advantages to be derived. The great majority of the population would gain by the introduction of FM.

(9) It will probably be found desirable eventually to use medium wave channels exclusively for high quality rural service in preference to their use by stations which are primarily designed to serve a city and suburban population.

(10) Although

(10) Although the majority of stations in Australia cover a range of fidelity of not more than 10,000 cycles, the majority of receivers manufactured only cater for a quality of reception up to 5,000 cycles. The poor receiving sets in use adversely affect appreciation of music. Nothing but good could come from a campaign directed to the general improvement of receivers.

(11) FM station licences should be granted on a longer term (say, 3 or 5 years) than the annual basis applicable to AM licences.

(12) Commencement of operation of FM should be timed with the commencement of production of FM receivers, otherwise if FM plant is put in too soon it may remain idle for a long period and become obsolete.

(13) With mass production, the cost of FM receivers will probably be within a few pounds of the average AM set. Sales would follow the establishment of FM transmitters and an appropriate publicity campaign.

(14) Experimental stations should be erected, and some measure of priority should be given to existing licensees to avoid economic dislocation.

20. In evidence given on behalf of certain capital city newspaper interests which do not at present hold broadcasting station licences, the following submissions have been made:-

(1) Licences should be offered on a competitive basis for terms of 20 to 25 years and should go to the highest bidder, subject to the usual requirements. One newspaper company would be prepared to pay a licence fee of £1,000 per annum for 5 years.

(2) The idea that only existing stations should be granted FM licences is not acceptable. Licences should be granted to people who are prepared to finance experiments.

(3) Encouragement should be given to the development of FM, to enable young technicians to have the same facilities to gain experience as those in other countries.

(4) Monopolistic control should be guarded against.

(5) The public taste in fidelity of broadcast reception is of lower quality than it need be. This is due to the average type of AM receiver hitherto marketed and to the distortions and noise inherent in the AM system, which tend to induce the listener to further reduce fidelity, in an endeavour to overcome these defects, by operating the tone controls provided in these receivers. The effect of the resultant difference in reception is comparable to the difference between hearing a modern electrical producing gramophone and a gramophone of the inferior type which it has superseded.

(6) FM will provide an improved coverage beyond the primary service area of an AM station of the same power, day and night throughout the year.

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(7) The range of an FM station may be extended by increase of operating power, without substantially extending the interference range, but increase of an AM station's power will very substantially extend the interference range from its "sky wave" reflections at night time.

(8) FM will not only provide noise-free channels for reception in the metropolitan areas, with a fidelity unknown up to the present in Australian broadcasting, but, by reason of the increased number of channels which it will make available, it will eliminate the crowding evident in the standard broadcasting band and give additional organisations an opportunity to reach the radio public, thereby eliminating the existing factor of monopoly.

21. The Australian Broadcasting Commission, which has also supplied helpful data on overseas developments, has expressed the following views:-

(1) The granting of FM licences is a matter of high policy, as it involves the place of national radio vis-a-vis commercial radio, which is bound to become a point of considerable dispute.

(2) If heavy capital investments were made by private citizens and companies at this stage, the difficulty of making any variation in over-all policy would be very great.

(3) In America there has been a fairly strong demand from educational authorities for FM licences.

(4) FM will make it possible to consider the broadcasting of State parliamentary proceedings within limited areas.

(5) The Post Office should set up technical facilities at some metropolitan centre for national service experiments before a policy for the introduction of FM in either the national or the commercial service is decided upon.

22. The Columbia Graphophone Company dissents from the opinion of the Federation of Commercial Stations concerning the unsuitability of existing recordings for use in the FM system. The Company believes it can be demonstrated that the bulk of the recordings can be re-broadcast, with first-class equipment, without evidence of increased distortion and with actual benefit to the fidelity of re-production.

23. Equipment manufacturers, their technical experts and others interested in radio development are not in complete agreement among themselves or with the Federation of Commercial Stations in some respects, as will be seen from the following summary of their evidence, which includes expressions of opinion which are in conflict with one another and which differ from the views of other witnesses summarised elsewhere in this report:-

(1) The provision of more stations in the medium frequency band is not favoured. The Post Office policy in the allocation of frequencies in that band is satisfactory.

(2) Considering what has been done in America, more channel-sharing in the medium frequency band could be authorised in Australia. This possibility should be examined by a technical committee comprising representatives of the Post Office, commercial stations and manufacturers.

/(3) Under

(3) Under the present set-up, unless sectional interests hold a broadcasting station licence they must purchase time from an existing station. The introduction of sectional interest material may affect the goodwill of the station, in which case the purchase of time may be refused. Any sectional interest is entitled to publish a newspaper or journal; similarly it should be able to obtain a radio programme channel, if available, without restriction provided it can give guarantees regarding continuity and quality of service. With the use of VHF a multitude of channels will become available, enabling sectional interests to be provided for.

(4) Provision for sectional interests to obtain "a place in the sun" would permit the investment of greatly increased capital, would result in a wider variation of programmes and would generally help in the economics of the industry.

(5) In America frequency allocations and general regulations governing broadcasting are made by a Government agency, the Federal Communications Commission, which thus performs similar functions to those carried out in Australia by the Post Office.

(6) A number of leading Australian companies hold patents or licences which would enable them to build efficient FM transmitters without making special arrangements. This number is sufficient to ensure economical competition.

(7) Australian manufacturers have made FM transmitters and receivers for the Defence Force during the war and could quickly produce similar equipment for civilian use.

(8) It is predicted that any listener who has a modern AM receiver will be able to buy an attachment for reception of FM.

(9) Experience has shown that radio receivers are renewed about every ten years.

(10) It would be wrong from a national viewpoint to introduce FM into Australia. No advantage would be gained. Australian listeners do not experience the interference troubles to dwellers in the congested areas of some American cities. FM would limit a station's coverage to an area of only 25 or perhaps 30 miles in radius, and would accelerate absolescence of present receivers, the value of which is probably £20,000,000. FM receivers will cost 50 per cent. more than AM sets; combined AM and FM receivers will cost even more. The only result will be a reduction in the ratio of listeners to population.

(11) The audio-frequency quality of "luxury" model FM receivers in America is appreciably superior to that of normal AM receivers. There is no perceptible difference in audio-frequency quality between FM receivers of f.a.q. standard and comparable average AM receivers.

(12) In turnover and in level of employment FM would bring no advantage to the industry. To commercial stations this could well develop into disadvantage and render nugatory the results of any plan to improve the quality of service.

/(13) Although

(13) Although re-production up to 10,000 and even 15,000 cycles is possible in an AM receiver, most of the recorded music etc. now available is recorded on discs and other media which themselves do not contain frequencies above 4,000 or 5,000 cycles. Programme transmission lines in Australia are mostly limited to 5,000 cycles; a few transmit at 7,000. Loud speakers capable of reproducing at 15,000 or even 10,000 have not yet been developed.

(14) By adopting tape recorders and the photo-electric method of picking-up recordings, the quality of recorded programme material could be improved. By re-designing transmission lines, such recordings could be faithfully re-produced. By equipping receivers with a multiplicity of loud speakers, sets of very high fidelity could be provided. All these things, however, could be done and applied to the present AM system.

(15) The national stations and a great many of the commercial stations are now capable of modulating up to 10,000 cycles. FM transmitters are not needed to achieve this, but with FM there would be the advantage that noise is reduced in noisy localities.

(16) In America FM became a popular public requirement, but at a low price. The industry "prostituted" FM by selling receivers which, while capable of FM reception, gave no better tone than a good ordinary AM receiver.

(17) The expectations of some Australian manufacturers in regard to the demand for new AM receivers have not yet been realised, due, it is said, to the following factors:-

(a) Publicised discussions affecting the possibility of new systems being introduced which might have a bearing on the economic life of receivers now on the market.

(b) The probability that, owing to people having been deprived of many necessary appliances during the war, the tendency is to purchase such appliances rather than radio sets.

(c) Radio has lost some of its war-time value as a medium for disseminating news.

(d) Returned service-men who have used new systems during the war have been instrumental in spreading an erroneous view that it would be unwise to buy existing sets which do not incorporate improvements with which they are more or less familiar and some of which are still secret.

(18) A lot of the devices developed during the war were used for communication purposes rather than for broadcasting. The laboratories of the world have not yet had time to adapt war-time developments to civil use. When all that is accomplished it is possible that a new broadcasting system will be evolved which may render some present methods obsolete.

/(19) FM

(19) FM has not reached its fullest development, and before any new system is introduced in Australia there should be a complete investigation of all factors. For example, "time pulse modulation", developed during the war for point-to-point communication, may prove by experiment to be advantageous in the broadcasting field, in that it might enable, say, ten different programmes emanating from different sources to be broadcast from one central station. The design of a time pulse receiver promises to be very simple; possibly only three valves will be required. This system offers a high degree of immunity from man-made noise, but as it is operated in the higher frequencies its range is limited in the same way as other systems using similar frequencies.

(20) FM was used extensively by the R.A.A.F. on the mainland and throughout the South West Pacific. The range was found to be as much as 250 miles from the ground to aircraft, and from 50 to 100 miles from one point on the ground to another point on the ground, the varying distance depending upon geographical formation.

(21) The prospect of FM enabling additional stations to be licensed naturally raises serious objections on the part of commercial stations which at present operate very profitably with reasonable freedom from competition.

(22) Australia should not be deprived of the benefit of a new system of broadcasting through influence exercised by people who consider that their interests might thereby be jeopardised. Changes which would affect the interests of listeners, broadcasters and manufacturers should be introduced in a controlled and orderly manner to prevent undue fear of immediate obsolescence of existing equipment. An authoritative announcement should be made in this respect to re-assure all concerned.

(23) A VHF station with its aerial in the centre of one of the capital cities and situated several hundred feet above ground level would be able to cover practically the whole of the city and suburban area. Reception outside that area would depend upon the contour of the ground. A range of 50 to 60 miles might be possible under favourable conditions.

(24) To cover country areas with VHF service from a distant transmitter would be costly owing to the number of relay stations required.

(25) The advantages of FM over AM in VHF transmission hold only under conditions where there is a clear air-line between the transmitting and receiving aerials. If there is a hill or steel building or other obstruction to the direct path of the waves, the receiving aerial will pick up waves which have been reflected, resulting in some distortion under AM but very severe distortion with FM. This difficulty may be overcome by comparatively high transmitting and receiving aerials.

(26) High buildings would not cause any noticeable interference with FM transmission. Experiments by the chief engineer of an Australian company which has made a large number of transmitters for use during the war, have led him to conclude that the waves tend to scatter in the same way as do light waves and thus pass around obstacles.

/(27) Before

(27) Before FM is introduced in Australia it will be necessary to adopt and adhere strictly to a given frequency band, in view of the experience in America, where a recent alteration of frequencies for FM will render a large number of receivers useless, as they have been designed to tune to frequencies differing from the new allocation in that country.

(28) In the past it has been necessary to co-ordinate world-wide frequency allocations to ensure the standardisation of equipment on mobile radio stations, such as those on ships, for communication or navigational purposes. This necessity still exists in the VHF band above approximately 50 megacycles, only so far as aircraft or shipping navigational aids are concerned; in other words, in transmissions above 50 megacycles the range is so restricted that Australia could have absolute freedom to make its own frequency allocations, as there would be no transmission beyond the Commonwealth.

(29) The strongest possible powers should be vested in the Post Office to deal with man-made interference with reception of broadcast programmes.

(30) Rather than embark upon a new method, it would be advantageous to build up the medium wave system by giving higher power to the stations now operating and developing FM side by side with that system.

(31) At least one experimental station should be established in each State to provide facilities for receiver design research.

(32) There is a misconception among some radio engineers that a gramophone record having a coverage of, say, 5,000 cycles will sound very much better in FM than AM. The fact is it will sound the same in both systems. The object of FM is to reduce extraneous noise, natural or man-made, and in this it has an advantage over AM. The statement of the Federation of Commercial Stations that there would be horrible distortion if ordinary recordings were broadcast by FM is technically unsound.

(33) If the majority of listeners are satisfied with the quality of reception available at present (irrespective of the noise experienced with the AM system), there is no need to introduce special recordings, new microphones, studio equipment, land lines, loud speakers etc. for FM transmissions.

(34) There is no comparison between the quality of reception by FM in America and the general standard of reception provided in Australia at the present time. (Standing Committee's note: This opinion has been expressed by the Managing Director of an Australian manufacturing company after personal experience during a visit to America).

(35) In an AM receiver the quality of re-production depends mainly on the valves; in an FM receiver it depends mainly on the design of the circuit in the set and also on the receiving aerial. At present more valves are required in an FM receiver than in an AM set.

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(36) The excise duty on all Australian-made valves should be revoked and there should be a substantial reduction in the duty on imported valves which are uneconomic to make in Australia owing to the comparatively small quantities required. Adoption of this suggestion would result in a reduction of from £2 to £5 in retail prices of receivers. In addition, a reduction in the listed prices of valves would encourage set-owners to replace partially worn valves, thereby stimulating the valve-making industry and effecting improvement in reception of programmes.

(37) At the request of Australian manufacturers, a company was formed in 1933 under the name "Australian Radio Technical Service and Patents Co. Pty. Ltd." (known as ARTS) to enable receiver makers to obtain a single licence to use all the radio patents emanating from the most important overseas laboratories. The company entered into agreements with the major patent holders and obtained an exclusive right to grant such licences. The formation of this company enabled manufacturers to deal with a single agency instead of having to make arrangements with individual patent holders. ARTS charges royalty on the basis of the number of valves in a receiver.

(38) A patent-owning company is entitled to charge a fair royalty for the use of the inventions which it controls, but it would be against the public interest for the company to charge excessive royalties. Negotiations are proceeding between manufacturers and ARTS in an endeavour to arrive at a mutually acceptable basis for the determination of future royalty charges. The parties are also considering the question of agreeing to have recourse to arbitration in the settlement of any disputes in view of the high cost of resorting to litigation.

(39) The total amount paid in excise and sales tax influences the manufacturer to deprive the Australian public of many refinements in receivers available in other countries.

24. The Post Office evidence is condensed as follows:-

(1) Over 900 applications are recorded for additional commercial station licences. Although many of the applicants are no longer interested, there are many worthy organisations and persons anxious to establish stations. There is a limit, however, to the number of stations which can be profitably maintained by any one community.

(2) The most important requirement is to improve the service to country listeners. The most effective method of doing so would be the provision of more stations in rural areas, but the shortage of channels in the medium frequency band is a great difficulty. It has not yet been possible to allocate channels in that band for some of the additional national stations awaiting construction. Any extension of channel-sharing working in the medium frequency band would degrade the night-time service of the stations concerned, and if existing clear channels had to be shared the secondary coverage of the stations affected would become non-existent.

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(3) It would not be advisable to adopt in Australia the American system of allocations in the medium frequency band. Although the two countries are approximately the same size, the vast difference in population is the determining factor, because stations can operate profitably in much smaller areas in a densely populated country.

(4) Many of the high-powered stations in America are subject to interference from distant stations. This disadvantage has been avoided in Australia by placing the higher-powered stations on exclusive channels.

(5) Other American practices which cannot be advantageously adopted in Australia are restriction of operation to daytime, sharing of time, and reduction of operating power at night.

(6) If American sharing conditions were applied in this country, listeners in remote localities would be deprived of a service and many stations would be forced to cease operations.

(7) The main factor limiting extension in the medium frequency band is the "sky wave" at night-time, which restricts the number of stations which may operate if they are to be afforded reasonable coverage.

(8) In a tentative Commonwealth plan to use the VHF band of frequencies (between 30 and 300 megacycles per second), the band 90-108 megacycles has been allocated for broadcasting. "Sky-wave" is of no consequence in that band, and consequently a given frequency may be shared between a number of transmitters, giving the same coverage day and night, provided the transmitters are separated by approximately 150 miles.

(9) Atmospheric noise is much less in the VHF than in the medium frequency band, and, in the absence of any other forms of noise, lower values of signal strength may be used to give a satisfactory service.

(10) In VHF service the coverage of a station increases considerably with increase of height of the transmitting aerial above the surrounding terrain.

(11) FM has a distinct advantage over AM in VHF service, in that it is less susceptible to noise from electrical appliances.

(12) FM service from a 5,000 watt VHF station 500 feet above the surrounding terrain would over-ride noise 58 miles from the transmitter, whereas with AM the same grade of VHF service would only be obtainable to 36 miles. With AM the power would have to be increased to 250,000 watts to cover the same area with the same grade of service as the 5,000 watt FM station. (Standing Committee's note: Some idea of the cost which this increased power would involve will be apparent from the evidence tendered on behalf of a certain station owned by a capital city daily newspaper, that the cost of operation at 50,000 watts would absorb practically the whole of the revenue received by the station, whose manager has said: "I believe that when the operators of commercial stations learn how much it will cost them to operate on high power, many of those now clamoring for an increase will not be so enthusiastic".)

/(13) ..

(13) A high quality of re-production is more readily obtained with FM than AM, provided receivers, programme lines and studio equipment are suitably designed.

(14) In the tentative allocation of 90-108 megacycles in the VHF band for broadcasting, 90 FM channels would be available. Of those, it is probable that about 30 could be used at a number of localities under certain conditions. For example, if all stations operated with a power of 5,000 watts and an aerial height of 500 feet, a common channel frequency might be used provided the stations were 150 miles apart. If the power were limited to 250 watts and the aerial to 200 feet, the spacing of co-channel stations could be reduced to about 84 miles. Hence, although the number of channels would be limited to 90, sharing would be possible to such an extent that the number of stations which could be operated in Australia would be very large, probably well in excess of 1,000.

(15) If AM were used in the 90-108 megacycle band, 450 channels would be available compared with 90 FM channels. But, as noted above, a 5,000 watt FM station would give the same service as a 250,000 watt AM station, and, in addition, common channel FM stations could be operated at much closer proximity than AM stations. These factors give such a pronounced advantage to FM that its use must be recommended in preference to AM in the VHF band.

(16) On the grounds of greater fidelity and lower noise level only, FM would not be worth while, as in these respects the improvement which city listeners would notice over their present standards of reception would be slight. FM, however, would be well worth while in providing a means of expansion which would ultimately allow country listeners to benefit from an improved medium frequency service.

(17) It is not expected that inordinate delays would be experienced by manufacturers in placing on the market FM receivers or combination units which would receive medium frequency in addition to FM transmissions.

(18) In order that listeners, particularly those in the country districts, may have adequate choice of programmes, a wholly FM service should be provided only in areas which are capable of supporting several stations.

(19) Some medium frequency stations should be retained for listeners in isolated localities who have to rely on secondary service from the "sky wave" coverage of such stations. FM has no secondary service and with its limited range would not be generally suitable for rural areas, although it would not necessarily be excluded from country areas in appropriate circumstances.

(20) The most suitable plan would be to provide for a combination of FM and medium frequency broadcasting. A wholly FM service would be suitable in city areas, where sufficient stations could be operated to give choice of programmes, but medium frequency stations should be used for rural areas.

/(21) In

(21) In many country localities residents are dependent upon an inadequate service from a distant national or commercial station. This could be remedied by converting city stations to FM and using their medium frequency channels for country stations. More than 30 clear medium frequency channels would become available in this way. City listeners, when equipped with suitable receivers, could be adequately served by FM stations.

(22) As city listeners are not equipped to receive FM broadcasting, it would be necessary to operate FM stations simultaneously with the existing city medium frequency stations until practically all the 700,000 city listeners had obtained suitable receivers, over a period of perhaps ten or fifteen years. City medium frequency stations could then be closed down and their medium frequency channels made available for rural areas.

(23) World experience with FM has not been sufficiently extensive to justify its introduction on a wide scale immediately. The advantages claimed for it should be proved in practice over a period of time under actual operating conditions in Australia. It is suggested that the Post Office should provide an FM transmitter in each capital city for trial purposes and radiate the national programme during tests. The trials are intended as a means of giving to the trade and to Post Office technicians an opportunity of handling the matter during a precautionary period.

(24) There would be no great objection to the Federation of Commercial Stations being afforded an opportunity to establish an experimental FM station in each capital city, provided the programmes were confined to those of existing medium frequency stations and provided that permission to erect any such test stations would not convey any rights for a commercial licence in the event of FM being introduced ultimately into the Commonwealth. However, in view of the high costs involved in purchasing and operating such stations purely for trial, it would be to the advantage of the commercial stations to await the outcome of the Post Office tests.

(25) After the experimental period equal opportunities should be afforded to national and commercial services in city areas. The Post Office would arrange for FM transmissions of the national programmes, and commercial station licensees would be encouraged to simultaneously radiate their programmes by FM with the aim of surrendering their medium frequency channels as soon as possible.

(26) Listeners with a medium frequency receiver only would be guaranteed service for some years. Those who purchased a combined receiver would be able to hear the programmes in medium frequency or FM transmissions. The use of receivers covering only FM is not visualised until such time as most of the stations in any one city have commenced regular FM transmissions.

(27) It would be technically practicable to license entirely new services on FM, but there would probably be little demand for them for some years until such time as a reasonably high proportion of listeners had equipped themselves with FM receivers.

/(28) Up

(28) Up to November 1945 applications for FM station licences in America totalled 676, of which 126 had been granted and the remainder were still under consideration. Of the total applicants, 68 per cent. comprised broadcasting station licensees. (Standing Committee's note: Later information, as at the end of January 1946, is that more than 750 new applications for FM transmitters had been received and that 300 licences had been issued).

(29) In England tests of FM are in progress; in Canada technical aspects are under consideration; in South Africa and New Zealand no plans for the introduction of FM have yet been formulated. (Standing Committee's note: Later advice, March 1946, is that the Canadian Broadcasting Corporation is about to begin operation of 250 watt FM transmitters in Toronto and Montreal and plans to have similar transmitters operating in Winnipeg and Vancouver later).

(30) For broadcasting, the system of modulation known as time pulse compares unfavourably with FM. To give the same quality of service with equal powers, the pulse channel requires about six times the bandwidth of an FM channel. If confined to the same bandwidth, the power for the pulse transmissions would have to be about forty times greater for the same quality of service. The feature of the pulse technique whereby a number of programmes can be radiated from the one transmitter appears to have little prospect of application in the Australian system.

(31) If receivers of three valves were developed to give the same service as those at present needed in FM receivers, then one or more of the valves must perform a multiplicity of functions and there would be no reduction in complexity or cost.

(32) Neither pulse time modulation nor any other system of broadcasting is near the stage of development reached by FM broadcasting in 1937. Hence many years may be expected to elapse before a system of superior capabilities is available.

25. Later evidence, from the Supervising Engineer of the Post Office Research Laboratories, who has just completed investigations abroad, confirms the general views and technical explanations expressed by his colleagues. He agrees that the expansion of broadcasting into the VHF band should be undertaken as soon as possible. He points out that, technically, FM broadcasting could begin almost immediately, and that the method proposed by the Department for its introduction should result in the change-over being effected with the least disturbance of the people's listening habits. He has emphasised that there is nothing new in FM for the public, that it is merely sound coming out of the receiver in the same way as it does now, that the quality is better, but that the listener can obtain the same high quality now by spending more money to get a very good amplifier. In reply to questions, the witness has explained that there has been continuous co-operation between the engineers of the Post Office and the C.S. and I.R. experts in the investigation of radio matters. In 1930 a radio research board was set up, comprising representatives of the two organisations, - the Post Office bearing four-fifths of the cost and the C.S. and I.R. one-fifth. During the war the various services also contributed to the cost, but at the present time the Post Office is contributing more than half of it. The witness adds that there is no longer any need for investigations into the VHF band; all the conditions are known, and the problems remaining are administrative and financial only.

/Standing

Standing Committee's Comments.

26. In a preamble to the presentation of its views, the Federation of Commercial Stations has expressed the opinion that better service for listeners should be the sole consideration in determining whether or not any particular system should be adopted and that there should be no holding up of any technical advance to that end.

27. In contrast with that opinion, however, and notwithstanding authoritative testimony of the beneficial technical advance which FM is capable of conferring, there is a tendency in the evidence submitted by the Federation and by some other commercial interests, to emphasise difficulties in the introduction of FM, to minimise its advantages, and to urge alternative proposals based on American practices in AM medium frequency service which are unsuitable for Australian conditions. As shown in the Post Office evidence, the application of such practices in this country would restrict still further the already inadequate service available in rural areas, would force many stations to close down, and would prevent country listeners from securing a better medium frequency service than they experience at present.

28. Our impression is that some interests are reluctant to become reconciled to the prospect of additional competition and to acceptance of FM in place of AM channels in capital cities, some of which, at least, are required for expansion of the national service in country districts. An old claim that commercial stations should have "absolute parity with national stations" has also been revived by the Federation.

29. In weighing the pros and cons, especially in regard to the absolute parity claim, we have necessarily been mindful of the evidence tendered to our predecessors by the Post Office in 1942, when it was explained that, in accordance with Cabinet decisions of July 1928, the national service was to be a co-ordinated public utility operating throughout the Commonwealth, and that the commercial stations were to be "individually operated units intended to give a service essentially local in character.... If commercial stations were forced to duplicate the kind of service provided by national stations in some very sparsely populated areas, they would be financially embarrassed. There are cases where the annual costs of the plant in a national station (that is, excluding programme costs) are over five times the total revenue drawn from the area served. Because such a station is but a unit in a co-ordinated (national) system, the losses are compensated by surpluses in densely populated areas".

30. In view of that evidence, as well as the evidence of FM's advantages over AM in the VHF band, and bearing in mind the overriding necessity to provide adequate service in rural areas, we are in agreement with the Post Office proposal ultimately to substitute FM in that band for AM in the medium frequency band in the capital cities.

31. As emphasised in the Post Office and other evidence, the most important, though indirect, objective in applying FM to the capital cities, is to enable AM channels to be diverted for badly needed service in country districts.

/32. Besides

32. Besides that objective, however, and in addition to the direct advantage of greater freedom from noise, it is necessary to consider the view of witnesses who hold that FM is also worth while by reason of its higher quality of reproduction if receivers, programme lines and studio equipment are suitably designed.

33. The opinion of those inclined to dissent from this view is contingent on the assumption that listeners are satisfied with present standards of reception. That assumption was the subject of disputation in America, in the initial stages of FM development in that country. For instance, one leading American company contended that listeners do not appreciate even the degree of fidelity which AM sets are capable of reproducing and that they deliberately tone it down to what has been described as a "mellow" effect. There have also been suggestions that appreciation of fidelity is affected by deterioration of the sense of hearing after listeners reach a certain age.

34. On the other hand, a highly placed executive of another well-known company in America affirmed that "enough practical FM field experience is available to prove that higher fidelity does have definite public interest and that it is liked and appreciated and is a logical natural advance in radio progress." This experience was confirmed by Major Osborne, a technical officer, whose services were made available to Australia by the British Government, and who had previously held responsible radio engineering positions in America. Giving evidence to our predecessors (the Standing Committee of the 16th Parliament) in 1942, Major Osborne declared that "frequency modulation has the advantage that.....you get high fidelity because the band is able to carry very high and very low notes. With the ordinary system, the band must be cut so as to increase the number of stations which can operate in the one area. After one has listened to a frequency modulation broadcast, one would not wish to go back to amplitude modulation which is used at present."

35. Whatever the degree of weight to be conceded to conflicting viewpoints on the value of this high fidelity characteristic of FM, it does not seem practicable to test properly the assumption that Australian listeners are satisfied with present standards until they are given the opportunity to make adequate comparisons with other standards at reasonable cost.

36. It may be that in some quarters the outlook is comparable, to some extent, with the course of events in connection with the development of motion pictures. We have been reliably informed that "talkies" were invented 12 or 13 years before they were made available to the public, and experience has shown how incorrect it would have been to assume that picture-goers would have remained satisfied with "silent" standards of films throughout those years if the new inventi. had been "released" earlier.

37. There is evidence that FM receivers will be more costly initially, but the higher cost of admission to "talkies" in comparisor with "silent" pictures has not deterred the people from patronising them. It is probably true to say of the average metropolitan household that its expenditure in the purchase and maintenance of an FM receiver on equitable terms would be very substantially lower than its accumulated outlay on "talkies" throughout the period of years during which the receiver would remain serviceable. A good deal will probably depend on the nature of the publicity campaign which the interests concerned will no doubt undertake at the appropriate time.

/38. In

38. In regard to means of making FM receivers available at reasonable prices, there is evidence of certain practices in the trade which might well be reviewed in the interests of listeners. It has been disclosed that, after paying royalty charges to patent holders on the basis of the number of valves in the set, manufacturers more than double those charges in passing them on to the public. For example, it is said that for a five-valve dual wave set the royalty amounts to 17/6d., but in fixing the retail price of the set the manufacturers increase that 17/6d. to £2 or more.

39. A similar practice is followed in passing on customs or excise duty on valves, except that the multiplying process appears to be on a higher scale, as shown in a report, dated 28th August, 1939, by the Tariff Board, one of whose witnesses declared that "the real analysis of the excise tax is that it is a tax collected from the user of the valve in which 75 per cent. is paid to the gross revenue of distributors and 25 per cent. to Commonwealth revenue". The Tariff Board suggested that if some method of collecting excise at a later stage in trade operations could be evolved, this would result in the same revenue to the Commonwealth with a much lighter burden on users.

40. In the same report the Tariff Board referred to certain valves, not manufactured in Australia, which cost importers 6/4d., including duty. The retail price is fixed at about 200 per cent. above that sum, notwithstanding that these valves, being merely replacements, have no Australian manufacturing costs associated with them. The Board expressed the opinion that this procedure was contrary to the public interest and suggested that efforts should be made to find a remedy. This is a matter which it would seem appropriate to refer to the Prices Commission for investigation.

41. We have drawn attention to these practices mainly because it is understood that FM receivers will require the use of more valves than AM receivers, and the imposition of unwarrantably high charges associated with their provision may tend to delay the substitution of FM for AM in the capital cities for a longer period than would otherwise be necessary, to the disadvantage of country listeners waiting to receive the benefit of the AM channels which are then to be released from capital city use.

42. A partial remedy may perhaps be found in adoption of a suggestion made by the chief engineer of one of the leading manufacturing companies, who formerly held responsible positions in the Commonwealth Public Service. In a report to the Secondary Industries Commission while he was a public servant, he pointed out that the charging of royalty on the basis of the number of valves in a receiver plus the excise duty on valves, results in a tendency on the part of manufacturers to adopt technical devices in an endeavour to "savagely skimp" the number of valves in a set. The consequence is, he says, that the public does not receive the best types of receivers embodying the best overseas inventions because of the fictitious value which has thus been placed upon the use of valves. His suggestion - and he still advocates its adoption - is that if the patent-owning companie could be persuaded to adopt a different measuring rod, such as a royalty on each completed receiver, and if another basis of excise duty, such as a percentage of the wholesale selling price, were adopted, it is certain that there would be an upgrading in the quality of the product.

43. Objection has been raised to this suggestion in some quarters, so far as royalties are concerned, on the ground that it would involve delving into manufacturers' costs, but that difficulty does not appear to be experienced in Britain and America, where, it is said, royalty payments are fixed on the basis of so much per completed set.

/44. It

44. It has been said that there are administrative difficulties in altering the method of collecting excise duty, but that phase of the suggestion might well be re-examined by the Customs authorities and the Prices Commission jointly, for the purpose of determining whether the administrative difficulties are really of such a character as to justify the financial burden imposed upon purchasers of radio receivers by a state of affairs in which they have to pay up to three times the amount of excise duty which the Government desires to receive for such duty, and which is intended to be a contribution to the consolidated revenue and not to afford an opportunity for intermediaries to increase its incidence so substantially at the expense of the user.

45. The suggestion appeals to us as being worthy of further consideration by the authorities concerned, as it appears to hold out a prospect of dual advantage, - first, in putting an end to the multiplying of royalty and excise charges in the process of fixing retail prices; second, in improving the quality of receivers, thereby helping in the objective of inducing wider appreciation of higher grade radio service. In addition, it should help to stimulate sales of receivers and thereby benefit manufacturers.

46. We commend to the consideration of all concerned that, as soon as financial and other circumstances permit, the aim should be to provide studio and transmission equipment, recordings, programme lines and receiving sets at reasonable cost in accordance with standards which will confer opportunities for Australian listeners to experience the best that world invention has to offer.

47. Conflicting advice from experts on technical aspects of FM emphasises the necessity of continuing to have, in the public interest, a competent technical authority whose opinions cannot be questioned on the ground of actual or potential partiality arising from association with commercial undertakings.

48. The Post Office, with its highly qualified and experienced engineers, its research laboratories, its "lines of communication" with world developments and, above all, its impartial outlook, is pre-eminently equipped to continue functioning as that authority, in collaboration, when necessary, with the Council for Scientific and Industrial Research.

49. We are therefore diffident about supporting suggestions which have been made on behalf of commercial interests for the setting up of mixed committees to deal with the allocation of frequencies and other technical questions. That is not to say that interested parties would be denied hearing and consideration of any submissions they might wish to make from time to time; on the contrary, they should be welcomed. But after such hearing and consideration have been conceded, there is a lot to be said for the view that in a field of public service such as broadcasting, in which public benefit is recognised to be the dominant element, determination of the nature of the technical advice on which decisions are taken should remain with an authority responsible through the Minister and through Parliament to the Australian people as a whole. It is debatable whether that responsibility could be satisfactorily shared with people who are only accountable to the commercial undertakings which employ them, and who, for that reason, could not be given access to information of the kind to which reference has been made by the Federation of Commercial Stations in its evidence that "the Federal Communications Commission (of America) had the advantage of access to military and naval information when reaching its conclusions (on the allocation of frequencies) that is not available to laymen".

/50. In

50. In any case it would be premature at this stage to determine finally the overall portion of the VHF band which the Post Office has tentatively allocated to broadcasting in Australia. This and other associated questions, such as, the allotment of specific frequencies within that portion of the band to various interests; the reservation of channels for religious and educational institutions (as recommended by the 1941 Joint Parliamentary Committee and by the Standing Committee of the 16th Parliament); the question of amending the law relating to the tenure of, and fee for, station licences, and the number of stations which may be controlled by any one company; also the general conditions under which licences may be granted - all these are matters which it would be appropriate to consider during the precautionary period of testing for the benefit of technicians and equipment manufacturers.

51. It has been suggested in certain quarters that the administration of broadcast licensing should be withdrawn from the Post Office and vested in a new body to be constituted with independent powers similar to those of the Federal Communications Commission of America. This involves a question of high policy and is outside our terms of reference.

CONCLUSIONS.

52. Our conclusions are:-

(1) National service tests of FM in the VHF band should be made in each capital city, as proposed by the Post Office, the estimated cost of the six stations being £48,000, excluding the cost of programmes (which do not enter into the calculation, as existing national AM programmes would be transmitted).

(2) Arrangements should be made for the Federation of Commercial Stations to make a similar test in each capital city if so desired (using existing commercial programmes), under such technical and other conditions as the Post Office deems necessary in the public interest.

(3) Similar tests by applicants for FM licences who do not hold AM licences would involve them in heavy expenditure, not only for transmitting equipment but also for studios and programmes, in respect of which they could not hope to secure advertising revenue until such time as a substantial number of listeners were equipped with FM receivers to hear such programmes. Hence, experiments by these applicants would probably have to extend over a number of years and would not be tests in the sense intended under the Post Office proposal. Therefore, to authorise tests by these applicants now would be tantamount to the issue of licences to them, - a procedure which would entail difficult discrimination and might be unfair to other interests pending determination of the overall policy which is to govern the issue of licences in future, after settlement of the questions referred to in paragraph 50.

(4) Consideration should be given to means of improving the quality of equipment and reducing the cost of receivers (see paragraphs 38 to 46).

/(5) FM

(5) FM, in the portion of the VHF band which the Post Office considers most suitable as the result of the tests, should be substituted for AM in the medium frequency band in capital cities, at a date to be so selected as to provide for the change-over occurring within a period bearing a reasonable relationship to the normal depreciation of receiving equipment.

(6) In order to safeguard the interests of all concerned as reasonably as possible, an official announcement should be made as to the approximate length of time during which AM service in the medium frequency band will continue to be provided from capital city stations.

TELEVISION.

53. Our terms of reference require us to report in what manner and to what extent television should be incorporated in the domestic broadcasting system of Australia.

54. Having heard evidence on the subject from representatives of the same groups of interests as are concerned in FM broadcasting, we set down a summary of the information supplied and opinions expressed by them. As in the case of FM, the views of witnesses, even in the same group, are in conflict with one another in some respects. In fairness to all concerned, however, the principal differences of opinion are included in the summary.

Summary of Witnesses' Submissions

55. On behalf of the Post Office -

(1) A public television service was opened at Alexandra Palace in London in 1936 by the British Broadcasting Corporation and remained in operation until 1939, when, on the outbreak of war, it was discontinued for military reasons. It covered a radius of 35 miles around London, embracing a population of about 10,000,000. The approximate number of receivers in use was 20,000. £450,000 was made available to the Corporation for the service during 1939.

(2) The British Government has broadly accepted a report made in December 1944 by a committee set up by the House of Commons, recommending that operations be re-commenced without making any technical changes in the British pre-war television system, but pointing out that vigorous research work should begin to produce a radically improved system, and suggesting that an additional licence fee of £1 per annum should be collected from those possessing television receivers. It is anticipated that the service will be re-opened in London during 1946. It is to be extended to possibly six provincial centres. (Standing Committee's note: Subsequent to the tendering of this evidence, the London service was re-opened in June 1946).

(3) In May 1941 rules and standards were decided upon in America for monochrome (black and white) service. By September 1944 six commercial television stations had been licensed in that country and each was rendering a programme service, although three of the stations had not completed full construction because of war-time conditions; also, 30 experimental stations had been authorised, including 15 relay stations. Three of

/the

the experimental stations were giving a limited service to the public. (Standing Committee's note: Later advice, as at January 1946, shows that 50 stations had then been authorised to proceed with construction and that 150 other applications were under consideration).

(4) In November 1945 a new allocation plan was decided upon in America, providing for more than 400 stations. The largest number allotted for an individual city is 7. Stations are to operate for at least 28 hours per week and for a minimum daily period of 2 hours.

(5) In late 1944 the estimated population within range of the American stations was 27,000,000. The number of receivers sold was 7,000.

(6) The public has not yet supported television in England or America enthusiastically. The service is not yet on a firm footing in either country, the emphasis being on research and developmental work with a view to introducing radical improvements.

(7) Lack of support may be due largely to the short daily hours (2-3) of service, on account of the cost of programmes and the difficulty in obtaining them.

(8) Probably the programme hours of television will always be shorter than those of sound broadcasting, due to the necessity for undivided attention on the part of the audience.

(9) Colour television has not yet passed beyond the experimental stage.

(10) Viewing screens on the receivers so far available have been too small. They have ranged from 5" x 4" to 10" x 8". It seems reasonable to expect that a size at least 20" x 16" will be generally available in future. One American manufacturer proposes a screen 24" x 18".

(11) Knowledge that has become available during the war will be of assistance in improving the performance of receivers, and mass production methods should be possible to reduce cost. It is unlikely that the cheapest model would cost less than £50; maintenance would probably cost from £5 to £10 per annum.

(12) To serve a 20 mile radius around a city such as Melbourne, the capital cost of a station is estimated at £210,000 and the annual cost at £390,000 for a service of 16 hours per week. Reception at a greater distance would be obtained at times, but generally beyond 20 miles it would not be satisfactory.

(13) There are approximately 250,000 licensed listeners in the 20 mile radius around Melbourne. Assuming that 25 per cent. of these purchased receivers, it would cost £6 per annum per receiver to defray the running expenses of the service. This assumed figure of 25 per cent. is much higher than the proportion of television receivers to licensed listeners in the London area, which in 1939 was 1 per cent. If the public only responded to the same extent as in London, the cost per receiver would be £150 per annum.

/(14) The

(14) The capital and annual cost of an independent service in another capital would be approximately the same as for Melbourne. The proportionate cost of the service per receiver would be considerably more in the smaller capitals where fewer receivers would be in use.

(15) If other capitals were provided only with relays of the Melbourne programme, there would be a reduction of programme costs in those capitals, but there would be additional costs of providing interstate channels suitable for television relay. At the present stage of development, the cost would be £3,000 per mile, which in the case of Melbourne-Sydney would total £1,500,000.

(16) In sound broadcasting the revenue from listeners' licences in densely populated areas helps to pay for the transmitting facilities in the sparsely populated regions. In the case of television, a service in one capital city would involve such high costs that the revenue from the rest of the Commonwealth might have to be applied, unless the service could be financed by a special levy on television receivers.

(17) Great Britain and America, in which countries most development has taken place, have adopted different transmission standards for television. In addition, they contemplate operating their services in different portions of the frequency spectrum. At the present time, if Australia adopted the English standard it could not use receivers built to American standards, and vice versa.

(18) There will be considerable alteration to present standards before stability has been achieved. In England, concurrently with the re-commencement of the pre-war service, it is proposed to pursue the matter of establishing a service conforming to higher standards. It would therefore be unwise to inaugurate a service in Australia without some guarantee that it could be established on a permanent basis. This guarantee could not be given if full advantage is to be taken of improvements which will eventuate. Nothing should be done which would encourage a large public investment in receivers which, by reason of technical advances, might become obsolete in a relatively short time.

(19) Publicity on the subject in England appears to be associated with plans for development of export trade and with the objective of holding a leading position in the television field. In America the elaborate publicity methods being employed suggest that it is becoming necessary for those who have made substantial investments to obtain some financial return. These factors in the two countries may cloud the issue whether television is at a suitable stage for adoption as a public service.

(20) In view of the unfavourable outlook towards the immediate introduction of television in Australia, it is not necessary to carry examination of the matter any further at present. The Post Office proposes to conduct such experimental work as is necessary to keep itself abreast of the trend of developments overseas.

/(21) No

(21) No licences for commercial television should be issued at present, in order to safeguard the interests of the public who might purchase receivers which may ultimately be useless on account of termination of the service or a change in technical standards.

(22) In Canada many applications for stations have been received but no licences have yet been issued. Experiments in other countries, particularly the United States, are being watched and when it is felt that a satisfactory stage of development has been reached the Canadian authorities will give consideration to the establishment of stations at principal centres.

(23) In South Africa the authorities have decided to await the time when international standardisation is decided and success proved by results. There are no plans for television in New Zealand.

56. In later evidence, the Supervising Engineer of the Post Office Research Laboratories, who has just returned from investigations abroad, confirms the general views expressed in the earlier Post Office evidence, and has also supplied additional information and opinions based on his inquiries overseas, which are condensed as follows:-

(1) British authorities expressed the opinion that it would be better to adhere to the 405 line standard in England until such time as it were practicable and justifiable to make a change to a much better standard, such as 800 lines, which would permit large projected pictures of a quality approaching that of motion pictures.

(2) In England there is optimism among highly placed authorities as to the future of television service, but among the general public the witness received the impression that television is overshadowed in their thoughts by the problems of food, clothing and housing. There was no production of television receivers proceeding up to the time the witness left England (eight months ago); manufacturers were unable to get labour and material for the conversion of their factories to the production of peace-time domestic goods.

(3) The black and white pictures produced on a television receiver to American standards are very good from the standpoint of technical quality.

(4) There is almost no activity in the manufacture of receivers in America except in the making of cathode ray tubes, due to difficulties in securing material and labour for the conversion of factories from war-time production and the strikes that have affected the electrical industry and the basic industries upon which it depends. In addition to these retarding factors, a successful demonstration of colour television by the CBS (Columbia Broadcasting System) in February 1946 illustrated the added significance and vividness given to fast-moving events when they are shown in colour, e.g. a football match or a horse race.

/(5) In

(5) In the witness's opinion, the addition of colour to television is more important than the addition of colour to the cinema film. In the latter case it may be regarded as a refinement; in television it will probably be a vital matter bearing upon the crux of the television situation, namely, its acceptance by the public as a service in the home.

(6) Colour television must be operated on higher frequency bands than are required for monochrome. There are also other technical factors which will need resolution by further experiment. None of these are fundamental, and requests have been made to the Federal Communications Commission to allocate frequencies for regular colour television services.

(7) Certain manufacturers in America who were about to resume production of television receivers decided to postpone their plans because of the CBS demonstration. One publicly announced that it would abandon the making of monochrome receivers and would concentrate on colour television.

(8) The witness was given to understand that as a result of the CBS demonstration the Canadian Broadcasting Corporation would adjust its plans so as to avoid introducing black and white television.

(9) It would be unwise to introduce television in Australia on a monochrome basis. Within the next two or three years colour television should be so well advanced that it will be worth while to postpone decisions until that time.

(10) The cost of a transmitter for colour would be about ten per cent. higher than for black and white television; if more than one were to be made the cost would no doubt be proportionately lower.

(11) Although colour has gone a long way towards supplying the "missing link" in the essential public appeal, there still remain the very high capital and annual costs, which apply to any form of television.

(12) The equipment for colour television does not differ materially from that used for monochrome television, but it is not interchangeable. For colour, certain additions are necessary at the transmitting and receiving ends.

(13) Television is a luxury service and is analagous to home movies, except that it has the advantage of making it unnecessary to put up a screen, arrange a projector, change film spools and so on; also the further advantage of actuality in respect of events that are suitable for television broadcasts, that is, where only a few performers are taking part, or perhaps only two, as in boxing.

(14) In America the largest receiver gives pictures 16" x 22" and the set costs 600 dollars. A new valve for the set costs as much as £20. Hence television is a very costly service, and the public would have to pay for it either directly in the way of licence fees or indirectly through sponsored programmes.

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(15) The Federal Communications Commission of America believes that colour might make the difference between television being a luxury service as it is now and the popular service which everyone hopes it might become. In America, television as a luxury service might still be able to support a considerable industry, but that would not be possible in Australia with its smaller population.

(16) If the addition of colour "touches the trigger" of public interest, television should be introduced in Australia, in preference to monochrome, but how it would be financed is another matter.

(17) The provision of the technical service associated with television is so expensive that private enterprise in Australia could probably not afford to bear the cost.

(18) A new system of programme planning will be required, and it is almost certain that picture-making studios will be brought into it. For that reason the witness is unable to commit himself on the question whether control of the programmes should be in the hands of the Australian Broadcasting Commission or not. In any case, the provision of cables for the transmission of actuality programmes to studios for broadcasting would be a matter for the Government.

(19) In Great Britain the Government has accepted the recommendation of the Hankey Committee to charge a television licence fee of £1 per annum in addition to the ordinary licence fee of £1. Even at that, the Treasury will have to subsidise the television service to the extent of more than £2,000,000.

(20) In America television is left to private enterprise; the Government confines itself to functioning as the regulating authority to control the operation of the industry.

(21) It is unlikely that television will constitute any real threat to the moving picture industry. It will be complementary to that industry rather than in competition with it.

(22) Perhaps the only real thing of value about television is its provision in theatres. It is believed that the theatres will add a television service to their programmes and that this may change the whole financial outlook in regard to television in the home.

(23) There should be evidence of acceptance of home television by the public before a very expensive service is embarked upon, and it would be preferable to await the perfection of colour television in the hope that this might ensure its popularity.

57. On behalf of the Australian Broadcasting Commission.

(1) Television is in a stage of development which renders it inadvisable for Australia to determine its policy until overseas investigations and experience have proceeded further.

(2) At the appropriate time the Post Office should set up technical facilities at some metropolitan centre for experimental purposes.

(3) One of the most valuable fields for television lies in the presentation of current events, sporting fixtures and other similar material where an ability to see what is taking place is of primary importance.

(4) The British Television Committee suggested that for the post-war development of television, licences should be introduced both for domestic viewers and for the use of television in cinemas.

(5) The Commission will require additional revenue to provide the programmes.

(6) In the initial stages, at least, the service should be confined to the national system. Once heavy capital were invested by private enterprise, there would be very great difficulty in making any variation in over-all policy.

58. On behalf of the Federation of Commercial Stations.

(1) Television is more competitive with motion pictures than with broadcasting.

(2) There is no doubt regarding the technical practicability of television, but there is still a doubt regarding its capacity to attract and retain a mass audience.

(3) Immediately prior to the war there was a new development with the introduction of the Scophony projector, which provided a 24" x 20" picture in a commercial model home receiver. This development was also adopted for theatre screening of current events.

(4) More than £8,000,000 has been spent by leading companies in America in endeavouring to popularise television.

(5) Premature fixing of standards might eliminate the benefits of research work carried out during the war and at present on the military secret list.

(6) Suggestions have been made that Australia might align itself with Great Britain to establish Empire standards, but if this means accepting an inferior article the idea should be opposed.

(7) Before a potential purchaser of a receiver is likely to be induced to invest in it he must be convinced that the programme will satisfy more than transient curiosity, that it will maintain a continuity of interest through its variety and quality, and that the receiver will not have to be scrapped or altered too soon because of technical changes.

(8) Programmes may be derived from three sources - films, telecasts of outside events, and studio presentations.

(9) Some enthusiasts suggest that with the advance of television the motion picture industry will either go to the wall or will have to accept television as an alternative outlet. Before that happens television will have to provide the life-size image seen in the theatre and will have to compete successfully with the attractive conditions of theatre screening, where the "herd instinct" is a factor and where there is freedom from the distractions experienced in the home.

(10) The "documentary" or educational typ of film, which received an impetus during the war, is one which might provide possibilities for use in television.

(11) An international conference should be arranged to determine technical standards and frequency allocations. The problem of television would then be reduced to one of costs.

(12) If the Post Office establishes an experimental station, commercial stations should also be allowed to do so.

59. On behalf of equipment manufacturers and others.

(1) Television can be made an extremely valuable advertising and entertainment medium. It will revolutionise the home life of

the average citizen far more effectively and more quickly than any form of entertainment that has been devised within the last 50 years.

(2) Subject to satisfactory selection of frequencies and standards of transmission, television should be introduced at an early date, jointly with FM, as both require special receivers and transmitters using wavelengths of the same frequency order.

(3) Being an entirely new service, television will add to the scope of broadcast audiences without detracting from the value of sound broadcasting. Television is complementary to, and not a substitute for, sound broadcasting.

(4) The public should be fully advised of the limitations of television and be assured that it will never replace existing forms of aural broadcasting.

(5) One of the activities of television will be the repetition of successful plays or other programmes a number of times, as in the theatre; in other words, television will introduce the "long run" idea to radio.

(6) Satisfactory sound broadcasters would not necessarily be acceptable to the same extent as television artists. As in stage plays, there would usually have to be a separate actor for each part, of appropriate type, age and costume. Television artists must memorise their lines; they could not read from script, as sound broadcasters do.

(7) Television will develop types of entertainment which cannot be featured in the sound broadcasting system, e.g. the performances of dancers, jugglers, acrobats and conjurors.

(8) There is a "fatigue" factor in television which would probably limit "looking in" sessions in the home to about 30 minutes because, unlike sound broadcasting, television requires concentration to the entire exclusion of other occupations.

(9) Two fields of services are likely to develop - one for medium definition transmissions for which a comparatively cheap receiver would suffice, the other a high definition method capable of reproducing colour and having a projection system giving a picture 24" x 18".

(10) Great public confusion and financial loss could be easily caused by premature introduction of television. It will pay to "make haste slowly". Extensive research in Australia would be too costly for the resources of this country. It would be preferable to await stability in overseas services and then erect government-owned and commercially-owned experimental stations to allow of proper study of the best station locations, reception peculiarities, development of programme technique, planning of receiver manufacturing processes, etc. This procedure would permit orderly introduction of television. When sufficient experience had been gained, commencement of regular programmes would coincide with the production and sale of receivers.

(11) Some of the difficulties in introducing television to Australia are :-

(a) Problem and high cost of giving service to the widely scattered population. To cater for even 75 per cent. of the Australian public, an elaborate and costly system of relay stations or coaxial cables would be needed. Only recently the Americans were exulting over their success in relaying a television programme 200 miles at great cost.

(b) High cost of receivers, which average the use of 20 valves. The use of 40 valves is not uncommon.

(c) Difficulty in obtaining, and high cost of, programme material. While a play can run at a theatre for six months, fresh material must be available for television almost daily.

(12) No city with a population less than 500,000 could support a station operated in commercial interests.

(13) No television system should be introduced in Australia until such time as it has been accepted by an appropriate authority as being something that will continue in service sufficiently far ahead to warrant the public purchasing receivers.

(14) There has been built up during the war years a vast store of electronic knowledge, which so far has not been exploited, to any appreciable extent, for the purpose of improving upon television as it was known in 1939. To exploit this store will probably take four or five years. (Standing Committee's note: The report of the British Television Committee, December, 1944, states that "war research has produced little information and no discovery of a fundamental character bearing directly on television".)

(15) A television receiver is usually specifically designed for that purpose and as a rule does not embody facilities for reception of aural broadcasts other than those which normally accompany the visual programme.

(16) Surveys in America show that from 40 to 60 per cent. of the population will patronise television service when receivers are within reach of the normal income. Successful operation of a service in Australia will depend on availability of low-priced receivers and on the quality and availability of programmes.

(17) It is understood that moves are being made in America for a welding of motion picture and television interests. The film interests are planning to co-operate in the provision of "actuality" televised transmissions of sporting events, etc. direct to theatres.

(18) Experiments are being made in America with small valves for dual and treble purposes.

(19) In America several television services are now operating and it is evident that they are gaining popularity with the public. The standard of service is good and there is unquestionably entertainment value. Within the industry, at December 1945, it was estimated that 250,000 television receivers would be sold in 1946 at an average price of 100 dollars.

(20) An experimental station, financed from consolidated revenue, should be erected by the Government.

(21) Two stations should be erected by the Government, for national service - one in Sydney and the other in Melbourne - as a commencement, and one of two alternatives should be adopted:-

(a) Australia should wait a maximum period of two years for England and America to determine a common standard on which they are going to operate, and Australia should then follow that standard; or

(b) Australia should select, within the next two years, either the English or the American standard - preferably the American because Australian valve and other developments seem to follow more closely the American pattern - and should follow the selected method exactly without any attempt to make alleged improvements.

(22) When technical standards have been determined, licences should be granted to suitable private organizations prepared to provide a service, if they are able to give guarantees regarding continuity and quality of programmes.

(23) There is an impression that the present telecasts in America are fundamentally experimental and only serve to keep faith with people who have purchased receivers. Television in England appears to be on a much sounder basis; a satisfactory system has been evolved in that country and it is possible Australia would do well to follow English practice by adopting standards which, though somewhat obsolescent, have been tried and proved acceptable.

(24) Subject to the receipt of a licence, Philips Electrical Industries of Australia Pty. Ltd. is prepared to bring to Australia during 1946 from its headquarters in Holland a television transmitter with demonstration receivers, in order to exhibit some of the latest developments, including large size screens and screens which can be viewed in daylight. The transmitter is of a type which enables the number of lines in the picture (405 English and 525 American) to be changed at will by a switch. (Standing Committee's note: The report of the British Television Committee, December 1944, states that "to bring the British post-war system entirely into line with the American system, so as to render British and American television apparatus interchangeable, would involve more serious problems than a mere change in the number of lines, e.g. the picture signals in the two systems are transmitted with opposite polarities and the frequency of the electrical supply is not the same".)

(25) Australia should have the benefit of all improvements and innovations in broadcasting. Radical changes should be introduced in a controlled and orderly manner.

(26) Leading companies in Australia are in a position, from a patent and manufacturing point of view, to supply equipment. In the initial stages it would be necessary to import certain parts.

(27) Television will not pay in any country for some years. Its introduction in Australia, now or ten years hence, will be costly for the first few years, so that postponing the commencement of a service will only defer that inescapable experience. So far as fundamental principles are concerned there is very little for which there would be justification in delaying introduction of television in Australia.

(28) Colour television is being investigated in America, but according to the best authorities it is still five years away as a practical proposition.

(29) Australia must choose a time to start. It could wait year after year for the ultimate in perfection, but technically television is available now and the outstanding problem is programme production.

(30) The standards adopted in America have been based in some measure on considerations of broadcasting film.

(31) Most of the television programme material in America is in the form of film similar to that used for sound picture reproduction. Some stage plays are produced specially for television purposes; they are filmed and copies are distributed to transmitting stations. In other cases current stage presentations are filmed and again copies of the films are prepared and distributed. This seems to be the future method of securing programme material in America; it may be that the television industry is one more allied to the motion picture industry than to the broadcasting.

(32) In the interests of full employment in the electronic industry in Australia, television should be introduced as soon as world standards have been agreed upon.

(33) America and England might decide to adhere to different standards, from considerations of export trade. The British system might be adopted in Europe, which would exclude the use of American sets, and vice versa. The holding of an Empire conference to decide upon standards within the Empire might verge on political considerations. It would not be a good thing to exclude Australia from the benefits of American developments.

(34) In view of the number of years likely to elapse before multi-colour television becomes a practical proposition, there seems no reason why Australia should in the meantime continue to be deprived of a service in black and white.

60. On behalf of broadcasting stations in which capital city newspapers are financially interested.

(1) Television has unlimited potentialities for post-war expansion.

(2) Experimental stations should be erected at an early date to enable the public to assess the value of the service and in order that manufacturers may be in a position to prepare themselves for production of receivers. Any commercial station which is prepared to finance such experiments should be allowed to do so and should have a reasonable claim to a permanent licence.

(3) It is unlikely that television would result in diminution of attendances at sporting events and theatres. People like to gather in masses. Television would probably stimulate attendances.

(4) Television programmes on educational subjects would be more effective than mere talks on the same subjects.

(5) The cost of programmes will be so high that syndication will be necessary. Australia should be able to draw on programmes from both America and England. It would be disastrous if the choosing of American equipment would involve cutting Australia off from British programmes.

(6) High intensity lighting formerly necessary in television studios has been dispensed with by the development of a supersensitive camera tube.

61. On behalf of capital city newspaper interests which do not hold broadcasting station licences.

(1) Television impinges directly upon the newspaper business. The granting of licences should not be restricted to the existing holders of sound broadcasting licences. Consideration should be given to the claims of newspaper interests which are independent of any form of chain control.

(2) As in the case of FM, licences should be offered on a competitive basis for terms of 20 to 25 years and, subject to appropriate conditions, should go to the highest bidder.

(3) The research necessary to keep stations abreast of world developments and the artistry required to create suitable programmes involve expenditure which would only be economic if the licensees have a guarantee of reasonable tenure.

(4) If Australia is not to lag behind in television developments, permission should be given without delay for the establishment of experimental stations, and research should be aided and encouraged in every possible way. The exploitation of these developments would familiarise young Australians with their technique and would inevitably lead to discoveries in this field by Australian inventors and scientists.

(5) Certain television stations in America provide a reliable service area of 60 miles radius.

(6) In recent times in America the emphasis has been on use of prepared film for programmes rather than on simultaneous transmission of events as they are happening. Production of such film in Australia should be encouraged for television service in this country, and for export to Britain, America and other countries. As television enters the home life it is more intimate than the cinema and will be the most widespread way of conveying intelligence and story by picture of Australia.

(7) The establishment of television should be so planned that it may flourish in its individual field. It should not be subjected to or controlled by either sound broadcasting or sound cinema interests. Any organisation with the necessary enterprise and resources should be allowed to participate in its development.

(8) Experience in England and America has clarified many of the difficult problems that usually beset the introduction of an entirely new project, and has produced a "blue print" from which a service may be established in Australia without delay and with confidence.

(9) The technical excellence of a television monochrome picture under existing standards is adequate for the conveyance of entertainment and education. Reliable authorities are agreed that up to five years will elapse before the colour method is evolved, and then it will only be ready for experimental establishment.

(10) There is no justification for delaying the introduction of a service merely to await a successful colour method, which after all is a small part of television appeal. Although colour has been evolved for the cinema in ever increasing efficiency since 1926, it only represents 13 per cent. of feature film production in America.

(11) It is the programme itself, rather than the colour, which is the main attraction; it is not expected that the public would pay two to three times more for this feature.

(12) Cinema studio production costs for colour films are from 20 to 35 per cent. higher than comparable production in monochrome; hence the use of such films in television service would load the programme costs to a corresponding extent, the significance of which has to be considered in relation to the probability that television programmes will largely consist of film re-productions.

(13) In 1939 the Australian radio and electronic industry

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was incapable of coping with the design and production requirements of the armed forces. During the war years the industry became very learned in the new arts and performed a magnificent service to Australia, after the engineers of the Post Office research laboratories and the C.S. and I.R. had developed apparatus for mass production. If this industry is to be maintained in a condition of up-to-date knowledge and practice, so that it could undertake a similar service should it be required in some future emergency, it should be induced to develop civilian equipment in the higher arts of electronic science, of which television is a part; otherwise the industry will depreciate in its capabilities. It was the existence of the television services in Great Britain and America that gave industries in those countries an advantage during the emergency in the manufacture of radar equipment.

(14) A station should be set up in one of the Australian cities for a period of experimental transmission, in order that manufacturers may acquire information which will help them to become proficient in the production of equipment, and as a means of training in the provision of programmes. The Post Office could control the experiments, but private enterprise should be given the opportunity to participate in them.

(15) Television has reached a stage - both as to manufacture and the provision of programmes - where it should be introduced into Australia. If its introduction is delayed for, say, five or ten years, Australian technicians will be that far behind technicians in other countries, and Australian programmes also will be correspondingly inferior. It would be wiser to go ahead than to await further developments in other countries.

(16) It is not improbable that motion picture interests will resist the introduction of television, but with proper planning it should not have any great effect on them.

(17) For the financing of the service, the best system would be a combination of licence fees and sponsorship.

(18) In an article on colour television by O.H. Caldwell, Doctor of Science, published in "Electronic Industries" of April, 1946, the author says:-

> While several radio leaders express themselves enthusiastically about CBS color television, the preponderance of industry opinion seems to be that the best present course will be to:
>
> (a) Go ahead immediately with black and white television as originally planned.
>
> (b) Study and develop color television so that an adequate color-television system can be ready in 3 to 5 years.
>
> Meanwhile, CBS is demonstrating to the press, radio manufacturers and broadcasters, and the public, a most enticing demonstration of color television. This, with postwar refinements, uses the same

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mechanical principle of rotating color screens as CBS exhibited before Pearl Harbor.

At CBS headquarters, visitors are first led into a luxurious semi-lit reception room where several minutes' wait assures adaptation of the eyes to night conditions. Then the audience files into the darkened viewing room, to see the 12-in. picture.

An effective film program is shown, contrasting color with black-white, in presenting a variety of indoor and outdoor action sequences, including a football game in which color clearly distinguishes the uniforms of contrasting teams, in a way impossible with black-white.

In watching these color scenes of fast-moving action the visitor will detect none of the "barber-pole" effects of the earlier demonstrations of this same rotating color-wheel principle applied to color movies and color video. But engineers present remember that the CBS demonstration uses color films as the source of the program, and that as far as the television equipment is concerned, it is merely scanning a "still" picture at any moment! Hence the speeding ball or flying white horse had already been stopped by photography, and no color fringes are possible from the television-film scanner. Quite a different result is expected by engineer critics when the live color-pickup camera (which CBS promises soon) goes into action.

62. Advice from an official of the C.S. and I.R. - After visiting England and America, the Chief of the Division of Radiophysics of the Council for Scientific and Industrial Research, made a report published in November 1945 in regard to television developments in these countries as at August 1945. Extracts from the report are condensed as follows:-

(1) It is generally agreed in England that the standard of definition provided by 405 to 525 lines is adequate for black and white television in the home and that no improvement which would be apparent to the viewer would result from an increase in definition over this standard.

(2) In the event of the introduction of colour television later on, the number of lines would have to be increased to a figure of the order of 1,000. It is certain that any new equipment which is produced and installed in England from now on will be engineered so as to accommodate the bandwidth necessary for 1,000 line definition.

(3) Plans are in hand in England for the production of receivers at costs varying from £30 to £150 and higher for luxury models.

(4) The television services in the eastern States of America were continued on a restricted scale throughout the war. Since V.P. Day all interests have gone about increasing the number of stations and improving technical standards. It is agreed in America that for black and white home television, there is no advantage to be gained in providing more than a 525-line definition. It is estimated that by 1947 there will be about 400 active stations.

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(5) The present standard of service in America is very good from the user's point of view; the entertainment level achieved in the "flesh and blood" programmes is high. A wide variety of programme material is available, and nowhere does one obtain the reaction that the cost of providing programmes is excessive, nor that the difficulty of providing a series of new programmes five or seven times a week is unduly severe. The tendency is to concentrate programmes in the evenings, with possible extension to afternoons if the demand warrants it.

(6) The American listening public is being subjected to a steady pressure of television publicity through the medium of programmes on the sound broadcasting systems.

(7) The number of valves required in the simplest form of receiver could not very well be less than 16 to 18, in addition to the viewing tube.

(8) All American television services are equipped with FM sound channels.

(9) Owing to a basic difference between the English and American methods of providing the various synchronising signals between transmitter and receiver, it is impossible for a receiver designed to receive transmissions on the British system to receive signals from transmitters designed on the American system, and vice versa. The picture signals of the two systems are transmitted with opposite polarities and, moreover, the frequency of the electricity supply in the two countries is different. If and when it is decided that television should be introduced into Australia, a fundamental decision will need to be made, as it is impossible to contemplate both systems simultaneously in operation in this country. Expert technical advice should be taken on this question. It may be that for Empire reasons Australia should support British industry in this matter. The fact that the electric supply frequency in the two principal centres of population in Australia is 50 cycles would tend to favor the British system. The industry in both countries is putting large resources to work to improve the present standards, and there is no reason to believe that either will outstrip the other in technical advancement in the future.

(10) The first step in the introduction of television in Australia is the establishment of an experimental service. It is debatable whether the Government or private industry should undertake this project. As certain items of equipment may only be obtained from certain firms, it may be considered that the proving of the technical aspects could and should be left to private enterprise under appropriate conditions.

(11) In the experimental stage no receivers should be sold; they should be lent by the "pioneer" to selected people for test purposes and the gathering of data on quality of reception, area of service coverage etc. Questions of programme provision and composition could also be examined and general experience gained during this stage, which may have to cover at least twelve months' operations. Prior to that, a period of perhaps 18 months would have

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to be contemplated in training engineering and other technical personnel, procuring components, constructing the transmitter and studio equipment, and a limited number of receivers. As much as possible of this work should be carried out in Australia; a minimum of equipment, components etc. should be imported from overseas.

(12) A very thorough investigation into costs of locally producing the receiving equipment is a high priority job. This would not be solely a question of factory production costs and oncosts, and selling expenses. Very large items in the factory cost are represented by excise or customs duty on vacuum tubes, cathode ray tubes and other components. The policy of the Government towards the new industry would therefore be a factor of major importance in the final selling price of the receivers. The question of royalties, patents, etc. will also vitally affect the cost both of the transmission service and the receiving equipment.

Standing Committee's Comments

63. In a summing up of the evidence on general principles, it may be said, without dissent from the majority of witnesses, that the benefits of world invention in the art of television should not be withheld from the Australian people for a longer time than is necessary to provide a satisfactory service at reasonable cost for a sufficiently large number of users to justify the innovation.

64. There is expert testimony that an adequate black and white service for the home can be provided under either the British or the American system, and manufacturers of standing have indicated that practically the whole of the equipment can be manufactured in Australia. Determination of transmission and programme standards, consideration of costs, availability of programmes, and surveys of prospective patronage of the service, are the outstanding factors.

65. In some quarters it has been suggested that the development of a multi-colour system should be awaited, but that would probably involve a further delay of at least five years before the initiation of any move to provide a television service in Australia. It should be remembered that cinema moving pictures in black and white have not been superseded by multi-colour productions. The latter, according to the evidence, have been in process of improvement in efficiency for 20 years, and yet, at the present time, they only comprise 13 per cent. of feature films in America.

66. In some of the submissions attention has been drawn to seeming apathy to television on the part of the public in both America and England, that impression having been formed from the comparatively small number of receivers initially sold in those countries.

67. As regards America, however, Major Osborne (a television expert with American experience whose services were loaned to Australia by the British Government) stated in evidence to the Standing Committee of the previous Parliament in 1942 that "the United States of America made the mistake at the beginning of putting on the market a cheap, inferior set which gave the public a bad impression of television."

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68. In regard to England, the Chief Engineer of the British Broadcasting Corporation, in his article published in the London "Listener" of November 1945, says :-

> "The number of television receivers sold in the London area before the war was very small. It did not exceed 30,000, and in view of the fact that Alexandra Palace gave a service up to a radius of about 40 miles embracing a population of some ten millions, the number of those willing to buy a receiver was disappointing. Several reasons can be suggested for this slowness to buy on the part of the public, but there are certainly two important ones. The first was that there was an air of experiment and uncertainty surrounding television. People were inclined to hold back until 'teething' troubles had been overcome and the service had become fully established. The second reason was the comparatively high cost of a television set. It is true that in 1939 receivers with a screen measuring about seven inches by five inches and costing about £25 were beginning to come on to the market, but a receiver with a screen of about ten inches by eight inches, in my opinion a much more suitable size, costs about £50 or more. Listeners were unwilling to spend such a large sum to become viewers until they were certain that the service was a permanent one and that their sets were not likely to become out of date in a very short time.
>
> "However, few of those who spent their money regretted their decision. Television was a nightly source of entertainment; it appealed to both grown-ups and children, and its unique character took an increasing hold on those who participated in it. In passing I might mention that in my experience it was not easy to convert a doubtful purchaser by just one or two demonstrations. Visitors who came in to see the programme expressed great interest, but did not rush to their wireless dealers the next day to place an order. But those who eventually did so became confirmed television fans when they had had the set in their own home for a week or two. This experience seems to suggest that some kind of extended trial period in the home of the prospective purchaser will be necessary, at any rate until television sets become more common than they are at present."

69. It was subsequently announced that the production of 100,000 post-war television sets at about £50 had been licensed for the London service.

70. It is unfortunate that the British and American apparatus is not interchangeable, which means that unless the ideal of international standardisation urged by the British Television Committee is realised within a reasonable time, it will evidently be necessary, as has been said, to make a fundamental decision involving Empire preference as regards any Australian service introduced in the meantime.

71. The Post Office estimate of the capital cost of a station is £210,000. Major Osborne's estimate, given in his evidence in 1942, was £30,000, excluding land lines. At that time the Post Office estimate was £200,000. Apparently Major Osborne's figure did not include studios and other items in view of the very pronounced disparity between the two estimates.

CONCLUSIONS

72. In order to test the cost aspect and to facilitate a decision on the standards which might be adopted, we recommend - as a first step in evolving adequately informed conclusions on the issues raised in our terms of reference - that tenders be invited, as soon as circumstances permit, under conditions acceptable to the Post Office, with a view to consideration being given to the question of arranging experimental transmissions in Sydney and Melbourne.

73. We suggest that the conditions of tendering should include a stipulation that a limited number of receivers shall be made available on loan for the use of selected viewers and that none shall be sold to the public until such time as television is eventually authorised as a stabilised service in this country, after surveys have confirmed a satisfactory prospect of public patronage under guaranteed minimum periods of programmes. When that time arrives, it would appear to be eminently desirable to prescribe safeguards under a code of manufacturing standards, preferably with the voluntary acquiescence of the industry, in order to avoid the overseas mistake of allowing the usefulness of this new art to be discredited by a policy of false economy inherent in any move to produce and distribute inferior receiving equipment.

74. With regard to the question of issuing experimental licences to commercial undertakings at the present time, we are of the opinion that it would be preferable to avoid duplication of the heavy expenditure involved in their conducting independent trials, especially as a question of high policy may arise if, failing international standardisation, it becomes necessary to decide whether the British or the American standards are to be adopted in Australia. In any case, a commercial undertaking could hardly be expected to incur such a heavy outlay without an assurance that it might be licensed to provide a regular service later on. To give such an assurance would necessitate discrimination among the various undertakings which might be prepared to finance a similar venture if they were made aware that this assurance would be forthcoming. To make a choice in favour of a particular applicant would be almost certain to cause embarrassment to the administration and dissatisfaction to other applicants who might consider themselves equally deserving of the same consideration. For these reasons we recommend that such experiments as may be authorised after the tenders have been received should be confined to the national broadcasting system. It should be understood, however, that it is not intended to preclude commercial interests from co-operating in the experiments if they so desire.

75. In addition to technical, financial and other considerations, an essential requirement in both experimental and regular transmissions is the adoption of a code of standards in programmes, whether they be actuality, film or studio productions. As indicated in our Eleventh Report, paragraph 64(8), we recommend that the detailed provisions of the motion picture code should be wholly applicable to television service.

FACSIMILE BROADCASTING

76. Facsimile broadcasting, which has been described as the lantern-slide phase of television, consists in the transmission and reproduction of still, in contrast with moving, pictures or copies of material such as printed or typed matter, script, sketches or drawings.

77. Appended is a summary of the evidence we have heard on the question of introducing this service in Australia. It will be noted that on this subject, too, there are some differences of opinion among witnesses in the various groups of interests.

Summary of Witnesses' Submissions

78. On behalf of the Post Office -

(1) The possibility of facsimile as additional to the normal broadcasting service was first realised in America following upon its successful transmission for point to point services by wireline or radio.

(2) In 1937 certain standard broadcasting stations in America were authorised to conduct experimental transmissions in the medium frequency band. By 1940, 15 licences had been issued, but by 1942 all had discontinued transmissions. At December 1945, three stations were licensed.

(3) The Federal Communications Commission of America recently reported that the service is still on an experimental basis. During the war years the speed of transmission and reception was greatly increased and enhanced the possibilities of facsimile broadcasting as a service to the public. The Commission has reserved channels for it in the VHF band.

(4) Some of the services which facsimile is capable of providing are a newspaper in the home, market reports, weather maps, election results and sporting details.

(5) The usual speed which has been in operation in America is approximately one news sheet 8" x 11" every 15 minutes. Recently an experimental system has been demonstrated capable of transmitting and receiving an 8" x 10" news sheet per minute.

(6) A large body of opinion in America is that facsimile co-ordinated with sound broadcasting would be necessary to popularise the service.

(7) As an advertising medium, there is no evidence that facsimile would offer any advantage over the service now given by newspapers or sound broadcasting.

(8) Five applications for facsimile broadcasting licences have been received, - two from capital city commercial stations (in one of which a daily newspaper is financially interested), two from capital city newspaper organisations (neither of which has a broadcasting station licence at present), and the fifth from a country commercial station. These applications were made at various dates during 1945.

(9) It is an open question whether the public would support a facsimile service in Australia, as the existing distribution of newsprint material is highly organised and is made in the populous centres at probably the most convenient times for perusal. In rural areas, rapid circulation of urgent news is provided by the normal radio service, although in such areas facsimile might result in a fuller presentation of news than is given by sound broadcasting.

(10) Facsimile could be transmitted by medium frequency stations provided the speed of printing were limited to approximately four or five 8" x 11" pages per hour. It could not be transmitted simultaneously with sound programmes in the medium frequency band. Service during hours when the transmitter was not in use for sound programmes was tried in America but apparently was not commercially successful and has been discarded.

(11) The speed of one news sheet per minute, demonstrated in America, could not be transmitted over medium frequency stations having a 10 kilocycle channel width, as a width of 30 kilocycles would be required. Such a band width requirement would make it impossible to use existing landlines without modifications for relaying the higher speed facsimile.

(12) In the medium frequency band facsimile would have to be restricted to the hours when sound transmissions were not taking place. It would probably be unsuccessful in cities on this basis but might have a field of usefulness in rural areas.

(13) To provide a service in city areas it would be necessary to make use of the VHF band, in which provision could be made to accommodate stations exclusively for the purpose.

(14) It would be possible in the VHF band to operate facsimile with or without an accompanying sound programme. Facsimile service in this band could be given at any hour.

(15) Facsimile sending equipment is relatively inexpensive. If a sound transmitter were available, the added cost of technical equipment would be only of the order of a few hundred pounds. The running expenses would depend largely on the extent to which the service was introduced. For example, if it were desired to transmit a newspaper, news reporting, editing staff, etc., would be required and running expenses would approximate those of services already run by the existing newspapers.

(16) It is possible to design facsimile recorders which can be attached to standard broadcast receivers, but this is not a simple matter, especially if means have to be provided for automatic starting on a signal from the transmitter. A complete receiver and recorder is regarded as the most practical proposal at an estimated cost of £50 if purchased in sufficiently large numbers.

(17) Before the introduction of a service, technical standards would have to be determined; otherwise if two stations operated on different systems, receivers for one would be unable to receive transmissions from the other, even though they operated in the same frequency band. It is conceivable, however, that a need for different standards might exist if a broadcaster wished to confine reception to his particular subscribers.

(18) It is probable that the principal programme material would consist of news items. Capital cities are already reasonably well catered for by newspapers and sound broadcasting stations. Residents in country areas might benefit from facsimile, but the number would be small and insufficient to make Australian manufacture of receiving equipment a commercial proposition.

(19) It does not appear possible to give both city and country residents high speed transmission. A low speed service might be satisfactory in the country, but in the city it is doubtful whether this would be commercially successful owing to the increased competition by newspapers and by sound broadcasting.

(20) Probably the public generally would be reluctant to incur the fairly high cost of purchasing receiver and recording equipment to obtain a service which has not yet been accepted in America, where most development has taken place.

(21) It is very doubtful whether commercial interests would be prepared to undertake the operation of a service, the future of which is problematical.

(22) Introduction of facsimile in Australia should be deferred pending further developments. In the meantime the Post Office proposes to procure equipment for experimental transmissions so that it will be better placed to judge the merit of developments as they occur.

(23) There are no proposals for the introduction of facsimile broadcasting in England; in South Africa and New Zealand it would appear that no interest is being taken in it; in Canada some satisfactory tests were conducted several years ago, but there is no demand for a broadcasting service of this type at present.

79. On behalf of the Australian Broadcasting Commission -

(1) Facsimile is in a stage of development which renders it inadvisable for Australia to determine its policy until overseas investigations and experience have proceeded further.

(2) At the appropriate time the Post Office should set up technical facilities at some metropolitan centre for experimental purposes. In the initial stages, at least, the service should be confined to the national system.

80. On behalf of the Federation of Commercial Stations -

No evidence has been tendered.

81. On behalf of broadcasting stations in which capital city newspapers are financially interested -

(1) Prior to 1941 experimental work had progressed to the stage that 30 American stations were transmitting illustrated facsimile news bulletins on a daily schedule. Most of this activity was curtailed with America's entry into the war.

(2) The American organisation mainly responsible for research in facsimile broadcasting intends to mass produce a facsimile-sound receiver as soon as conditions permit. The equipment is to be entirely automatic and is planned to reproduce a five-column sheet at the rate of not less than 22 square inches per minute. This rate approximates a 15-inch five-column news sheet in eight minutes. The organisation has received a licence to instal and operate an experimental FM transmitter, from which it is intended to transmit a simultaneous common-carrier sound and facsimile service. The revenue to cover operation is expected from the sale of facsimile advertising space in a manner similar to newspaper practice.

(3) The Federal Communications Commission of America has assigned the frequency band 106-108 megacycles for facsimile, adjoining the 92-106 megacycle band allocated for FM broadcasting. In addition, the Commission has ruled that all conventional FM stations may transmit facsimile outside their aural service hours.

(4) While facsimile was in its early stage of experiment, the normal broadcasting band (medium wave AM) was used. This resulted in two major disadvantages - first, reception in rural areas could be adversely affected by static and/or fading; second, it was necessary to have a similar power supply at both transmitting and receiving localities. These disadvantages have been removed by the new band of frequencies allocated to facsimile and by a technical development which makes it unnecessary to operate on similar power supplies.

(5) It is unlikely that facsimile broadcasting will ever be popular in Australia. It is difficult to imagine a farmer spending £50 or £60 on a special set to get news and weather charts when he can get news and forecasts by means of an ordinary aural receiver. The facility might, however, serve a purpose in city areas.

(6) The peculiar conditions in Australia resulting from vast spaces between communities and the limited number of large city populations involve problems requiring research and experimentation. Newspaper organisations should be licensed to experiment and ultimately operate services if they so desire.

(7) Although facsimile broadcasting has been a technical possibility for some years, it is still in the experimental stage in some respects. A place for it in the scheme of broadcasting as a public service has not yet been found.

(8) Considerable experimental work has been done overseas in the duplex operation of FM stations, enabling simultaneous transmission of high quality sound together with facsimile.

(9) In association with the development of FM broadcasting, Australian stations should be permitted to conduct experiments in facsimile.

(10) Facsimile is almost exclusively a news service, and no agency could provide such a service so effectively as a newspaper, particularly a morning newspaper.

82. On behalf of capital city newspaper interests which do not hold broadcasting station licences -

(1) Facsimile impinges directly upon the newspaper business. Licences should be offered on a competitive basis for terms of 20 to 25 years, subject to the usual requirements, and should go to the highest bidder.

(2) During the United Nations Conference at San Francisco some newspapers used facsimile transmission to send their papers across the continent and had them printed locally, so that they appeared almost simultaneously with the New York editions. This illustrates the effect which facsimile broadcasting may have upon newspaper communications internally and internationally.

(3) Although Australia's geographical position and its small population in a vast territory militate against the commercial exploitation of facsimile, the experience of the war years shows that no important nation can afford to ignore or limit scientific developments. Introduction of facsimile broadcasting would familiarize young Australians with its technique and would probably lead to discoveries in this field by Australian inventors and scientists.

(4) During the war years facsimile equipment has shown remarkable improvement under the intensive development of its use by American armed forces. The speed has increased from 3 square inches to 40 square inches per minute. The full extent to which the service has improved will not be known until a proper commercial service is initiated. Pre-war experimental service did not excite public attention because facsimile is not entertainment. There is, as yet, no evidence that a technically satisfactory service has operated, but present-day results are vastly superior to the pre-war productions.

(5) Provision for facsimile should be made in the allocation of frequency bands for future use, should its utility as a public service become established.

(6) There should be safeguards against monopolistic control of any services introduced.

(7) Newspaper organizations with the necessary financial resources are in the best position to operate services on a commercial basis and should be given the opportunity to do so, in addition to any services which might be operated as public utilities. Special consideration should be given to newspaper organizations which have no capital affiliation with another newspaper.

83. On behalf of equipment manufacturers and others -

(1) Transmitting and receiving equipment could be manufactured in Australia if it were decided to introduce the service. Manufacturers would cater readily for any demand.

(2) American manufacturers have not had much success in persuading the public to accept the idea of a newspaper transmitted over the air and reproduced in the home as a suitable substitute for the regular newspaper service.

(3) Several attempts have been made in America to operate regular news or picture broadcasts, but it is understood that the only regular service in operation is a morning news production to 100 subscribers, broadcast by a newspaper organization. Facsimile has never attained popularity in America, notwithstanding all the efforts made by manufacturers of equipment to stimulate public interest.

(4) Before the war about 20 experimental licences were issued in America. These were granted on condition that the applicants presented a research programme and supplied 50 receivers, free of charge, for each station. Applications for renewal of the licences were to be accompanied by a report on the research done and the conclusions reached.

(5) Unless a facsimile service were owned by a newspaper, the broadcaster would either have to supply a reporting and editing staff or wait for the newspapers to supply him with material.

(6) The Government should be very cautious about introducing facsimile. It would almost only replace the daily newspaper in areas where the latter cannot be delivered "with the milk". The broadcasting news services are quite good, and the additional cost of having the news in documentary form through a facsimile service would not be worth while. Other uses of facsimile, such as for broadcasting stock reports, could not economically justify the introduction of a system in Australia.

(7) Although facsimile will have limited application for commercial use and little or none for domestic purposes, licences should be issued to suitable applicants who are properly equipped to render good quality and continuous service.

(8) The commercial value of facsimile for point to point service has been amply demonstrated, but public acceptance of facsimile broadcasting has yet to be proved.

(9) It is doubtful whether the service would prove either economical or necessary in Australia. Nevertheless, it is possible that the broadcasting of a "tabloid" newspaper of pictorial form might be acceptable and prove a useful service to remote rural areas.

(10) The possibility of applying facsimile in Australia to the broadcasting of a home newspaper should not be dismissed on account of failures in other countries.

(11) The outback station manager who may wait as long as a week to get his newspaper may get the latest news with pictures directly recorded in his homestead.

Standing Committee's Conclusions

84. The weight of evidence is to the effect that production of "tabloid" newspapers for country people is likely to be the principal activity contemplated in any attempts to popularize facsimile broadcasting in Australia. Such being the case, it is conceivable that any prospect of intensive development in that direction in the years to come might necessitate the consideration of means, in the public interest, of preserving existing decentralised rural news facilities, which could be endangered if operation of the facsimile services were centralised in capital city organizations.

85. The need to bear this aspect in mind will be evident from the reflection that, apart from general Australian and international news, it would seem quite impracticable for "tabloid" newspapers, produced in the capital cities for country-wide broadcasting, to provide the kind of service which is of exclusive value to separate rural communities and which is of present catered for by country newspapers. As is well known, each of these newspapers, in its own area of circulation, specialises in reports of local social, commercial, political and other happenings which are of interest to people in that area but are of no particular interest to the majority of people in other areas. Because of the aggregate volume of such reports, it would appear that in a centralised facsimile broadcasting system it would be found impossible to provide an adequate cover of local news to meet the varying requirements of the different communities. Hence there would probably have to be drastic curtailment and omission, to the dissatisfaction and disadvantage of the country residents concerned, if centralised operation of the service had driven their local newspaper out of business.

86. However, it would be premature to consider means of meeting such a situation until facsimile broadcasting is actually proposed on a scale calculated to deprive country people of the local news service they now enjoy.

87. According to the evidence, there seems to be little scope for the establishment of a facsimile broadcasting service in Australia at the present time, especially in view of the apparent lack of demand for the facility in other countries, notably in America, where the greatest attempts have been made to popularize it without much success. That is not to say that Australia should necessarily wait until the service has been proved worth-while overseas before initiating any move to test its utility in this country, and as five requests were made as recently as last year for permission to introduce it, we recommend that a copy of this report be sent to the five applicants and that they be invited to submit argument which, in their opinion, notwithstanding the lack of support in America and the apathy evidenced in other countries, is of sufficient weight to justify a belief that facsimile broadcasting service would be patronised in Australia to an extent warranting introduction of the innovation at the present time.

88. In the event of convincing representations being received from a suitable applicant desirous of conducting a service in spite of the discouraging experience overseas, we recommend that consideration be given to the issue of an experimental licence subject to compliance with such technical and other conditions as the Post Office may deem necessary in the public interest, including, we suggest, the stipulation that a number of receivers shall be made available by the licensee on loan for the experiments and that none shall be sold until such time as a licence to operate a regular service may be issued; also that the printed material, drawings, pictures, advertisements, etc., transmitted shall conform to the standards of the motion picture code so far as they would be applicable to facsimile broadcasting.

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17th June, 1946.