"RADIO COMMUNICATION IN WESTERN AUSTRALIAN FORESTS"

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Task.

Between Mundaring and Pemberton there are two million acres of Fire Protected Forest. To this must be added a considerable acreage to which fire control must be extended in the near future. The task of radio is to provide communications covering the whole of this area from any one point to another. The Fire Control Organisation demands the quick movement of vehicles for inter-divisional reinforcement, and it is not uncommon for vehicles and equipment to move north and south to aid a district with more fires than it can handle alone. The Radio Organisation must meet these circumstances and provide easy contact to supply Fire Control Personnel with up-to-the-minute information on vehicle movements.

A simple summary of the radio requirements is:—

	Range
(a) Contact between all fixed stations	0—200 miles
(b) Contact between fixed stations and fire vehicles	0—40 miles
(c) Contact between officers' vehicles	0—200 miles
(d) Contact between officers' vehicles and fixed stations	0—200 miles

It is advisable to group stations geographically for the purposes of control. This has been organised in Western Australia on a divisional basis. From north to south control stations are—Mundaring, Dwellingup, Collie and Manjimup.

History.

The first test of radio as a communication medium in this State was made in 1924-1925, between Perth and Mundaring. Later, in 1929, further testing was carried out at Collie. Little exact information can be ascertained of results, but from what is gathered it appears that the findings in both tests were similar, namely, that radio technique and available equipment were insufficiently advanced for practical forest communications.

During July, 1946, further tests were made, this time with success.

The R.A.A.F. and Navy made personnel and equipment available, and a mobile unit conducted tests at many locations in the Jarrah forests, with three fixed stations set up as the mobile party travelled. These tests indicated that two-way contact could be maintained with a mobile truck under very trying winter conditions.

The Department, convinced that radio could now be of practical assistance, immediately set about the task of providing equipment and staff. Progress has been good and the following shows the number of stations installed each year:—

	Fixed	Mobile
1946	3	Nil
1947	8	30
1948	2	25
1949	Nil	5
Total	13	60

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Equipment.

Decisions on the best type of equipment to employ were unnecessary as a number of Service "disposals" were available at very attractive prices. Although designed for light duty battery operations to Service specifications, certain sets are readily adaptable for forest requirements. These sets are giving good service and providing valuable information and data on which later to base a specification for our particulars needs.

The capital outlay involved in purchasing "disposals" equipment represents one-sixth to one-half of the cost of purchasing new equipment. Add to this the advantages of four to five years' practical work before deciding on final models best suited to the work, and it may be said that the course taken has been economical and prudent.

Principal types in use are:—

Mobile—

AWA type FS6—5 watts.*
AWA Teleradio 3BZ—10 watts.
Radio Corporation RC8—18 watts.

Fixed—

Teleradio 3B—10w.
Tasma AT14—150w.†

* Extensively modified.
† Installed only at Main Divisional Centres.

ORGANISATION

Maintenance.

All radio maintenance, overhauls, modifications, etc., are done in Perth at the Radio Branch. Each winter to date, sets have been collected, a Division at a time, taken to Perth for overhaul and any necessary repairs, and returned. Fixed station equipment is replaced by service equipment as these stations carry on throughout the winter. Centralised maintenance has many advantages, the chief of which is that the Radio Control Officer gains valuable data on which to base the periodic time for overhauls, effectiveness of mobile mounts, life of cables and components, etc.

Staff.

The staff consists of a Control Officer, one mechanic and an apprentice. Other duties which the staff covers are installation of battery charging facilities, which is closely allied to radio maintenance.

Training.

Fire schools are held annually and radio is prominent on the syllabus, one full day being devoted to set operation and talks on elementary radio theory. In addition, training is carried on in the field by the Radio Control Officer, particularly to gangs not producing the expected results.

Orders.

All facts appertaining to radio are promulgated as "Radio Communication Orders." These orders are divided into parts A, B and C, General, Procedure and Technical. They serve to acquaint field staff with radio methods and provide ready reference for new members.

General.

For the greater part of the year, conditions for radio are good. During the months of January and February mid-day working is not easy owing to heavy ionospheric absorption, but as this period only lasts for little more than an hour, it does not cause serious inconvenience. There are very few, if any, "dead" spots in the forest where signals cannot be read. This is mainly due to the type of aerial and choice of frequency. The ground wave of the frequencies in use is short, and reflected skywaves provide most of the signal energy. The use of high frequencies (4 to 5 Mc/s) sometimes under very difficult conditions, makes it easier to relay through a distant station than work a Base Station direct. For Fixed Stations the common practice of using half-wave horizontal aerials is followed. All mobile vehicles using 12-volt equipment have been fitted with an additional battery and series-parallel switches. This eliminates entirely the need for recharging radio batteries. The switch places the car and the additional radio battery in parallel whilst the vehicle is running and in series when radio is to be used. To make the FS6 set suitable for operation, it has been extensively modified. The receiver has been fitted with a loudspeaker and output valve while the transmitter is plate modulated. Transmitter valve line-up is now 6J5 oscillator, 6V6 modulator, 807 P.A. For some purposes the transmitter power has been increased to 11 watts by the use of a higher output vibrator power supply.

Procedure and Operation.

This fire season it is hoped to introduce Divisional channels. During past seasons only two channels have been available, 5630 Kc/s for the Karri (Kirup and south) and 4880 Kc/s for the Jarrah (north of Kirup). This was adequate until last year when additional stations and a prolonged hot season caused serious jamming. Under the proposed set-up each of the five Divisions will have the sole use of one channel, and it is proposed that 4880 Kc/s will become the channel for inter-Divisional use, to be used exclusively for weather information, calls for assistance from other Divisions, officers travelling between Divisions and limited administrative traffic of an urgent nature. Each Divisional Control Station will listen on its own and the inter-Divisional frequency and will reply using the channel called on. This system will be able to cope with the busiest periods. One night frequency will be available to all Divisions.

All calls are made to schedule, except during high hazard weather, when Fixed Stations and Fire Trucks maintain continuous watch. To keep a schedule a truck (if on the move) stops, erects its aerial and awaits the Fixed Station's "go ahead." If "all clear" the truck takes in the aerial and moves on until the time to make the next schedule. This system has the disadvantage of loss of time, but erecting a long wire aerial ensures good signal strength. Development to the stage where the operator remains seated in the cab and communicates to base while moving or stationary is somewhere in the future; besides it is very costly.

In winter, only Fixed Stations operate on two schedules each working day.

Value.

In last year's Annual Report it was stated, "As an aid to fire control the use of radio is the greatest advance since the introduction of

the power pumper." This statement is true only when serviceability, training and radio discipline is high, coupled with the use of equipment most suited to the task. This combination will make radio an outstanding success but any great departure from these ideals can make it a humbug.

The principal reasons for using radio in fire control work are firstly to make it possible for trucks to get to fires sooner, and secondly, while attending fires, to send information to the base station to ensure organisation of the most efficient use of man-power and equipment.

Radio can be used efficiently for many other purposes, but they are subservient to the main purpose. This must always be kept in mind, otherwise efficiency will be lowered by administrative work overloading the system to the detriment of the operational side.

Future Development.

Technical improvement prompts most of the plans for development. The number of sets in use will not increase greatly as it is considered that most of the needs for radio have been met. It is proposed, however, to carry out tests at fires with pack sets, easily portable by one man. A number of pack sets are on order for this purpose. They are the model ATRP1 developed recently by the Victorian Forestry Commission for this special need.

Other plans are:—

Develop and test a prototype mobile transceiver.

Development of fixed dual channel receivers.

Investigate types of mobile top loaded and solenoid antennas to replace long aerials for close-range work.

Development of aerial reels.