FIRE DETECTION USING AIRCRAFT

A Note on a Trial at Pemberton During the 1973/74 Season.

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Fire detection in W.A. State Forests has traditionally been built around the use of Lookout Towers and over the years a comprehensive system of towers has been installed and manned. Most of us have "grown up" with the tower lookout system and have learnt to work with its inherent weaknesses, some of which are:

(i) Relatively high cost of installation and maintenance of the towers themselves and their communication systems;

(ii) high cost of manning towers, especially with the overhead component allowed for;

(iii) inflexibility in hours of manning related to fire danger index, due to isolation of most towers and the method of payment of towermen by the half-day;

(iv) the indirect view, which even the most perfectly sited towers have over large areas of forest; and

(v) the basic inaccuracies in the "triangulation" method of plotting smokes, particularly as the angles from towers to smoke approach reciprocal bearings.

Despite these difficulties, the tower detection system has always seemed to work quite well and all of us are familiar with examples of brilliant detection work by certain towermen. For these reasons there is a degree of resistance to any change in the system and a conservatism of outlook has developed which is inimical to progress and development in the fire control scene.

Recent trials of aircraft detection at Pemberton, however, may lead to a revolution in this field.

THE PEMBERTON EXERCISE

A decision to conduct a full-scale aircraft detection trial at Pemberton in the 1973/74 fire season was undertaken following a brief exercise at Nannup in the previous summer. The Nannup exercise, lasting only a few days, indicated the potential of the technique and provision was therefore made in the 1973/74 estimates for a full summer's trial in the Pemberton Division. After a number of preliminary discussions, tenders were called and a contract let; a Cessna 150 aircraft being selected by the successful tenderer. The price was $18.00 per hour.

Preliminary work then commenced. This included:

1. Compilation of special plans, mounted in sections on plywood, and showing clearly those ground features readily seen from the air and not usually marked on F.D. 80 maps - e.g. private property areas cleared or uncleared, plots, karri regeneration areas and areas cut to seed trees, repurchased farmlands etc.

2. Training of aircrew in navigation, plotting, smoke descriptions, general features of the area, basic fire control and communications.

3. Calculation of flight patterns and flight times in relation to F.D.I.

The flights proper commenced on 26th November, 1973 when all the Pemberton Towers were also manned. Towers were manned continuously until mid-January so that a detailed comparison with the detection work of the "spotter" aircraft could be made.

FLYING SCHEDULES AND PATTERNS

A flying schedule based on daily forecasts was developed. This is discussed with the pilot at 0800 hours each morning and is basically as follows:

F.D.I. (5 year old karri)	Schedule
White	One circuit at DFO discretion
Purple-Green	Two circuits (a.m.) from 0900 Two circuits (p.m.) from 1300 or 1400
Blue-Brown	Three circuits (a.m.) from 0900 Three circuits (p.m.) from 1300
Yellow plus	Continuous operation 0900-1700 with ½ hour refuelling stop at midday.

The daily schedules are upgraded or down-graded when changes in condition warrant, by DFO or Duty Officer.

The "circuits" referred to involve a pre-determined flight pattern covering the Division and can be "broad" (1 hour turn-around) or "narrow" (30 minute turn-around) as required.

RESULTS

For the trial period December-January when both tower and spotter systems operated simultaneously, an analysis has been made of smoke reports on a number of selected days (wet days were excluded).

During this period, the aircraft reported 379 smokes and of these the towers reported only 181. Only 22 smokes were reported by towers which were not seen by the aircraft. Of these 22, 20 occurred when the spotter was grounded with communications problems which initially bugged the system (a new multi-channel aircraft VHF set was installed just after New Year and since then no communication problems have occurred).

All aircraft plots were very accurate six-figure references accompanied by a description of the origin of the smoke (e.g., "log smouldering in old C/B", or "running fire in grass paddock 50 metres from State Forest, no-one in attendance!") and any other relevant information. A large number of the tower plots were one-tower efforts when cross-bearings from other towers could not be obtained.

In addition, the aircraft was responsible for a number of significant "saves," including the early detection of a private property fire only 50 metres from a pine plantation, the location of a spot fire 800 metres outside the edge of a previous days aerial burn and the "catching" of an incendiarist setting fire to State Forest. In the latter instance, the fire had only burnt a few square metres before a nearby officer arrived on the scene, directed from the air, and the culprit was caught at the scene. None of these fires was picked up at all by the lookout towers.

PROBLEMS

Certain problems have emerged and these are:

1. In nearly every case where the towers and the spotter report the same smoke, the towers make the sighting first. In some instances a time interval of 2 hours occurred between a tower and aircraft siting of a particular smoke. The reasons for this are:

   (i) With a circuit turn-around time of about 1 hour, the pilot only has a certain area of the division in view at any given moment. The tower system, of course, was deliberately designed to provide continuous surveillance over the entire area all the time.

   (ii) On days of white to green fire danger the aircraft is not continuously in the air. The towermen were not "stood-down" while the aircraft was down for obvious administrative, and, in the case of towers 70 metres or so in height, sheer physical reasons.

   It must be noted, however, that time intervals decreased with increasing fire danger and with time of the year - at the end of the Restricted Burning period, they became insignificant. Balanced against the time interval is the fact that the aircraft is not only the <u>detector</u> of a smoke, he is also the first investigator. A smoke from a tower which takes an hour to plot, seek cross-bearings for, find on the ground and appreciate by an officer or overseer on foot, is quickly covered by the same smoke plotted accurately from the air and described in detail at the same time, even if the plane saw it an hour after the tower.

2. On very bad days in spring and early summer (and probably autumn, too) when there are large numbers of smokes to investigate and plot, circuit turn-around time can extend up to two hours. On such days the dual use of the aircraft and the towers is essential.

3. The aircraft cannot accurately measure wind speed and direction. When this information is required, for example during aircraft burns or wildfires, towers must be manned to provide it.

4. Pilot boredom is a problem when, as often happens, day after day goes by with nothing to report. This is the well-known "towerman's syndrome" and can only be overcome by crew changes, by lighting a few fires or by spending a bit of time with the pilot or towerman to bolster his morale and listen sympathetically to his personal troubles.

CONCLUSIONS

There is no doubt in the minds of those officers at Pemberton who have worked with the spotter this summer that the system is a "goer" for southern hardwood forest fire detection.

Speaking generally it is likely that the use of towers will decrease and the use of aircraft will increase. However the degree of reliance on one or other technique will depend on many factors such as location of towers, detection requirements, forest types and relative costs in each locality.