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Trigger for Atomic Holocaust

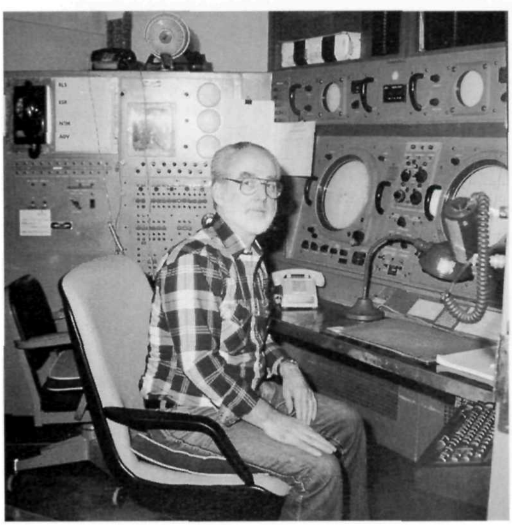
Aircraft Detection on the DEW Line

Royal Canadian Air Force officer T.H. Collins stands before a doppler antennae towering over the DEW Line Main Station at the Hall Beach in 1955. Photo courtesy Dept. of National Defence DND-CPU-PCN 1660.

The isolated antenna of the Distant Early Warning (DEW) Line are enduring images of the Cold War in Canada. Stretching across the 70th parallel from Alaska to Greenland, the DEW Line was the northern bastion of a huge air defence system built in the 1950s. In Canada, the system included 4 main stations, 18 auxiliary stations, and 20 smaller intermediate sites. Two stations, the BAR-1 Auxiliary radar station and the BAR-B I-Site, operated from locations in what is now Ivvavik National Park in the northern Yukon Territory. The cultural resource management of these sites provides an opportunity to evaluate the aircraft detection technology.

This extraordinary arctic military facility detected transpolar aircraft activity for continental defence. Designed to alert defending fighters and give six hours warning, the rapid development of military aircraft soon cut the DEW Line's warning time in half. Once ICBMs supplemented Soviet bombers in the early 1960s, the warning shrank to minutes; and air and civil defence efforts became pointless. The DEW Line was limited to confirming attacks and triggering massive nuclear retaliation.

Air traffic monitoring in remote areas offered unique challenges to system designers in the early 1950s. Because air traffic was infrequent in northern areas, console operators spent long, tiresome periods without any contact. The extra staff needed to cover remote areas was expensive. To overcome these difficulties, designers equipped the DEW Line with two kinds of electronic detection gear, a powerful gap-filler radar and a doppler radio detection system known as the "McGill Fence," developed under the leadership of McGill University physicist John S. Foster.[1] The fence operated on the DEW Line and the Mid-Canada Line, another link in the air defence system on the 55th parallel.



Radar technician Bob Virgin at the console of BAR-1, April 1993. Photo courtesy Johnson collection, Parks Canada.

Transmitting and receiving gear connected to a set of 100-meter radio masts equipped each DEW Line station. Radio transmissions between stations emitted lobes of electromagnetic radiation reaching from the ground to 30,000 meters. Station recording devices detected passing airplanes when they disturbed the energy field. The system provided intrusion warning, tracked aircraft, supplemented radar sightings, and covered gaps between radar stations. The system was an innovative and inexpensive solution to the need for automatic air traffic notification.

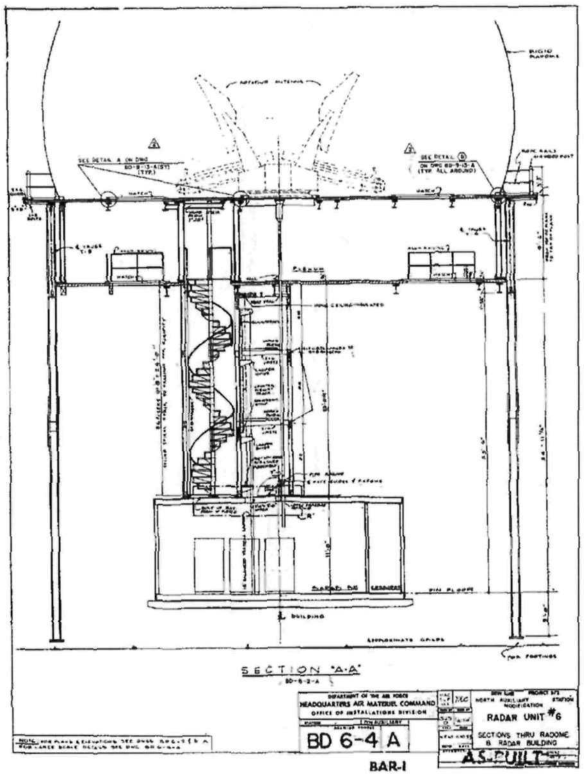
Although theoretically attractive, the "McGill Fence" was notoriously unreliable. Field reports on the "Fence" noted that operators were "cancelling the alarm without even inspecting the scope for target presence." Sam Lightman, a radar technician responsible for the doppler in the early 1960s reported, "We either got nothing, or we got geese. We never, ever got aircraft. It was a hopeless system. It was also a tremendously temperamental system, it was almost impossible to keep the damn thing running, I don't exactly know why. I think it was because the receivers were hideously sensitive and it was just awful."[2] As the need for aircraft detection diminished in the early 1960s, the doppler systems were taken out of operation. All DEW Line I-sites were closed in 1963. Two years later, the Mid-Canada Line was also abandoned. The large antenna and wire webs used for the "McGill Fence" on the BAR-1 and BAR-B sites were removed in the mid-1960s.

Besides the passive notification provided by the "McGill Fence," each DEW Line station was equipped with powerful long-range search radar. These units, capable of tracking aircraft to 30,000 meters and almost 500 kilometers away, provided overlapping radar coverage.[3] The rotating antenna was sheltered within the protective white hard shelled geodesic radome popularly attributed to Buckminster Fuller. Transmitting and receiving equipment and the consoles were housed in the building train immediately below the antenna tower.

USAF Captain Joseph A. Miller beside the radar array in the geodesic dome, BAR-1, April 1993. Photo courtesy Johnson collection, Parks Canada.

According to Sam Lightman, technicians had two sets of radars, "We had a six-degree radar and a three-degree radar. Inside the big geodesic dome was a huge rotating antenna ... And it had twin beams—one aimed at six degrees and one aimed at three degrees to the horizontal." The six-degree beam, also called the high beam, was designed to detect high flying airplanes. Lightman reported that in the year and a half he worked on the DEW Line, the high beam never detected anything. Lightman and his colleagues could talk with high altitude U2 planes, but never saw them. The three-degree radar, or low beam, was more effective. With the three degree beams, technicians could detect everything from commercial jets to police and military aircraft.

To meet the "empty skies" problem and keep console operators alert, an auto warning system, known as a radalarm, was installed. This device sounded an alarm whenever the radar detected an intrusion and was an important contributor to the staff reductions. However, it also suffered failings. Because ground clutter frequently triggered the alarm, technicians often turned off the sensitive equipment.[4]



Section drawing of BAR-1 radar tower and antenna. Photo courtesy BAR-1 DEW Line Collection, Parks Canada.

To preserve information on the aircraft detection systems of the DEW Line, Parks Canada has undertaken a significant collection program. Some 1000 kilograms of material were collected from the site when it shut down. A drawing set provides details on extant structures. A complete photographic record of the site was also made. As a full DEW Line radar console and associated equipment were previously collected, radar equipment collection at BAR-1 was limited to the actual console screen and surrounding panel. This equipment retains the grease pencil markings showing the last aircraft tracking completed before the shutdown.

Beyond this console panel, the park obtained a set of U.S. Air Force Technical Orders and DEW Line Instructions, though restricted volumes were not available. These cover the installation and maintenance of equipment installed on DEW stations. BAR-1 files covering actual maintenance schedules and breakdown reports are important complements to these manuals. Perhaps the most important element in the program was the oral history research. These limited interviews were made on-site while the operators were on the job. Although the line was closed, continuing contact with some of these individuals allows their participation in the project. An interactive report (CD-ROM) includes 200 images; indices of artifacts, files, and drawings collected; and a pair of essays describing the history and cultural resource management process of the site. A more detailed history of the site is in preparation.

Notes

1 D. Winkler, *Searching the Skies: The Legacy of the United States Cold War Defense Radar Program*, U.S. Air Force, Air Combat Command, June 1997, p. 83.

2 Report noted in Roy J. Fletcher, "Military Radar Defence Lines of Northern North America: an Historical Geography," *Polar Record* vol. 26, 1990, p. 270 and Sam Lightman interview with the author, June 6, 1995, Whitehorse, Yukon.

3 David Neufeld, BAR-1 field notes, conversation with radician George Bridger, July 18, 1993.

4 Telex of 27 Aug. 1986 in file AN/FPS-19, BAR-1 DEW Line Collection, Parks Canada and David Neufeld, BAR-1 field notes, conversation with Station Chief Ric Stephens, July 18, 1993.

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