

File 66742, "USFS - Region 6, F - Co-operation."

25. Hammatt, "Airplanes," pp. 1531, 1533 and Hardy, "Aircraft," p. 15.

Chapter II

"Ring Bell" Adams:

Using Radio Before Its Time

Cranking the phone or picking up the receiver to talk to the Ranger during an electrical storm was about as hazardous as reaching for a rattlesnake in a gunny sack.

- David S. Olson¹

The potential of radio to detect and report forest fires had not gone unnoticed in the Forest Service. As early as June 1909, the Vermont State Forestry Department had secured "... Government money in hope that this method of reporting fires will prove workable and prove more economical than building telephone lines throughout forest regions."² Under the direction of Federal Border Patrolman W. P. Powers, the department experimented with a 500-watt, fixed-base station at Proctor, Vt. Two other units were placed on Killington Peak and Equinox Mountain. The results were sufficiently encouraging for Powers to devote "...some little attention to the assembly of a portable set."³ He came up with an 8-pound receiving set and a 50-pound transmitter, including batteries, that could transmit signals 4 miles and receive over a distance of 20 miles.

In his experiments, Powers had to determine the best aerial-ground system for the solid rock formations on Killington. First he tried to secure a ground source in a flowing spring, but he found the source of the water was superficial and of no benefit. The practice of burying metal ground plates in the rock proved no better, so Powers resorted to inductive grounding by using six steel wires, each 240 feet long, placed down the peak at 60-degree angles to each other. The antenna was of the "umbrella" type, similar to the

ground system, because he did not have enough room to construct an inverted L.⁴

The Vermont experiments demonstrated the ability of the radio to transmit signals between fixed points; they also demonstrated the considerable effort and expenses involved in constructing and maintaining fixed-base stations. It was a major job to transport heavy, expensive transmitters, and the antenna-ground system was too complex to put up quickly.

In his reports, Powers also indicated that the portable set had severe limitations. At least two people were needed to carry the 58-pound radio and the other equipment needed for a camp. He also noted that the "storage batteries are not to be relied upon," and that this adversely affected long-distance transmission.⁵ If radio were to replace the telephone, it would be when the overall cost and effort were less expensive and time-consuming than stringing telephone lines.

One day in the summer of 1916, at the remote Baseline Ranger Station on the Apache National Forest in eastern Arizona, Ranger William R. Warner left on horseback for his weekly 38-mile trip to Clifton, N. Mex. About midway to town, he noticed an amateur radio antenna at a local ranch installed by Ray Potter, a high school student. Because he knew it was too expensive to build a telephone line into Baseline, "Mr. Warner became greatly enthused ..." about the possibility of radio for the Apache and detoured to the Potter ranch. Before the day was out, young Potter had helped Warner order a similar set from a mail-order house.⁶

While waiting for the equipment to arrive, Potter and Warner constructed an antenna across the adjacent canyon, a distance of 1,625 feet, at a maximum height of 557 feet. They used every-

thing from copper wire to barbed wire, including the side frame of an iron bed for a ground rod. They reported the final product "...could have been raised to a height of nearly 200 feet (low end) but the strain on the barb wire began to show ..."7

Warner's work caught the attention of Southwestern District (now Region /R-3/) Telephone Engineer, R. V. Slonaker, who had recommended in fall 1914 that experiments with radio be conducted on the Carson National Forest in northern New Mexico. Initially approved and followed up by several of his supervisors, the trial was discarded because of expense and lack of skilled operators.⁸

By November 26, 1916, Warner had received the radio apparatus, consisting "... of a receiving set, a set of head receivers, jump spark coil, transmitting condenser, stationary spark gap, transmitting key and buzzer, three switches, a lightning arrester, fifteen dry cells, and the necessary wire." At a low, total cost of \$115.45, including the labor of Ray Potter, Warner was ready for his first experiment.⁹

That night, in the company of Slonaker and District (Regional) Forester Paul Redington, a message was prepared for transmission. Aware of the importance of the event, Redington composed the following note for Warner to tap out on his key:

Forestry, Albuquerque, New Mexico. This message by wireless from Baseline Ranger Station, Apache National Forest, Arizona, to Clifton, Arizona, distance 40 miles. First of its kind sent in this district. Probably first from any Ranger Station in the United States. Project conceived by Ranger William R. Warner, apparatus installed by

him and Ray Potter. Cost \$75.00. This method should render possible large decrease in construction and maintenance cost Forest communication systems. This message being sent to all Districts /Regions/ and Washington.

The message was received by a Mr. Harriman of Clifton, who could not respond because of lack of power, but Redington and his party received acknowledgement by telegram from the Army Signal Corps when packing out the following day.¹⁰

Warner made three significant findings. First, the location of the antenna did not have to be within the line of sight of a receiving station. It could even be deep in a canyon. With Baseline at 4,482 feet, Clifton at 3,464 feet, and the area between them rising to 6,000 feet, it was apparent that radio waves could get through. Second, after a few weeks of practice, Warner was

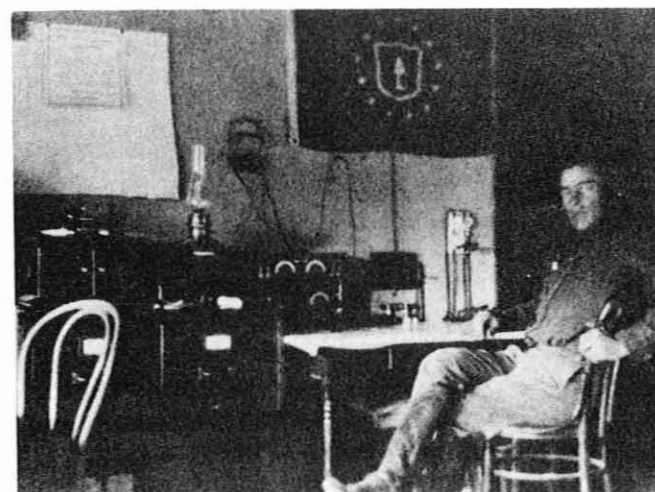


Figure 15. Ranger William R. Warner at wireless telegraph transmitter-receiver that he built at Baseline Ranger Station, Apache National Forest, eastern Arizona. He sent the first official Forest Service wireless message, by telegraph key, on this set on November 26, 1917. Note Forest Service flag on wall. (Forest Service photo, History Section)

sending and receiving code at 12 words per minute, "...thus showing that wireless telegraphy codes do not require years of practice and study to master sufficiently for practical use." Third, radio need not be expensive.¹¹

Warner's experiment was sufficiently successful to encourage District (Region) 3 to conduct further tests. By the time of the final report, Telephone Engineer Slonaker was already recommending wireless-telephone and getting price quotes from manufacturers. He cautioned, however, that "it is not proposed at present to parallel any existing system of communication by the installation of wireless equipment but to use it where the maintenance of a line which is already built is more expensive than the installation and cost of operation of the wireless equipment."¹²

Air Patrols Use Radio

After this initial trial, the Forest Service-Army Air Service patrols were resumed on the Pacific Coast in 1920--this time with radio transmitter sets installed in all planes. Pilots and foresters in the air fire patrol



Figure 16. Army Air Service airplane on forest fire patrol, Olympic National Forest, Wash., 1921. (NA:95G-162658)

program also attended a pre-season short course.

The radios and the instruction were recommended by Colonel Arnold on November 22, 1919, to the Airplane Patrol Committee of the Western Forestry and Conservation Association in Portland. At the urging of Senator Charles McNary of Oregon, Congress provided \$50,000 to the Forest Service for patrol costs.

The flying fire observers were hired by the Forest Service, which also paid for outlying landing field maintenance, ground transportation, telephone and telegraph messages to report fires, and guards for aircraft and buildings--substantially the same practice as in 1919. The same general two-State area was covered, and in Oregon, Curtiss planes were used again. Tentative plans were made for patrols in western and northeastern Washington, but shortages of planes, personnel, and funds precluded flights until 1921.

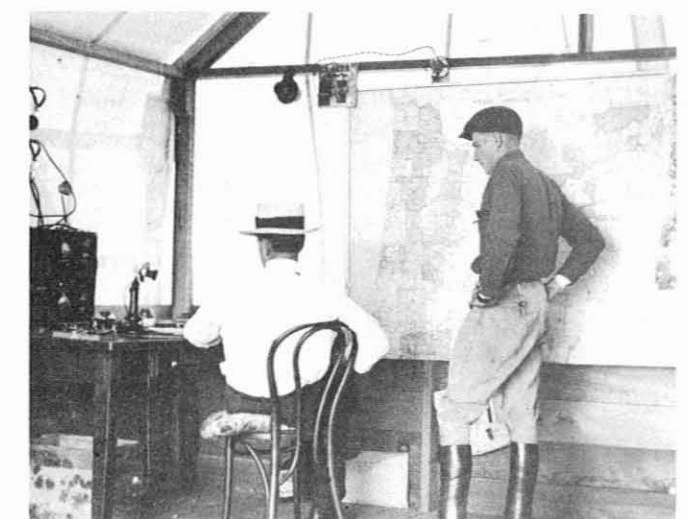


Figure 17. District (now Region) 6 Inspector Shirley Buck with W. E. Naylor of Army Air Service at command post of the joint Forest Service-Air Service aerial fire patrol in the operations building of Aviation Field, Portland, Ore., August 1920. (NA:95G-47880A)

To keep in closer contact, pilots radioed location reports to ground stations every 10 minutes. Nine ground stations were set up in California at the four patrol bases, Santa Barbara, Alturas, and three other points. Three stations were set up in Oregon at Portland, Eugene, and Medford. Radio operation was uneven at first, but improved considerably by the height of the fire season. Nearly half, or 741, of the patrol's 1,632 smoke discoveries were reported by radio. Most were reported by special landings and only a few by drops.

Apparently this scheme failed to provide an adequate network. In an activities summary for the season, the Air Service concluded that more SC-59 radio sets installed along specific routes were needed to make the patrol more effective. "This would mean that every fire sighted could be reported immediately to a receiving station which was in direct contact by wire telephone with the rangers and wardens." The 26 planes used in California and the 11 in Oregon flew 476,085 miles, nearly twice that in 1919, and covered 16.3 million acres. A test flight with a "pony" blimp and a Forest Service observer aboard was made over the Angeles National Forest. For



Figure 18. Northwest forest air patrol radio in operation at Army Air Service command post, Aviation Field, Portland, Ore., August 1920. (NA:95G-47879A)

the first time, special air patrols were launched to get a better view of fires.¹³

In 1921, at the urging of the Air Service, the Forest Service assisted greatly in expanding the ground radio network from 9 to 20 stations in California and 3 to 4 in Oregon, and in setting up 2 for the first time in Washington.

The Air Service stations in California were located at Alturas, in the north-eastern corner; Corning, south of Red Bluff; Visalia, south of Fresno; and at Mather and March Fields. The Oregon stations were at Zig Zag, near Mt. Hood; Fish Lake, east of Albany; Wolf Creek, east of Roseburg; and Johnson Mountain, near Powers. The Washington stations were at Port Angeles and Lake Quinault on the Olympic Peninsula. The Forest

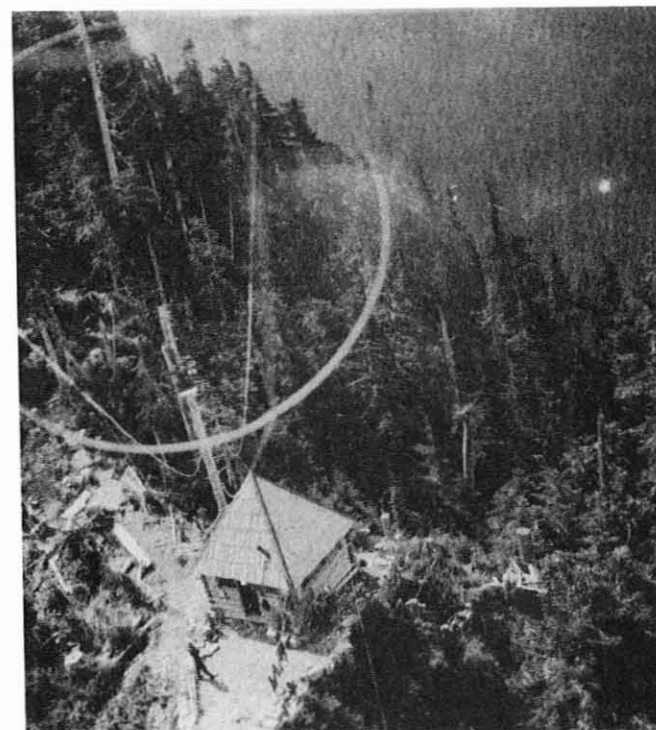


Figure 19. Wireless station used to receive messages from airplanes in Northwest forest-fire air patrol, 1920-21. Finley Lookout, Olympic National Forest, Wash. (NA:95G-158369)

Service itself provided 15 stations in California: Happy Camp, Yreka, Orleans, Sisson, Weaverville, Mineral, Quincy, Alder Springs, Nevada City, Placerville, and Sonora in northern California; and Hot Springs, Northfork, Los Angeles, and Santa Barbara in southern California.¹⁴

This time, Congress appropriated \$50,000 for the 1921 air patrol, all for the Air Service¹⁵ with nothing for the Forest Service. The Air Service, therefore, made the necessary ground installations for the Forest Service, and the Service borrowed the SCR-74 sets from the Navy. Many Forest Service stations in California were staffed by 16- to 25-year-old radio amateurs, who were paid \$80 to \$95 per month by the Forest Service, with no allowance for field expenses. The rest were staffed by the Signal Corps and Air Service. With few exceptions, all stations gave satisfactory service. Only "the Los Angeles station had trouble because of interference, and it was necessary to request through newspapers that the many amateurs keep quiet during the period of day when the planes were in the air."¹⁶

The Air Service set up a regular schedule of daily radio reports to Crissey Field at the Presidio Military Reservation on the Golden Gate. From Crissey, they were telephoned to Army Headquarters and to the District (Region) 5 office in San Francisco. Radio Engineer Richard and Sergeant Lange from Mather Field installed radios in the planes and spent the summer servicing the radios in the planes and on the ground. Thus, the planes were within communication distance of Forest Service stations at all times. Confirmation reports were telephoned or telegraphed from the bases and subbases right after the planes landed.¹⁷

The airplane transmitters were equipped with coils for sending messages on nine different wavelengths and five different tones were available for each wavelength, so interference of reception could be kept at a minimum. Each sub-base had a radio receiving set for voice so that aerial supervision over a fire could be instantly obtained.¹⁸

During the 1921 fire season, the number of planes almost doubled, from 37 to about 70. There were 25 crashes or forced landings. At the end of the season, 7 planes were in use in Washington, 10 in Oregon, and 33 in California. The original plans had called for 87 planes. One source states that the patrols reported 1,248 forest fires, of which one-third, or 373, were the first reports received of the fires.¹⁹ Another source states that the patrols reported 1,632 fires, of which 818 were reported ahead of ground detection.²⁰ At any rate, the advantage of radio during the season is apparent from these figures, and appears to justify R. B. Adams' claim that the experiment was a "decided success."²¹

Air Patrols Curtailed

By the 1922 season, however, both radio and the daily patrols were abandoned. Instead, special flights were made during periods of high fire hazard. State and Forest Service fire observers rode in the planes, obtained firsthand knowledge of the fires, and made direct reports after landing.²²

Advance notice had been given of curtailment of the program. In September 1921, Secretary of War John W. Weeks announced that forest air patrols would be discontinued because of "large reductions" in appropriations for Army aviation as voted by Congress.²³

Congress did not provide funds for patrols, but the Army consented to

make special flights during periods of severe hazard. In Oregon, 294 flights were made; 258 fires were located, of which 114 were "first."²⁴ The radios from the previous season were stored during 1922 in Eugene and used only to broadcast music and lectures by the Forest Service--an activity that met with "huge success" because there were many radio amateurs and only one commercial station in Eugene.²⁵

The reasons for the demise of radio in the air patrol programs were varied and controversial. First Lt. W. C. Goldsborough suggested that radio would have been successful if a more complete pattern of ground radio stations had been established.²⁶ His argument implied that the radio failed because of Forest Service omission rather than commission. On the other hand, Lt. Col. W. E. Gilmore, Goldsborough's commander, was highly critical of the level of cooperation received from the Forest Service. In his report he advised "... that there appeared to be an attitude of criticism against, if not actual opposition to, this activity on the part of many field officers of the Forest Service, due in part to objections which, as a rule, follow in the wake of innovations along any line of accomplishment--the tendency to cling with jealous tenacity to the established order of things."²⁷

According to the Forest Service, radio's demise resulted from the technological state of the art. Radio was a relatively new tool, and its price did not often justify its performance. Lieutenant Goldsborough had also hinted at this by placing some of the blame in the air rather than on the ground. In his recommendations, he called for development of an airplane radio with a range of 150 miles capable of communicating with local radio stations.²⁸

Inadequate aerial-ground systems in airplanes were undoubtedly one major cause of poor communications in the experiments of the early 1920's. The Forest Service, however, did see promise in the air patrols, as shown by the resumption of the patrols, again without radio. Any further experiments in improved air fire patrol radio performance would have been at the mercy of uncertain funding. The Washington Office was aware of Adams' experiments and may have decided that radio was not advanced enough to warrant other trials either on the ground or in the air.

Little if any patrolling was conducted in 1923. In 1924, a prolonged dry winter and spring led State and Federal forest officers in Oregon to secure the services of two Air Service planes and pilots for emergency fire patrols out of Eugene, as needed. The requesting officer flew as observer, and the modest costs of fuel, quarters, and subsistence were shared by the Forest Service and the Oregon State Department of Forestry.²⁹ The special air patrols were reinstated over all three West Coast States for the summer of 1925 and also covered northern Idaho and western Montana (Region 1) for the first time. The planes flew out of Los Angeles and Sacramento, Calif.; Eugene, Ore.; and Vancouver and Spokane, Wash. Ten DeHavillands were provided by the Army Air Service, but the pilots, mechanics, and observers were hired by the Forest Service under a special appropriation of \$50,000. At some locations, Forest Service fire control personnel directed the flights and flew as observers.

Patrols were made only when visibility by lookouts was low and during dry lightning storms. Scouting flights were made on large going fires. The 421 flights covered 75,615 miles.³⁰ The \$50,000 appropriation was renewed for 1926, and 429 special flights

were made from five bases, with fields at Glendale, Calif., and Seattle replacing those at Los Angeles and Vancouver. Similar patrols were resumed in 1927, but only 247 flights were made; an airfield at Missoula, Mont., replaced the field at Seattle, and two National Guard pilots were hired for the two planes based there.³¹

Except briefly in emergencies, the 1927 season was the last to see military planes or pilots used for fire patrol.³² The early years had showed that they were justifiable only during times of poor visibility and high fire hazard in areas well covered by ground lookouts. Planes could also detect and locate fires in "blind" areas that could not be seen from stationary lookout points. They were also valuable in scouting fires, locating "spot" fires ahead of main fires, locating natural barriers, finding best routes to back-country fires for fire crews, and carrying supervisory personnel.³³ Beginning in 1928, the Forest Service made flying contracts with commercial air services for air fire patrols. (State forestry agencies also followed this practice.) Congress again provided the Forest Service with \$50,000 for this purpose in 1928.³⁴

A decided difference of opinion persisted about the use of aircraft within the Forest Service. In 1926, the Northern District (now Region, R-1), for example, strongly favored aerial observation, even requesting its own planes. Its headquarters in Missoula, Mont., explained that its 208 primary lookout towers and locations used only 3 months each year were spread across Montana and northern Idaho, and cost \$125,000 to build and \$80,000 to staff. Viewing the air patrol as a decided economic advantage, the office also pointed out that "with the number of individual fires in District [Region] 1 during the past season, with costs

as high as \$50,000 each, it is apparent that any device, which by prompt discovery or other service, averted one such fire was worth what the Air Patrol cost for the entire United States."³⁵

On the other hand, District (Region) 6 (Pacific Northwest) whose dry eastern forests border the western forests of District (Region) 1, found the reverse situation. It was the contention of the Portland headquarters that same year that the air patrols, with or without radios, were of no value because standard fire protection methods discovered and reported all fires before they could be spotted and reported by aircraft. "For the last season," the Assistant District (Regional) Forester adamantly stated, "we cannot sight [sic] a single case of original discovery on National Forest areas by the Patrol."³⁶

This decided difference of opinion between neighboring jurisdictions undoubtedly confounded the Washington Office. Although their personnel had similar backgrounds and training, the two could not have been more at odds. While both were using airplanes with identical preparation and equipment, Portland was inclined to retain its system of lookouts, while Missoula seemed ready to phase them out. In retrospect, the only factor that sheds light on these contradictory stances was that the Pacific Northwest, more heavily populated than the Northern Rockies, probably had a more refined telephone system connecting its lookouts. With more open space and fewer roads and trails in its territory, the Missoula office undoubtedly found a number of remote areas where early air patrol discovery was valuable.³⁷

Radio Experiments, 1916-1928

Between 1916 and 1928, a number of other radio experiments were conducted,

usually by individuals who claim to be the first on the National Forests. Except for the early experiments in Vermont and Arizona, they got little attention. One worth mentioning was conducted by Dr. H. Barringer Cox in 1916 on the old Santa Barbara National Forest. Though the experiment was not recorded, Assistant District (Regional) Forester T. D. Woodbury inspected the work and reported to the Chief Forester that "Dr. Cox's [wireless] experiments, while not conclusive, show progress in the right direction and it seems clear that only time and money are required for him to work out some solution that will be eminently practical and decidedly useful to the Forest Service."³⁸

The first documented efforts to demonstrate the usefulness of radio on a large scale were completed by R. B. Adams. Ring Bell Adams' interest in radio was coincidental with his interest and background in telephone. G. M. DeJarnette recalled that Adams, who gave him "so much hell" for the way he built his first telephone line, was also "... the first man I ever heard predict the [routine use of] radio for our communication, and that was almost before 'radio was'."³⁹ Adams recalled that it was not until the spring of 1917 that he "... felt that there were strong possibilities in the use of ground radio ..." on the National Forests.⁴⁰ Because of the absence of radio-telephone (voice radio), which had to wait for an improved vacuum tube, Adams did not urge wireless for general field use until the winter of 1919,⁴¹ after the success of radio during World War I. He then decided to broach the subject to the Chief Forester, Henry S. Graves, and was subsequently invited to Washington to confer with the Signal Corps and the Navy Department. Through the courtesy of Graves, Adams was able to borrow four SCR-67A's for experimental work. He shipped two to District (Region)

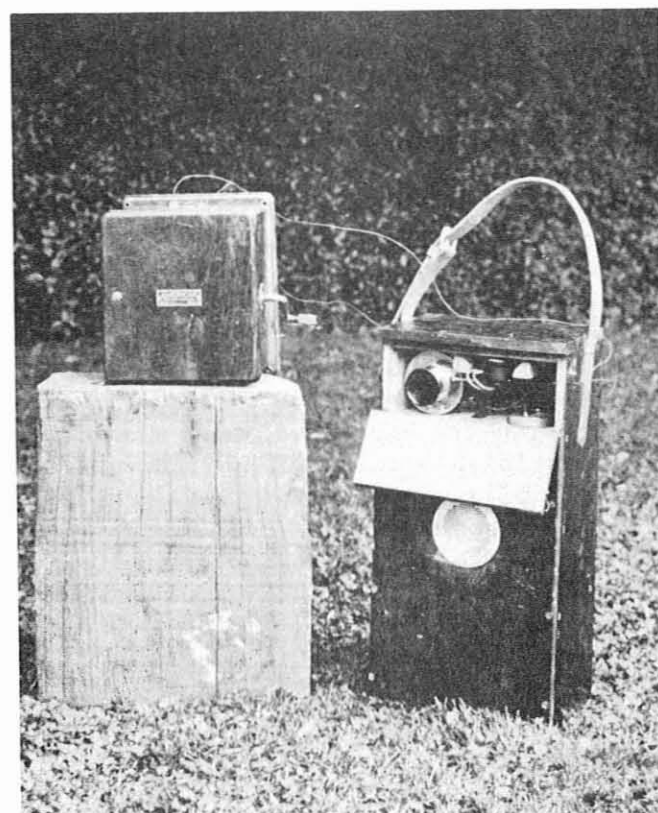


Figure 20. U.S. Army SCR-67A radio used by Forest Service in trial on Mt. Hood National Forest, Ore., 1919-20. (NA:95G-38733A).

6 for Clay Allen to use between Mt. Hood and the Zig Zag Ranger Station 12 miles away.⁴² He kept the others for his experiments.⁴³

Preliminary tests at Mt. Hood, Ore., proved satisfactory after a bamboo antenna mast was constructed to withstand wind speeds of 70 to 80 miles per hour and frequent sleet storms. In the conversations between the sets approximately 10 miles apart, "... the voice carried very clearly and was about as loud as over a wire line."⁴⁴

In the meantime, the radios were set up to test the efficiency of the sets between Mud Creek Ranger Station near Lolo Hot Springs, Mont., and Beaver Ridge, Idaho, an airline distance of 12 miles.

Adams was worried by predictions that radios would be adversely affected by the proximity of "mineral zones," timber, and terrain, so the sites, separated by the Bitterroot Mountains Divide, promised an adequate challenge.⁴⁵ Adams called for a moratorium on other Forest Service radio experiments and purchases until the tests were complete. Then, with Everett Cutting assisting at Mud Creek, he set about transporting the equipment by a train of pack horses to the selected sites.⁴⁶

One of the most trying tasks was moving 270 number 2 Burgess batteries necessary for the 350 volts of required plate potential, along with an Adams-designed dynamo for recharging, over 30 miles of trail. The trip proved the near undoing of the project. Quoting from Cutting's diary, Adams recounted the experience:

July 8, 1919. Started out 7:30 A.M. with storage batteries, Beaver Ridge, over trail 30 miles long. Ate dinner Brush Fork then started up ridge. Had awful time. Windfalls very bad and rocks were everywhere predominate [sic]. The slope was unreasonable. After about an hour's time we had made very little progress. One pack horse (the last one) started pulling back. She kept pulling until she pulled the rest of the horses over and all rolled down the mountain about 100 feet to where a tree stopped them. Finally righted them again and started up. In a short time the horse repeated the performance, and this roll completely put the storage batteries out of commission, the electrolyte having completely run out.⁴⁷

One week later on July 14, a set of new batteries arrived, and communication was established the following morning.

These sets were operated continuously and amply demonstrated the practicality of radio during the 1919 summer fire season. One important incident occurred in late August when fire surrounded Beaver Ridge and threatened destruction of Cutting's radio camp. Perhaps recalling the difficulties encountered in the earlier stages, Cutting built a small raft, floated the set to the middle of the lake, and then beat a hasty retreat. When the fire was under control, he returned the set to the lookout and reestablished immediate communication. "An interesting contrast is shown here," reported Adams, "by the fact that a telephone line on the Clearwater Forest was destroyed by fire the same day, and it was not possible to restore telephone service for several days, even temporarily, due to the fire along the trail and the necessity of using a large crew to accomplish the work ..."⁴⁸

In summarizing the results of the 1919 fire season, Ring Bell was very optimistic about the future of radio in the Forest Service. He pointed out the problems of static interference, transportation, battery recharging, and the necessity of leaving the sets on to receive signals. But he believed further experimentation could eliminate these inconveniences. After obtaining "excellent results" between the two stations which had 6 miles of heavy vegetation between them, he became satisfied that radio could be used in timber. Radio signals also provided "excellent" results over intervening high ridges. He gave similar praise to operation of the SCR-67A's in "mineral zones."⁴⁹

However, Adams was still hesitant to recommend the total replacement of telephones by radio. He recommended a study of the 27,000 miles of Forest Service telephone lines to determine where it would prove economical to

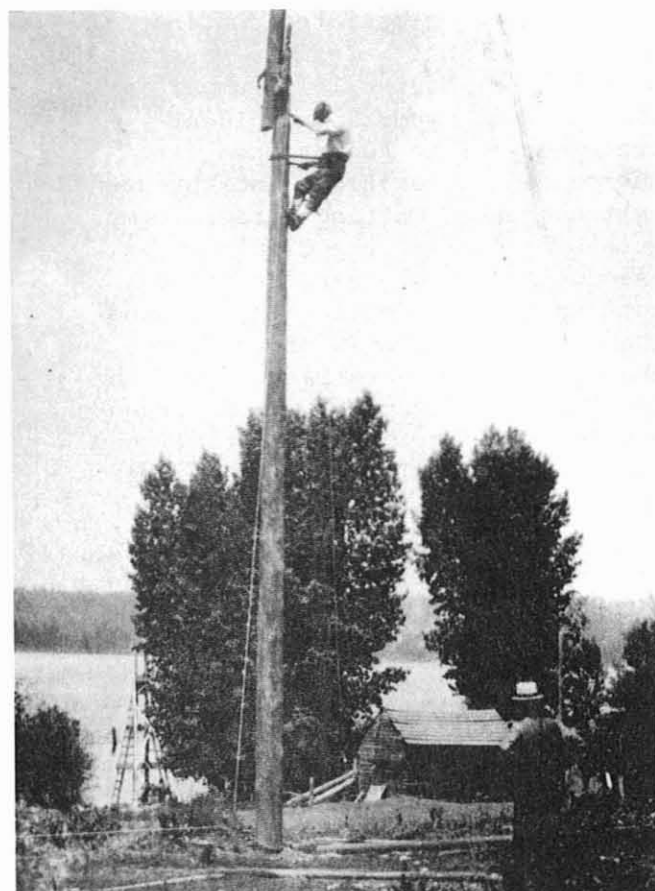


Figure 21. Completing final splice on antenna jib at supervisor's office of Idaho (now Payette) National Forest, McCall, Idaho, 1921 or 1922. (NA:95G-170649)

replace them with wireless, and also continued tests the following season. Adams prepared for the tests by shipping the four high-powered sets to Thunder Mountain in District (Region) 4 where "... it is believed that the hardest possible test that could be given the radio telephone will be carried out ..."⁵⁰ Similarly, he forwarded a copy of his report to the Signal Corps along with a request for the loan of 24 additional sets. He planned to distribute these additional sets among Districts (Regions) 1 through 6 with the intention of inaugurating radio on a Servicewide basis.⁵¹

Not only did the Signal Corps deny his request--Adams ended up with five SE-1370 transmitters and five SE-1414 receivers from the Navy--but his plan to use radio in the six Districts (Regions) fizzled before it began.⁵² The chief problem proved to be improper wiring of the SE sets. Pressed for time, Ring Bell could not figure out the error before the fire season was underway. In addition, the previously operable SCR-67A's on Thunder Mountain took a beating in shipment and needed repair. Without trained operators to get the "delicate equipment" working, there was little to do but wait for the 1921 season.⁵³

The tests for the 1921 fire season were conducted with the Navy's SE equipment between Moore's Ranger Station on the Nez Perce National Forest and the town of Warren, Idaho, a distance of 43 air miles. A third set was also installed at Edwardsburg, Idaho, but operated for only a short period before it had an "unfortunate accident." The remaining sets operated effectively during the entire fire season, "... and the results obtained were all that could be desired" during the handling of some 200 official messages.⁵⁴

Forest Service Cools Toward Radio

Although "R. B. provided it would work over reasonable distances,"⁵⁵ the Washington Office had decided that any further schemes for improving fire detection with radio including Air Service patrols and Adams' tests, would be difficult to justify. In fact, Roy Headley, Chief of Operation, was a little put out at the results. When District (Region) 3 requested either telephone or wireless on the Prescott National Forest, Headley said no to both. The Thunder Mountain Project, he resoundingly declared, had, "... demonstrated conclusively that

wireless is a pretty complete failure in any ordinary scheme of Forest administration and protection." While he might agree to the transfer of equipment, Headley warned District (Region) 3 that he would "... be inclined to regard any money spent on the transportation and use of this equipment as good money thrown after bad." If this were not strong enough for anyone in the Forest Service who might still harbor positive thoughts about wireless, Headley pointed out that the Washington Office wanted no more "good money" spent until electrical engineers and electrical equipment companies developed wireless beyond its present limitations.⁵⁶

The main lesson learned by the Washington Office during the 1919, 1920, and 1921 fire seasons was that radio as a communications tool was expensive--at least on a limited Forest Service budget. To demonstrate that two complete wireless stations could be installed, as Adams had said, for \$2,000 to \$2,500 less than a comparable telephone line⁵⁷ was of no significance if "unfortunate accidents," "delicate equipment," and "mis-wirings" resulted in inoperable equipment. Similarly, radio air patrols were of no benefit if, after 3 years, they "... were not found to produce results in first discoveries of fire great enough to justify the burden of keeping it up."⁵⁸

Thus, by early 1923, Headley was in no mood to overlook the realities of radio use. In what amounted to a minor hand slap for the Intermountain District (R-4), he requested a "permanent record" be kept of the problems encountered at Thunder Mountain. "It is a pretty sad story if we allow the incident to drop out of sight without the making of any permanent record which can be used in future to guard against similar expensive projects," he wrote.⁵⁹

In retrospect, the Washington Office probably took radio about as far as it could go in the late teens and early twenties. With two decades of development behind it, telephone had the advantage of being a proven, reliable instrument for point-to-point communication in spite of its shortcomings. The Adams demonstration that a relatively powerful, heavy radio set could transmit messages paralleling telephone lines was not of particular significance to the Forest Service's first line of defense. Smokechasers would still have to make their way to a fixed-base radio. Airplanes did show greater potential for filling the void between the time of first sighting and immediate action, but air-to-ground radio technology left too much to the imagination in 1921 and promised to be a very expensive tool to develop. Another serious barrier was the lease agreements with A. T. & T. that forbade competition, wireless or otherwise, for point-to-point communication.

Thus, the Forest Service considered further experiments potentially harmful, if not economically damaging, to a host of other Forest programs. Until technology could provide a communication device that was as economical, portable, speedy, and rugged as a carrier pigeon, the Forest Service would remain cool to any new radio schemes. As Roy Headley told the District (Regional) Forester in Albuquerque, "So much money that we need for other things has gone into wireless that I am not inclined to be open-minded on the subject at the present time."⁶⁰ The present time, for the Washington Office, lasted 5 years.

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8. Slonaker, "Report," p. 10.
9. Slonaker, "Report," p. 7.
10. Slonaker, "Report," p. 8. The Signal Corps also acknowledged receipt of the message, by telegram.
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15. "Radio Helps Fight Forest Fires," *Radio APCO Bulletin* (Association of Police Communication Officers) 29, no. 4 (April 1963): 14.
16. R. B. Adams, "The Use of Radio Telephone in the Forest Service" (Paper presented at the Missoula Section, Society of American Foresters, Jan. 22, 1923), pp. 15-16; Forest Service, *Service Bulletin* 5, no. 21 (27 June 1921): 13; and typed report, no title or date, National Archives and Records Service, Seattle, Wash., File 66742, "USFS - Region 6 - Cooperation."
17. Forest Service, *Service Bulletin* 5:21, 13.
18. Hardy, "Aircraft," p. 26.
19. Hardy, "Aircraft," pp. 25, 27.
20. Erle Kauffman, "Flying Foresters," *American Forests and Forest Life* 26, no. 4 (April 1930): 198. This was also reported as 772 preliminary sightings in the August 1921 issue of *Radio News*. A single daily flight was also conducted over the Coronado National Forest in Region (District) 3, between the Army base at Nogales and Tucson, Ariz. It was arranged by the Tucson Chamber of Commerce, beginning May 25, 1921. Radio communication was to be maintained by the plane throughout its flight. See Forest Service, "Aerial Patrol in District," *Service Bulletin* 5, no. 20 (6, 13, 30 June 1921): 14.
21. Adams, "Use of Radio Telephones," p. 15.
22. W. C. Goldsborough, 1st Lt.-Air Service, and recommendations by Lt. Col. W. E. Gilmore, "Airplane Forest Fire Patrol Report--Season of 1922." Typed copy, (n.d.) National Archives and Records Service, Seattle, Wash., File 66742 and Hardy, "Aircraft," p. 31.
23. Robert W. Ruhl, "Fighting Forest Fire From the Sky," *Leslie's Illustrated Weekly*, 24 September 1921, p. 412.
24. Hardy, "Aircraft," p. 31.
25. Goldsborough and Gilmore, "Airplane Forest Fire Patrol Report."
26. Goldsborough and Gilmore, "Airplane Forest Fire Patrol Report."
27. Kauffmann, "Flying Foresters," p. 198. This might have been Kauffman's paraphrase or summary of Gilmore's remarks. Hardy, "Aircraft," p. 31.
28. Goldsborough and Gilmore, "Airplane Forest Fire Patrol Report," p. 10.
29. Hardy, "Aircraft," pp. 32, 33.
30. Hardy, "Aircraft," p. 33.
31. Hardy, "Aircraft," p. 34.
32. Hardy, "Aircraft," p. 36.
33. Hardy, "Aircraft," p. 37.
34. Hardy, "Aircraft," p. 38.
35. "Air Patrol Program-1926," Dec. 15, 1926. Typed copy under signature of Assistant District (Regional) Forester A. O. Waha, C. J. Buck's supervisor (R-6), National Archives and Records Service, Seattle, Wash., File 66742, "USFS - Region 6, F-Cooperation."
36. "Air Patrol Program-1926."
37. This theory was suggested by communication officers of a decade later. See my interviews with Wilbur Claypool and William Apgar: Wilbur Claypool, interview with author in San Antonio, Tex., July 1978 and William Apgar, interview with the author in Sun City, Ariz., January 1978.
38. T. D. Woodbury, "Monthly Report for April, 1916," to the Forester, April 1916 (National Archives, Washington, D.C., Record Group 95G, Records of the Forest Service, Row 1, Section 17, Drawer 103, "File D-5.").
39. G. M. DeJarnette, "Recollections," *Early Days in the Forest Service* (Missoula, Mont.: U. S. Department of Agriculture, Forest Service, Region 1, 1976), 3:60.
40. Adams, "Use of Radio Telephones," p. 2.
41. R. B. Adams, like many others, held the belief that telegraphy required expert operators. See Adams, "Use of Radio Telephones," p. 20.
42. *American Forestry* 25, no. 7 (July 1919): 1244.
43. (R. B. Adams), (n.p., n.d.), Gaylord Knight Collection. The author is purported to be R. B. Adams. The text, however, suggests a Washington Office document intended for publication

and written, or rewritten, by other than Adams. The contents are consistent with other accounts of the time.

44. "Foresters Test Wireless Phones," *American Forestry* 26, no. 4 (April 1920): 254.

45. Adams, "Use of Radio Telephones," p. 3 and (Adams).

46. R. B. Adams to District (Regional) Forester, 28 June 1919, National Archives, Washington, D.C., Record Group 95G, Records of the Forest Service, Row 3, Section 20, Box 12, "Division of Engineering, Records of Regional Office, #7."

47. Adams, "Use of Radio Telephones," p. 3.

48. Adams, "Use of Radio Telephones," p. 5 and R. B. Adams, "Memorandum for the Forester," 14 February 1918, National Archives, Washington, D.C., Record Group 95G, Row 2, Section 14, Box 18, "USFS - O, Improvements, Telephone."

49. Adams, "Memorandum," p. 3.

50. Adams, "Memorandum," p. 3.

51. J. R. Riggs, Acting Secretary, U.S. Department of Agriculture to Secretary of War, 23 March 1920, National Archives, Washington, D.C., Record Group 95G, Row 2, Section 14, Box 18, "USFS - O, Improvements, Telephone."

52. R. B. Adams to Roy Headley, 13 April 1920, p. 6, Gaylord A. Knight Collection. General Electric modified these sets for 800 to 1,000-meter use.

53. U.S. Department of Agriculture, Forest Service, *Service Bulletin* 5, no. 28 (15 August 1921): 2, 3. The comments on the inoperable sets were in Roy Headley to Lt. Rash, Camp Alfred

Vail, New Jersey, 17 January 1923, National Archives, Washington, D.C., Record Group 95G, Row 3, Section 20, Box 22, "USFS - F, Control, Equipment, N-R."

54. Adams, "Use of Radio Telephones," p. 5.

55. Clyde Fickes, interview with the author in Missoula, Mont., May 1978. Mr. Fickes assisted Adams in the 1921 experiment.

56. Roy Headley to District (Regional) Forester (R-3), 28 November 1922, National Archives, Washington, D.C., Record Group 95G, Row 2, Section 14, Box 18, "USFS, O-Improvements, Telephone." By the following spring, Headley had softened somewhat and allowed an experiment with the SCR-67A's on Medicine Bow Peak, Wyo. See Roy Headley to W. A. Wheeler, USDA Bureau of Agricultural Economics, 27 April 1923; and M. L. (Loveridge) to R. H. (Headley), 18 April 1923, both National Archives, Washington, D.C., Record Group 95G, Row 2, Section 14, Box 18, "USFS, O-Improvements, Telephone."

57. Adams, "Memorandum," p. 12.

58. Headley to Rash.

59. Roy Headley to District (Regional) Forester, Ogden, Utah, 17 February 1923, National Archives, Washington, D.C., Record Group 95G, Row 2, Section 14, Box 18, "USFS, O-Improvements, Telephone."

60. Headley to District (Regional) Forester (R-3), Albuquerque, N.M., 17 February 1923, National Archives, Washington, D.C., Record Group 95G, Row 2, Section 14, Box 18, "USFS, O-Improvements, Telephone."

Chapter III

Dwight Beatty:

Selling the Forest Service on Radio

Late one afternoon, in a park-like grove of timber near Missoula, Montana, during the spring of 1927, a small group of men studied with interest a crude little contraption of coils and condensers built around a single 199 radio receiving tube. Attached were a couple of small copper wires, one stretched some 20 feet high by cords thrown over convenient limbs and the other stretched between trees close to the ground. These wires served as an antenna system for the apparatus which in spite of its small size was a fairly efficient radio receiver and code transmitter. The author had constructed it to check-up the possibilities of extremely low-power radio communication in the woods with the idea of using it to supplement the regular Forest Service telephone communication system.

- Dwight L. Beatty¹

This description, the opening paragraph in Dwight L. Beatty's lengthy 1931 report, "Radio Communication in the National Forests," recounted the demonstration that rekindled Roy Headley's interest in wireless. The author, a 20-year veteran of Region 1, had acquired an interest in radio while progressing from Forest Ranger, Deputy Supervisor, and Supervisor of three National Forests to the rank of Inspector in the Office of Operation at Missoula.² Convinced that ultralight radio could serve as a valuable communication tool for ground personnel, Beatty had set out in 1925 to educate himself on the intricacies of radio and to design a lightweight code transmitter-receiver.³ This

interest culminated in the impromptu demonstration in mid-August 1927 of the "crude little contraption" for Headley, Washington Office Chief of Operation; Colonel William B. Greeley, Chief Forester; Earl W. Loveridge, Headley's assistant; and several District (Regional) personnel attending a fire conference in Missoula.

Beatty was remembered as a pleasant, impressive individual, large in stature and with a good husky build. He was described as meticulous about Forest Service regulations, although he was not averse to a roaring night on the town with a close friend. His attention to detail is reflected in a number of his studies and experiments and in his penchant for considering every possible situation that might affect an outcome. To him, such details as turning a vehicle around "just in case a fire started and you came out in a hell of a hurry," were not matters to be overlooked.⁵ Always curious about the ability of firefighting crews to control a major conflagration, he sought to design and construct aids that provided an improved margin of effectiveness. One of his designs, a trail grader, eventually proved to be "... an advantage on practically all trail construction projects at a great savings in trail construction costs in comparison with hand labor."⁶

At Missoula, Beatty had selected a wavelength of approximately 200 meters for "an old 5-watt army phone" at his residence and the "crude little contraption" a short distance away.⁷ This home-built set--complete with batteries, phones, antenna, and counterpoise--weighed less than 7 pounds. After taking about 15 minutes to set up the rig, Beatty "... tuned up the transmitter and began pounding out the call with the [telegraph] key mounted on the baseboard of the set."⁸ After sending the call several times to a