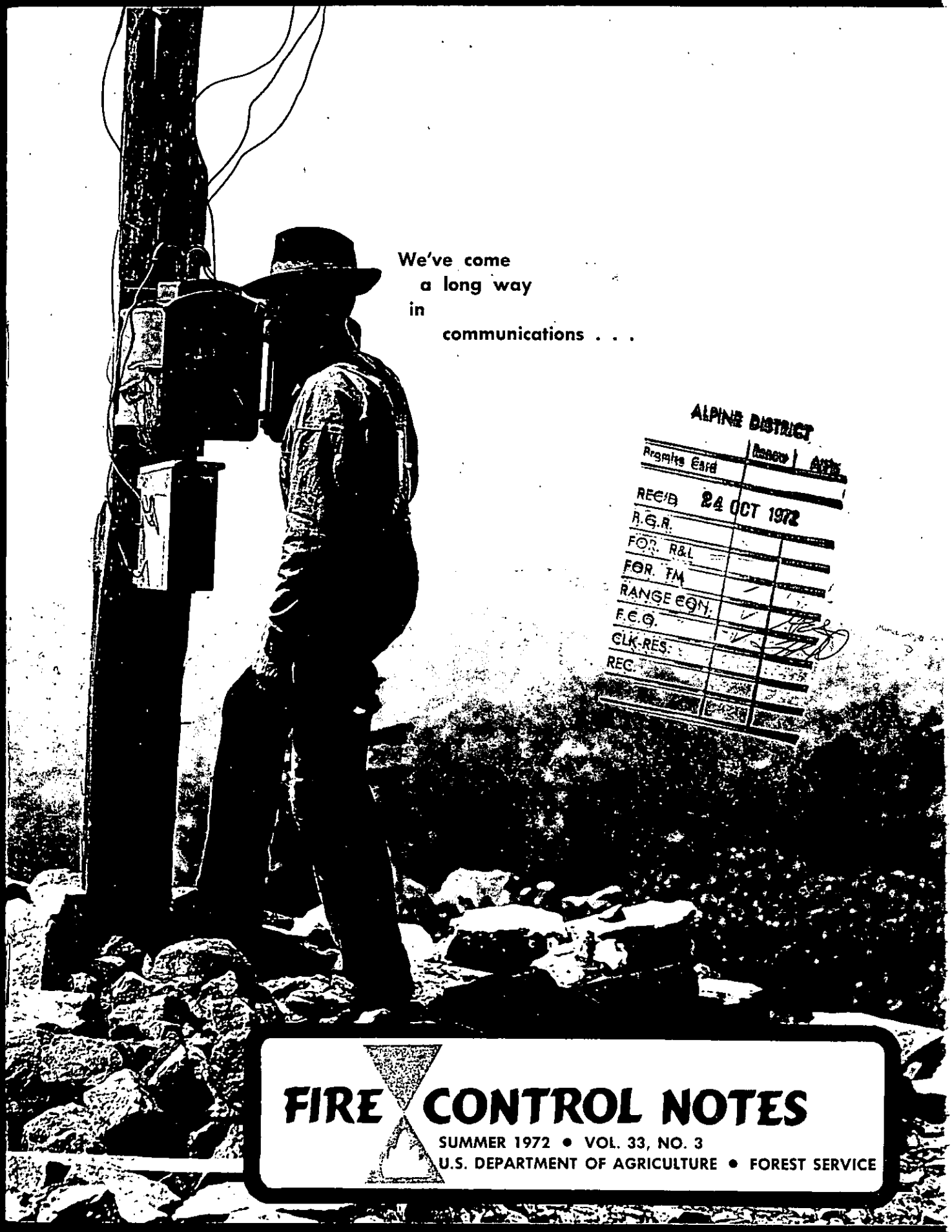

FIRE CONTROL NOTES

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FIRE CONTROL NOTES

An international quarterly periodical devoted to forest fire control

CONTENTS

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 is approved by the Director of the Bureau of the Budget (Aug. 19, 1968).

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The National Fire-Radio Cache Is a Module System at Work

Norman C. Anderson and
Dale Peacock

The National Fire-Radio Cache is an organized network of communications equipment and frequencies for use on large fires. Assigned frequencies reduce communication interference. The Cache system has been tested and used. It will be completed as funds become available.

Poor Communications Are A Hazard

How many times have you heard of a large fire situation where inadequate communications contributed to loss of life, property, resources, or the fire itself?

A giant step toward overcoming inadequate communications is to provide a complete communication system. This system must be transportable and self-contained, meeting all activity requirements. It must be easily and quickly placed in operation.

The National Fire-Radio Cache began with establishing frequencies (fig. 1). This plan provides for: six air frequencies, five fire command and tactical frequencies, two crew frequencies, and three pairs of repeater frequencies.

Norman C. Anderson is Forest Service Administrator, Boise Interagency Fire Center.

Dale Peacock is National Fire Radio Cache technician, BIFC

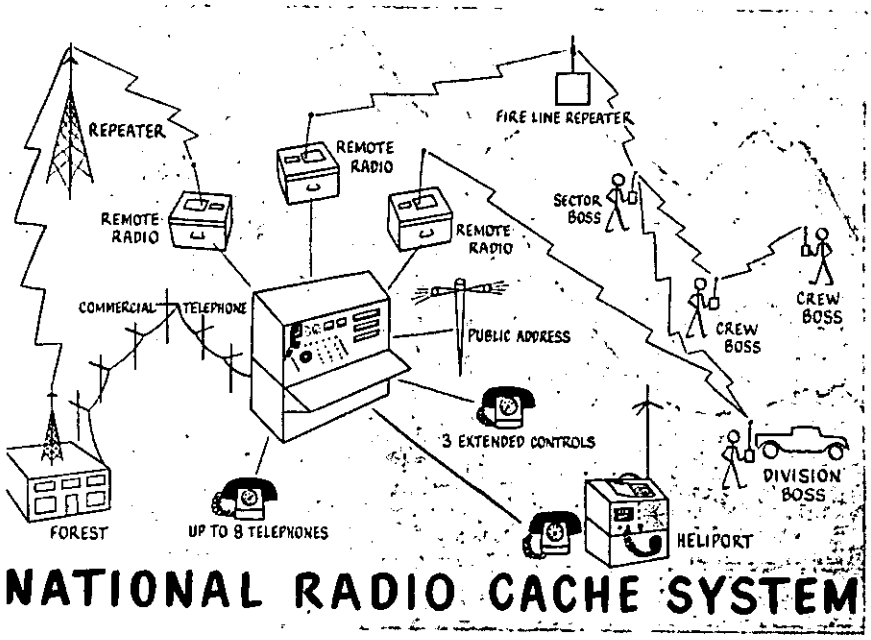
The National Fire-Radio Cache at Boise Interagency Fire Center contains elements for a large fire ground attack radio system. It consists of six Division Modules, two Fire Camp Units, and a Repeater Unit.

Each **Division Module** (fig. 2) contains 15 radios, complete with replacement batteries, in a fiberglass box (packed weight approx. 110 lb.):

1. One Division (command) Radio
   (5-frequency personal portable radio)
2. Three Sector (tactical) Radios
   (5-frequency personal portable radios)
3. Nine Crew Radios
   (2-frequency personal portable radios)
4. Two Special Assignment Radios
   (2-frequency handie-talkie radios)

Each **Fire Camp Unit** consists of 11 fiberglass boxes, (packed weight about 110 pounds each). These boxes contain:

1. Remote, 2-way radio communications for 4 frequencies.
2. A camp telephone system.
3. A camp PA system.
4. One portable 360-frequency VHF radio (fig. 3).



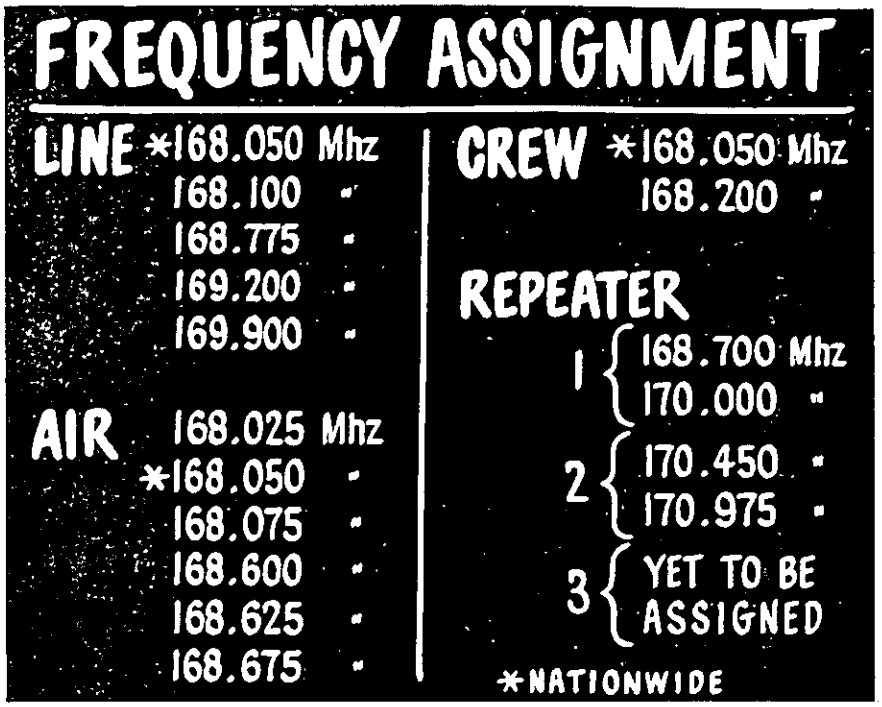


Figure 1. The frequency plan assigning use on large fires is the foundation for implementing the National Fire-Radio Cache System.

5. Four Division Radios, 5-frequency personal portable for overhead and special assignment.
   a. Fire boss
   b. Safety officer
   c. Line boss
   d. Air attack
   e. Heliport
6. Five Crew Radios, 2-frequency handie-talkie for replacement or special assignment.
7. Fire Camp console (fig. 4).

The **Repeater Unit** comes in two boxes, packed weight 40 lbs. each.

Romero Fire Benefits from the Cache

During the summer of 1971, the National Fire-Radio Cache, at the Boise Interagency Fire Center, was made ready for use. A call came from the Romero Fire and on October 9, within 1½ hours after arrival there, the radio system was in use. Romero fire communications requirements included:

1. Fireline and fire camp coverage over rough, front-country terrain and possibly over a main ridge.
2. A tie-in from at least one spike camp with main fire camp.
3. Provision for ground control and dispatch of helicopters at main heliport.
4. Communications for one-way road traffic control.
5. Communications for various agency and forest ground tankers in the tanker pool.
6. Intra - crew communications.
7. Communications for special critical burnout operations on one division.
8. Additional frequencies for separating air operations for California State Division of Forestry.

These requirements were met by:

1. A repeater installed on a ridge. All line personnel down through sector boss and fire camp were tied into the repeater. The line overhead were given 5-frequency "Sector Boss Radios" with the repeater frequency. The fire camp had three 10-watt base radios and one with the repeater frequency. The fire camp also had service net, Forest net, PA System, and camp telephone network.
2. A 5-frequency "sector boss radio" with service net tie-in to the spike camp.
3. A 360-frequency VHF, battery-operated radio, which provided the base heliport communications and was assigned an emergency FAA frequency.
4. "Division radios," assigned to "switch position 1" for traffic control personnel. Note: Repeater requirement made the Division radio unsuitable for line overhead use.
5. Extra handie-talkie type crew radios on "switch position 1" assigned to various ground tankers. Tanker boss tie was with "Sector radio."

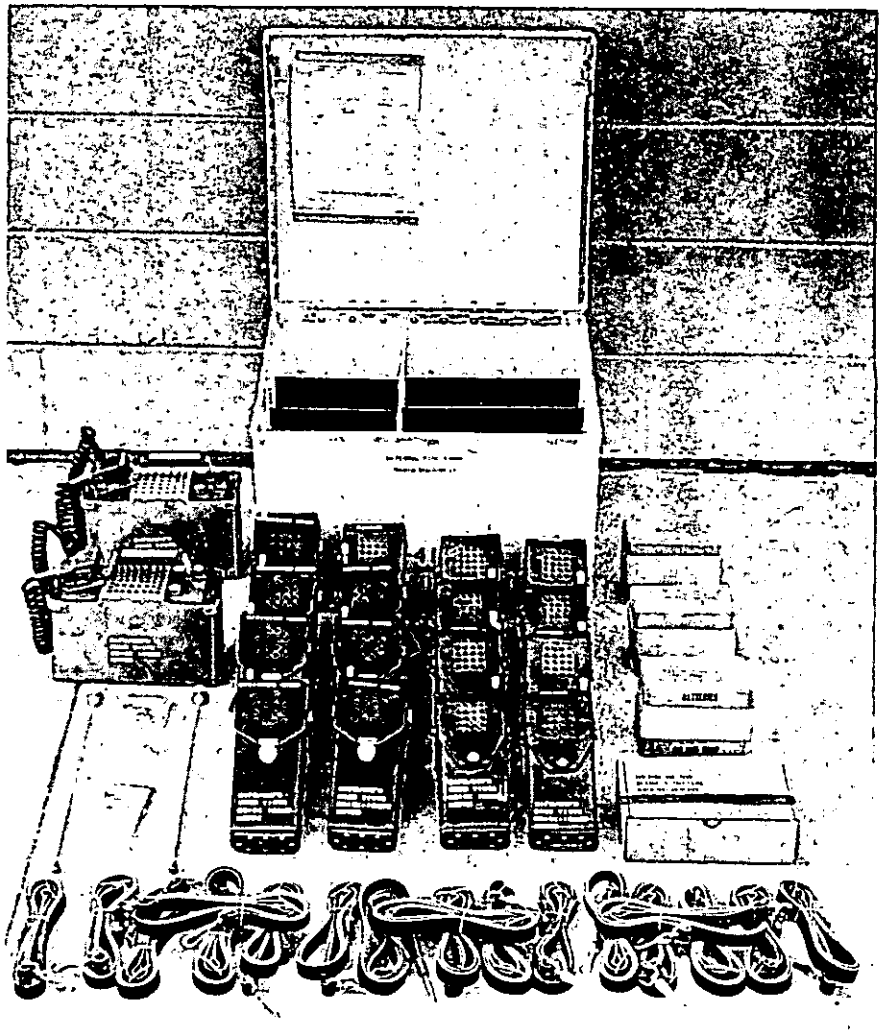


Figure 2. One Division Module, 18 5- and 2-frequency radios with replacement batteries, weighs 110 pounds in shipping container.

6. Crew radios used "switch position 2."
7. Sector boss monitoring crew radio on "switch position 2."
8. A 5-frequency "Division radio" for the critical burnout division boss, linked to rest of fire with "Sector radio."
9. Additional VHF emergency FAA frequency obtained and put into use after first frequency became congested.

See chart; National Fire-Radio Cache System.

Cache Judged 90% Effective After The Romero Fire

An informal questionnaire was distributed to the last shift of line overhead on the Romero Fire. The results indicated the "Module System" was at least 90 percent effective. Some of the comments, remarks, and ideas from the evaluation were:

- The "Module System" is an improvement and is workable.
- The "Module System" is flexible and provides adequate frequencies and equipment to meet large fire needs.
- A communications officer and National Radio Cache Technician is needed to accompany the National Cache until sufficient fire communications officers can be trained.
- Three of four frequencies were adequate to handle the total fire traffic with no overloads even during shift changes.
- The air operations of the National Fire-Radio Cache System needs to be implemented as soon as possible. FAA emergency VHF frequencies are a good backup until a National Radio-Air Operations System becomes a reality.

Fill Out A Fire Order For The Cache

Requests for the Cache are made by Fire Order to the Forest Service Coordinator, Boise Interagency Fire Center, 3905 Vista Ave., Boise, ID. 83705. An individual Division Module (15 radios) can be ordered. When three Division Modules are ordered, a Fire Camp Unit and National Radio Cache technician accompanies the Cache. The Repeater Units will be sent only by request.

The technician will assist and advise the fire communications officer in the implementation of the Cache System and arrange for return and maintenance of the Cache. The National Cache

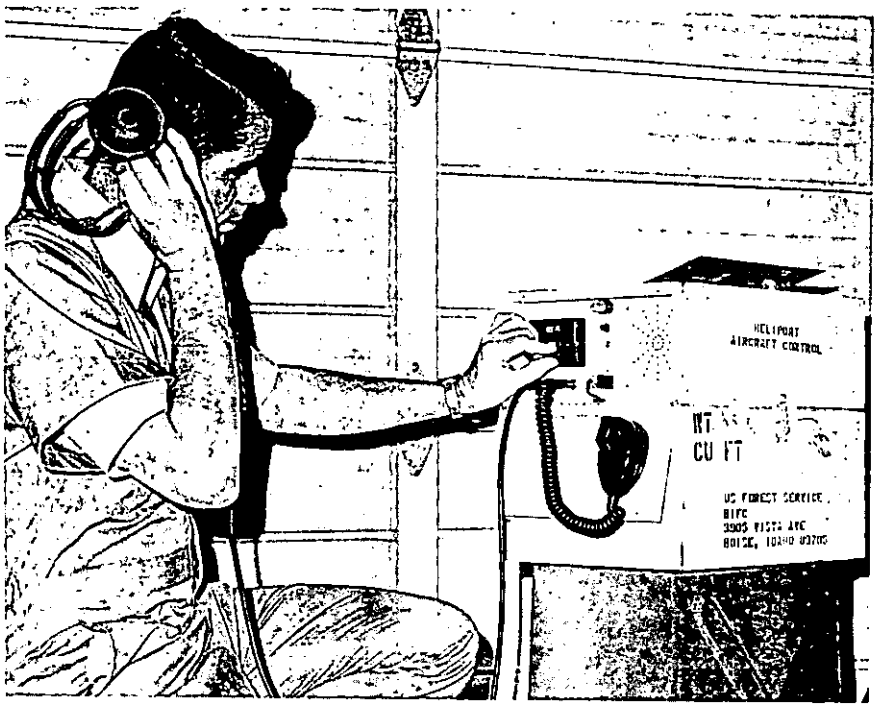


Figure 3. Technician Bill Barrus, BIFC, at the portable 360-frequency VHF radio has own power supply and can be positioned any place air-ground communications are needed. Need requires approval for use of emergency FAA frequency.

at the Boise Interagency Fire Center has the capability of maintaining six Division Modules within 48 hours.

BFIC Provides Training

A module system brings with it training needs. To date, this has been done by the National Cache technician at fire schools and communication officer's workshops. This training will continue as BIFC gets requests. Actual fireline communication systems training is done when the National Cache technician assists on fires. Slide tapes and written material are now being prepared to inform fire managers about the use of the new National Radio Cache System.

First, Finances, Then The Future

Fireline–The present plan calls for 36 Division Modules with an accompanying Fire Camp Unit for each three Division Modules. Immediate need is: financing to implement the rest of the plan: 30 more Division Modules.

Fireline Repeaters–The Cache presently has two fireline repeaters with associated frequencies. For full system implementation, ten more repeaters and one more pair of repeater frequencies in the fireline frequency range are needed.

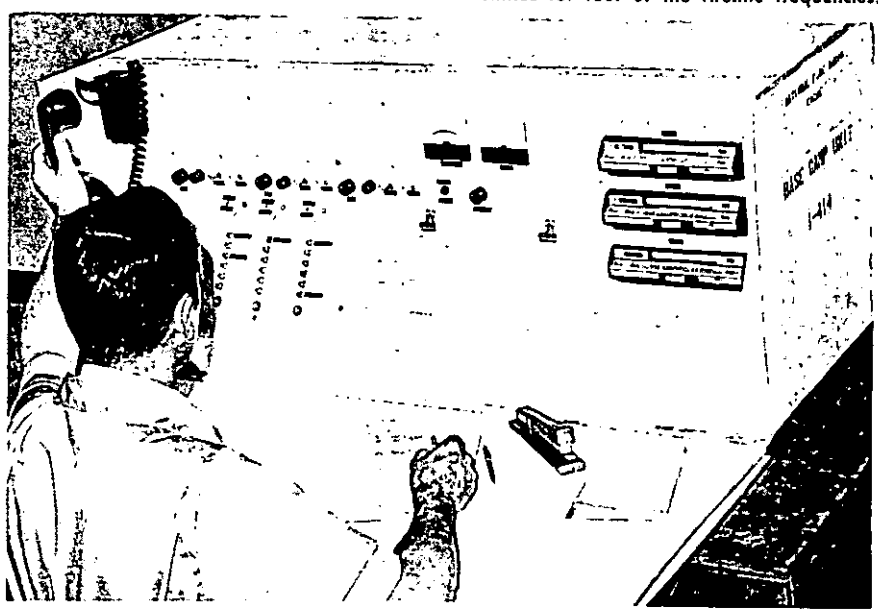
Service Nets–One service net is presently available with 11 more needed and two more pairs of repeater frequencies are required to meet service needs.

Air Net–No actual implementation of the Air Net is possible yet. The air net will make it possible to tie in six air frequencies with the ground and provide a way for the fireline frequencies to be available in a single multi-channel radio.

Suitable multi-channel radios are manufactured and the market is becoming competitive. Implementing the Air Net system awaits financing. With it Forest Service aircraft will be equipped with high band F.M. 4800 channel radios. Provision in the National Cache will be made to furnish contract and rental aircraft with multi-channel radios.

But the module system now available can help sort out communications on a large fire. Could the system work for you? △

Figure 4. Fire Camp console provides 1 location for radio operator to handle all radio telephone for public address communications. NOTE: Features remote capabilities for four of the fireline frequencies.



Fire Is a Terror...But Also a Tool

Richard E. Baldwin

Instead of promoting only the idea that all fires are *bad*, fire prevention efforts need to emphasize fire as a forest management tool and as a natural environmental happening.

Smokey Is A Good Teacher

The Cooperative Forest Fire Prevention (CFFP) program with Smokey Bear as the symbolic image of fire prevention is an impressive success story. The millions of dollars of advertising services contributed to the program have paid off in resources saved even though the saving can't be accurately measured.

Many dedicated fire protection people have been swept into the main stream of the mass media approach to fire prevention, and today fire prevention is almost synonymous with public relations, Smokey Bear, and the idea that all fire is bad. For example, if you are considering hiring a fire prevention specialist, what is one of the first prerequisites for the man? You probably will say, "He must be good in public relations."

Prevention Has Many Facets

But there are other aspects and approaches to fire prevention that probably need increased emphasis, such as prevention engineering and fuel management.

Consider fuel management. Why isn't more effort put into it? Fuel management requires scientific understanding of fire behavior and fuels. Unlike the mass media approach, the results of fuel manipulation designed to prevent fires can be realistically tested, measured and evaluated to determine cost benefit answers. The results of the mass media approach, on the other hand, cannot be precisely determined. Furthermore, these results are in terms of the number of people contacted and not in terms of actual resource damage averted.

Are We Our Own Victims of Oversell?

Early day lumber companies harvested vast areas in a devastating and reckless manner with little concern for the soil, fire hazard, or perpetuation of a healthy forest cover. Because the silvicultural methods of clearcutting were carelessly applied, the public was aroused and educated to believe that clearcutting was all bad. Did forest managers oversell the public to the point that scientific management is seriously hampered today?

Can this same question be put to the "all fire is bad" type of prevention program mentioned earlier? Will the public be able to accept forest fires as a fact of life, that fire's impact on forest ecosystems is as elementary as soil, air, and water?

Educational Reemphasis Needed

Fire prevention efforts must cease trying to manipulate public attitudes with single objectives as if it were selling a brand name soap powder. Educational programs should complement overall land management objectives. Since wildfire has been generally misrepresented as being bad, this concept needs to be tempered, and the natural role of fire in our forests emphasized. The public needs to learn that fire is a dynamic factor of the forest environment, not necessarily good or bad but natural.

A. B. Mount, silvicultural research officer from Australia, made the following observation after visiting fire research organizations in our country:

> I was told that anti-pollution authorities are about to ban forest burning in Oregon; this in spite of general recognition by most foresters that fire is an integral part of the local forest environment. However,

Richard E. Baldwin is chief, Fire Programs Branch, Division of Fire Control, Missoula, Mont.

this recognition has apparently not been strong enough to allow a vigorous campaign of public education on the need for forest fires. Perhaps if the complete role of fire in the environment had been understood by the public, foresters would be more outspoken about their use of fire.

Mount also makes the following observation:

> One remarkable difference between Australia and North America occurs after a fire disaster. In Australia there is public recognition of fuel accumulations and public pressure for the use of controlled fire to reduce these accumulations. In California there appears to be public condemnation of the firefighting organizations for not controlling the fire. It is apparently overlooked that the very efficiency of the fire brigades guarantees fuel accumulations that will one day produce a holocaust.

Fire's Natural Role Must Be Understood

Along with public reeducation, comprehensive burning prescriptions, realistic preattack planning, and fire prevention engineering through fuel and vegetative manipulation must constitute the backbone of the approach to fire management in the 1970's. When fire's natural role in the environment and its ecological significance are understood, land management programs will be able to complement natural processes instead of trying to overpower them with man's advanced technical skills and machines. △

Aircraft Altimeter Can Be Used To Set Up Hose Relay Lines

J. Leo Cote

In areas with rapid elevation changes you can lay an effective multiple relay pump line by using an aircraft altimeter.

On one of Connecticut's stubborn back-country fires during late June 1971 it became necessary to set up a multiple relay pump line a distance of 7,500 feet, with a substantial elevation rise. To place the pumps properly in relation to both the horizontal lay and vertical rise, with performance ratings of each pump known, Al Goldstone, foreman at People's State Forest Headquarters and I resorted to a "gimmick" that we have used before: A standard aircraft altimeter. It is a free operating unit requiring no wires or piping for use and is small enough (3 inches diameter and 4 inches long) to fit in your pocket.

Start at water source or first pump unit. Jot down altimeter reading. Graduations are 20 foot; in-between markings can be interpolated if you wish to be that accurate. As hose line is laid, the number of lengths can be counted for horizontal distance. Watch the altimeter, and difference between starting point and second location will give you vertical rise. You can then set your second pump in relation to the known ratings of the first pump. This procedure can be continued if a third pump is necessary.

J. Leo Cote is assistant fire control officer, Department of Environmental Protection, Preservation and Conservation Division, Forestry Unit for the State of Connecticut.

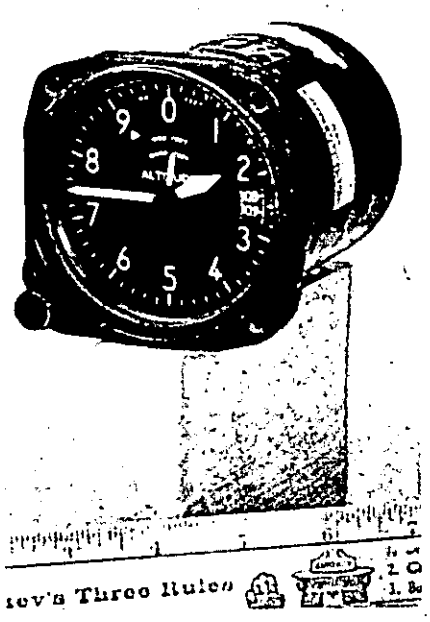
Altimeters Not Expensive

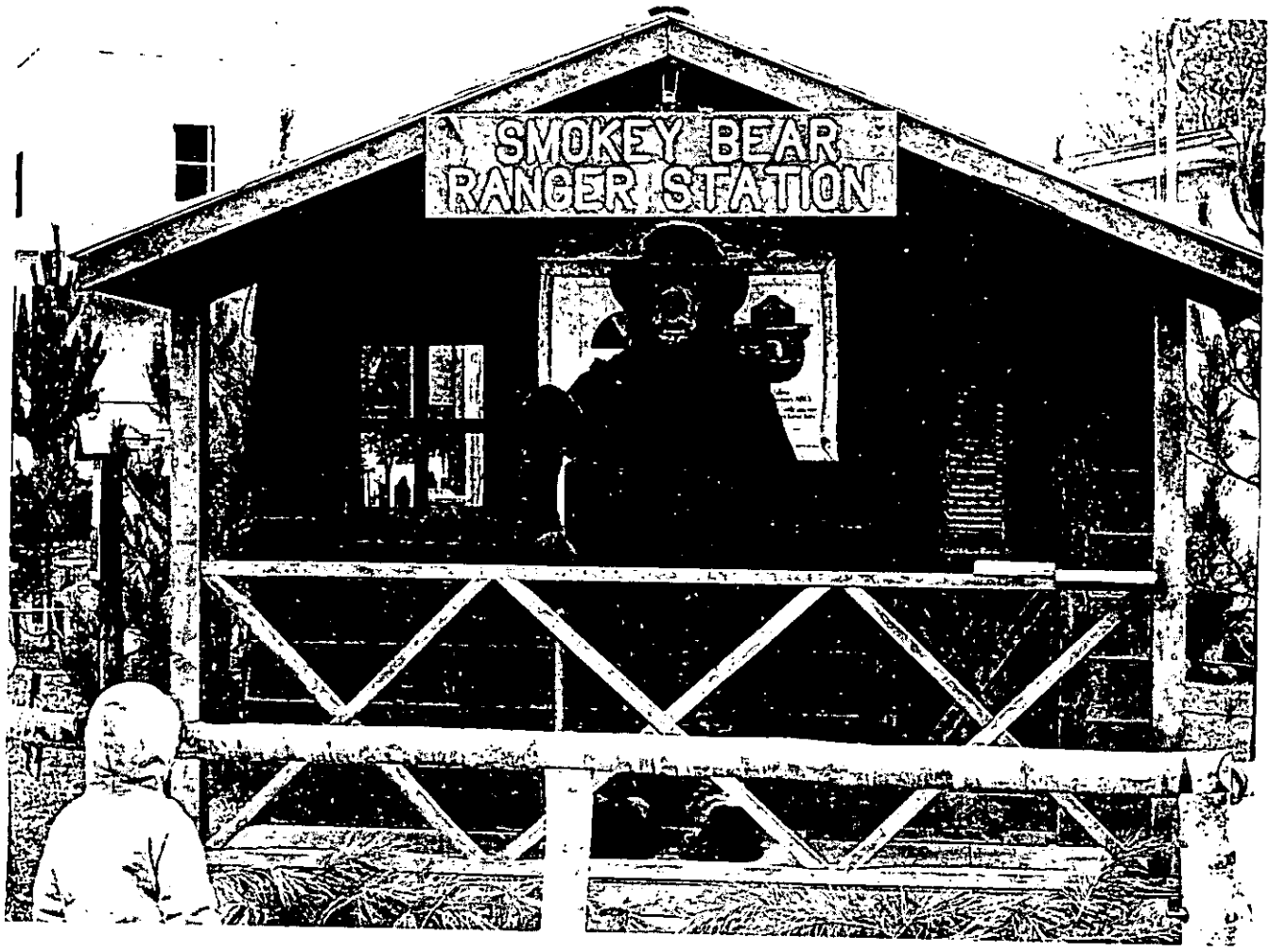
The altimeter need not be an expensive instrument; we got ours from Federal excess property.

The altimeter does not have to be set at an exact elevation when you start, because for your purpose, only the relative values between stations are important.

The value in establishing a well planned hose line pays dividends in assuring continuous water up where it's needed. Our system can give a measure of confidence when the pressure is on. △

Aircraft altimeter used to determine height in feet—of—water "lift" from pump to fire (1 foot water = 0.43 p.s.i., 1 p.s.i. = 2.3 feet).





This Smokey Bear Is Ready To Go ... and So Is His Station

James D. Moore and
Paul E. Pendowski

In preparing for the 1971 Wisconsin State Fair, the Lake Michigan District of the Wisconsin Department of Natural Resources created a unique addition to their fire prevention displays. It was a prefabricated, easily transportable, ranger station with which Smokey appeared.

The station, designed and built at the Wausaukee Ranger Station, has a base 5 x 8 feet, and is 6 feet high. An operator works inside and "Smokey" appears on the porch.

Ease of Upkeep and Transport Built In

An exterior, dark wood stain was brushed on the station, and the roof was made of unpainted cedar shakes. The stain offers the convenience of on-site touch-up in case sections are marred in transportation or setup.

A white birch fence was put in front of the station. Besides being attractive, the fence holds spectators back. The entire station can be assembled or disassembled by two people in less than 1 hour.

The complete station consists of 11 prefabricated sections. The

James D. Moore is a forest ranger at the Wausaukee Ranger Station, and Paul E. Pendowski is a forest ranger at the Pound Ranger Station for the Wisconsin Department of Natural Resources.

entire station when disassembled can be carried in a pickup truck.

Only One Operator Is Needed

The station requires only one operator working behind the framed window, which is one-way glass on the front of the station. Sitting behind the window, the operator can be the voice of and operate Smokey unseen.

Because many appearances are during the summer months, it is important that the operator's quarters be well ventilated. Decorative louvered windows and a roof vent provide fresh air.

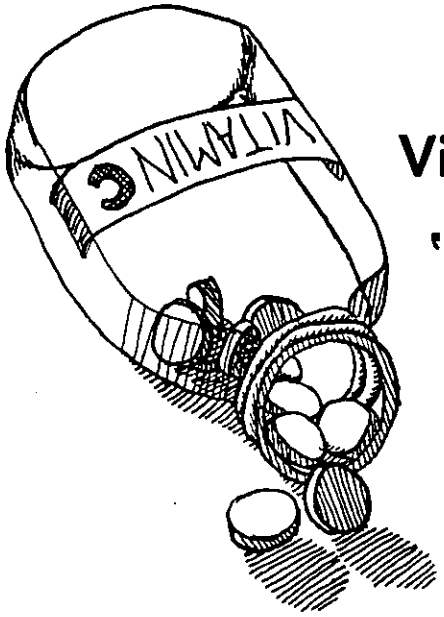
The Smokey that travels with the station is made from a tanned black bear hide mounted over a wooden frame. The headpiece has a movable jaw to simulate talking. A speaker is mounted at the neck inside the bear suit. With the use of an Army surplus Signal Corps amplifier, the "Smokey" can talk to the crowd.

It Worked for Us . . . How About You?

During 1971, the Smokey Bear Ranger Station appeared at the State Fair, a county fair, and the Peshtigo, Wis., Fire Centennial. At every appearance Smokey and his station were a definite attraction.

Using this station, we have been able to present an attractive and popular fire prevention display with a low manpower requirement. Because of the hidden operator, Smokey can "talk" to spectators and accomplish his prevention campaign most effectively — person to person.

If you want more information, write to Stanley W. Welsh, administrator, Department of Natural Resources, 4610 University Ave., P. O. Box 450, Madison, Wis. 53701. △



Vitamin C Is An 'Ounce of Prevention'

Philip V. Cloward and Bill E. Williams

During the 1971 fire season vitamin C tablets helped keep the Sawtooth Interregional fire crew in good health.

Each year many men suffer respiratory illnesses on interregional fire suppression crews. These crews spend a lot of time on the fireline each season. Smoke, dust, long hours, and temperature extremes are conditions common to crews on most of the fires they fight. Under these conditions, colds, flu, bronchitis, and other infectious diseases flourish, sometimes spreading through an entire crew in a few days.

Illness Reduces Crews' Effectiveness

With the Sawtooth Interregional Fire Crew, based at Twin Falls, Idaho, these illnesses were a major problem each year from 1967 through 1970. During that time there was one case of pneumonia as well as many serious infections requiring a doctor's care. During the 1969 fire season, for example, 27 of the 30 men on the crew received treatments for respiratory ailments.

This much sickness seriously reduced the crew's effectiveness, especially late in the fire season when most of the colds and flu occurred. Several times crewmen had to be flown home from a fire due to illness. This resulted in increased transportation costs.

Vitamin C Used

During the 1970 season, three men on the Sawtooth crew took vitamin C capsules daily throughout the season on a trial

Philip V. Cloward is TM-FC staff officer and
Bill E. Williams is supervisory fire control officer, both on the Sawtooth National Forest.

basis. They had fewer and milder colds than the rest of the crew. None of the three missed a fire due to sickness. The rest of the crew didn't fare as well. Many had to get treatment, and some were sent home sick.

Based on the results of this trial, enough vitamin C was purchased to give each man one 250 mg. tablet every day throughout the 1971 season. The 2,500 capsules needed cost about $30 and were made available to the crews. All members but one elected to take the tablets.

The results were surprising. Colds and flu were not a serious problem during the 1971 season. No one had a serious respiratory ailment, and colds were fewer and less severe. In 1970, the crew used 344 hours of sick leave, but in 1971, while taking vitamin C, the crew used only 124 hours of sick leave. Furthermore, the crew went on more fires in 1971 than in 1970.

For the first time in 5 years, the crew members were all still healthy at the end of the season. From now on, vitamin C will be dispensed to the Sawtooth crew as a very worthwhile "ounce of prevention."

Vitamin C Is A Glue

Dr. Lee Buchanan, Medical Officer for the U.S. Department of Agriculture, explains the need of vitamin C in our bodies: The vitamin acts as a glue between the surface cells, including throat and lungs, thus increasing our resistance to disease.

In times of stress, such as fighting a fire, our need for vitamin C increases. Dr. Buchanan says 250 mg. is a safe dosage and may well be effective, especially when fresh fruits are not available. △

Float Plane Mounted,

Scanner Reads Reflections As Well As Fires

Frank J. Squillace and
William O. Beel

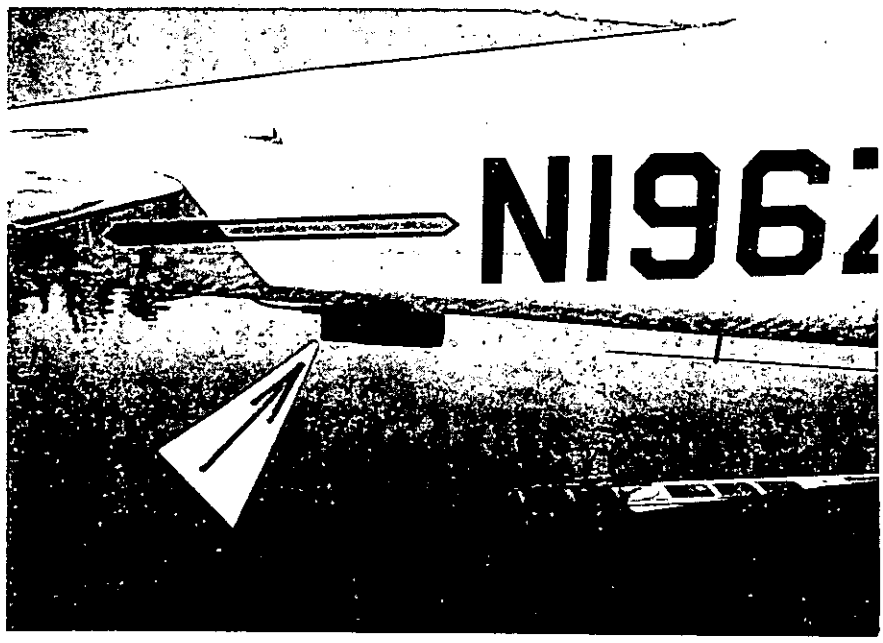
Because of the many lakes in the roadless wilderness of the Boundary Waters Canoe Area, float planes patrol the forest for fires. An infrared scanner has been placed on a float plane to detect fires; however, reflections from the lakes have caused most of the false readings.

Unit Has To Be Waterproofed

The infrared scanner[1] is mounted on the bottom of the fuselage of a float plane for testing and evaluation (fig.). Wing tip mounting is not possible because the floats would interfere with the scanning. Because of the quantity and velocity of water striking the device on take-off and landing, the unit was waterproofed with a combination of silicone rubber, plastic tape, and cement. The power cable was put through an inspection hole in the fuselage and up to the instrument panel. New

Frank J. Squillace is forest dispatcher, and
William O. Beel is chief pilot, both of Superior National Forest.

[1] See "No Smoke Needed," by Robert F. Kruckeberg, FCN, Vol. 32 No. 2, Spring 1971.



Scanner (arrow) is mounted under the airplane, to the rear.

weight and balance figures were computed and they fell well inside the aircraft safety envelope. Flight tests were made both at light and gross weights without any noticeable change in flight characteristics.

Initial Test Successful

In the fall of 1970, tests of the scanner were conducted. A charcoal fire, 1 foot across and 3 to 4 inches deep, in a garbage can cover, was placed in the woods. Positive location of the fire was not known by the aircraft's occupants. The plane was flown over the general area at an altitude of 1,000 feet. The detector immediately picked up the fire.

Tests were also made at 2,000 feet. Some skipping effect was noted, but the detector pinpointed the fire within 200 feet of its location at ground level.

False Readings Take Up Time

More tests were conducted in the spring of 1971, when patrols were flown at an altitude of 2,000 feet. Three pilots each flew 2-hour patrols with similar results; the scanner flashed almost constantly from water reflections, making its use on a routine patrol counterproductive.

The pilots used much of their time checking false alarms and resetting the instrument and did not have time for adequate visual scanning. Numerous false alarms disrupted the flight patrol detection pattern causing considerable delay in the schedule.

The scanner was more reliable during the mopup operations on the 14,629-acre Little Sioux Fire during late May and early June of 1971. On 3 consecutive days pilots flew a total of 17 hours and found 40 hot spots, some of which would have been missed due to lack of visible smoke. Best success in locating the hot spots was during the early part of the mopup period.

In August 1971, the scanner was used in an attempt to locate lightning fires in an area of mixed forest and lakes. Use of the scanner was discontinued on this project because of continuous false alarms caused by water reflections.

Some false alarms were recorded from other sources. Operation of the aircraft radio (XMIT) actuated the unit. The rotating beacon mounted on the bottom of the aircraft reflects on the floats. The sun actuated the unit in a turn. False readings were recorded from reflections off natural rock outcrop areas, concentrations of bottles and cans, and from the cabs and windshields of vehicles.

If the sensitivity of the scanner can be reduced to overcome false alarms and still locate fire on patrol flights, the scanner can be an effective tool for detecting fire in the Boundary Water Canoe Area. △

Prescribed Burning

Particles and Air Quality Studied

Ward, D. E., and R. C. Lamb.

1971. Prescribed Burning and Air Quality — Current Research in the South. Tenth Annu. Tall Timbers Fire Ecol. Conf. Proc. 1970: 129-140.

Describes pilot studies to determine particular production of burning forest fuels and to correlate particulate concentration with smoke plumes. Techniques involved use of high-volume samplers and optical particle counters. △

National Fire Danger Rating System Is Explained In New Book

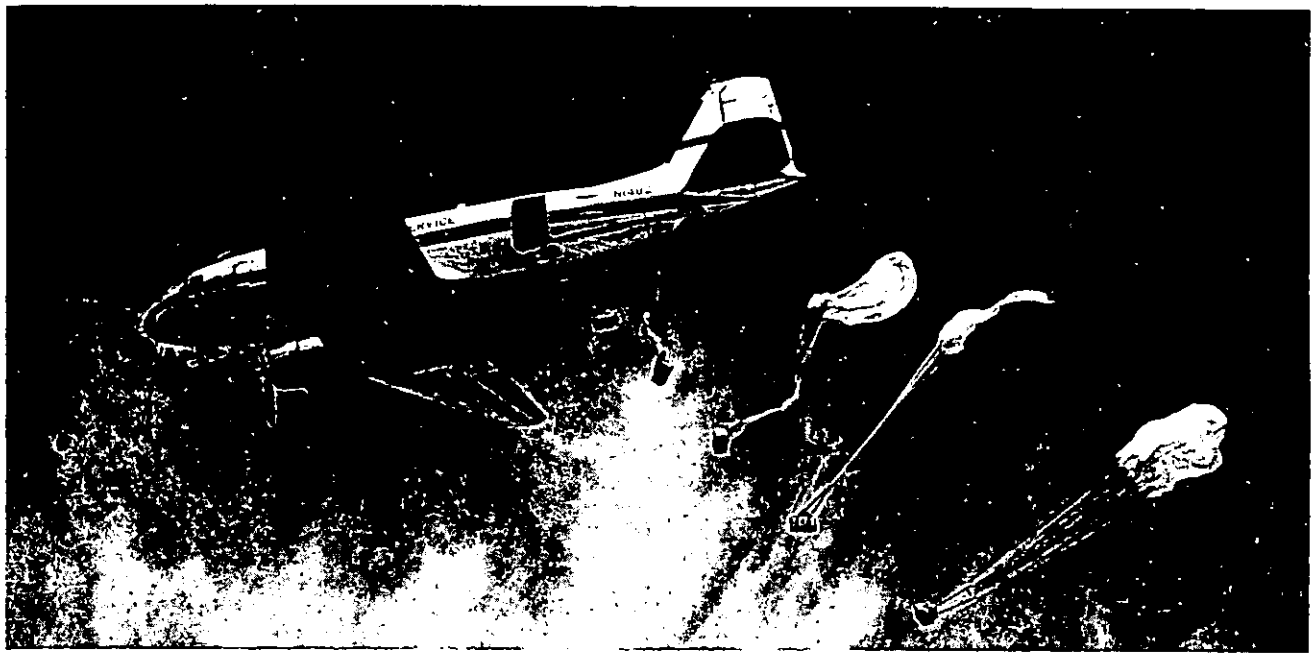
Three innovations in fire-danger rating are introduced in the NFDR System. First, it is solidly based on the physics of fire behavior; it is not empirical or statistical. Second, it makes use of the fuel model, an open-ended means of treating the myriad of naturally occurring fuel situations. Third, the system is designed so that improvements can be incorporated with a minimum of impact on the users.

1972 The National Fire-Danger Rating System;

by John E. Deeming, James W. Lancaster, Micheal A. Fosberg, R. William Furman, and Mark J. Schroeder; USDA Forest Service Research Paper RM-84, 165 p. Available from Rocky Mountain Forest and Range Experiment Station, 240 West Prospect Street, Fort Collins, Colo. 80521.

The National Fire-Danger Rating (NFDR) System produces three indexes — *Occurrence, Burning*, and *Fire Load* —that measure relative fire potentials. These are derived from the fire behavior components— *Spread, Energy Release*, and *Ignition*—plus a consideration of *Risk*.

Instructions and tables necessary to manually compute the indexes and components for all nine fuel models are presented. △



Smokejumper Cargo Rolls

Dale E. Major

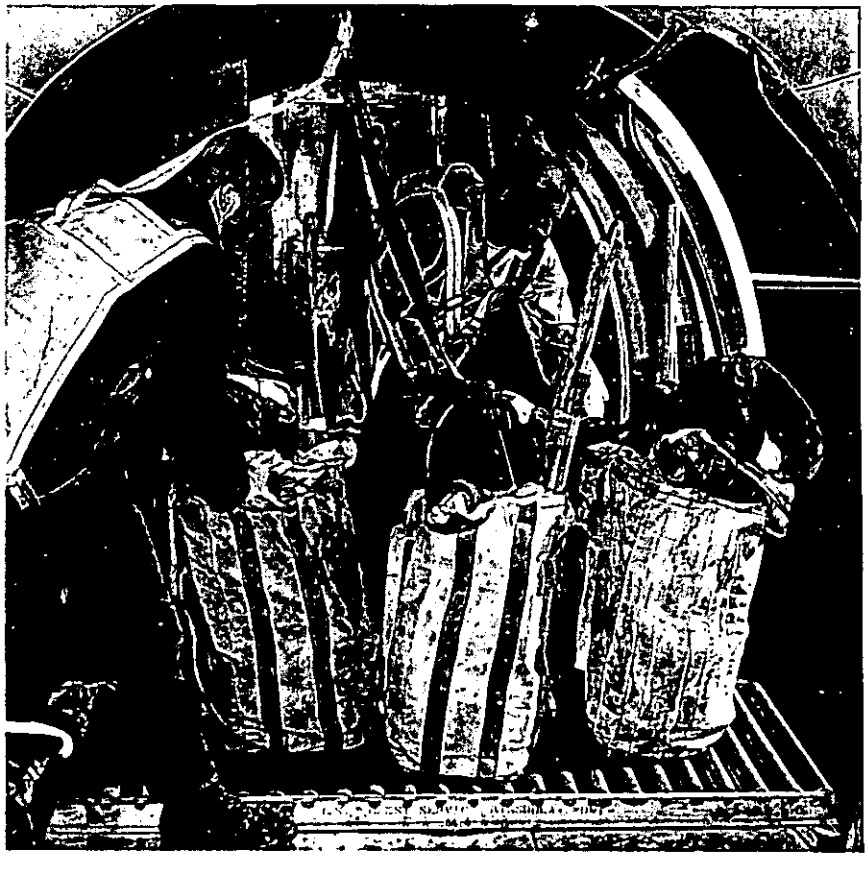
By using a roller track arrangement for smokejumper cargo (fig. 1), up to three fire packs can be dropped with each pass of the airplane. This not only saves time; it also reduces the hazard of low-level cargo passes over rough terrain.

In previous years the method for dropping cargo has been to push one two-man pack across the floor of the airplane and out the door for each pass of the airplane. The one-pack-per-pass has been necessary because each fire pack weighs 90 pounds. But now, the roller track bears the burden.

When the roller track is not in use, it can be stowed out of the way of other operations by means of a harness bolted to the bulkhead (fig. 2). The track can be removed from the aircraft by undoing four cap screws.

Present-day installations of roller track in DC-3 airplanes do not allow for smokejumping when the track is in use. △

Dale E. Major is FS deputy regional air officer at the Boise Interagency Fire Center.



Using a roller track arrangement, up to three fire packs or up to five smaller bundles can be dropped during one pass

Ignition of Prescribed Burns More Reliable

Electrical Igniter Tests Circuits

William A. Main and Peter J. Roussopoulos

One of the recent advances in prescribed burning technology has been the development of remote ignition techniques. Hand-thrown grenade-type ignition devices (Dell and Ward 1967; Fenner 1962), mechanically launched incindiary projectiles (Dell and Ward 1967a), and electrically ignited fuel boosters (Reifsnyder 1952, Fenner 1962, Schimke et al. *1969) are foremost among the devices tested. Studies by Murphy* et al. *(1968) indicate that electrical ignition systems can be successfully used to manage smoke dispersal for minimum air pollution impact. The following article is about building safety and reliability into electrical systems.*

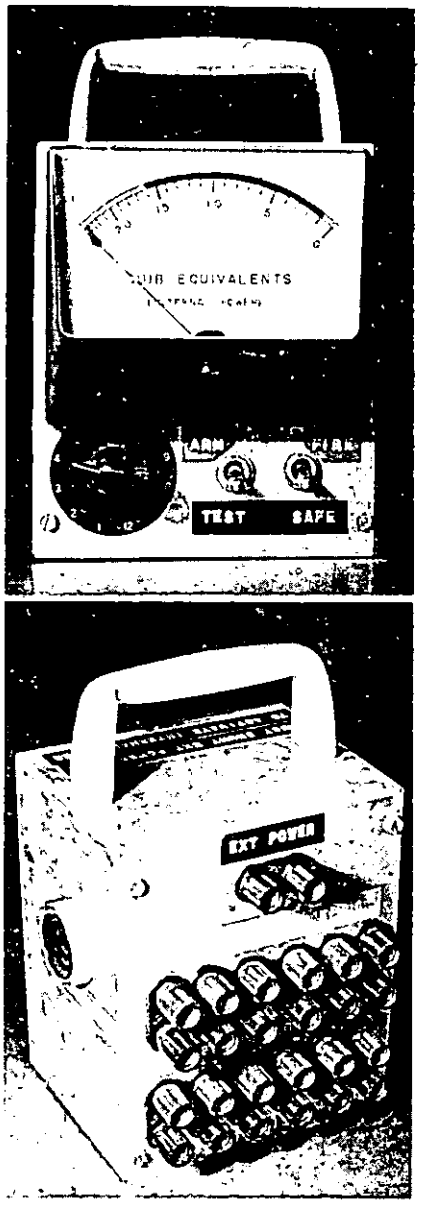


Figure 1.—Top, front view and, bottom, rear view of the electrical squib igniter.

The electrical squib igniter (ELSI) has been devised so that circuits can be tested and the ignition of prescribed fires can be more reliable.

Forest Service fire researchers at the North Central Forest Experiment Station have been using electrical ignition for several years in both experimental and operational burning. From the beginning it has been apparent that electrical ignition is not totally reliable. This makes possible a potentially disasterous situation should a circuit fail during the actual firing process.

Ignition Circuit Malfunction Is Hazard

Briefly, every electronic ignition system for prescribed burning consists of: (1) a power source, usually a blasting machine, portable generator, or battery; (2) a wire or a similar conductor to complete the circuit between the power source and the fuse lighters; (3) one or more squibs (electrically fired fuses); (4) a spitter-fuse or igniter cord wrapped around the squib; and (5) a fuel booster such as gelled petroleum.

The squibs are arranged in one circuit or several series of circuits, each circuit igniting a fuse when fired by an electrical impulse. Each fuse then lights one or more strategically placed fuel boosters that, in turn, provide an ignition source for the combustion of natural fuels.

Ignition circuit malfunction usually results from one of two causes:

1. The circuit may have been damaged, possibly by people, wildlife, inclement weather, or rolling material, preventing the flow of electrical current.
2. The power source may be run down or simply inadequate to fire the circuit.

Some Testing Dangerous

How might circuit viability be verified before the firing attempt? One possibility involves walking around and measuring the electrical resistance of each circuit with a blasting ohmmeter to determine requirements and ignition circuit continuity. You must be careful, however, that the ohmmeter power output does not exceed the firing power threshold of a single squib. Moreover, the practice of connecting each individual circuit to an ohmmeter first and then to the power source before firing is somewhat cumbersome in the

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field—a serious drawback when precise timing is required.

ELSI Tests Circuits

To increase safety and field convenience, an electrical squib igniter (ELSI) was designed and constructed to test and fire multiple circuit ignition patterns from a single point without reconnecting circuit leads during the firing process (fig. 1). It was used successfully on several prescribed fires and appears to be an improvement over conventional ignition power sources.

ELSI is portable, measures 8 x 5½ inches, and weighs about 3 pounds. As many as 12 ignition circuits can be simultaneously connected to the back receptacle panel, and each can be tested, fired, or both, as chosen by the operator turning the dial-type circuit selector switch mounted on the front of the assembly casing.

Circuit Design Incorporates Safety

Power for the ELSI is provided by a 12-volt DC internal battery with provision for additional external power. When toggle switch S1 is in the TEST position, the device is essentially a low power ohmmeter—incorporating a Wheatstone bridge (an electrical resistance measuring device) to easily measure squib resistances (fig. 2).

Circuit resistances between one and 16 squib equivalents can be fired by the 12-volt internal power source alone. This "go-zone" has been delineated on the meter face by the center colored arc; the "no-go-zones" are designated by a contrasting color (fig. 1).

Unit Just About Fail-Safe

Because accidental firing cannot be tolerated during circuit test procedures, two safety devices have been built into ELSI, making it essentially fail-safe. First, two separate switches must be thrown to fire the circuit. S1 must be thrown to the ARM position to remove R4 from bridge circuit and make firing possible, and then S2 (which is spring-loaded on SAFE) must be thrown to the FIRE position to complete the firing circuit.

Only when both switches are thrown is maximum current allowed to flow through the squib circuit. The second safety device is a warning horn that informs the operator when the firing circuit is armed by S1. The combination of these two safety devices practically eliminates the possibility of accidental firing.

You Can Build One

ELSI can be constructed easily and inexpensively. Materials and components of the prototype were purchased for about $43 plus battery.

Since internal meter resistance varies between different kinds of meters, each meter has to be calibrated.

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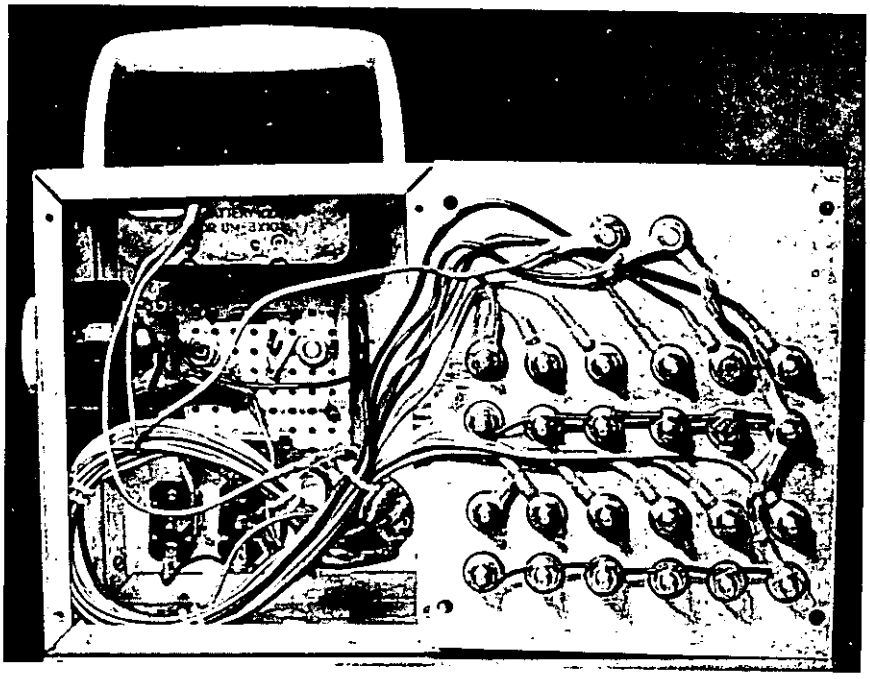
Figure 2. Internal anatomy: note "Perf" board in rear.



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First Intercompact Agreement Signed

An agreement expanding mutual aid assistance in forest fire fighting and training between the Middle Atlantic Interstate Forest Fire Protection Compact and the Southeastern States Forest Fire Compact Commission was signed in Harrisburg, Pa. on February 2, 1972.

Attending the signing ceremony were (l. to r.): Philip L. Archibald, USDA, FS; State Foresters — Samuel S. Cobb, Pennsylvania; Samuel V. Mace, Delaware; George R. Moorhead, New Jersey; Lester McClung, West Virginia; A. R. Bond, Maryland; George W. Dean, Virginia; and Ronald C. Schureman, Kentucky.

Samuel V. Mace, chairman of the Middle Atlantic conference, and Ronald C. Schureman, chairman of the Southeastern States conference, both signed the agreement for their conferences. △