FIRE CONTROL NOTES

A PERIODICAL DEVOTED TO THE TECHNIQUE OF FOREST FIRE CONTROL

VOL. 23 NO. 4

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Forest Service

UNITED STATES DEPARTMENT OF AGRICULTURE

FORESTRY cannot restore the American heritage of natural resources if the appalling wastage by fire continues. This publication will serve as a channel through which creative developments in management and techniques may be communicated to and from every worker in the field of forest fire control.

UNITED STATES DEPARTMENT OF AGRICULTURE 1862 1962

Growth Through Agricultural Progress

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Volume 23 Number 4

FIRE CONTROL NOTES

A Quarterly Periodical Devoted to the

TECHNIQUE OF FOREST FIRE CONTROL

The value of this publication will be determined by what Federal, State, and other public agencies, and private companies and individuals contribute out of their experience and research. The types of articles and notes that will be published will deal with fire research or fire control management: Theory, relationships, prevention, equipment, detection, communication, transportation, cooperation, planning, organization, training, fire fighting, methods of reporting, and statistical systems. Space limitations require that articles be kept as brief as the nature of the subject matter will permit.

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Forest Service, Washington, D. C.

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A KEY TO BLOWUP CONDITIONS IN THE SOUTHWEST?

ROBERT W. BATES
District Ranger, Tonto National Forest

Can minimum nighttime temperatures be used in some areas as an indicator of one type of blowup conditions? A preliminary study of several project fires occurring on the Tonto, Sitgreaves, and Prescott National Forests in the years 1951 to 1961 showed that the night before each of these fires blew out of control was unusually warm. Of particular significance is the fact that most of them occurred following the warmest nights of the critical June fire period and often occurred at a peak after several consecutive days of rapidly rising temperatures. For some fires which occurred in July and September this also appeared to be true. Only 4 of the 13 fires in the study failed to show this, but even for those 4 the temperatures were at or above what is believed to be the critical point. Temperatures on the nights preceding the start, or blowup, of these fires varied from high of 81° in the semidesert to 52° in the pine above the Mogollon Rim. These temperatures were all unusually high for the area where the fire occurred.

Why, in June, are some fires controlled at small size while others defy control no matter what the action taken? Why can you reach some lightning fires while they are still in the tree, yet others explode into major fires? Why does a quiet or apparently controlled fire suddenly act up? A look at relative humidity showed day-to-day fluctuations and seemed not to be an adequate answer to these questions. This study seems to indicate that a deadly one-two combination of an unusually warm night followed by a warm day may be the key.

If further study should prove this to be reliable, we could determine more accurately when to increase emergency fire forces and signal the start of intensive fire prevention. Following lightning, extra efforts to ensure early detection could be undertaken. By taking 8:00 a.m. readings of the previous night's minimum temperature and plotting them on a graph, it might be possible to spot the beginning of potential blowup conditions. There is usually a very sharp rise from relatively cool nights to hot nights over a period of only 2 or 3 days (figs. 1-4). Since this leaves very little time to get ready, the use of nighttime temperatures may be a better indicator than daytime temperatures because it allows more time to prepare.

Too, the charts on the 13 fires studied actually indicate a better tie-in using minimum rather than maximum temperatures.

Fire control organizations are not fully aware of this change in conditions as it is not indicated in present fire-danger meters by any definite rise in the index. During June, the Southwest is in extreme conditions already—so it might be said that conditions have suddenly gone from critical to supercritical.

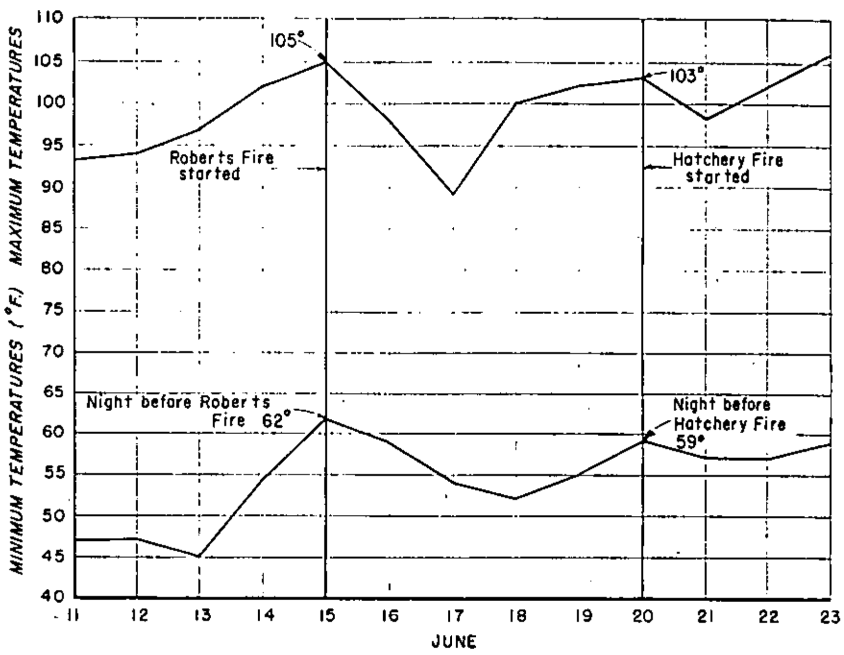

FIGURE 1.—Roberts and Hatchery Fires, June 1961.

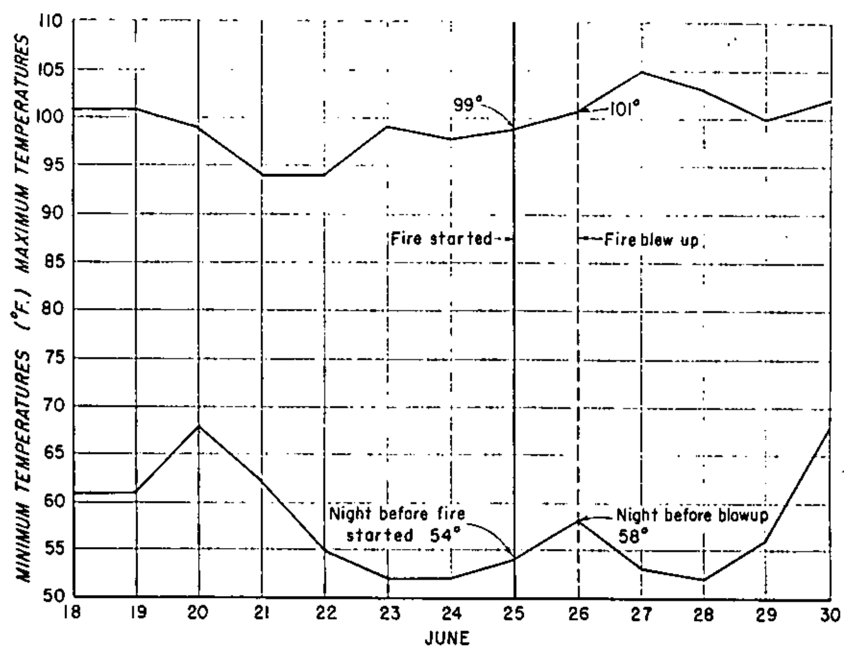

FIGURE 2.—Russell Gulch Fire, June 1951.

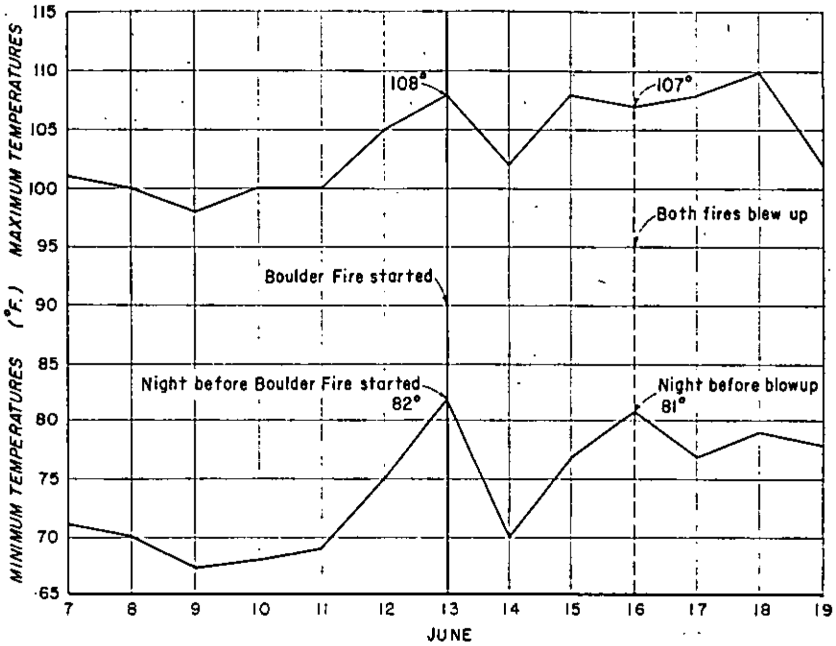

FIGURE 3.—Boulder and Pranty Fires (lightning), June 1959.

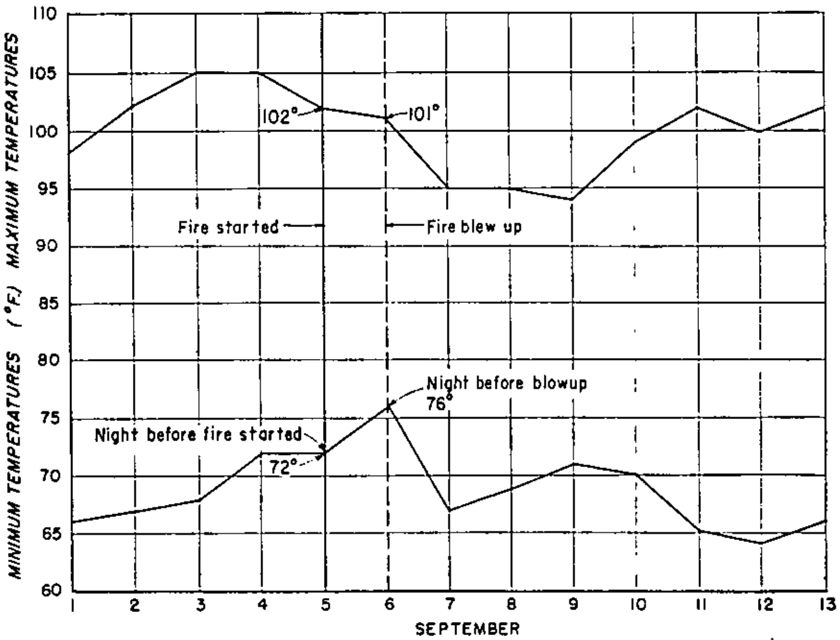

FIGURE 4.—Buckhorn Fire, September 1956.

An attempt to expand on this theory and determine an average date at which this temperature rise occurred proved futile. It can apparently happen almost any time in June in this area and may occur as early as May or as late as July in other southwestern localities. In 1956, the condition seems to have appeared in September on the Tonto National Forest on the Buckhorn Fire, coinciding with a dry fall period. However, June 10 is often mentioned as the breaking point on the Tonto. Each forest—possibly each district—would have to chart this separately and watch for the start of the temperature rise. From this temperature study, I have arbitrarily said that nighttime temperatures above 45° are critical; and with those above 55° blowup conditions exist. Cloudy nights keep nighttime temperatures high and may or may not be serious depending on whether the clouds disappear by morning. During June, there is probably only a small likelihood of nighttime clouds.

It is recognized that factors other than temperatures also contribute to fire size. Some areas have large fires during periods of high early spring winds; some fires are large because of organizational breakdowns, others because of topography; California has its Santa Ana winds; and so on. Undoubtedly, most of these fires would show temperature correlation only through coincidence. On the fires studied there was no attempt to make a complete analysis of all factors affecting the particular fire such as topography, wind, relative humidity, human error, time of day, fuels, and aspect. What was suggested by the study is that this one common denominator may provide a predictable basis for increased manning and a crash prevention effort during the critical periods.

Some assumptions and recommendations that can be made from this limited study follow.

1. High nighttime temperatures do not of themselves cause fires to blow up, but under these conditions, all other factors which tend to cause large fires are maximized.

2. If nighttime temperatures are rising, going fires must be secured before temperatures rise above the critical point. This is seen in the case of fires which blow up on the third or fourth day after start.

3. Fires occurring before and after temperature peaks are controlled at small size; some of them under much worse rate-of-spread conditions.

4. Spotting was a big factor in most of these fires although winds were not exceptionally strong. This fact was mentioned consistently in discussing these fires with people who had participated in the suppression. Some of these fires became big even though firefighters were on them at the very start when they were only a few feet across.

5. In June, before the summer lightning period, temperatures can be used as the basis for increased prevention effort at all levels.

6. When lightning occurs, detection forces could be augmented, especially in the case of long aerial patrol routes where some areas are not covered until 3 or 4 hours after daylight.

7. It might be possible to develop new rules for prescribed burning. Limit burning to times when nighttime temperatures are less than 45° and to a time when the temperature trend is down.

8. In the June dry period, rapidly rising nighttime temperatures often seem to presage the first lightning storm of the season. These high nighttime temperatures usually occur from 24 to 48 hours before the lightning storms occur. These first storms are often dry.

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Bag-In-A-Box Milk Containers for Fire Use

During the past year, milk companies have been delivering milk to restaurants, ice-cream drive-ins, and other users in a 6-gallon double plastic bag inside a cardboard box. These containers are usually thrown away after they are emptied and removed from the dispenser.

These containers can provide a useful supplementary water supply that is easily handled, transported, and stored. They can be kept filled with 5 gallons of water even during freezing weather since they cannot be damaged by ice expansion. The containers might be placed in storage sheds, attics, and other locations where the water would be available for use on small fires.

The containers can be carried in cars or trucks to provide an instant refill for backpack cans. They can be strategically dropped where a firefighter can go to refill his can.

A small folding harness was designed by Randall to enable the firefighter to carry a container for use in mopup work. The small rubber hose which protrudes from the bag can be clamped to provide a shutoff so that water can be dribbled onto burning embers or small logs in the same manner as water from a backpack can.

The best part of all is that the containers are free for the asking from most milk users, and if they wear out or are otherwise damaged, there is no replacement cost.—CLAUDE H. RANDALL, *Chief, Havana Rural Fire Department, and* GORDON O. CECH, *District Forester, Illinois Division of Forestry, Havana, Illinois.*

LET'S HANG ON TO COLOR SLIDES—THEY'RE VALUABLE

ALVA G. NEUNS
Information Specialist, Forest Service, USDA

Color slides have come to be recognized as very valuable assists to all types of presentation for the purpose of increasing understanding—I&E, training, in-Service staff meetings, cooperative technical sessions and extension work, to name a few.

Slides offer many advantages for these purposes. They are lightweight, occupy small space, and can be mailed ahead with written manuscripts. Projectors for them are lightweight and usually available.

But some of these advantages lead to disadvantages. Slides are expensive in spite of the fact that it is easy to photograph 20 to 36 on a camera loading. Copies are equal in cost to the original or master slide. This leads to a tendency to use the master slides for projection, as one would for home shows, and damage often results.

Unlike a B&W photographic negative, an original slide can serve for either positive projection or as the means to obtain color print enlargements. Because such enlargements are very expensive and do not serve a publishing purpose, master slides are not classed as negative material and usually no permanent, central system or file is set up for them except in small specialized units where they are kept as photographic records.

So, color slides land in desk drawers. They stack up in assorted boxes on shelves. The best, often once-in-a-lifetime chances, and most usable slides from a number of boxes are removed and combined for specific showings and these, in turn, are put in more boxes.

Soon, the ease with which slides can be utilized in infinite combinations with other slides in series becomes a disadvantage because single slides are often "lost" among dozens of others. To go through hundreds of slide combinations to find or relocate one is time consuming. And slides are often "lost" in other agency collections while on loan. They are hard to keep track of unless they are strongly identified.

To collect, edit, catagorize, put in series, title, number, label, and caption color slides for permanent use by many people is hard work. It takes selective judgment to cull slides and to keep the right ones and arrange them in usable subject-matter combinations. No matter what file or distribution system you eventually use, this job must be done. Once done then it is important to keep the slides in order.

Next it is important for people to determine quickly whether there are any slides on a subject and what they show. If slides can also be checked in and out easily and fast and a simple record maintained of when they went out on loan and to whom, one person, located nearby, can oversee the system. Or, if no one is present, sometimes the borrower should be able to review slide content and check them out or in himself.

To meet all of these specifications, a visual file and distribution rack for color slides was designed (fig. 1). It took advantage of the fact that some of the local slide processors are returning mounted slides in transparent plastic boxes. These 2- by 2- by 1¼-inch, lightweight boxes are available in most areas at wholesale prices and quantities. They have hinged snaplock covers, are excellent protection for the slides from dust and damage, and are

FIGURE 1.—This slide distribution rack is being used as a review and check-out unit for a research staff.

easy to handle and store. The slides can be countea and identified without opening the box—an added damage-prevention factor.

The rack was built by the Pacific Southwest Station's Fire Research Division. It is mounted on the wall facing the secretary's desk. The Division's entire collection of color slide copies (masters are filed separately) are immediately available for review and/or use by both the research staff and their cooperators for talks, briefing sessions, project review, and other presentations. Each transparent plastic box has the Station's name and return address on the cover. A card, 2 inches square, is first filled out with the Subject or Title, Series No., Copy No., Location, Date, and Author. The card is then dropped face down into the bottom of the box and the slides placed on top of it. Another card, 2 by 3¼ inches, showing identical information as the square one is also filled out when the slides are edited and identified. This card has one column for "Loaned to" and one for the date loaned; it is placed in the rack behind the box of slides. As can be seen in figure 1, the whole collection, when installed in the rack as shown, can be readily and easily reviewed.

It takes but a few moments for the secretary to fill out the check-out card and replace it in the rack. If the borrower wishes to take only 1 or 2 slides from a category, the slide numbers are entered on the check-out card and the box is replaced with the cover side out. This way a glance at the rack will show what slides are out on loan and who has them.

Master slides should always be filed elsewhere and regarded as negative material for copying; they should not be loaned for projection. They should also, of course, be categorized and identified exactly as the distribution copies are.

The rack shown here can be any size that wall space permits. This one is mounted on one standard 4- by 6-foot sheet of mahogany plywood and matches the mahogany wall paneling on an adjacent wall.

THE PROTECTION OF VEHICLES IN BUSHFIRES

I. S. WALKER [1]

Research Officer, Bushfire Section, Division of Physical Chemistry, C.S.I.R.O. Chemical Research Laboratories, Melbourne, Australia.

Motor vehicles engaged in bushfire fighting should be protected against radiant heat, since at times they need to be used close to intense flames, and in an emergency they may be used as refuges for firefighters.

Three major problems arise from radiation:

1. The tires may decompose somewhat, causing rapid loss of strength with the likelihood of deflation, and at times tires may actually ignite.
2. The body panels of the vehicle may be heated to the temperature where paint finishes decompose to give off unpleasant or toxic vapors both inside and outside the vehicle, and at times physical deformation of the metal work will cause doors and windows to jam.
3. The motor may overheat; this results in loss of power. Vapor locking in the fuel system may occur and lead to stalling of the motor and to starting difficulties.

THE HEAT REFLECTING PROPERTIES OF ALUMINUM PAINT

The only surfaces that reflect to any great extent infra-red radiation, as emitted by normal flames, are those of some polished metals. Thus aluminum which has such a power could well be used in the construction of vehicles. Even after continued use unpainted aluminum could still be expected to reflect 60 to 70 percent of the radiation falling on it.

Paints containing aluminum powder have been measured by radiometer for their reflectance of normally expected infra-red radiation. The absorbing element of the radiometer was either blackened or painted with the paint under test. The reflectance figures and general properties of three paints tested are shown in table 1. Clearly, such paints could give protection to those parts of the vehicle that are likely to be affected by heat, e.g., external steel work and the sides of the tires.

Tire sections, untreated and painted with two suitable paints, were subjected to two different intensities of radiation (table 2). After 40 minutes exposure the untreated tire showed much greater deterioration (fig. 1). This lengthy exposure would only be experienced in unusual situations (e.g., in mopping-up procedures where vehicles may be parked adjacent to burning heaps of heavy fuel).

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[1]The author is grateful to Mr. B. Oglethorpe, Technical Manager, Automotive Division, Dunlop Rubber Australia Ltd., for his technical advice, and to Dr. A. R. King, Division of Physical Chemistry, C.S.I.R.O., and Mr. A. G. MacArthur, Forestry and Timber Bureau, Canberra, for helpful criticism.

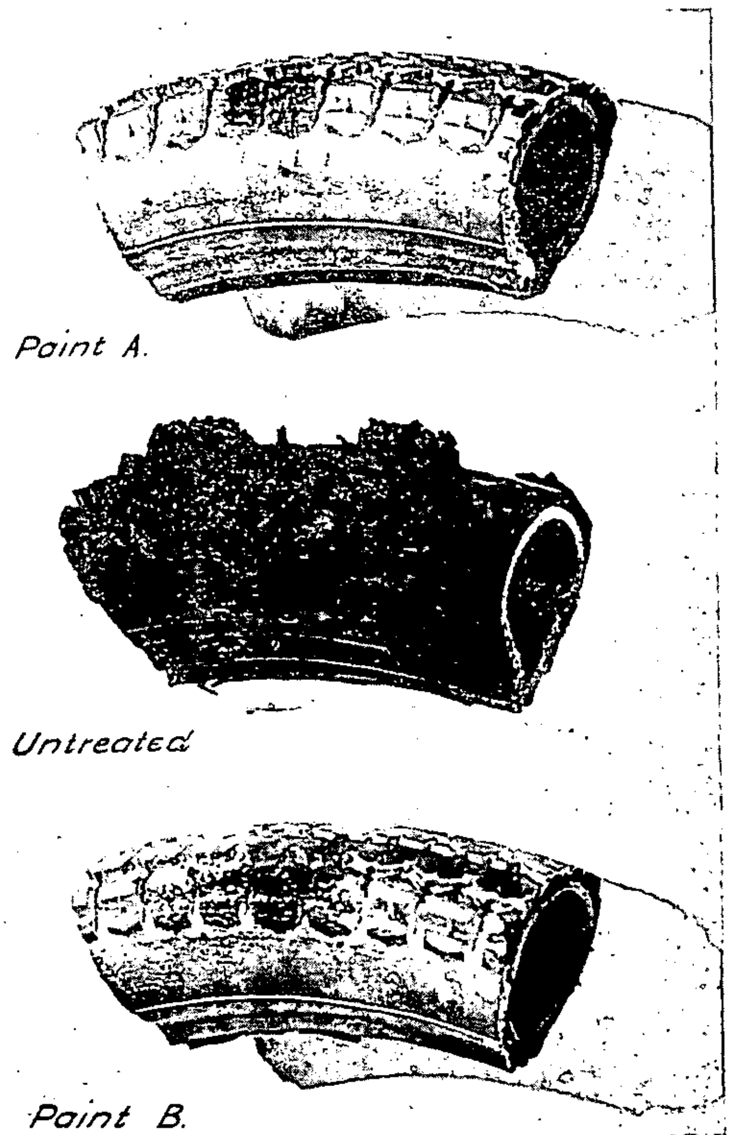


FIGURE 1.—Effect of 40 minutes irradiation on tire sections untreated and protected by aluminum paint.

In many cases it is quite possible that the inner tube would fail well before the tire had seriously decomposed since the tube will be more sensitive to heat, which is conducted to it not only through the tire wall but also by the hot wheel rim. Also over a period of time the lives of both tires and tubes are likely to be shortened greatly by frequent exposures to even comparatively low radiation intensities.

Actual experience indicates that tires, particularly if new, should be well cleaned with a solvent before they are painted, and the first coat should preferably be applied by brushing. In fact,

TABLE 1.—*Properties of aluminum heat-reflecting paints applied to tires*

Paint	Heat reflection average [1]	Heat reflection maximum [2]	Mechanical adherence to rubber	Method of application and covering power	Drying time, approximate
	Percent	*Percent*			*Minutes*
A	66	69	Excellent	Brush: use from the tin (800 sq. ft. per gal.). Spray:[3] dilute with 10-15 percent mineral turpentines (600-700 sq. ft. per gal.).	45
B	60	66	Good, but surface has a tendency to crack	Brush or spray,[3] use from the tin (covering power same as paint A).	20
C	49	52	(4)	(4)	(4)

[1] Obtained from measurements carried out at radiant heat fluxes of 0.07, 0.11, 0.17, and 0.35 cal./cm.^{2}/sec.; maesurements at each intensity.
[2] Obtained at 0.17 cal./cm.^{2}/sec. and below.
[3] Spraying however is not recommended.
[4] Surface remained tacky, even after several days, though finish appeared good. Pigment became mobile in base on heating. Rejected as unsatisfactory.

subsequent coats when brushed on give finishes that are somewhat superior (for the present purpose) to those obtained by spraying. In an emergency when the vehicle becomes a refuge, the outer surface of the windows could well be rendered reflecting by paint applied either by brush or, less desirably, by spray (paint contained in a "pressure pack"). Possibly though, a more appropriate method would be to cover windows with pieces of thin (0.005- to 0.020-inch) aluminum foil which could be pre-cut to size. In most emergency situations there would be sufficient time for the use of such protective devices on the windows. Two objections have been raised to the painting of vehicles with aluminum paint. These are that the vehicle becomes less easily seen in dense smoke and that the glare from the bonnet and body tends to dazzle the vehicle driver and other persons in the vicinity. However, actual experience with one vehicle (the Mobile Laboratory, C.S.I.R.O. Bushfire Section) has shown that these problems are not serious.

Minimum of Fuel Vapor Locking

An electrically operated gasoline pump installed adjacent to the gasoline tank (preferably below it so that the pump is gravity fed) will almost entirely eliminate the possibility of vapor locking. The gasoline will thus be pushed to the carburetor and not drawn to it by suction. Only when the gasoline in the tank is itself actually boiling will the problem become serious and this fortunately is a rare occurrence. A pump of this kind need not replace the pump already installed in a vehicle, but can be used as an auxiliary pump to be switched into use from the dash when the occasion arises.

TABLE 2.—*Heat irradiation tests on 6-inch sections 2¾- by 19-in tires*

Radiation intensity and tire treatment	Time till—		
	Smoking	Cracking	Glowing
	Minutes	*Minutes*	*Minutes*
0.35 cal./cm.^{2}/sec.:[1]			
Untreated	⅓	3	3½
Paint A	1¾	5–6	8¼
Paint B	1¾	8–9	11½
0.17 cal./cm.^{2}/sec.:[2]			
Untreated[3]	¾–1	5½	[4] 10½; 15¾
Paint A	4½	21	[4] 40
Paint B	3¼	18¼	[4] 40

[1] Radiant intensity equivalent to the average usually encountered 5 feet above ground at 5 feet from 10- to 20-foot flames.

[2] Radiant intensity equivalent to the average usually encountered at ground level 5 feet from 10- to 20-foot flames.

[3] These are the results of two tests; the time to glowing is governed in part by the specific way in which the surface cracks.

[4] Pilot ignition immediate for the untreated tire and at 40 minutes took 4 and 5 seconds respectively for paints A and B. Pilot ignition is that brought about by direct contact of the flammable material with a separate flame, as opposed to spontaneous ignition, which takes place when flaming is initiated by the interaction of the hot vapors from the decomposing tire with the oxygen in the air.

CONCLUSIONS

The measures suggested here should not be expensive to carry out. They should greatly increase the safety of a vehicle and its attendant firefighters and at the same time the vehicle's operational efficiency should also be improved.

BACKPACK MIST BLOWER FOR FIRE SUPPRESSION

OWEN L. LASHLEY
District Ranger, Remer District, Chippewa National Forest

A backpack mist blower was used on the Remer Ranger District, Chippewa National Forest, during the spring fire season of 1962 (fig. 1). The unit was used in brush and slash areas and on running fires in hardwood leaves. Results, on the whole, were good when the machine was used alone or in conjunction with other tools. It was found that when the machine was used in dry, heavy, densely packed grass fuels, it was a great help in knocking the flames down and cooling the surface so that water from the backpack pumps could be pumped directly on the hot fuel underneath the matted surface. Use of a wetting agent increased the effectiveness of the mist a great deal.

The machine held enough water to spray continuously for a period of 8 to 10 minutes. This can be extended by running the motor at the slowest possible speed which, incidentally, is the best speed under most conditions. A man carrying a 5-gallon backpack can was assigned to carry water for replenishing the supply in the machine.

The size of the crew varied from four to six men depending on conditions. Crew organization was as follows: One man to operate the mist blower; one man to carry water for the mist blower; one man with backpack pump; two or three men with firefighting flaps, rakes, or shovels. Organization of the crew and location of the tools in the line were determined by the nature of the fire.

FIGURE 1.—A backpack mist blower being carried by a forest worker.

NEW 105-GALLON HELITANK

ROBERT C. SINGLETON
Public Information, Los Angeles County

A radically new type tank for dropping fire retardant chemicals or water from a helicopter was recently demonstrated by the Los Angeles County Fire Department at its Fire Combat Training Center. Fire officials from throughout the area who witnessed the demonstration were very enthusiastic and many stated that this new tank would drastically change helicopter air attack operations.

"The tank," Los Angeles County Fire Chief Keith E. Klinger says, "doubles and in many cases triples a helicopter's chemical carrying capacity as compared to rubber and plastic bags which were formerly used." The new all-metal tank holds 105 gallons, three times the capacity of the old 35-gallon bag (figs. 1 and 2). The new tank also is safer and more accurate, according to Chief Klinger and Roland Barton, the Department's helicopter pilot. Barton stated that the tank does not affect the helicopter's stability.

One of the 50-pound metal tanks can be installed or removed by two men in 2 minutes. The rectangular tank, which is fitted with interior baffles, is clamped to the fore and aft cross tubes of the helicopter at the four saddle points. Doors of the tank can be

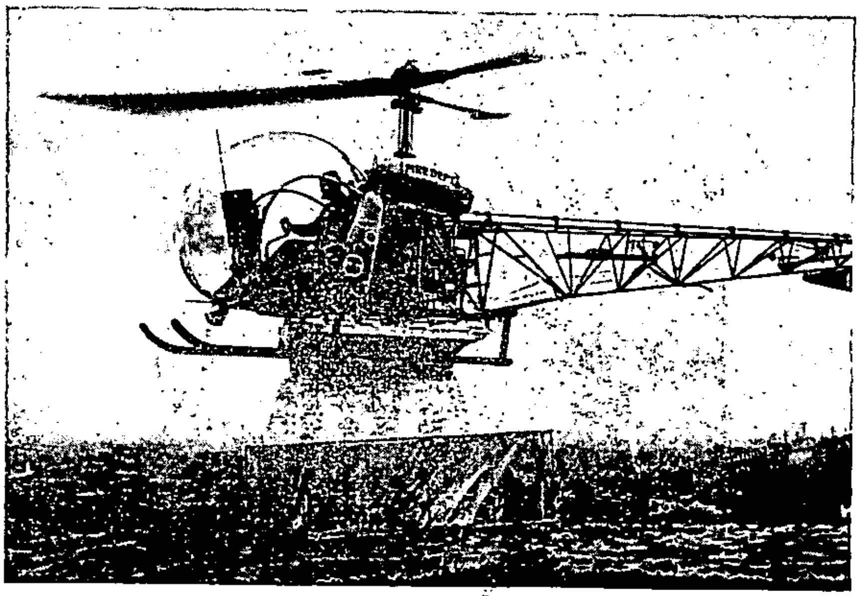


FIGURE 1.—Helicopter loading 1000-gallon portable water reservoir by using 105-gallon drop tank.

operated electrically or manually. Manual control is mounted next to the pilot's left hand by the collective pitch control. Electrically, the doors are opened by the pilot pressing the cyclic stick button. To close the doors the cyclic stick trigger is used.

The tank was developed by the Research Section of the Los Angeles County Fire Department, under Captain Frank Hamp and Pilot Roland Barton. "Additional information may be obtained," Chief Klinger said, "by writing the Los Angeles County Fire Department, P.O. Box 3009, Terminal Annex, Los Angeles 54, California. The cost at the present time is approximately $1,200, but this is a variable factor."

FIGURE 2.—Helicopter dropping 105 gallons of water at Los Angeles County Fire Department Training Center.

AN IMPROVED FIRE PLOTTING BOARD

ROBERT L. BJORNSEN
Fire Staff, Gifford Pinchot National Forest

A plotting board is an essential tool in locating fires from azimuths reported by lookouts. Over the years a number of plotting boards have been developed for use by forest fire protection agencies. On such a board the retracting string with azimuth circle makes plotting forest fire locations accurate and fast. The Gifford Pinchot National Forest uses an adaptation of the retractable string-magnet-azimuth circle board (figs. 1 and 2). In addition to plotting fires on the board, the dispatcher can write temporary notes on the plastic cover protecting the map and azimuth circles with a grease pencil. The fact that descriptive notes can be made on the map can be very useful, especially when a lightning "bust" results in a large number of fires being reported in a short period of time.

Following is the procedure for assembling the plotting and dispatching board:

1. Construct backing frame using flathead wood screws and glue all joints. Bottom of the frame should be several inches wider than the top.

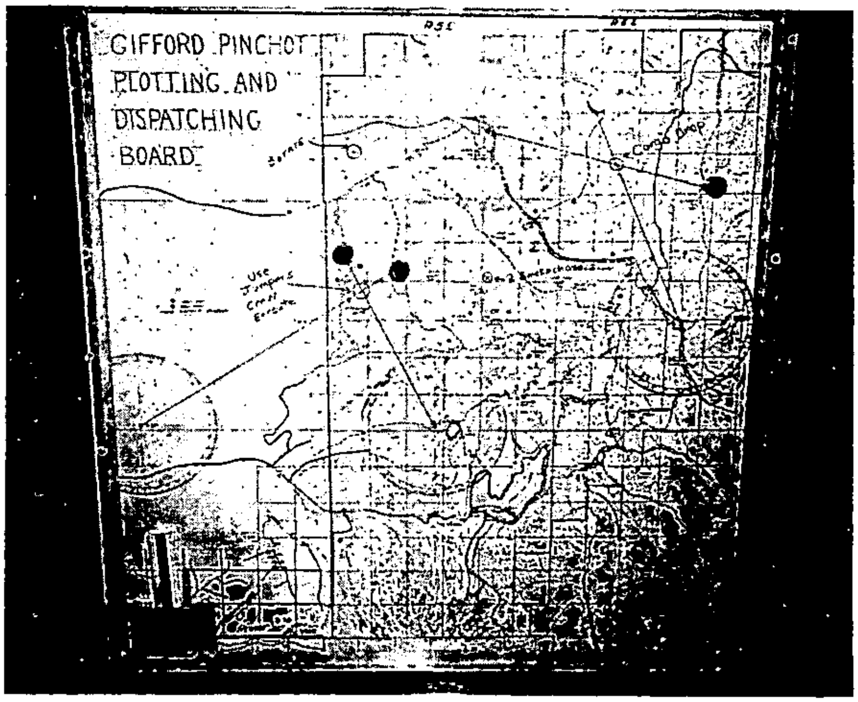


FIGURE 1.—Retractable strings extended from lookouts, illustrating cross-shot method of locating fires. Note temporary dispatch notes in grease pencil.

FIGURE 2.—Side view showing beveled bottom of frame and back view showing retractable string steel mounting. Back should be left open for servicing.

2. Affix plywood to backing frame. Use flathead wood screws and glue all joints.
3. Attach sheet iron to plywood using contact cement. Apply adhesive to both surfaces. Note: Use temporary spacers between plywood and iron until centered, then remove spacers from center toward edges. Once two surfaces touch, further adjustment is extremely difficult.
4. Wallpaper map to sheet iron using regular wallpaper paste and brush. Small wrinkles will flatten out when dry.
5. When dry, affix azimuth circles to map. Drill holes through lookout location to receive retractable map reel.
6. Attach plastic sheet to map using wood molding or aluminum counter edge molding.
7. Attach retractable map reels. Wooden spacers will be needed on the back to take up the slack. Leave back of plotting board open for servicing map reels.
8. Attach eyebolts to top of frame for hanging on wall hooks.

The magnets used are permanent type and guaranteed as such by the manufacturer. Orders should specify that 1/32-inch eye be slaughtered (not soldered) flush to bottom of magnet.

Materials List [1]

Item	*Cost*
Magnet, T811 with 1/32-inch dia. eye slaughtered flush to bottom; in quantities of 5 or more	$5.00
Reel, retracting string	4.15
Azimuth circle, 8-inch, red, size B	1.30
Subtotal, each lookout on board	10.45
Cement, contact, 1 pint	1.25
Plastic, clear 10 mil., $0.41/sq. ft., average size 25 sq. ft.	10.25
Sheet iron, galv. 24 ga., $0.28/sq. ft., average size 25 sq. ft.	7.00
Plywood, ⅜-inch, interior AA, 4 by 8 feet	4.75
Molding, aluminum angle, $0.20/linear ft., average size 20 linear feet	4.00
Misc., hardware and 1 pc. 1-inch select S4S pine	4.00
Map, planimetric blue line, 2 inches = 1 mile (including preparation of negative)	20.00
Subtotal	51.25

Average cost of materials per lookout $= \frac{51.25 + (10.45 \times 4)}{4}$ 23.26

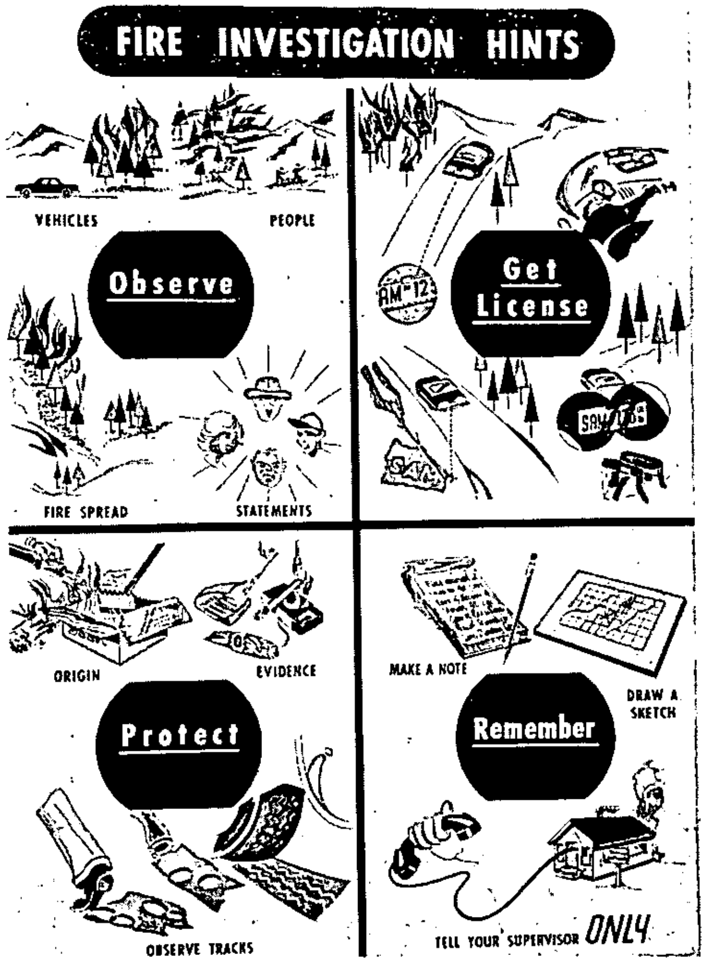
[1] Based on 5-ft. by 5-ft. plotting board with four lookouts. Labor costs to construct not included.

FIRE INVESTIGATION TRAINING AID

RAYMOND HIGGINS, *Fire Prevention Officer,* and
GEORGE BERDAN, *Assistant Law Enforcement Coordinator,*
California Division of Forestry

This poster has been developed as a training aid as well as for posting in fire control stations where the "Fire Investigation Hints." would be a constant reminder to officers and crews. Size is 2 by 3 feet; colors, black and white with shading. Art work was done by inmates of the California Medical Facility and printed by the State Printer. Total costs are approximately 10 cents per poster. It is planned to interject new ideas into a similar design each year and possibly to produce the poster in multicolor by silk screen process at one of the State prison facilities.

Calif. Dept. of Conservation-Div. of Forestry



THE TRACTOR-CABLE METHOD OF PREPARING AREAS FOR BURNING

BYRON BALDWIN and JOHN E. WILSON
Lolo National Forest

The tractor-cable method of preparing logged-over areas for burning was adapted for use on the Lolo National Forest during 1960 and has proved to be more economical and efficient than any other method used in this Region. The condition of some stands of timber, which are diseased or stagnated or contain undesirable species, makes it necessary to harvest by clearcutting. After all the merchantable timber has been removed, tractors and cables are used to uproot the residual stand in preparation for burning and subsequent reforestation. While this method is not new, we believe the way in which it is applied is different.

The cable method was initiated on the Missoula District because of the need for clearing a residual stand on slopes that were nonoperable by mechanical methods (fig. 1). Two of these methods, tractor bunching and tractor pushover (trampling), are limited to slopes of 35 percent or less. The cable method has

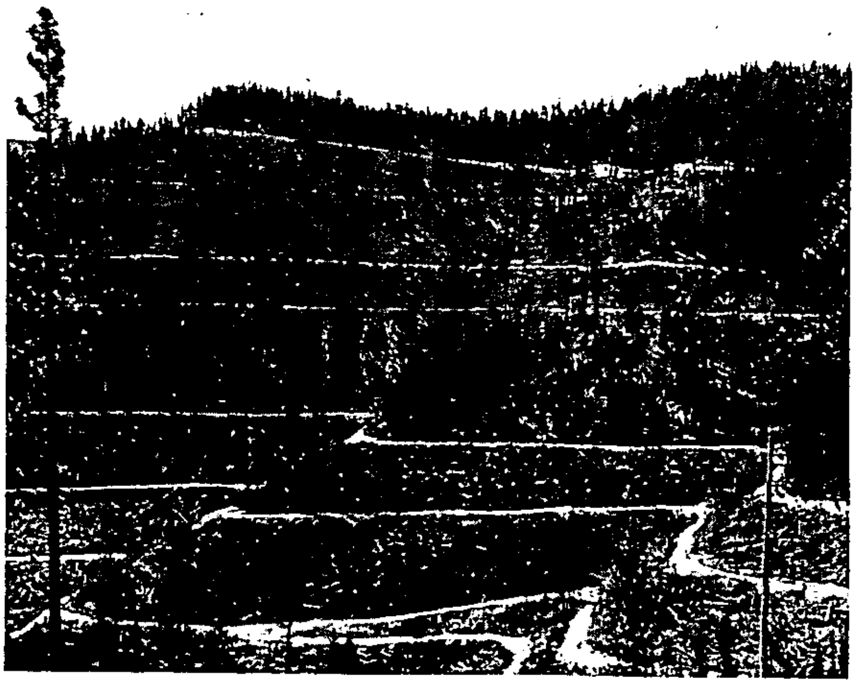


FIGURE 1.—Two lower terraces cleared with tractor-cable.

been used successfully on slopes ranging from level to 70 percent. Although maximum slope limitation has not been determined, it is safe to assume that this method will function on any slope where there is a usable road.

Substantial savings have resulted from the use of the cable method over a 2-year period. Costs per acre prepared should continue to decrease as the original investment is amortized and refinements are made as a result of additional experience. This type of work has been done on three ranger districts and five different areas, involving a total of 815 acres. Costs ranged from $3.84 to $25.77 per acre, and average cost on all projects was $16.96. During the same period, average costs per acre for other methods of preparation were as follows:

Method	*Average cost per acre* *Forest*	*Region*
Tractor trampling (walkdown)	$20.82	$22.41
Tractor bunching and piling	34.00	32.51
Hand felling	32.66	—

The cost on the 815 acres done by cable was approximately $3,260 less than it would have been had the next most economical method been used. Actually, the saving was greater since an even more expensive method would have had to be applied to the nonoperable slopes.

A private owner, as a result of observing this operation, used the method on some of his lands during 1961, and the State of Montana Forestry Department has obtained equipment for use in 1962. Several industrial concerns are interested in the potential of the cable method and the possibility of large-scale manufacture of the equipment.

Application of Method

General

The cable method is best adapted for use on fairly large areas that must be cleared of all the residual stand. Two tractors are required and should be of a size comparable to the D-6 or larger. Three-quarter-inch cable is made up into 100-foot sections, and the end of each section is fitted with a pressed-on ferrule which in turn is inserted into one end of a specially made connector (fig. 2). The cable sections and connectors provide for the following:

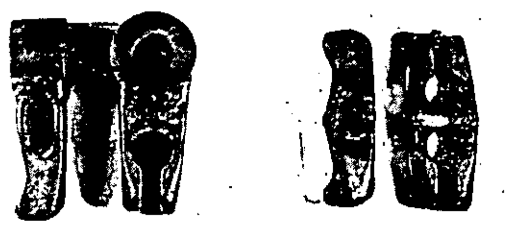


FIGURE 2.—Tractor connector, *left*; cable connector, *right*.

1. Ease of handling by crew members.
2. Increasing or decreasing the cable length as needed.
3. Disconnection for bypassing seed trees, seed-tree groups, or obstructions such as rock outcrops and large snags.
4. Swivel action necessary to prevent kinking of the cable.

On slopes greater than 35 percent, the tractors need some form of road from which to operate. The type of road system left on an area by the jammer method of logging lends itself readily to cabling. Also the tractors can operate from firebreaks that were constructed earlier for a prescribed burn.

Soil moisture conditions are important to the success of cabling. When adequate soil moisture is present, the trees can be easily uprooted and only a few small ones will be left. Some handwork may be necessary if the fuel created through logging and cabling is insufficient to scorch out the scattered small trees that remain standing. The damage to roads and the amount of debris on them are considerably less than that created by other methods of tractor preparation.

Equipment and Personnel Required:

2 tractors of a size comparable to a D-6 or larger, in good working condition and equipped with canopies.
Approximately 600 feet of ¾-inch steel-core cable in 100-foot sections with ferrules pressed into each end.
12 straps for binding coiled sections of cable or cable reel.
2 tractor connectors and 5 cable connectors (fig. 2). (It is desirable to have one extra connector of each type for a spare.)
Signaling equipment: athletic-type whistles and signal paddles. (The signal paddles resemble large table tennis paddles and are faced with highly visible material.) Lightweight, two-way radios would supplement or take the place of the whistles and paddles.
Foreman (generally functions as a signalman).
2 to 3 crewmen (depending upon conditions).
2 experienced tractor operators.

Operating Procedure

Lay out the required number of cable sections and connectors. It is desirable to connect sufficient cable to permit a large loop to the rear of the tractors. This allows a relatively straight pull and eliminates the necessity of adding cable when the distance between tractors increases slightly.

Maneuver the tractors into starting positions. Generally the lower tractor operates slightly ahead of the upper one. This allows the cable the best chance of sliding up the side of a stump when encountered. It also reduces the hazard of rolling rocks dislodged by the upper tractor. Under some conditions, it may be necessary for the upper tractor to operate even with or ahead of the lower one.

Position the signalmen and cablemen to rear of the tractors. Signalmen must be visible to operators at all times and intervisible when possible.

The cableman's job is mainly to lift the cable over obstructions or disconnect it to bypass them. Most hangups occur on the backslope of the lower road and shoulder of upper one. Between these points the cable rides high enough on the uprooted trees and debris to clear stumps or other low obstructions. The cable should not be approached or handled until the tension on it has been relieved.

In summary, the potential of the tractor-cable method may be far reaching because of the efficiency and economy of the method. However, this method, like any other, has its limitations, and anyone contemplating its use should become familiar with them. For example, its use may influence the layout of sale areas or the retention of seed trees. The tractor-cable method will undoubtedly be improved as we gain more experience with it.

DIDYMIUM GLASSES FOR SMOKE DETECTION

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Although there have been tales of lookout men with weak eyesight, good vision is a prime requirement for the position. However, an observer cannot report a smoke he cannot see and even with the best of vision it is difficult to recognize a light smoke against a light sky background, especially if atmospheric haze is present.

Glasses with didymium lenses, the type used by glass blowers, were reported to improve the outline of smoke and clouds on a misty day. These have pale blue lenses that absorb portions of the yellow and red sections of the spectrum. A pair of these glasses was tested by Department of Forestry staff at the Petawawa Forest Experiment Station, Chalk River, Ontario, during the 1960 and 1961 fire seasons.

Individuals in any group of people may have different reactions to the use of colored lenses; one may note an improvement while another will feel there is no betterment with the same type of lens under identical conditions. Thus the rating of the glasses is necessarily based on a somewhat subjective judgment.

Throughout this test, ratings were made on a comparative basis by observers viewing from a fixed observation point with and without glasses. Observers tried the glasses during the 2-year period and observations were made during a variety of weather conditions. Each observer recorded on a printed form the most distant landmark he could distinguish without glasses, the meteorological conditions, and the date and time of observation. Then ratings "yes" or "no" were made for the improvement in visibility of light and dark smokes, cloud outlines, and distance. Fortunately there were several fairly consistent sources of smoke in the area enabling the observer to make a rating on smoke for most sets of observations. On some occasions additional observations were recorded in which a pair of ordinary sunglasses with green-colored lenses were also tested.

Reports show an improvement in smoke recognition on slightly more than half the times the glasses with didymium lenses were used. When atmospheric conditions were clear, or only slightly hazy, light-colored smoke seemed easier to recognize with the glasses. When pronounced haze or mist was present, an improvement in both light and dark smoke identification was noted. However, on those occasions when ordinary sunglasses were tried, the observers felt they were equally effective. Thus, though it seems desirable for observers to have some form of light-filtering glasses, the selection of a particular type could be a matter of personal choice.

One interesting improvement in visibility was noted during an observation when heavy ground fog was present near the observation point; when the observer looked without glasses in a direction toward the sun, no detail could be seen in the shadow areas. Using the ordinary sunglasses, he could make out the outline of a roadside sign about one-eighth mile away in the shadow of a hill and could distinguish a tractor working beyond the sign. When the didymium glasses were used, it was possible to see and read the road direction sign and to recognize detail on the tractor. This improvement in visibility, if substantiated by aerial tests, might be of interest to pilots attempting water dropping in smoke-covered areas.

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INFORMATION FOR CONTRIBUTORS

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The title of the article should be typed in capitals at the top of the first page, and immediately underneath it should appear the author's name, position, and unit.

Any introductory or explanatory information should not be included in the body of the article, but should be stated in the letter of transmittal.

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Smokey says:
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it's DEAD OUT