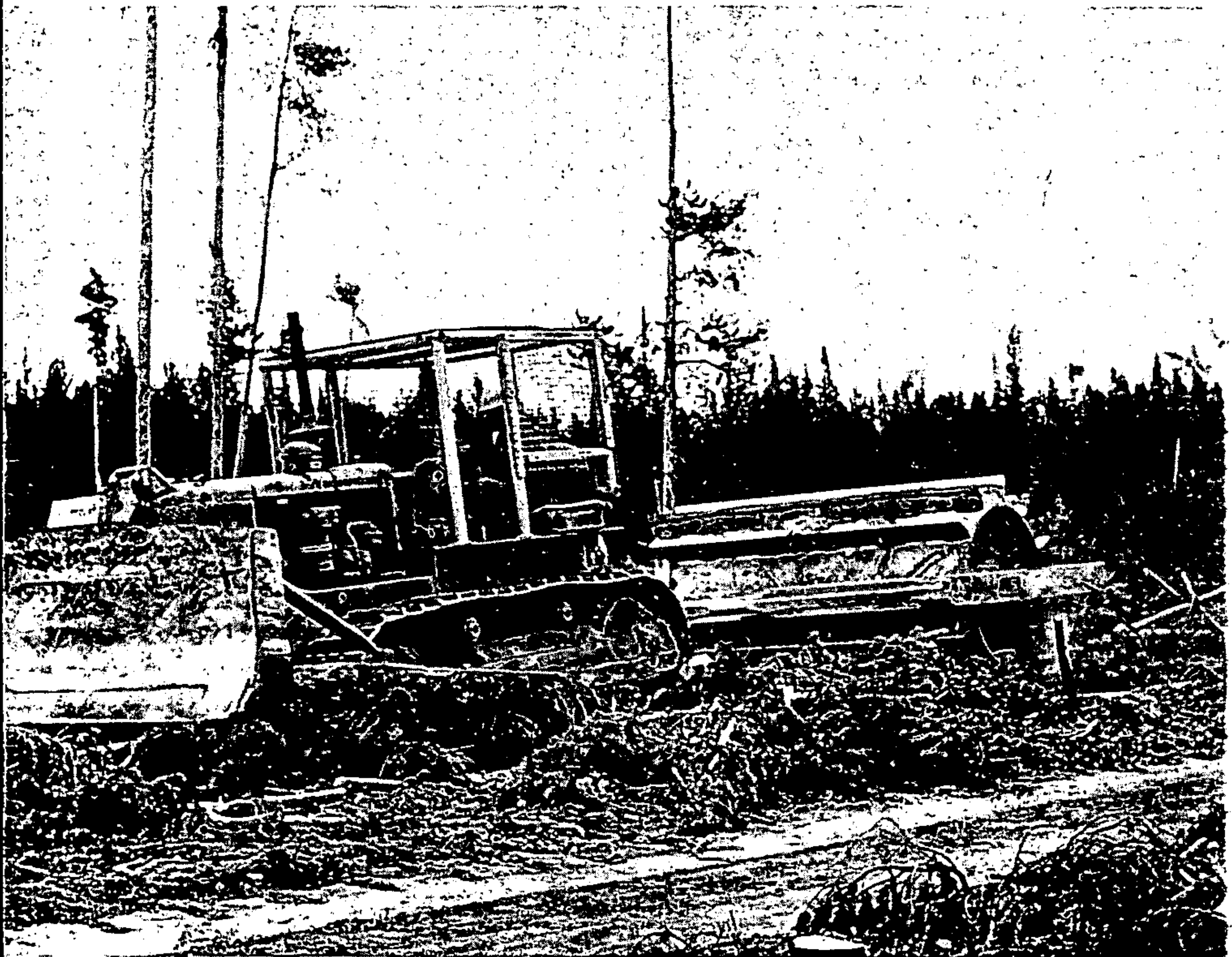
FIRE CONTROL NOTES

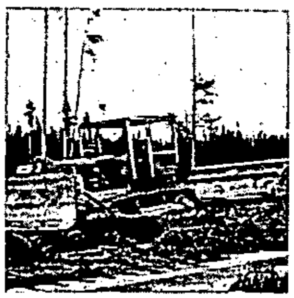
U.S. DEPARTMENT OF AGRICULTURE/FOREST SERVICE/APRIL 1968/VOL. 29, NO. 2



FIRE CONTROL NOTES

A quarterly periodical devoted to forest fire control

CONTENTS



COVER—Slash reduction using a rolling chopper on the Medicine Bow National Forest. See story on page 7.

(NOTE—Use of trade names is for information purposes and does not imply endorsement by the U.S. Department of Agriculture.)

FIRE CONTROL NOTES is issued by the Forest Service of the United States Department of Agriculture, Washington, D.C. The matter contained herein is published by the direction of the Secretary of Agriculture as administrative information required for the proper transaction of the public business. Use of funds for printing this publication approved by the Director of the Bureau of the Budget (Sept. 16, 1963).

Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402, 20 cents a copy, or by subscription at the rate of 75 cents per year, domestic, or $1.00, foreign. Postage stamps will not be accepted in payment.

A BREAKTHROUGH IN EFFECTIVE LOW-COST FIRE SIMULATION

SOLOMAN ZIMMERMAN, *Electronics Engineer*
Forest Service Electronics Center
Beltsville, Md.

The value of simulation as a fire control training aid is well established. This realistic "classroom" method of portraying the variety of problems encountered in actual fire situations has been widely accepted. Personnel from Federal, State, and local protection organizations have gained extensive experience, and therefore knowledge, during simulated fire exercises. The initial development of fire control simulators has been basically oriented toward the larger "command" models.[1] By using these sophisticated simulators, with elaborate optical, communication, and sound systems, trainees are placed in a realistic, complex fire management situation.

However, the command models are expensive, and many problems have been encountered in developing a system capability. This has limited to seven the number the U.S. Forest Service has been able to procure. Also, except for one trailer-mounted system, these simulators are difficult to disassemble and reassemble; therefore, they are not easy to move from place to place. Because of these disadvantages, the number of personnel who have been able to receive simulator training has necessarily been limited. Generally, only personnel operating in the higher positions in the large fire suppression organization could be accommodated.

Because the Forest Service recognizes that simulation is an effective training device for all fire control personnel, it has been investigating the feasibility of developing an effective, low-cost model for several years. General criteria for the proposed system have been: (1) Cost of less than $2,000; (2) weight of less than 200 pounds; (3) simulation capabilities to produce changes in fire and smoke patterns, smoke motion effect, and char: (4) a one- or two-channel communications network; (5) and a background sound effects system. Desirable, unessential features included the capability to show fire motion and a symbol effect to portray fireline construction.

The Beltsville Portable Simulator recently developed at the Forest Service Electronics Center meets all these criteria. Preliminary evaluation of its capabilities and performance indicates that the system has the potential to greatly increase the amount of simulator training which can be carried out.

The total cost of the prototype model is approximately $1,000. The components weigh less than 175 pounds. When disassembled, it can be carried by one man and then transported in a station wagon. Assembly and operation of the system is uncomplicated and easily learned. Simulation of fire, smoke, and char effects is excellent, and is completely manageable. Realistic fireline is easily introduced into the scene.

The heart of the Beltsville system is a set of three overhead projectors. The first is used for fire, the second for smoke, and the third for the background scene, char, and fireline or other symbols (fig. 1). A rearview screen projection is used. The operators and all equipment are in a curtained enclosure behind the screen, out of sight of the trainees. With rearview projection, total darkness is not required; exercises can be conducted in a room where direct outside light is subdued.

The fire projector has a dark orange filter covering the writing stage. The filter is covered by a sheet of opaque Vu-Graph film. As the film is scraped away with a stylus, the filtered light is transmitted through the opening and appears on the screen. By controlling the size, shape, and location of the opening, a fire of the desired size and shape is created at the appropriate location on the background scene. Smoke is created similarly by a second projector without a colored filter.

The illusion of motion and direction of movement is imparted to the smoke and flame projec-

Continued on page 15

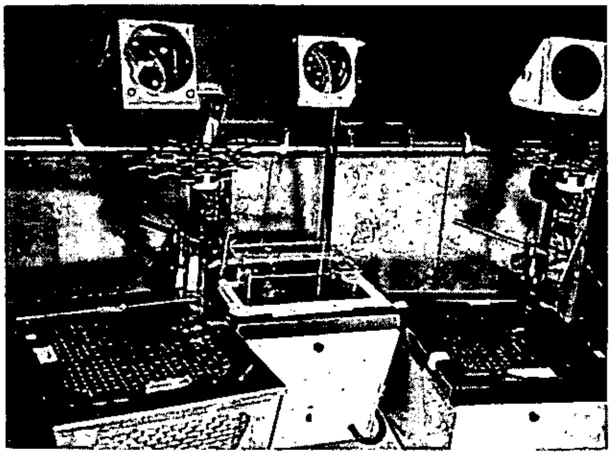


Figure 1.—The simulator optical system consists of three overhead projectors. The perforated disks mounted on the upright arms of the projectors on the left and right revolve to give the motion effect to fire and smoke simulation.

[1] O'Neal, N. C., and Holtby, B. E. The fire control simulator. Fire Control Notes 24(2): 25-31. 1963.

A PRELIMINARY REPORT ON THE INFRARED LIGHTNING FIRE PATROL STUDY

B. JOHN LOSENSKY, *Research Forester*[1]

Intermountain Forest and Range Experiment Station

The key to efficient fire suppression is early detection. Between 1940 and 1949, in U.S. Forest Service Region 1, holdover fires[2] that reached the D and E size classes (burning more than 99 and more than 299 acres, respectively) accounted for 41 percent of the total acreage burned, although representing only 0.13 percent of the total fires.[3] Thus early detection could substantially reduce the total acreage burned.

Forest Service aerial patrols are obtaining faster detection; however, holdover fires have not decreased proportionately. Analysis of 4,073 lightning fires in Region 1 between 1960-65 indicates that 45 percent burned more than 8 hours before discovery. Infrared scanners may be effective in reducing holdover fires. These scanners detect fires from heat radiation rather than by visual means and are therefore usable at night as well as by day.

INFRARED STUDIES

Research in infrared fire detection started at the Northern Forest Fire Laboratory in 1962. Tests in eight major western timber types related infrared detection probability (the number of fires detected expressed as a percent of the total scanned) to such variables as canopy cover, scan angle,[4] and fire size. From the data collected, the major timber types of the Western United States have been grouped into three general detection probability classes (fig. 1). The curves will be used for planning detection flights.

An infrared patrol study was started during the 1966 fire season to scan lightning fires under natural conditions following thunderstorm activity. The study was aimed to find some answers to questions associated with an operational infrared detection system. For example:

1. Do ground conditions affect detection probability?
2. Do all lightning fires provide enough radiation for detection?
3. Are the detection probability classes assigned to the various timber types valid?

Two areas with high lightning occurrence were selected for patrol tests:

1. Montana-Idaho test area—located between latitudes 45°20′ N. and 47°00′ N. and longitude 114°25″ W. and 115°35″ W.—including parts of the Bitterroot, Clearwater, Lolo, Nezperce, and St. Joe National Forests (fig. 2).
2. Oregon test area—including parts of the Wallowa-Whitman, Umatilla, and Malheur National Forests. No usable data were obtained from the area, and it will not be discussed in this report.

STUDY PROCEDURES

The Montana-Idaho test area was divided into strips 8 miles wide and 100 miles long. Flying at 15,000 feet over terrain provided 10-mile-wide coverage and permitted 1-mile overlap on each edge. To fly large areas with a minimum of overlap or gaps between strips requires highly sophis-

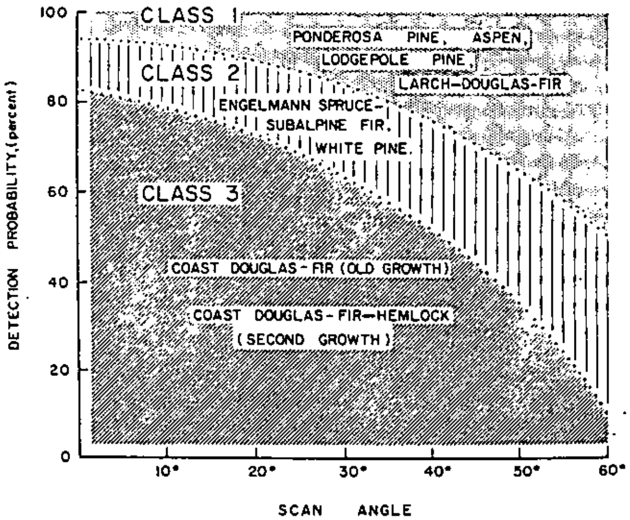


Figure 1.—Infrared detection probability classes. On the basis of individual probability curves for each timber type, generalized class groupings indicate results that may be expected. Scan angle has definite influence in most timber types but relatively little in ponderosa pine. In class 3 types, the infrared method is not likely to be an improvement on conventional methods.

[1] Stationed at Northern Forest Fire Laboratory, Missoula, Mont.

[2] Here defined as fires not detected within 8 hours after origin.

[3] Data on fires based on Individual Fire Reports (form 5100-29) submitted by U.S. Forest Service personnel. These reports include estimated time of origin, discovery time by conventional detection methods, position, size, etc.

[4] Scan angle—the angle expressed in degrees between the vertical nadir and line of sight from scanner to observation point.

ticated navigation. A Doppler radar system measured true groundspeed and drift angle of the aircraft. Heading was obtained from the aircraft compass. From this information a computer continuously supplied the latitude and longitude of the plane. After lightning occurrence in the test area, night patrol missions were flown as soon as weather conditions permitted. So that there would be no unnecessary flying, the extent of daily thunderstorms was determined from Polaroid slides of the weather radar display obtained from the U.S. Weather Bureau in Missoula. This data—together with reports from each forest on estimated time of lightning occurrence, general area affected, and relative storm intensity (light, moderate, or severe)—was placed on an overlay of the patrol zone. As determined from the overlay, only the segments of the strips affected by lightning were flown.

A continuous strip picture was taken of the infrared imagery on Hyscan Plestar film and was developed with a rapid processor. At the beginning and end of each strip a slate unit, including a clock face, was photographed on the edge of the imagery and discovery time determined. Developed film was available for any point on the ground about 3 minutes after the point was scanned. Rapid film processing provided control of image quality, and allowed us to check the navigation system by comparing the imagery with aerial photos and determining aircraft position. No attempt was made to locate possible targets on the film until the flight was completed.

The imagery was read at the end of the mission, and targets were reported to the forests affected (fig. 3). The forests in turn reported any fires they had found in the test area.

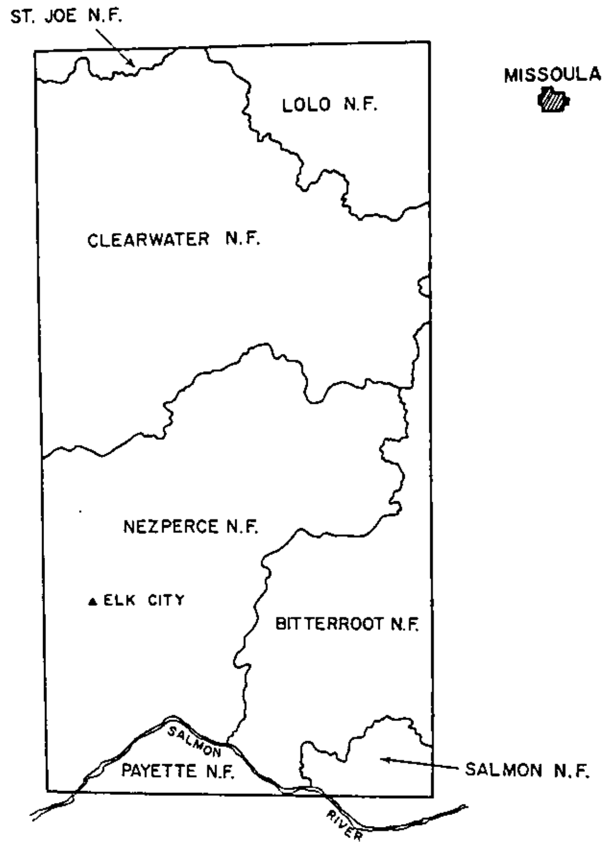


Figure 2.—Montana-Idaho test area.

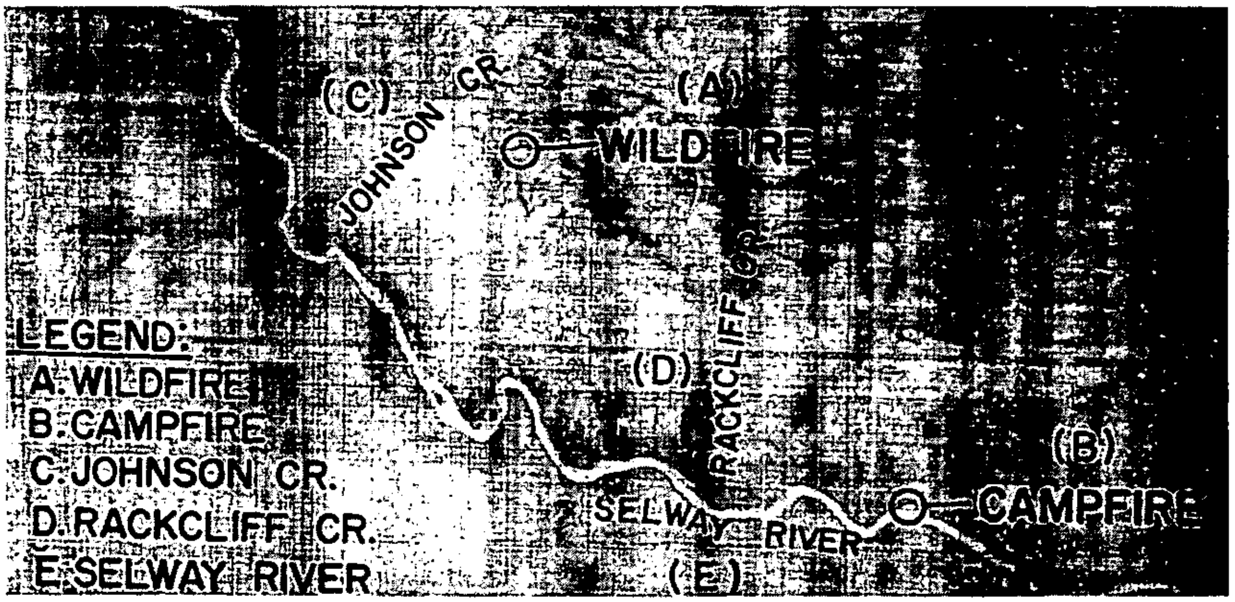


Figure 3.—Infrared imagery showing a wildfire and ground detail.

In the analysis of infrared imagery, an estimate of the fire conditions was attempted as they were when the fire was scanned; also considered were fire size, position (on the ground or in a tree), and heat radiation from the fire. In addition, slope aspect, species composition, and density of the vegetative overstory were estimated to determine their effect on infrared detection. These data were obtained from the Individual Fire Reports, information supplied by the districts, and Fire Laboratory personnel investigating the accessible fires.

RESULTS OF FIRE SCANNING

Seven missions were flown on the Montana-Idaho test area between July 31 and Aug. 15, 1966. Sixty-three targets were scanned and may be classified as follows:

Detected	
Campfires	29
Dwellings	9
Slash Fires	4
Wildfires	12
Subtotal	54
Undetected	
Wildfires	9
Total	63

Of the 12 detected wildfires, four have not been considered in the analysis because of their size; each was larger than one-half of an acre and therefore not a detection problem. The remaining eight are examples of typical lightning holdover fires. Following is a tabulation of fires detected by infrared, showing the lapsed time between origin and infrared detection. These values are compared with the lapsed time for conventional detection. (For example, fire 1 was detected by infrared 8 hours after starting, but it had burned 21 hours before discovery by conventional methods.)

Fire	Lapsed time between origin and infrared scanning	Lapsed time between origin and conventional detection
	(Hours)	*(Hours)*
1	8	21
2	11	24
3	13	17
4 (estimated)	16	Fire went out before found
5	51	50
6	51	15
7	47	40
8	30	13

Fires 1 through 4 were found earlier with infrared; fires 5 through 8 were found earlier with conventional methods. All fires were detected with infrared the first time they were scanned. The lapsed time for infrared detection probably could have been reduced, especially for fires 5 through 8, if flights had followed more closely upon the storms from which the fires originated. Delays were caused primarily by scheduling problems that can be corrected in future testing.

Nine fires were scanned but not detected by infrared; eight of these may be classed as holdover fires. They were discovered by conventional methods from 12 hours to 48 days after origin. Following is a tabulation of fires scanned but not detected by infrared, showing the lapsed time between origin and scanning. The lapsed time between origin and detection by conventional methods is also shown. (For example, fire 9 was scanned but not detected by infrared 52 hours after it started. It was discovered by conventional methods 4½ days after it started.)

Fire	Lapsed time between origin and infrared scanning	Lapsed time between origin and conventional detection
9	52 hours	4½ days
10	12 hours and 31 hours	71 hours
11	17 hours	24 hours
12	6 days	20 days
13	50 hours	5½ days
14	8 hours and 32 hours	49 hours
15	6 days, 17 days, and 18 days	29½ days
16	6 days, 17 days, 18 days and 38 days	47½ days
17	9 hours	1 hour

DISCUSSION

Some questions posed at the outset were answered, although much remains to be investigated.

Detection probability.—Present indications are that ground conditions, such as slope, aspect, and fire location on the slope, do not adversely affect infrared detection probability. Validation of detection probability classes cannot be made because of the small number of fires scanned in a wide variety of timber types. However, 55 percent scanned at angles greater than 40° were detected. This percent agrees with data obtained from the detection probability study.

Radiation.—Reliable data are not available on whether or not all the fires scanned radiated enough heat for detection, because determining the exact character of the fires at the time they

Continued on page 16

DISPOSAL OF LOGGING SLASH WITH A "ROLLING CHOPPER"

S. H. VAN and DALE G. GALLAGHER[1]

After an area has been logged, the land manager is faced with the problem of the many treetops, limbs, small unmerchantable trees, and other debris which remain. It is often necessary to reduce this slash for fire control, mistletoe control, aesthetics, and other reasons. Since little, if any, of the material can be economically utilized, other treatment measures are usually required. The method most commonly employed is burning. However, in recent years a "rolling chopper" has been successfully used in some areas. Treatment of slash by the chopper has proven to be less expensive, and has offered several other advantages over other treatment measures.

Figure 1.—Rolling chopper used in lodgepole pine slash disposal on the Medicine Bow National Forest.

EQUIPMENT

The chopper is a hollow-steel cylinder, with cutting blades on the rolling surface. The model shown in figure 1 is 12 feet wide and has a drum diameter of 5 feet. The blades are 10 inches high, and they are spaced 21 inches between cutting surfaces. When empty, the chopper weighs 18,500 pounds, but when filled with water, it weighs 32,-100 pounds.

The chopper is pulled by a late-model crawler tractor, usually in the D-7 or D-8 class. It costs approximately $6,500 to $8,000, depending upon the specific model and freight charges.

UTILIZATION

The chopper can be used on slopes of up to 20 percent where conditions are favorable. It cannot operate in areas that are swampy or where there are numerous rock outcrops.

The cutter is able to treat an average of 12 to 15 acres per 8-hour day, at a cost of $10 to $15 per acre. This cost figure includes overhead, amortization or rental of the equipment, hauling of the equipment, repairs, etc.

Because use of the chopper will destroy any residual stand on an area, it cannot be employed where it is desirable to save advanced reproduction. However, since mistletoe is often a problem in lodgepole pine, elimination of the residuals is often an advantage there.

RESULTS

Limbs and treetops are broken and partially buried in the soil by the cutter. Larger material, up to 7 inches in diameter, is broken, shattered, or sliced. In addition to this action, the blades also make small furrows in the soil, reducing the potential for erosion and preparing a good seedbed.

Figure 2 shows a logged area before any treatment. This timber stand was mature, even-aged lodgepole pine *(Pinus contorta)*. It was clearcut to a tree diameter of 8 inches. Figure 3 shows a typical area after the "rolling cutter" has made one pass over the debris.

ADVANTAGES

There are a number of advantages to using a chopper for treatment of logging slash in lodgepole pine. These also would be applicable to similar timber types.

1. The chopper can be used anytime after the site has dried out, whereas burning can be done only under certain weather conditions, often delaying needed treatment.

2. The cost of $10 to $15 per acre is less than one-third the cost of piling and burning. The treatment is completed in one operation, and supervision time is also reduced.

3. The slash, which is on the ground or partially buried, de-

[1] Respectively, Timber Staffman and Fire Staffman, Medicine Bow National Forest, Wyo.

composes rapidly. This decomposition returns organic matter to the soil, rather than consuming it as with burning.

4. The furrows in the soil made by the blades provide a good bed to catch and hold tree seed. Those areas treated with a chopper from 1960 to 1963 were found to have naturally established regeneration averaging 1,830 seedlings per acre in a 1966 survey. These furrows also help to hold moisture and reduce runoff and erosion; therefore, there is minimum topsoil disturbance.

5. After chopper treatment, other equipment can traverse the area for thinning, fire control, etc.

6. The chopper-treated area is always more esthetically desirable than untreated areas, and often more desirable than burned areas.

7. Disposal of slash by the chopper method does not affect air pollution.

SUMMARY

Rolling cutters have been used on the Medicine Bow National Forest since 1960. Both smaller tandem units and single, larger choppers have been used. The single, larger unit is easier to maneuver, and maintenance has been cheaper and less frequent.

We have developed the following guides for using a rolling chopper:

1. Use on lodgepole pine areas within 3 years of the timber cutting. Do not use on spruce-fir stands with well-established advanced reproduction, or on lodgepole stands containing more than 2½ cords per acre of residual stand.

2. Use on mistletoe-infected areas.

3. The optimum minimum size area for treatment is approximately 20 acres. This can be a single area, or several smaller units close together.

4. Use on cutover areas with light to heavy slash.

5. Use on slopes of up to 20 percent that are reasonably free of rock outcroppings and swampy areas.

6. Do not use on areas where live or dead snags with a diameter of 10 inches or more exceed 5 per acre.

In summary, the rolling chopper has allowed treatment of more areas of logging slash at less cost per acre. This treatment has not only reduced fire and erosion potential, but also provided better seedbeds with resulting satisfactory natural regeneration.

Figure 2.—Untreated slash on mature, even-aged lodgepole pine clearcut area.

Figure 3.—Lodgepole pine slash after chopper treatment.

IMPROVED BASE FOR OSBORNE FIREFINDERS

Missoula Equipment Development Center

When the lookout's view of a fire is obstructed by a portion of the lookout building, the standard firefinder must be lifted and moved to the alternate set of rails on the base.

An employee suggestion for an improved base, which makes this lifting and moving unnecessary, has been evaluated by MEDC (fig. 1). The new base permits sliding the firefinder to either side without disturbing settings or leveling. It also permits the firefinder to be positioned in locations which would fall between the rails of the standard base.

Paraffin lubrication of the base is recommended. Movement in any direction within the limits of the rails is smooth and positive.

A list of materials follows:

Part number	Part name	Quantity	Item	Dimensions (inches)
1	Base	1	Exterior plywood	¾ x 24 x 24
2	Rail	2	Angle aluminum, ¼" stock	24 x 1¼ x 1¼
3	Slide pipe	2	Steel pipe	11½ x ¾ (1.05" O.D.)
4	Cross rod	2	Steel rod	¾ x 23½
5	Bolt	4	Steel	5/16 x 1 18NC
6	Nut	4	Steel	5/16 18NC

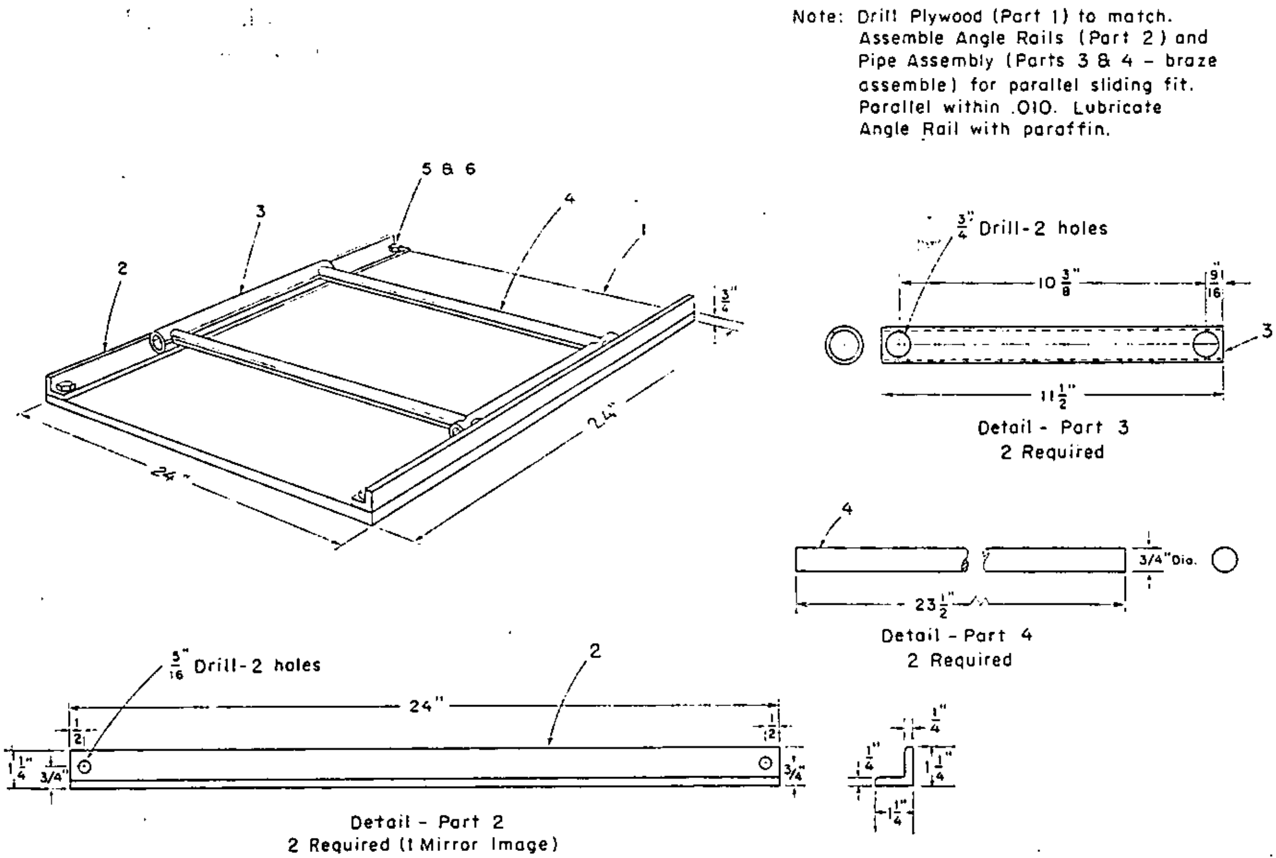


Figure 1.—Construction plan for improved base for the Osborne firefinder.

TIPS ON APPEARING AS SMOKEY BEAR

DAVID C. PHILLIPS
Fire Prevention Specialist
Pike National Forest, Colo.

This report describes the impressions gained during more than 100 impersonations of Smokey Bear within 3 years. These impressions were obtained as Smokey rode a racing car up the Pikes Peak Highway, from publicity photos, and from appearances in parades, in skits with youth groups, in schools for deaf and blind children, and in ordinary schools, etc.

Smokey Bear may be the most universally recognized symbol of fire prevention. He is recognized by young and old, both in this country and in many other nations. (fig. 1) Most people will stop to shake hands and converse with this symbol. Dignitaries, whether political, military, or business, usually welcome a handshake and a few words with Smokey.

The Smokey symbol is not closely identified with any specific organization. Forest Service identification is present, but it is usually secondary to that of the sponsoring organization, i.e., volunteer fire departments, military fire departments, or school administrations. Also, the Forest Service encourages use of the Smokey symbol by all wildland management agencies. Relations with other organizations can be strengthened by inviting uniformed representatives to accompany Smokey.

GENERAL SUGGESTIONS

Fear

Probably the most important suggestion is that the impersonator should be constantly alert for frightened people.

A few adults are frightened by Smokey. Women are affected more often than men. Most adults are startled by Smokey's appearance. Speak carefully to people who are not facing you. Keep as much distance as possible until Smokey has been recognized.

Two- to four-year-old children are usually frightened by Smokey. Only a few 5-year-old children are frightened, and many will come to Smokey if given adequate time. Parents often need to be warned that their child may be alarmed.

Reaction of Different Ages

The reaction varies by age. The general reaction pattern is:

0 to 2 years old—This age group usually does not react to Smokey. If children react, it probably will be with fear.

2 to 4 years old—Children often react with panic. It is best to keep some distance from them.

4 years old—Children are very timid. Many cower behind their parents and will not approach Smokey. Stand still and let them walk to you.

5 years old—Most children will approach Smokey and will want to shake his hand.

6 to 8 years old—Children are curious about the suit and try to detect flaws. The impersonator should volunteer the information, "Of course Smokey is a man in a costume." Explain why there is such a costume.

9 to 13 years old—Children are embarrassed to be seen with Smokey. Smokey needs to offer encouragement. It seems best to ask questions and to attempt to establish a teacher-student relationship. It is difficult to control the behavior of a group of boys if rapport is too closely established.

13 to 21 years—This group usually ignores Smokey. Some interesting conversations occur if

Figure 1.—Smokey's friendliness toward children favorably influences children's fire-prevention attitudes.

groups include both boys and girls.

Adults—Self-confidence is directly correlated with the amount of conversation with Smokey. Conversation should not exceed 30 seconds unless initiated by the other person. Special effort should be made to contact dignitaries.

Attributes of Impersonator

Fewer skills are required to impersonate Smokey while on a parade float than during a question and answer session with a group of sixth-grade students. Summer employees, especially recreation guards who normally contact people, can adequately impersonate Smokey at parades.

At schools the impersonator needs Forest Service experience. He also must have the ability to speak in public and provide suitable answers to the many questions which are asked. The most important need is to like children and to enjoy talking with them.

MEETING PEOPLE

When a large crowd is expected, Smokey must have assistance, for he cannot control those who may press around him and still make effective prevention contacts.

When Smokey shakes hands, he should put his hand where it can be grasped by the other party; he must lower it for small children. Do not grab hands that are extended. For children, it is often effective to ask if they want to pet you rather than shake hands.

Contact with each individual is normally brief. Usually there is only time to shake hands and exchange a word or two. Speak to as many individuals as possible. Some typical comments are: "Isn't this fun to pretend?"; "I have more fun than people."

A specific fire prevention message may be difficult to get across unless time is taken to establish rapport. Such a strong impression is made by the Smokey suit itself that it often takes at least 1 minute to gain the necessary attention.

Figure 2.—Blind girl "sees" Smokey.

Visits to Handicapped Children

Approach these children slowly. Emotional problems are occasionally associated with physical handicaps. The child, or an adult accompanying the child, will usually indicate the behavior pattern Smokey should follow.

Blind children need to touch Smokey (fig. 2). Encourage the blind children to "see" the entire suit, from the hat to the furry feet. Special interest is created by the ranger's hat, moveable mouth, and the shovel.

Parade Appearances

When Smokey appears on floats, he is usually the main attraction. Simple floats featuring Smokey are effective. Elaborate floats may lose some of their effectiveness to Smokey. Smokey should be at the front of a float so he can be viewed as the float approaches. An unobstructed view of Smokey, which allows the crowd to see him waving to both sides, is most effective.

However, many Forest Service floats are on trucks where it isn't possible to put Smokey at the front of the vehicle. In this case, put Smokey at the rear of the float, facing the direction of travel.

Balance is a problem. A hand hold, or a brace to help keep balance, is essential.

School Appearances

Smokey's appearance at a school assembly is not nearly as effective as his visits to classrooms. In classrooms, close rapport can be established between the children and Smokey if an atmosphere for fun is maintained. Smokey's appearance is effective with or without advance preparation by the class. Smokey is an effective tool when he is used to reinforce material already learned. Clear distinction should be made between the real bear named Smokey and the symbol of Smokey which is in the classroom.

Typical classroom appearances have four steps: (1) Establishment of rapport, (2) explanation of need for Smokey, (3) Smokey's rules and items suggested by local fire department, and (4) a question period. Smokey's appearance must vary from grade to grade and class to class.

THE SUIT

The Smokey suit must be in first-class condition for each appearance. The suit is closely examined by the public, and every flaw detracts from the overall impression. The fur of the suit should be brushed regularly. A hairbrush is adequate. Dry cleaning by a commerical cleaner is satisfactory.

Padding worn under the suit improves the appearance. One approach is to make a "corset" of 1 inch of foam rubber and to pad the seat with 3 more inches. Most impersonators perspire freely in the suit. Lightweight absorbent clothing should be worn.

Continued on page 16

THE LINCOLN HARNESS

ABEL A. ZAMORA, *Electronics Technician*
Lincoln National Forest, N. Mex.

The Lincoln harness (fig. 1) was devised to fill the need for an inexpensive method of simultaneously monitoring Air Net and Forest frequencies and instantly communicating to either while on air observation.

The portable radios, harness, and strap-on antennas make a compact, self-contained kit and enable the operator to fly in any available craft.

The control box is simple to build and parts (fig. 2) are inexpensive, many being available on surplus.

		Cost
P 1	U-93A/U (Military surplus)	
P 101	Microphone plug, Motorola #28A16370	$0.53
P 201	Microphone plug, Motorola #28A16370	.53
J 1	U-92A/U (Military surplus)	
J 2	Microphone jack, Motorola #9B16345	.62
J 3	Phono plug, Motorola #9B54664	.05
S 1	Switch, pushbutton, DPST, Type 35-1 (Allied #56A4964)	1.20
S 2	Switch, rotary, 4-pole, 2-position, Type 3142J (Allied #56A4306)	1.05
S 3	Switch, SPST, miniature	1.10
	Housing, bud type 2102A (Allied #42A7618)	.80

Figure 1.—Air observation scout using Lincoln harness prepares for patrol flight.

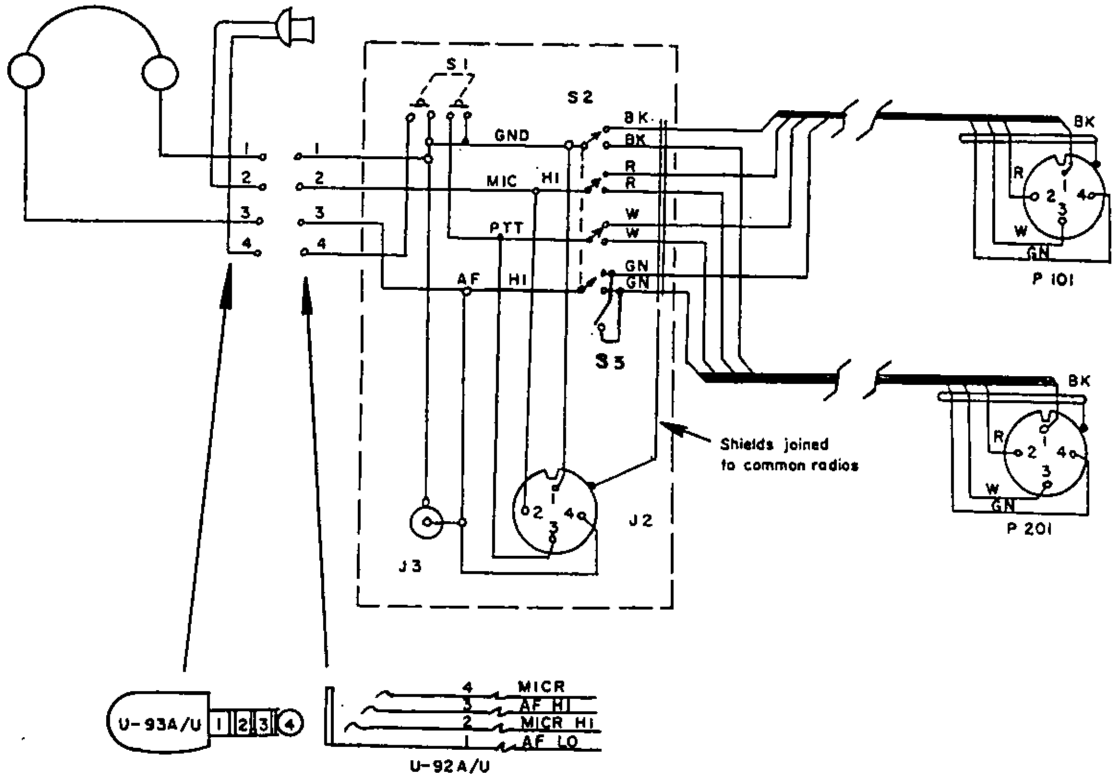


Figure 2.—Wiring diagram and parts for the Lincoln harness are shown.

The harness can be used with a Motorola type NMN6009B headset or with a military headset with carbon microphone preferred by this Forest. It can also be used with a crash helmet headset. Advantages offered by the military headset with carbon microphone include:

1. Cost: The earphones are generally available through surplus as complete headsets including the boom microphone.

2. Flexibility: Government surplus flying helmets with the headset built in are also usually available.

3. Impedance Matching: There is no need for a matching transformer as the earphones offer minimum mismatch to the output transformer. Therefore, audio loss and distortion are negligible.

Though no attempt was made to provide for dual transmission, another pair of earphones can be paralleled for dual reception.

The net selector on the control box (fig. 3) gives the operator a selection of Forest or Air Net frequencies. No provision has been made to switch channels at the control box as this would require modification of the radio units. Channel selection, however, can easily be accomplished due to nearness of the radios to each other and to the operator. The length of the control cables, 6 feet maximum, governs this distance. Normally, most of this length is alongside the operator for comfort in operation.

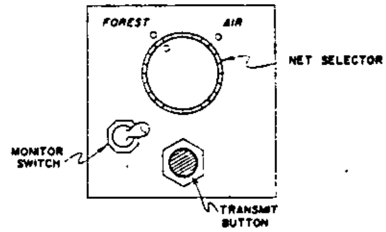


Figure 3.—Control box showing net selector.

The monitor switch provides for reception of both frequencies regardless of net selector setting. To transmit, though, the selector switch must be set to desired service.

The control box is mounted on a pilot's kneeboard. The kneeboards are also usually available on surplus and make an ideal base.

HOOK IMPROVES MOPUP WAND UTILITY

PHILLIP C. HICKS, *Forester*
Rouge River National Forest

The pipe nozzle extension, or wand, in the standard mopup kit is a valuable tool for the efficient use of water. Its use facilitates the direct application of water to the burning material, especially when the material is in hard-to-reach spots such as in deep duff and under logs and debris.

For the most effective use of water, an extra man with a shovel or some other tool usually must work constantly alongside the nozzleman. He turns material over when necessary to expose the burning side. The need for this second man can be reduced, however, by the addition of a small hook to the nozzle end of the wand (fig. 1). This addition makes the wand a light-duty pike pole, and the operator can easily turn small poles and chunks without assistance. Then one shovel man can turn the larger material for two or three wand operators.

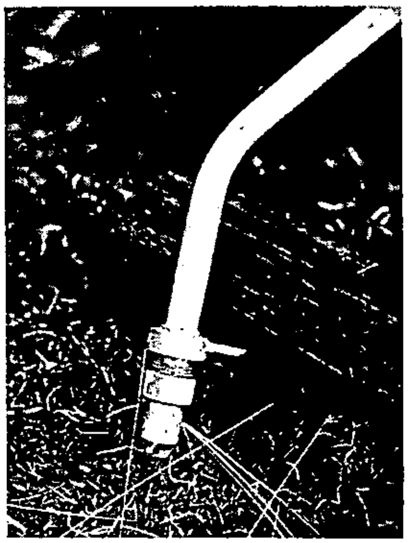


Figure 1.—The addition of a small hook to the mopup wand permits the operator to move small material easily without assistance.

The hook is fabricated by welding a pointed steel rod onto a steel ring. The ring is slipped over the wand and held in place just above the nozzle by an Allen screw. When the wand is used for boring into deep duff, the screw is loosened, and the hook assembly is slipped up the wand and refastened out of the way so that it will not hang up on matted roots.

The improved wand was tested during the past summer in Region 6, and it was enthusiastically accepted. The hook has been adopted as a standard accessory for Region 6 mopup kits.

The cost of making each model hook assembly was $3.50. However, when produced in quantity, this figure should be much lower.

A PORTABLE STAND FOR LARGE SMOKEY BEAR SIGNS

NATHAN DAUCHY, *Assistant in Charge, Fire Control*
Vermont Department of of Forests and Parks

The Vermont Department of Forests and Parks has designed a portable stand for use with the large Scotchlite Smokey Bear roadside signs. With this stand, the signs can be moved more often; in turn, they are seen by more people (fig. 1). Two weeks is usually the optimum exposure time for each location.

The stand is constructed of pine and spruce; it has sufficient strength and is light in weight. The base skids are mortised to a depth of 1 inch to hold the feet of the upright frame when the stand is erected. Each foot is secured in place by a lag screw through an iron plate bolted to the foot. (fig. 2). The sign is fastened to the frame by seven screws. Paint on the screw heads makes them inconspicuous. The entire stand is stained dark green.

To prepare the standard for moving, unscrew the two lag screws, raise the uprights to free them from the mortise, and pull the bottom forward; the frame pivots on the back braces. When folded flat, the assembly is about 9 inches high, 56 inches wide, and 96 inches long.

The best location for the sign is on the outside of a curve at the end of a long straightaway. It should be placed a few feet higher than the road, and the background should be woodland. The base can be staked or weighted down to prevent the sign from being blown over by wind. To discourage vandalism, it should be placed near an occupied dwelling.

Figure 1.—This portable stand permits optimum use of Smokey Bear roadside fire prevention signs.

LIST OF MATERIALS

	Item	Quantity	Dimension (inches)
Lumber			
	Base:	2	4 x 6 x 96
		2	2 x 4 x 52
	Braces:	2	2 x 4 x 56
	Frame:	2	2 x 4 x 73
		3	1—⅛ x 4 x 52
		2	1—⅛ x 4 x 60
	Head stay:	1	2 x 4 x 24
Hardware			
	Machine bolts:	2	⅜ x 9
		2	⅜ x 9
		4	¼ x 3
	Lag screws:	2	¼ x 1½
	Screws:	7	3 roundhead iron, 10 ga.
		4	2½ flathead iron, 12 ga.
	Washers:	8	⅜
		4	¼
	Iron plate:	2	⅛ x 3 x 6

Low-Cost Fire Simulation—*Continued from page 3*

tions by motor-driven perforated disks rotating across the paths of the light rays in out-of-focus positions. By varying the speed and direction of rotation, and the location of the disk, the complete ranges of both fire and smoke effects can be obtained. Realistic simulation is very satisfactory over a wide range of background scenes.

A 7½- by 5-inch color Vu-Graph transparency is used for projecting the background scene. The emulsion side of the transparency is protected by an acetate sheet. Firelines and other symbols are drawn directly on this sheet.

Char is put on the scene by shading with a china-marking pencil on a plexiglass char plate set 2 inches above the transparency. Since the pencil and operator's hand cast a shadow on the screen if char is added directly during the exercise, acetate sheets on which the char has been premarked can be quickly positioned on the plate as the burned area increases.

Telephone and radio communications are both provided with the prototype model. Inexpensive equipment is used. The telephone is a simple two-station intercom. The radio network consists of a pair of two-channel Citizen's Band walkie-talkies and a small base station. The base station is modified slightly to reduce power to conform with FCC requirements, and to enable it to be used as a public address amplifier. Two low-priced tape recorders provide a variety of background sound effects, and a third is used to record the exercise for later critique.

The Beltsville Portable Simulator, with its low cost and portability, permits greatly increased use of simulation for training at all levels. While the original concept in the development of a small model was to provide a method for initial-attack training, the system produced has the capabilities to effectively be used for sector size fire training. Only minor additions to the communications equipment are needed to handle more complex situations. Structural fire simulation is also possible; the system may also be used in training urban and suburban fire units.

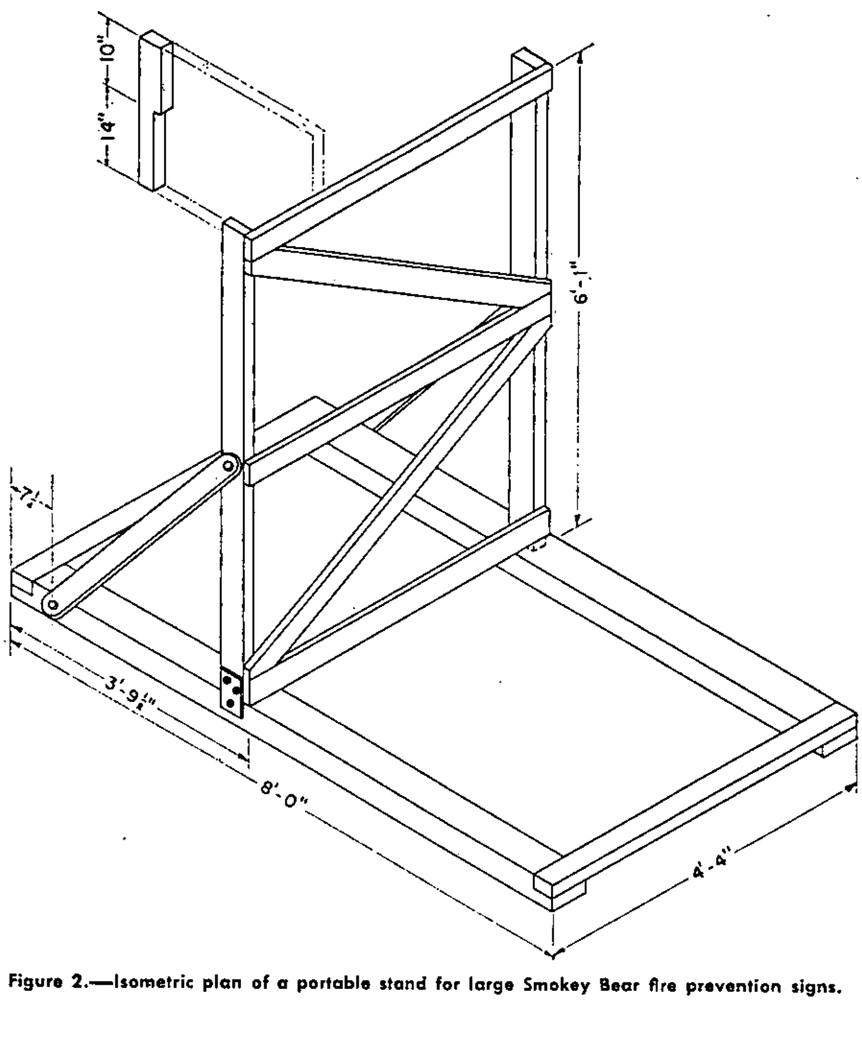


Figure 2.—Isometric plan of a portable stand for large Smokey Bear fire prevention signs.

U. S. DEPARTMENT OF AGRICULTURE
. WASHINGTON, D. C. 20250

OFFICIAL BUSINESS

U. S. DEPARTMENT OF AGRICULTURE
POSTAGE AND FEES PAID

Infrared Lightning Fire Patrol Study—

Continued from page 6

were scanned is difficult. We judge that all fires scanned probably had sufficient intensity for detection. The infrared system is almost certain to detect 0.25 square foot of unobscured fire source under these operational conditions.

Fire position (on the ground or in a tree).—An important element previously overlooked by us is fire position. We had assumed that a fire burning near the top of a snag would be easier to detect with infrared than a fire on the ground because obscuration from tree canopies would be less. This study tends to contradict this premise: of four fires (5, 9, 15, and 16) known too be confined to a snag at the time they were scanned, only one was detected with infrared. Examination showed that the three undetected fires were burning inside the snag when observed and the one detected was burning on the outside.

Nature of holdover fires.—Infrared detection probability seems correlated with the time a fire is likely to burn before discovery by conventional means. If the fires scanned are tabulated according to the time they hold over, the following breakdown results.

Time interval between origin and detection by: conventional methods	Fires scanned	Fires detected by infrared	Fires undetected by infrared
(Hours)	*(Number)*	*(Number)*	*(Number)*
8-24	4	3	1
24+	8	0	8

(Fires 5 through 8 are excluded from the tabulation because they were discovered before being scanned and therefore may have been atypical of holdover fires.)

Thus, as proposed by Alan R. Taylor, Associate Research Forester at the Northern Forest Fire Laboratory, the difficulty of detecting holdover fires by any means may be caused by the special nature of such fires; that is, fires that go undetected for extended periods may be those burning within a snag or live tree, and the lapsed time between origin and detection by either infrared or conventional methods may depend in part on when the fires break out onto the exterior or firebrands drop to the ground.

Vegetative cover (timber and brush canopies) and fire position are the most important limiting elements in infrared detection.

CONCLUSIONS AND FUTURE PLANS

Infrared scanners have been shown to detect fires under natural conditions, and sometimes do so sooner than conventional methods. Apparently fire position is more important than was originally thought, and its relation to detection should be studied further. Additional data are needed to evaluate the system in general, and tests on a larger scale were conducted during the 1967 fire season. Data from the 1967 season are now being analyzed, and a report will soon be published. The results appear to be encouraging, and operational testing may be initiated.

Smokey Bear—

Continued from page 11

Help is needed to get into the suit because there is a zipper up the back and a drawstring. Before a public appearance, answer the following:

1. Is the drawstring tucked in? 2. Is the zipper out of sight in the hair? 3. Is the belt firmly fastened to the pants? 4. Are the pants cuffs neat? 5. Are the pants long enough to cover Smokey's ankles when he is leaning over a small child? 6. Has the head been set straight on the shoulders?

Most pictures depict Smokey with a shovel. The shovel has become a part of the symbol and should be carried at all times.