Calling All Rangers!

A Brief History of Radio in the Forest Service

Richard Ferranti

"An invention of the devil!" muttered Clearwater National Forest lookout Red Stewart as, once again, the complicated mirror and shutter of his heliograph went out of alignment.

The year was 1915 and the Forest Service's brief dalliance with Civil War blinkers and sunlight was a dismal failure (Coats 1984). Frustrated foresters needed to improve their ability to communicate, but radio technology would not be ready for the fireline for another 15 years.

Radio's Rustic Beginnings

The Forest Service began its exploration of radio shortly after Guglielmo Marconi demonstrated long-range wireless telegraphy at the turn of the twentieth century. The earliest radio equipment was bulky, heavy, and required huge antennas—requirements that limited its potential for practical field use. In 1916, an experimental forestry base station used wires strung across a 1,600-foot (488 m) canyon to explore this new technology (Slonaker 1916).

At the end of World War I, R.B. "Ring Bell" Adams, the same Forest Service engineer that equipped the Forest Service with its telephone network, began experimenting with radio. Although his communications trials were largely successful, the equipment was still far too heavy, unreliable, expensive, and bulky for practical use (Adams 1923).

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Beatty Introduces Radio to the Forest Service

In 1927, long-time forester Dwight Beatty demonstrated a small, crude, but effective radio to Forest Service Chief Forester Greeley and others during a convention in Missoula, MT. The group was intrigued by the prospect of radio communications on the fireline. Beatty, who had a keen interest in radio engineering but no formal training, was immediately charged with exploring this possibility.

A Shortwave Discovery

When Beatty interviewed east coast radio experts, they told him that low-powered portable transceivers could never communicate over mountains or through timber. Nevertheless, Beatty was not discouraged. After conduct-

Forest Service radio pioneer Dwight Beatty operating his SP-1930 (Semi-Portable) Morse Code transceiver. Eight of these units were produced for fireline communications and testing. Photo: Forest Service, James Allen collection, Los Altos, CA.

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ing many careful experiments, he found that with the right antenna and the right frequency band, his rugged portable shortwave radio could communicate over a 10- to 20-miles (16- to 32-km) range, with its signals hopping over treetops and mountains (Beatty 1931).

Radio Lab Pioneers Technology

Dwight Beatty's success led the Forest Service to open a radio laboratory in Portland, OR, in the early 1930s. Though its engineering staff never numbered more than 8, the radio lab pioneered the development of some of the 25 different Forest Service radio sets over the next 20 years. As technology continued to advance, each improved radio set fulfilled the same basic agency requirements—they were simple, rugged, and reliable (Gray 1982).

When Beatty retired in 1931, World War I Army Signal Corps veteran A.G. "Ags" Simson took the helm as lab manager and spokesperson. Simson, a skilled manager and radio engineer, helped his team design radios that were more stable and easier to set up, tune, and use. The era also brought about voice capability, replacing the Morse code telegraphy used with Beatty's first radio. (Simson 1935, 1938, 1941a, 1941b).

Since large eastern manufacturers were not interested in the small quantities of radio gear that the Forest Service required, local radio manufacturers in the Pacific Northwest produced the lab-designed sets and forestry lab personnel tested them.

Lightening the Load

By the mid-1930s, forestry lab engineers pushed the technology up in frequency from shortwave to the lower VHF bands, where ranges were limited to line-of-sight, but with much reduced noise and interference. The VHF radio, with its short antenna and light weight, was ideal for communication between fire scouts in mountaintop lookout towers and smoke chasers on the ground.

The new technology complemented the shortwave sets ability to span mountainous terrain without lookout tower relays. By the beginning of World War II, nearly 4,000 radios had been ordered, and these had become an essential part of Forest Service communications (Gray 1982).

The Forest Service Type PF "Portable Fone" operated by Richard Ogg, Lolo National Forest, 1933. The PF was one of the smallest and lightest of the shortwave radio sets, so popular that some 450 were deployed by the Forest Service before it was replaced by an improved model in 1935. Photo: Forest Service.

Long-time forester Dwight Beatty's interest in radio engineering helped establish a Forest Service radio laboratory in Portland, OR, in the early 1930s.

Radio Network and National Security

During World War II, Forest Service personnel used their radio network to report suspicious aircraft as part of the Nation's Aircraft Warning System. Though not publicized at the time, foresters reported and tracked balloon-borne Japanese firebombs that were sent thousands of miles across the Pacific Ocean in hopes of destroying the national forests (Strain 2005). Thanks in part to the Forest Service's effective radio network, not one of the dozens of balloons sighted caused significant damage.

Fireline Radios Evolve

Following the war, the radio lab contributed another major technical innovation by making VHF-FM radio practical for fireline communications.

Though FM had been developed and deployed in the war, it was Logan Belleville, a Forest Service Radio Laboratory engineer, who shrunk a heavy backpack-sized VHF-FM radio to a transceiver that could fit in the hand (Lawson 1946; Biggerstaff 1949). This communications marvel weighed just 9 pounds (4 kg), carried its own batteries, and contained no less than 27 subminiature vacuum tubes.

Big Industry Tunes In

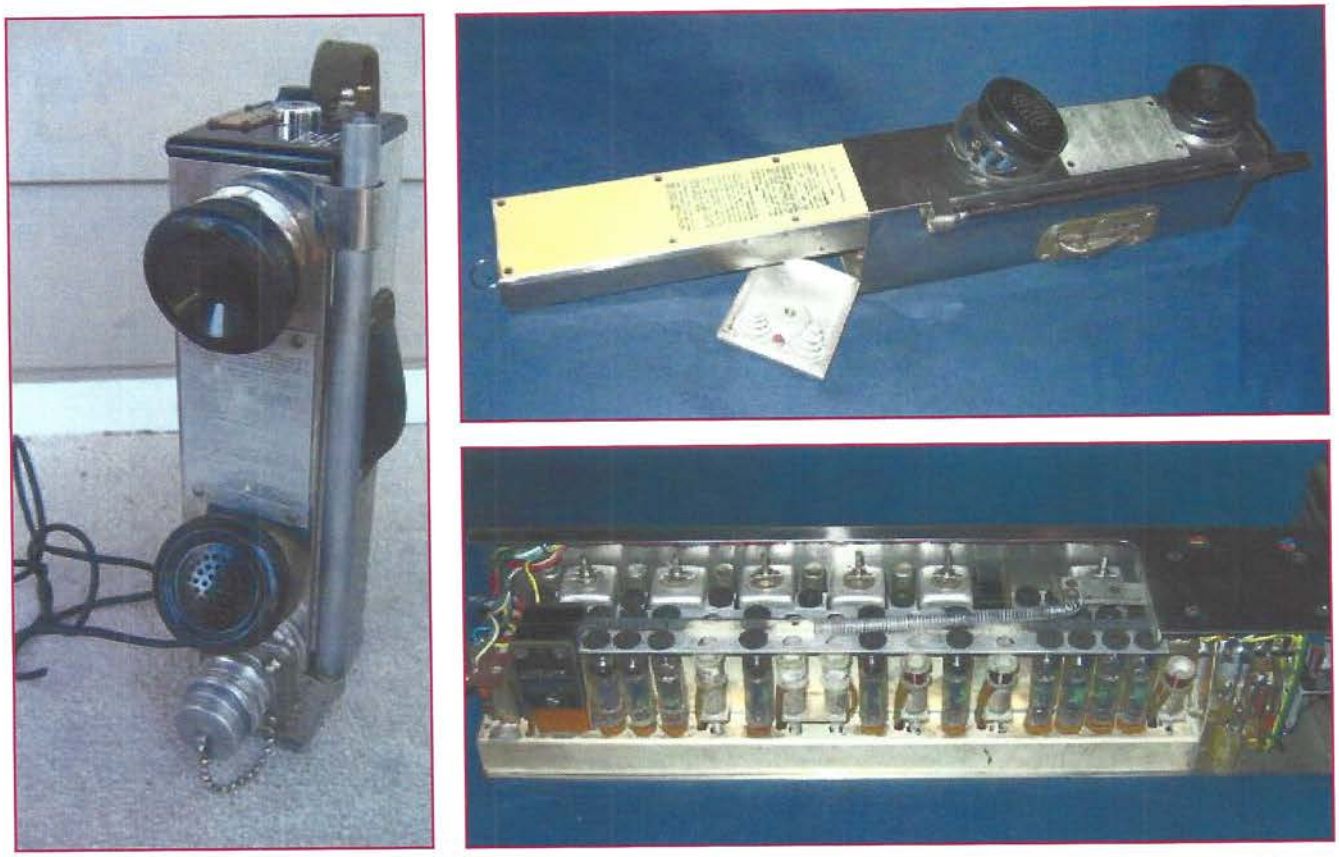
By the late 1940s, companies like Motorola finally took notice of the Forest Service's advanced communications equipment and began developing their own. Their earliest models were largely based on the radio laboratory's designs.

Within a few years, the fledgling VHF-FM radio industry was in full production, manufacturing equipment that not only met the modest needs of the Forest Service but the huge civilian police, fire, and other public service markets.

With industry taking over as the lead radio manufacturers, the era of homegrown Forest Service radio design ended. The radio laboratory moved to the east coast in the early 1950s, becoming a center for working with industry, adopting their advancing designs to forestry needs, and testing the results. Today, the National Interagency Incident Communications Division in Boise, ID, continues to work with industry to develop and test communications equipment.

Forest Service Radio Legacy

The Forest Service has a significant legacy in radio communications technology. Beatty's original discovery and exploitation of short-range,



The Forest Service Type SF VHF-FM walkie-talkie, 1947. (Top right) Model A shown with its slide-out battery box. (Top left) Model C with external handset connector. (Below right) Inside the SF, showing its array of 27 tubes and intricate construction. More than 200 radio sets were made before commercial manufacturers began producing their own versions. Photo: Richard Ferranti.

During World War II, Forest Service personnel used their radio network to report suspicious aircraft as part of the Nation's Aircraft Warning System.

shortwave radio propagation to overcome mountain shadows and foliage loss is often unrecognized as a major contributor to wireless communications.

Short-range, shortwave radios, used in both World War II and Vietnam are still used today as an essential military and commercial communications technique (Austin 2000; Hagn 1966).

The radio laboratory's equipment consistently incorporated the latest technical developments and always adapted to the Forest Service's unique needs. The lab's emphasis on portability, ease of use, ruggedness, and reliability has saved lives and forests. It was also a seedbed for the "Silicon Forest," providing engineering talent for pioneering Portland electronics firms such as Tektronix and Electro Scientific Industries (Cortright 2000).

It's difficult to imagine that when the Forest Service was first established, foresters worked in near-total isolation, without access to rapid communications, nearby assistance, and resources in case of an emergency.

The Forest Service responded to that critical need with foresight and vigor, giving firefighters, foresters, and the community a radio capability unequaled in its time.

References

Adams, R.B. 1923. The use of radio telephone in the Forest Service. Presented at the Missoula Section, Society of American Foresters, January 22. USDA Forest Service Headquarters History Collection [at the Forest History Society].

Austin, B.A. 2000. Near vertical incidence skywaves in World War II: An historical perspective. HF radio systems and techniques. IEE Conference Publication No. 474: 225-229.

Beatty, D.L. 1931. Radio communication in the national forests. USDA Forest Service Headquarters History Collection [at the Forest History Society].

Biggerstaff, W.F. 1949. FM radio equipment for forestry applications. Fire Control Notes. 10(3): 1-10.

Coats, J.H. "Bud," 1984. Communications in the national forests of the Northern Region: A history of telephone and radio. Missoula, MT: USDA Forest Service Northern Region. R1-84-14: 48-49.

Cortright, J., and Mayer, H. 2000. The ecology of the silicon forest. Portland, OR: Regional connections project, Institute for Portland Metropolitan Studies, Portland State University. 10.

Gray, G.C. 1982. Radio for the fireline: A history of electronic communication in the Forest Service, 1905-1975. Washington, DC: USDA Forest Service. FS-369. Canonical history of forestry radio development. Reports on the number of sets used by the regions prior to World War II. 9.

Hagn, G.H.; Van Der Laan, J.E.; Lyons, D.J.; Kreinberg, E.M. 1966. Ionospheric-sounder measurement of relative gains and bandwidths of selected field-expedient antennas for skywave propagation at near-vertical incidence. Special Technical Report 18. Menlo Park, CA: Stanford Research Institute.

Lawson, H.K. 1946. The Forest Service Adopts FM Radio. Fire Control Notes. 07(3): 5-7.

Simson, A.G., and Horton, F.V. 1935. "Calling All Rangers!" Forest Service weaves a network of 700 stations as radio is developed for protection of national forests of west. American Forests. August: 365-367 and 398-399.

Simson, A.G. 1938. Radio as a national forest protection tool. Journal of Forestry. 36: No. 4: 366-375.

Simson, A.G. 1941a. The communication facilities of the Forest Service. Electrical Engineering Transactions. 60: 976.

Simson, A.G. 1941b. Radio on the fire-line: Forest protectors shorten lines of communication in unceasing battle with fire. American Forests. July: 327-329.

Slonaker, L.V. 1916. Report on the baseline wireless station, Apache National Forest, Arizona, and wireless investigations in the southwestern national forest district. USDA Forest Service Headquarters History Collection [at the Forest History Society].

Strain, Douglas 2005. Personal communications with author. Mr. Strain worked at the Forest Service Radio Laboratory during the latter part of World War II, and later founded was what to become ESI, Inc., in Portland, OR. ■