

51. Horton, "Inspection Memorandum."
52. Knight, interview with author.
53. G. H. D. [Duvendack], "Communication Inventory-F. S.," 18 November 1947, mimeographed, Gaylord A. Knight Collection. These figures were plotted for 1947.
54. Lyle F. Watts [Chief] to Regional Foresters and Directors, 16 November 1950, Gaylord A. Knight Collection.
55. Conarro and Lawson, "Report," p. 10.
56. Harold K. Steen, *The U.S. Forest Service: A History* (Seattle: University of Washington Press, 1976), p. 234.
57. Knight, interview with author.
58. Horton, "Inspection Memorandum."
59. Logan [Belleville] to Harold [Lawson], 29 August 1945, Gaylord A. Knight Collection.
60. Biggerstaff, interview with author.
61. William B. Morton to Dennis Roth, Forest Service History Section, 18 April 1980, History Section files.
62. Knight, interview with author.

## Chapter XIII

### Putting the Pieces Back Together:

#### Postwar Adjustments and FM Radio

*With the transition of FM and the adoption of myriad [sic] improvements developed during the war, the Forest Service has reached a most important crossroads in its communications development program. It is important, therefore, that all interested factions understand and agree upon the various aspects of the developmental work and its application in the field.*

- David S. Nordwall<sup>1</sup>

By the end of World War II, Harold Lawson had invested 14 years in the development of Forest Service communication systems. The temporary concentration of Radio Laboratory efforts on the AWS had not diverted him from the original goal of the design program as he watched wartime technological advances broaden the chasm between the prewar accomplishments and postwar requirements. The rapid advance of technology reemphasized the need to be prepared for peacetime conditions. Many new techniques and new discoveries would have to be assimilated into the design goals of the Laboratory.

Lawson frequently updated the projected Laboratory work plans while supervising AWS production and testing. Through Regional inspections, special studies, and concept papers on probable applications, he could compare the present status of Forest Service communication with the probable future requirements of the Laboratory. The 1944 working plans emphasized his perception of the Laboratory mission if the war ended before too long. He looked at the prior restraints on network use vis-a-vis a "policy for use of radio for point-to-point communication in view of new agreement[s] with A. T. & T."

Lawson also gave thought to investigating "new developments in the radio field," "the perfection of the automatic relay," and the preparation of sample "Forest Radio Communication Plans." The emphasis upon "continued development [of] light weight portable radio in cooperation with Fire Control ..." also received attention. In fact, he went one up on the previous definition of portability by devising the following new yardstick for simple, rugged, and reliable portable radio equipment:

#### The Yardstick for Portable Radio Equipment

1. Light. Is it light enough to be readily carried or moved about?
2. Small. Is it small enough to be readily carried or moved about?
3. Simple. Is it simple enough to be operated by regular personnel without a long course of instructions?
4. Rugged. Is it rugged enough to withstand the shocks normally encountered by fire equipment?
5. Dependable. Does it always work when you need it?

Lawson was anxious to continue the application phase of radio after the war. The ultimate objective of the Laboratory effort had been full acceptance of radio. But the issues of interference, point-to-point use, administrative radio, and portable radio for the fireline had evolved into major areas of disagreement before the war, limiting certain applications. He did not wish to see this pattern repeated. Each issue could be handled if kept in proper perspective.

The Laboratory had been opposed to point-to-point contact only when the process violated A. T. & T. lease agreements. If the agreements were cancelled, this means of communication would now become part of the Laboratory plans. Administrative communication, per se, did not threaten Laboratory philosophy unless portable radio became a casualty of the budget process. Ever since Squibb and he had brought the first vhf sets into the light of day, Lawson had always believed that a combination of 100-meter, low-power hf radios for fire control and 10-meter, low-power vhf radios was the best possible mix of communication systems for adminis-



Figure 120. A fire scout with his lightweight SPF set. Note pulaski (grubhoe-axe firefighting tool), shovel, canteen, and bedroll in foreground. (Forest Service photo, History Section)

tration. The activity of one would not interfere with or overpower the other; they were complementary. Establishment of highly effective Regional networks at reasonable cost and without use of excessive power had become feasible with the design of the Laboratory repeater. He also supported this project. Otherwise there would have been no reason to include the RRS in the Forest Service radio repertory. Extended vhf communication had no purpose unless distant contact was intended.

#### Radio No Longer a "Stepchild"

These considerations were with Lawson when he set out in 1944 to inspect the western National Forests with Ray Conarro. Lack of a policy tying together all possible radio applications had been an unnecessary source of difficulty for the Laboratory. Lawson used the 1944 Forest inspection report as a forum for his views. He recalled the advantages of decreased fading and static, virtual 24-hour use, and relatively short antennas on the 10-meter vhf bands. He reevaluated the Laboratory 10-meter work plan. He called for an intensive design effort to remove the prewar obstacles of weight and form in the portables and an improvement in the physical and electrical reliability of the semi-portables and fixed-base units. For the first time, he stated in print that radio should no longer be the "supplemental" stepchild of telephone. In its sphere of application, Lawson hypothesized, vhf was an effective and efficient tool in the firefighter's arsenal. It could fill the void created by the 3-MHz primary-user status of the military.

To gain support, he canvassed National Forest personnel. He posed a situation where lookouts and Ranger District offices were provided with

enough vhf radios to achieve 75 to 90 percent reliable fire-control coverage over the average District. In such a case, he pointed out, the telephone lines previously serving the lookouts would be eliminated; the telephone system would be retained only from the Ranger District level up to the Regional office. Lawson noted that this plan was "enthusiastically received" by those who had a chance to review vhf use in this manner. "It is believed," he further reported, "that the Radio Laboratory now has sufficient background of accumulated experience to produce the desired equipment." The only obstacles were the lack of funds and a decision by the Washington Office to commit this plan to policy.<sup>3</sup>

Conarro and Lawson proposed 22 remedies to the Chief of the Forest Service. They began with the establishment of Regional communication positions and ended with a plea for taking radio out of "the Jim Crack, the toy, the play thing class" in Forest Service communications systems. They asked the Chief to accomplish this through effective leadership; a positive, progressive, Servicewide program, and sufficient funding.<sup>4</sup>

Conarro and Lawson also submitted a separate, unofficial report to the Missoula Regional office. The two inspectors reviewed Missoula's justification for the Regional radio network maintained by Clarence Westcott in Apgar's absence.<sup>5</sup> Neither inspector would support the Region 1 claim that telephone use was inherently more expensive than networks for administrative communication or that busy telephone lines created inordinate delays. At their request, the Regional office submitted a separate accounting of its claims, indicating an annual cost of \$2,080

on toll calls between the Regional office and its National Forests in 1943.<sup>6</sup> But there was no way the Region could determine toll savings on messages handled by the administrative network. Lawson and Conarro expressed doubts that a comparable reduction in toll charges would offset the estimated \$3,000 to \$5,000 annual operating costs for station KBCX.

The study also disagreed with the Region's contention that placing long-distance telephone calls was time-consuming. Checking with the Regional office switchboard operator and inspecting toll-call record sheets, the inspectors learned that "the preponderance of calls are completed in from one to three minutes and in those entries involving delays of one or two hours ..., in every known case, the called party was not immediately available to the telephone."<sup>7</sup> Region 1 would have to find grounds other than time or money if it intended to justify the existence of the radio network.

It was no secret in Forest Service communication circles that Region 1 had implemented its Regional network at the cost of portable radio for the fireline. Piqued by what he considered the Region's long practice of withholding or presenting information so that Rangers might develop a prejudice toward the concept of portability, Lawson used the 1944 inspection to try some reverse psychology. When asked, "What is the most important service radio can provide on your district?", the near-unanimous answer was "inter-district communication." But when the Rangers were asked if they were interested in "on the job" communication, the answer was universally, "Yes, it would be [the] first priority if simple portable equipment was available." Given the existence



of this equipment for 10 years, and the promise of better equipment in the future, Conarro and Lawson forewarned Missoula that its "limited fire use of radio, together with the 'lukewarm' attitude of many field men towards radio, is undoubtedly the result of the intensive Regional network attitude, while local applications have failed to receive adequate assistance, or the initiating introduction needed from the Regional communications man."<sup>8</sup>

#### Chief Watts Strengthens Radio Policy

The Washington Office indicated late in 1945 that a change in the Radio Laboratory mission would take place. Lyle F. Watts was in the Chief's position, having moved there in January 1943 from his post as Regional Forester in Portland. William P. Kramer, formerly in charge of Lands in Region 8, had been in charge of the Washington Office Division of Operations since 1938. Watts was well aware of the Laboratory's problems and decided to establish a stronger radio policy. In an official statement, he left administration of the program with the Region 6 Regional Forester, but "under specific guidelines" from Washington. The major change was a 3-year, advance planning program. Each triennial, the Laboratory was to submit its recommendations to the Washington Office, which would then incorporate suggestions from the Regions and reissue the document under the Chief's signature. Any later Regional problems or special equipment requests were to be submitted to the Laboratory for its analysis and approval. Radio Laboratory training sessions for regional radio technicians were expected to "...provide the means to obtain uniform acceptance and application of approved policies and procedures."<sup>9</sup>

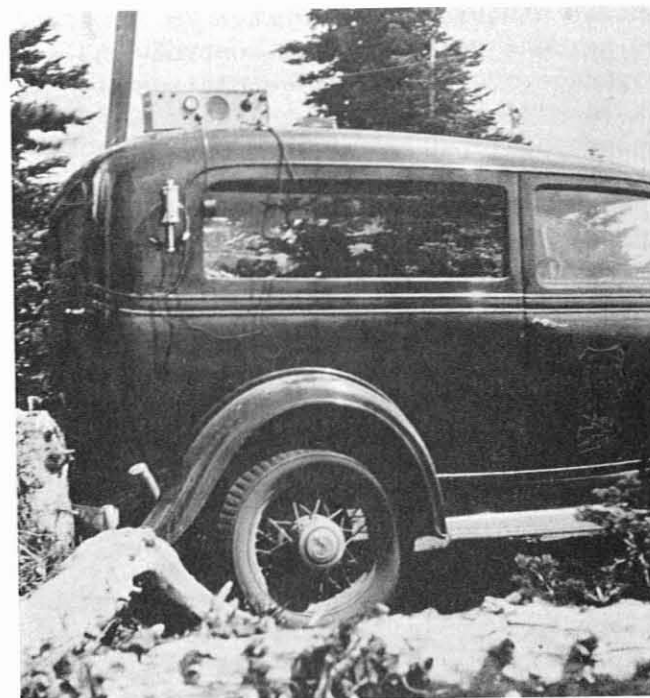


Figure 121. An early means of achieving vhf mobile radio operation. (Forest Service photo, History Section)



Figure 122. Establishing a fire base radio communications center, ca. 1940. (Forest Service photo, History Section).

Regional communications after World War II varied among Regions in a manner reminiscent of the prewar era. Region 6 perhaps gained the most because of the continued presence of the AWS. The conversion to peacetime operations for Bill Claypool meant maintaining and updating the AWS

acquired facilities.<sup>10</sup> Gaylord Knight had already been informed of the new role of radio in the Southern Region,<sup>11</sup> and a similar role at a lower level was planned for Francis Woods in the Intermountain Region.<sup>12</sup>

It would take several years before finances caught up with expectations in either Regions 4 or 8. Efforts in the Southwestern and Eastern Regions (R-3 and R-7) continued to be limited, and it would take time for these Regions to approach the communications levels practiced elsewhere in the Forest Service. After Guy Wood's assignment to the AWS project was terminated, he was appointed the communications officer for the California Region (R-5). Shortly after, he pooled all of the 10-meter Forest units, including the AWS sets and some additional KU-R/KU-T2 mobiles, and redistributed them in accordance with Regional plans to establish a vhf network on each Region 5 National Forest. "This was the start," wrote Wood, "of a concerted effort in R-5 to prove to the Forests, and others, that 30- to 40-MHz radio communications systems could be a most valuable tool in forest administration."<sup>13</sup>

When Bill Apgar returned to the Northern Region from military duty, he was reassigned to his earlier Regional communication position in Missoula. The Conarro-Lawson 1944 inspection report was one of the first documents requiring his review. He noted his approval or disapproval of several paragraphs with initialed comments. Across the bottom of the first page, he wrote: "This so-called study is rather pathetic. Twelve days in a Region (6 in the field) is hardly sufficient time to even begin to know anything."<sup>14</sup>

Apgar had not changed his opinion on the value of Regional networks during

his military absence, but times had changed. Chief Watts' memo meant he no longer was free to proceed without Portland's approval. Watts and Kramer had closed the loophole that had for so long allowed each Region to go its own way in communications, regardless of consequences. Pressed for justification after Conarro's and Lawson's report weakened his time and money argument, Apgar reviewed Lawson's earlier 1940 inspection report. Here he found, "based entirely on technical considerations and without reference to policy," Lawson's agreement to increase the power of KBCX if the network concept were approved by Washington. Lawson's position was adamant, and he had demonstrated convincingly to Apgar the value of portable 10-meter radio for Region 1 fire control.<sup>15</sup> The conclusion was obvious. If Region 1 intended to pursue the network concept, it would have to concede to portable radio for the fireline.

Apgar drew up new Region 1 network plans after a telephone call to Portland in which Lawson reaffirmed his earlier recommendations. Washington was asked to approve a Regional network between Forest Supervisors' offices west of Missoula and the Regional office. Radio (vhf) would be used to connect the Supervisors' offices with all the National Forests, including mobile equipment. A mix of hf Regional communication and vhf National Forest communication would take place for the first time in Region 1. Furthermore, Apgar conceded in his IRAC application that "vhf [is] to be used on fire suppression and [for] smoke jumpers."<sup>16</sup>

The IRAC "Application for Frequency Assignment" from Region 1 requested a power increase to 500 watts on 3,250 kHz, and 250 watts on 5,902.5 kHz at

Missoula and 13 Regional locations. The primary justification was lack of satisfactory wire (telephone) facilities between the proposed stations and sparsely settled areas. But Region 1 also replaced its weak argument for savings of time and money. The argument now was three-fold: The Region had come to rely on the Missoula smokejumpers as a first-strike force in fire control. Communications with airplanes precluded telephone communication lines. A network radio facility required "...the intense use of aircraft for putting men and supplies into remote areas of fire fighting work."<sup>17</sup>

#### Region 1 Granted Power Increase

Kramer notified Region 1 of the IRAC concurrence on February 19, 1946. "Full cooperation" of the Region was expected in return. To effect the plan, Missoula would give up all but two of its 3-MHz frequencies, aside from two for exclusive use, in order to replace the loss to surrounding Forest Service Regions by interference caused by the Region 1 power increase. Full use of the 500-watt authorization was restricted by limiting some existing fixed-base stations to their present power. "Also," Kramer reminded the Region, "we must ask that you make every effort to use vhf wherever possible."<sup>18</sup>

Apgar set out to implement his Regional network by purchasing an autotune, 10-channel, 300-watt Collins 16F-9 transmitter and a few Wilcox fixed-frequency receivers. This news proved disconcerting in Portland. The Collins set was 10 times the cost of the Forest Service type M set. By ignoring the new consultation procedure with the Radio Laboratory, Region 1 apparently overlooked less costly options and short-circuited Laboratory oversight and concurrence.

Many surplus military radios were made available for transfer to civilian Government agencies after World War II. They had a wide range of applications and eventually provided the Forest Service with some very useful communication devices, especially since they were available for only the cost of transportation, repair, and modification. The military type TDF, for example, was a fixed-base unit of about 200 watts that had been tested and accepted by the Radio Laboratory. Its relative cost and performance brought up the hard question of why it was necessary to spend \$4,000 on a Collins set when the inexpensive surplus set would serve just as well.<sup>19</sup> Apgar, quite expectedly, maintained that the higher power of the 300-watt Collins was needed in Region 1.

Lawson assigned Fred Biggerstaff to make an onsite comparison of the two sets. The test ground was to be between Orofino, Idaho, and Missoula, a distance of some 110 miles. When Biggerstaff arrived at Orofino, he uncrated the TDF, put the sets side by side, rigged a switching device, tuned the finials, and put in a test call to Portland about 400 miles away. He obtained the following results at noon while operating on both 50 and 100 meters:

#### TDF/Collins 16F-9 Transmitting Comparisons<sup>20</sup>

	3250 kHz		5902.5 kHz	
	Collins	TDF	Collins	TDF
I <sub>out</sub> [watts]	300	200	295	210
S <sub>meter</sub> [Portland]	7	6 3/4	8 1/4	7 3/4

Biggerstaff was confident that the 3 to 2 power differential favoring the

Collins would be insignificant when tested from Missoula, and a major disagreement with Region 1 would be settled. The results of the test were cogently recorded in the following entry from his field diary:

Friday, 12-6-46

Met with Crocker and Space shortly after 8 AM until 10:30 AM. Discussed communications problems and secured a disinterested listener Mr. Noel to judge the performance of the tests to be conducted at 2:00 PM. Went to Apgar's office and asked to have a buzzer and batteries supplied and explained there would be a test at 2:00. He promised to assist all possible and then tried to delay any progress. I finally ordered him flatly to get buzzer and batteries and to have them there and tested by 2 o'clock. He muttered something to the effect that I wanted a lot of things but he started getting the staff together and agreed to take me to the station at 1:00. I talked to Portland and then hooked up the buzzer and ran a few tests. At shortly after 2 Mr. Noel came in and the tests were run first without noise and then with noise in increasing amounts. The TDF outperformed the Collins in every respect. Bill [Apgar] produced a set of elaborate graphs of S meter readings taken over two days showing approximately 1/2 S-meter division separation and made the statement that at certain critical periods that would mean getting a message through or not getting through. I told him he was wrong and he could not deny it. Returned to Crocker's office and spent the rest of the afternoon with him,

Space, and Fred Waite who also witnessed the tests. The results of the tests preceeded me [sic] to the office for Crocker was in definitely a different frame of mind and open to any suggestions.<sup>21</sup>

The Region ended up keeping the Collins transmitter anyway, but it did purchase Army TDF transmitters for many of its western Forests' headquarters.<sup>22</sup>

With the advent of frequency modulation (FM) radio and Chief Watts' postwar order for a 3-year work plan, the Radio Laboratory was faced with a decision unlike that of the mid-1930's. When 10-meter operation was proposed, not enough 100-meter equipment was available in the field to make a major change. Then, too, vhf fulfilled a need that did not conflict with the hf operation. But in 1946, the need to plan ahead complicated the issue and the incompatibility of AM and FM sets made the decision more difficult.

FM radio had not been used extensively until Fred Link Radio Company produced an FM system for the Connecticut State Police in 1940.<sup>23</sup> It also found application during World War II in the military services, and in some circles it gained a reputation as being preferable to AM broadcasts. Yet early FM had one major weakness that some engineers believed offset its advantage to produce a high signal-to-noise ratio from moderate strength signals. It required a wide band width for the transmitted signal and was considered a "spectrum waster" by those such as the Forest Service where frequency abuse was not treated lightly.<sup>24</sup>

The Radio Laboratory considered the alternatives. Because many Regional radios were now obsolete, it was an opportune time to make the transition



before reinvesting in AM. The decentralized pattern of administration also favored FM. With the emphasis on National Forest use, as opposed to Regional networks, replacement could take place gradually without a large capital outlay. By moving all AM equipment from one Ranger District into adjoining Districts and equipping the first District with FM, satisfactory communication could continue. The remaining AM Ranger Districts could be similarly converted as funds became available.

Another factor was increasing Regional emphasis on FM mobile and airplane communication. Clarence Westcott had already completed preliminary aircraft installations in Region 1<sup>25</sup> and Gaylord Knight had acquired Lawson's permission to purchase and test several Link mobile FM sets.<sup>26</sup> Both men reported favorable results.

The drawback to this plan was the tendency of FM to be a "spectrum waster." Biggerstaff also believed that some early FM claims were not valid,<sup>27</sup> and Belleville "died slow" on AM. "I was a little stubborn about seeing its advantage for awhile," Belleville admitted.<sup>28</sup>

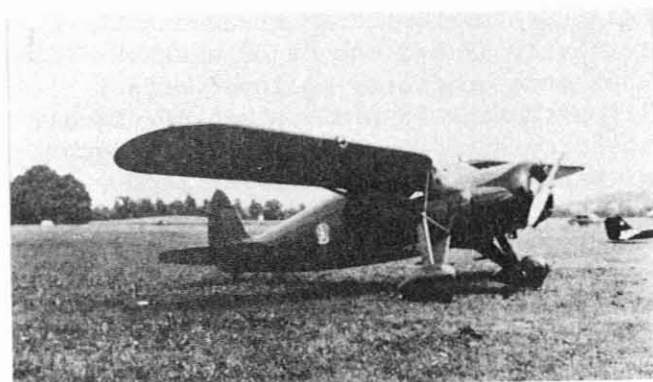


Figure 123. A Region 5 Forest Service airplane equipped with two-way radio for use in fire control. (Forest Service photo, History Section)

With the design of the mobile KU-T/KU-R, he had demonstrated the effective use of AM noise-silencing techniques comparable to the FM squelch control. He would argue against the transition until convinced otherwise.

#### Laboratory Switches to FM

A Radio Laboratory consensus on the merits of FM took several months to achieve. Finally the Laboratory staff concluded that FM was the way to go. They reached agreement by May 1946, and recommended to Jack Horton that the Forest Service communication systems be converted because of "...the more reliable squelch, better noise rejection, absence of heterodynes with interfering signals, and the capture effect inherent in FM discriminator circuits."<sup>29</sup>

After an inspection trip to Portland where the matter was discussed at length, Jack Horton agreed. He advised Kramer that "the procurement situation is still pretty bad but the Laboratory has arrived at the point where the Washington Office must make a decision as to whether we go to FM or stay with AM." Uneasy lest Washington again delay a decision and further compound the problem, Horton cautioned that "the question is entirely a matter of time, not equipment." He stressed the urgency of the matter and warned that "if we put off doing this now we will set back the use of FM at least five years."<sup>30</sup> The Washington Office accepted these recommendations and quickly approved the change. The Radio Laboratory officially made the transition in July 1946.

The Radio Laboratory FM work plans were similar to those of the earlier AM development program. Simplicity,

ruggedness, and reliability continued to be the goal, with the emphasis on radios that could be used in fire control. Conspicuously absent were fixed-base, high-powered units. Priorities for FM prototype design were scheduled with handie-talkie first, followed in order by mobile unit, look-out set, packset, aircraft unit, and portable repeater.<sup>31</sup>

The type designations for the FM units were changed from the AM practice of selecting letter designations to describe the sets. By this time, the types S, T, and K units had become synonymous with the classification for portable, semiportable, and mobile, respectively. The corresponding units were thus dubbed SF, TF, and KF, with the F representing FM. Circuitry, according to Biggerstaff, was "...similar to standard commercial practice."<sup>32</sup> The sets reflected composite ideas from published articles in professional and amateur radio publications that had been modified for Forest Service use; a unique design feature was two-channel transmitting capability.<sup>33</sup> This extended the effective range of the sets when the second transmitting channel was set to the frequency of a nearby repeater. The single receiving channel of the unit, set to the network and the corresponding repeater frequency, provided full coverage of messages from local or distant sources. With this capability, portable sets could communicate on intervisible transmissions or switch to the repeater frequency for communications beyond their normal range.<sup>34</sup>

The mobile type KF (model A-T2-R) was designed by Biggerstaff. The main circuitry was housed in a 1/2-cubic-foot cabinet, while the operator's controls were contained in a separate small enclosure that could be conveniently located in reach of the

driver. The superheterodyne receiver was crystal-controlled, which eliminated the critical and often difficult tuning procedures of previous units.<sup>35</sup> At an advertised output of 25 watts, the type IF was scheduled for availability in July 1947, but production was limited.<sup>36</sup> "It was so soon superseded by commercial models," recalled Biggerstaff, "that I thought the effort wasn't of any great value to the Forest Service. It was too short-lived."<sup>37</sup>

#### Type SF Has Most Efficient Layout

The primary design responsibility for the type SF (model A-T2-R), or FM handie-talkie, was delegated to Logan Belleville.<sup>38</sup> Field tests were scheduled for August 1947 and bid solicitations for the following March. The SF looked like the military SCR-536 walkie-talkie.<sup>39</sup> It operated in the 30- to 40-MHz range at 200 milliwatts (1/5 watt) and was also provided with dual transmitting and single receiving channels. At a weight of 9 pounds, including a 7-foot collapsible antenna, it continued the tradition of portability.<sup>40</sup> The handie-talkie, with the advantage of subminiature tubes, represented the most efficient physical layout of any Radio Laboratory design.

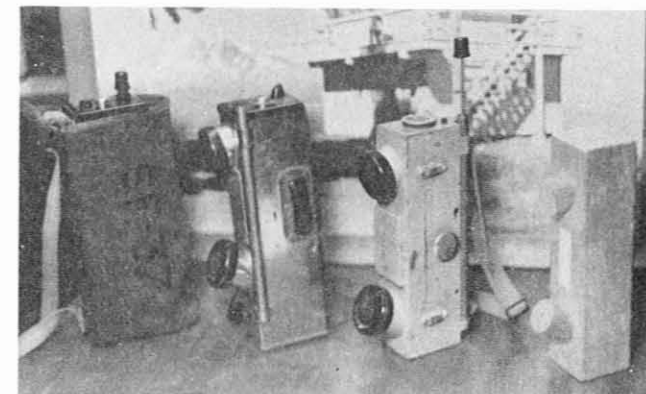


Figure 124. Forest Service handie-talkies. Right to left: wood mockup for type SF design; type SF, model A-T2-R; type SF, model B2; and type SF, model C in canvas bag. (Forest Service photo, History Section)

Development of the type TF (model A-T2-R), or FM lookout set, was a composite effort of the Laboratory staff. As outlined in the *Radio Handbook*, "It was designed to provide communications for lookouts or towers, act as an automatic repeater when required, and be used at stations where battery power is necessary."<sup>41</sup> The automatic repeating capability of the TF was considered "...of extreme value in radio networks employing handie-talkie type equipment."<sup>42</sup> If the handie-talkie operator had to address the network, the towerman would be requested on the first SF channel to flip a switch on the TF to the repeater position. By similarly switching to the network frequency on

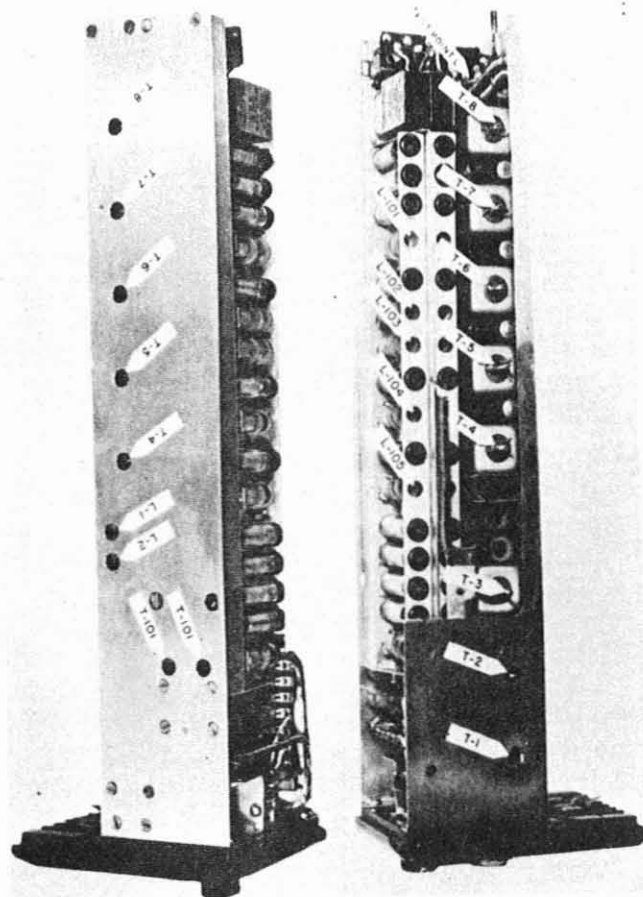


Figure 125. Two interior views of the component layout for the efficient type SF handie-talkie. (Forest Service photo, History Section)

the second SF channel, the handie-talkie operator could access the network. But the importance of the 2-watt TF for lookout operation was not overlooked. On behalf of the tower operator it was emphasized that "no function has been compromised to secure each service."<sup>43</sup>

The TF differed somewhat from the earlier semiportable configurations. Not the controls but the radio equipment was housed in a weather-proof cast magnesium case that could be located up to 200 feet from the operator's position. This provided separation for the dual antennas. An additional bonus was conserving space in the lookout tower rooms, especially those only 7 by 7 feet. A second control unit could be installed if separate living quarters were provided for the operator.

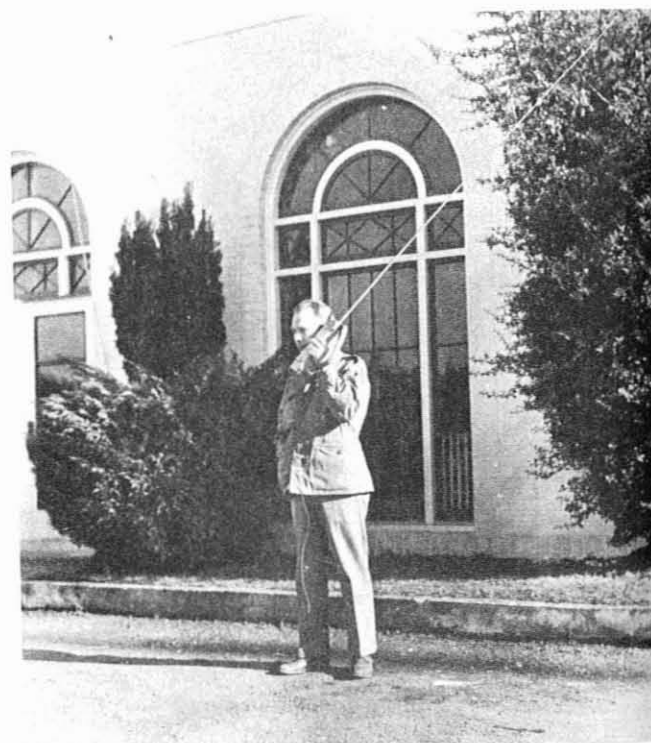


Figure 126. Type SF handie-talkie being demonstrated at the Radio Laboratory by Logan Belleville. (Forest Service photo, History Section)

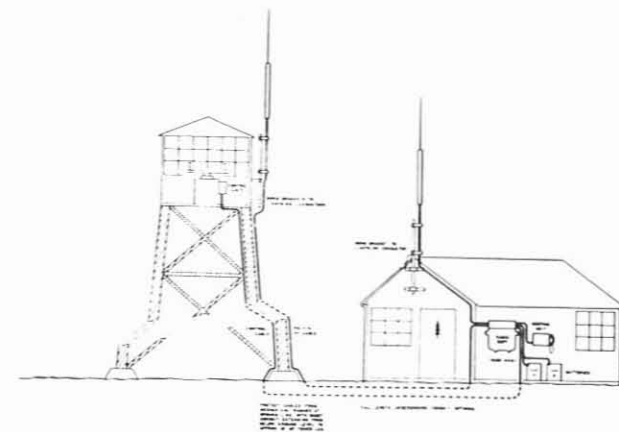


Figure 127. Simulated placement of model TF set for dual use as fire-lookout radio and automatic relay repeater unit. (Forest Service photo, History Section)

#### Lightning Arrester, Other Projects

A number of other projects were developed at the Radio Laboratory during the immediate postwar years. One of the most highly regarded was the cylindrical spark-gap lightning arrester designed by Lawson. It won high praise from the National Bureau of Standards for improvement over previous designs.<sup>44</sup> In the absence of suitable commercial models, the Laboratory staff also completed designs for a battery-operated type SGA signal generator, a battery-operated type DM deviation meter, a type VMA vacuum tube voltmeter, and a type RWA RF wattmeter.<sup>45</sup> Investigation of frequencies in the 150-MHz range, improved antenna designs, battery types, and remote controls, also went on during the early stages of FM development. Bill Claypool's assignment in 1948 to the Bureau of Animal Industry, U.S. Department of Agriculture, increased the workload of the other men at the Laboratory. Claypool later left to provide radio engineering and supervisory assistance to the

Mexican Government in an emergency program to stamp out hoof-and-mouth disease during a 3-year assignment.<sup>46</sup>

Region 6 sought a replacement who could serve halftime as the Regional communication officer and halftime at the Laboratory. Thomas H. Burgess, Assistant Regional Forester for State and Private Forestry, expressed his doubt to the Chief that someone could be found with both the required competence in "theory and design" for the Laboratory and the "practicable trend of mind" required for the Regional communications position. "The requirements are quite completely opposed," he noted. "The theoretical engineer would be quite apt to turn into a tinkerer in the field and the so-called 'practical' type of radio man is usually without the basic fundamentals and actual engineering ability we would like to have at the Laboratory."<sup>47</sup> Lest it be struck with a "prima donna," Region 6 put off the decision for a year and a half, until C. V. "Bud" Fontain accepted the position in late 1949.<sup>48</sup>

Well on its way to duplicating previous accomplishments in AM radio design, the Radio Laboratory was reaching a point where commercial FM developments were becoming competitive. From the beginning, the Laboratory's existence had been justified by the unavailability of suitable commercial radio products, and the 1945 "policy statement" from the Chief's office again pointed out that the primary function of the Radio Laboratory continued to be "...the development of radio and associated equipment for which a demonstrated need exists and which cannot be supplied from commercial sources."<sup>49</sup> But with more and more commercial products coming on the market in the postwar years, the Radio Laboratory's development program would inevitably be questioned. Even Lawson observed, "In my own mind I was



convinced that the Radio Lab, as it had been constituted in the past, had served its day."<sup>50</sup> With the proliferation of FM commercial products, particularly from Motorola, "There was little justification for the Forest service to 'invent' things any longer."<sup>51</sup>

This transition, although obviously necessary, did not take place without a delayed reaction from Washington. Long under pressure to accept more responsibility in the administration of a Servicewide communication program, the Washington Office took this occasion to also effect a simultaneous change in its policy on communication leadership.

Jack Horton had been conducting a one-man campaign for a consistent Servicewide communication program since 1932. In 1934, of course, he had asked Roy Headley to appoint "a court of last resort" as a means of deterring each Region from devising and determining its own communication products and program. By 1945, the Washington Office had made an effort to achieve this through a revised statement of the Radio Laboratory's role.<sup>52</sup> But this effort did not have the one element Horton considered essential to unification; it lacked a "dictator."

Frustrated by Washington's failure to grasp this point, he waited a year to see how effective the 1945 order would be. He then reevaluated the state of Regional communications nationwide for the Washington Office. "It is apparent to me that each Region wants a special set up as far as radio is concerned, and each Region thinks its conditions are different," he observed. He illustrated this point by calling attention to the opposing opinions held in Regions 1 and 6 on vhf use, special Region 8 requirements for 25- to 50-watt mobiles and radio-equipped, tractor-drawn plows, and a Region 5 request for a handie-talkie that was a "full man backpack load."

"I cannot believe," he concluded from these numerous examples, "that there is a need for as many different types of equipment as is indicated by the Regions' demands." Instead, Horton believed, the communication men in the Regions were "selling their own ideas," and this led to "as many ideas as there are radio technicians. Where they have no radio technicians, they have no ideas," he wryly observed.<sup>53</sup>

For the twelfth time in as many years, Horton urged the Washington Office to reconsider the appointment of a dictator. Nearly at the pleading stage and not wishing to see a repetition of the AM problems during FM development, he concluded his report with the firm resolve that "paramount to all the above, is the selection of a man in the Washington Office to correlate the needs in all the Regions and give leadership to the [FM] development."<sup>54</sup>

The Washington Office ordered an inspection of the Radio Laboratory before concurring with Horton. In all corners of the Laboratory and among the various aspects of the communication program reviewed by David S. Nordwall, Kramer's alternate in the Washington Office's Division of Operation, the question of leadership took precedence. After a talk with Horton, Nordwall agreed that a significant administrative problem existed in the Regional application of radio. He recommended "...the need for more positive direction and leadership from the Chief's office."<sup>55</sup>

The argument for leadership now caught the attention of Bill Kramer and Earl Loveridge. Their concern was not with technological issues but with administration. The gulf between the state-of-the-art in radio and the ability of nonradio men to understand significant techno-

logical issues was growing, and the Washington Office began to feel uneasy. While they were willing to take a secondary role in preliminary communication decisions, questions of fiscal and administrative responsibility were another matter.

By 1947, Kramer and Loveridge were primarily concerned with whether "they were getting their money's worth out of the Lab" and whether the Regions were usurping Washington's authority. In the vernacular, Kramer thought Lawson might be "leading him by the nose," and that allowing independence to such men as Apgar constituted a case of "tail wagging the dog."<sup>56</sup> Intent upon finding a solution, Kramer reached down to the Kaniksu National Forest in Region 1 to select a man with a reputation for being "a little bit hard-nosed" and who had also had several years of Army service. It did not surprise those who knew George Duvendack that, within a few weeks after his appointment as Chief of Communications, the Forest Service communications program acquired a new look and new force.

#### Reference Notes

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30. F. V. Horton, "Inspection Memorandum," 9 May 1946, National Archives and Record Service, Seattle, Wash., Box B4266.

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33. Fred Biggerstaff, telephone conversation with the author, November 1979.

34. W. F. Biggerstaff, "FM Radio Equipment for Forestry Applications," [n.d.], typed copy, pp. 3, 40, Gaylord A. Knight Collection.

35. Biggerstaff, "FM Radio," p. 16.

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37. Biggerstaff, telephone conversation.

38. There was a prototype forerunner of the SF known as the type SY "pack unit." Eight of these were placed in the field during 1945 for testing. The outcome led to a layout similar in design to the military walkie-talkie. Records on this set are unavailable, but the SY was undoubtedly AM even though it appears to have served as a handie-talkie model. See F. V. Horton, "Memorandum," 9 May 1946, National Archives and Records Service, Seattle, Wash., Box B4266.

39. Later designs included a hand-carried unit with telephone type handset included as part of the handle and a unit with special headset and close talking microphone for aircraft applications. See Biggerstaff, "FM Radio," pp. 1, 2.

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