AERIAL PHOTOGRAPHS IN FOREST FIRE PROTECTION

Submitted to

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by

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SYNOPSIS

This report has attempted to show the use of aerial photographs in four of the phases of forest fire protection: (1) fuel type classification; (2) prevention; (3) presuppression; and (4) suppression.

The fuel type classification determines two things on an area: (1) resistance to fire control; and (2) the rate that the fire will spread. The three advantages of aerial photographs for type maping in conjunction with ground work are: (1) aerial photographs can define exact boundaries of type; (2) it is cheaper than the old ground method; and (3) changes can be made without recourse to additional field work.

There is a possibility of making good use of aerial photography in fire prevention education by using it as a documentary flag to engender attention to the prevention program. Since it is possible to plot patterns from seasonal lightning storms, it is conceivable to plot the pattern on aerial photographs and determine exactly where and what the lightning hazards are so that corrective action might be taken.

Success in fire suppression is dependent upon the soundness of the planning done in advance. Hence the importance of presuppression, or the preparation for the expected. Since few organizations have all the money they would like to spend for placement of crews, equipment, water holes, fire breaks, and access roads, they must choose wisely when money is expended in preparation. Protection must be commensurate with need. The limited scope of the ground observer makes it difficult to determine the placement, quanity, and quality of presuppression measures which should be proportional to the area's need. Aerial photographs give an excellent

picture of the overall area, complete with all the important variables which must be considered.

Of all the aspects of fire protection, suppression, has enjoyed the greatest success in the use of aerial photographs. Photographs are, for the most part, the overhead's equivalent to the hazel hoe in the business of fire control. With photographs, even a new man to an area, can capably command a fire with all the aplomb of the legendary hero slewing the dragon. A man who knows how to utilize an aerial photograph, yet is unfamiliar to the area, frequently will demonstrate more affective fireline action than a man who knows the country well.

With a background of photographic interpretation and fire experience the forester should be able to pick out topography and fuels and correlate them to rate of spread, intensity of burn, and resistance to control. He should also be able to determine alternate fire lines and escape routes for the fire fighters, should the unexpected happen.

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INTRODUCTION

The role of aerial photographs has changed extensively with the changing times. Every year these valuable "tools" have seen more use. The present movement is toward a more important use of aerial photographs in almost every field of forestry. It is the purpose of this report to present generalities, published facts, and personal ideas of the use of aerial photographs in forest fire protection.

Probably the most convenient breakdown of fire protection is the separation of prevention, presuppression, and suppression. However, one important aspect of fire protection that does not seem to fit in any one of the categories of fire protection, and yet is a very important element of each phase, especially in the initial setting-up of a protection program is fuel type data on the area to be protected.

This report will endeavor to show the use of aerial photographs in each of the following aspects of forest fire protection:

1. Fuel type classification in relation to rate of fire spread under average bad conditions, and resistance to fire control.
2. Prevention from the standpoint of reduction of physical hazards and education of the public.
3. Presuppression in respect to placement of men and facilities, fire breaks, fire access roads, and water holes.
4. Suppression with special consideration of uses by fire-line over-head.

Unfortunately the use of aerial photographs in forest fire protection is a relatively new thing, and the result is that references are few and far between. Consequently, much of the ideas in this paper are suppositions on the part of the author and are based on the knowledge he has managed to garner in both fields. For example, the author does not really know if water holes could be located along roads cheaper, better, and faster by use of aerial photographs, but since he can not visualize any arguments against this method of location, and since no research has been done in this direction, the author will assume, for his own purpose, that his logic is correct.

FUEL TYPE CLASSIFICATION

The fuel type classification determines two things on an area: (1) rate of fire spread; and (2) resistance the area gives to control of fire. Rate of fire spread is how far the fire perimeter will advance in chains per hour, and takes into account the arrangement of fine fuels, steepness of slope, and the exposure of the area to wind and solar radiation. Resistance to control is how much fire line a man can build and hold by hand method rated in chains per hour, and considers everything that will make fire-line building more difficult, such as steepness of slope, amount of rock in the soil, and how much chopping or sawing is needed. The finished fuel type map is usually considered as chiefly an aid in dispatching, that is, the dispatcher looks at his fuel map and determines approximately how much and what type of equipment, and how many men to send to a particular fire. This, however, is not the only place that the fuel type information can be used. It will show the

prevention man where to center the most intensive part of the education program, that is, geographically, and where, in presuppression, the most advantageous placement of men and equipment would be in relation to hazard.

From the stand point of area, perhaps the most extensive and tedious class of information to assemble in a fire control plan is the nature and location of the fuels. The usual way of gathering fuel type information is by having a crew run survey lines accross an area and take plot information. Another quite common way, is to get on high points and take information, at a distance, on all the areas that can be seen. By the use of aerial photographs a man can delineate the different areas on the photograph and then go directly to the area without wandering all around the country side trying to find their placement and wondering if any had been over-looked. The three advantages of aerial photographs 1/ for type maping in conjunction with ground work are: (1) aerial photographs are the ultimate in defining exact shape of type; (2) cost can be reduced considerably under those obtaining information on a survey of comparative accuracy under older methods; and (3) subsequent modifications can be made in the basic information without the time consuming recourse to additional field work.

PREVENTION

Very important in the field of forest protection is fire prevention. In the past, the fire protection people gave all there attention to suppression, with very little work being done in prevention. Every one was content to sit back until a fire got going, giving little consideration to the fact that if the fire never got started in the first place would not

have to fight it. The fact that, even with a rising population, we now have less fires than in the past, exhibits what can be done by better forest laws and educating the public.

Education

Not all of our public prevention education is done with "Smokey Bear" signs and spot radio announcements. Much of the education work is done by personal contact at group meetings, such as the boy scouts or at sportsmen organizations. A prevention program of this type could build up interest by showing successive aerial photographs -- either verticle or oblique; color or black and white -- of a fire building up, and what the men on the ground were doing to combat it. It could also show where the fire had fooled them, and how the fire fighters eventually controled it at great expense to the tax payer and to the future economy. Incidently, aerial photographs with attached information about the fire and method of control would be a tremendous addition to the fire records -- for research and students of fire control, as well as prevention education.

Reduction of Physical Hazards

One does not need aerial photographs to determine where the high hazard areas are in propinquity with the human element of risk -- this can be done best on the ground. However, people are not the only element of risk -- lightning is another. Past fire records show that lightning storms, time after time, follow a fairly definite pattern. The use of photographs are then borne out by plotting these storm patterns on the photographs and then determine, by sterioscopic pairs, what lightning hazards are present and need to be removed.

PRESUPPRESSION

It is realized that not all fires can be prevented, so the second line of defense is to get ready for them by training crews, building access roads, fire breaks, and any other work that may be needed to prevent being caught flat-footed when a fire springs up. Success in fire suppression is dependent upon the soundness of the planning done in advance.

Placement of Men and Facilities

Most fire protection agencies have difficulty in prorating the amount of protection each particular part of their district believes it needs or deserves. It is probably elemental to say that high hazard areas need a higher intensity of protection than other portions of the district. The problem is to give each area the highest amount of protection available on the merits of what the area demands, with the amount of money available. If the district is large, the whole operation can not operate out of one headquarters and give a proportionate amount of protection. The trick is then to set up a guard station system, with side crews and equipment, at the proper places, to give the proper areas the proper amount of protection. The location of these crews can be facilitated by the use of aerial photographs. The photographic interpreter can see at a glance where the high hazard areas are, how far they are apart, and how much road is between. Not only that, but the experienced fire-fighter can see the type of terrain he would usually be fighting fire in, and thereby foretell the type of equipment he would need at the substation.

Placement of Firebreaks and Access Roads

The main function of fire protection surveys are: (1) to determine where snag free firebreaks are to be established; (2) where access roads are to be constructed; (3) where areas of high hazard exists due to heavy snag concentrations; and (4) fuel type map of the area. 2/ The location of the firebreaks is of great importance in relation to existing road systems since, in many cases, the fire access road serves both ends. Road connections can be determined easily and with accuracy by use of aerial photographs. 3/ The first year that Oregon's rehabilitation program was using aerial photographs (1:12,000 with a 12" lens) they found that they still needed ground work, but the limited scope of the ground observer makes it difficult to determine where the free corridors should run, whereas aerial photographs gave an excellant complete picture of the proposed area through which the corridor would run. 3/

Placement of Water Holes

About the newest thing in fire presuppression is the placement of water holes along road sides, near areas of high hazard. Their placement should, by no means, be a haphazard selection, but should take in consideration what type of pump will be placed available, how much area it is to protect, how steep the slopes, how much hose is on hand, and the amount of protection the area needs. By careful examination of the aerial photographs, one will be able to see all the relationships in one glance, and place the water holes in the best places without over-loading one area and under stocking another.

SUPPRESSION

When the fire has been detected, the dispatcher and fire fighting crews can lay out their plan of attack by use of aerial photographs. They can tell at a glance whether the fire is accessable by roads or trails. If it is accessable by neither, then they can pick out their easiest entrance without the painful experience of wandering through neck-high brush, trying to find an easier route. By the use of photographs they can tell what type of fuel the fire is in, the availability to water for controling or mopping up, whether power equipment can be used or is neccessary, and if smoke jumpers are to be used, where they could be droped. 4/ The aerial photograph gives a realistic view of the type of country in which the overhead will fight their fire.

The U.S. Forest Service has found that their is a shortcoming on the part of the overhead personnel in lack of large-fire knowledge, which is due to the fact that large fires in one area are so infrequent that a man may fight only one every 20 years. This necessitated initiating a new program where overhead personnel were moved from one large fire to another. The main drawback in this plan was that most of the time the overhead were in charge of a fire in country completely strange to them. This is where aerial photographs comes in to use. A man who knows how to utilize an aerial photograph yet is unfamiliar to the area "frequently will demonstrate more affective fireline action than men who know the country well." 5/

A skilled observer can gain complete and almost intimate knowledge of an area surrounding a forest fire in a few minutes by using the photographs as a complete source on going fires. One instance where the fallibility of

human judgement is almost completely eliminated, is in the northern rockies where a plane flies every fire, takes photographs, and drops the prints to the fire line after a fifteen minute film developing period. 6/

CONCLUSIONS

With a background of photographic interpretation and fire experience the forester should be able to pick out topography and fuels and correlate them to rate of spread, intensity of burn, and resistance to control. He should also be able to determine alternate fire lines and escape routes for the fire fighters, should the unexpected happen. With a knowledge of equipment, the fire protection man could be able to determine just what kind of equipment he needs, where he needs it, and what can be expected from it under specified conditions. With knowledge of weather predictions and reports of weather on the fire line, the fire boss could almost provide a complete control strategy without even moving from his sterioscope and radio.

The field of fire protection is just now opening to the uses of aerial photographs and doubtless will find uses for aerial photographs to a much greater extent than the author had even dared mention.

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