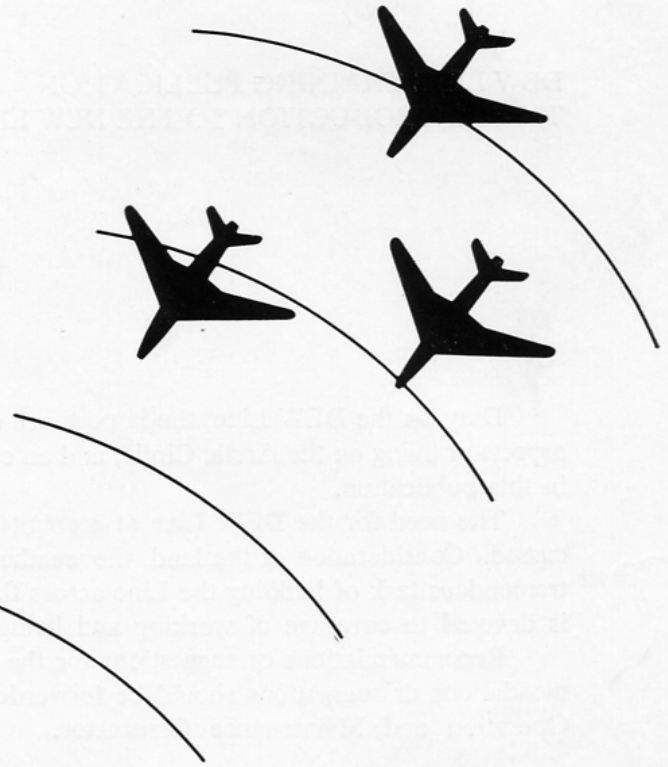
DEW Line
TRAINING MANUAL



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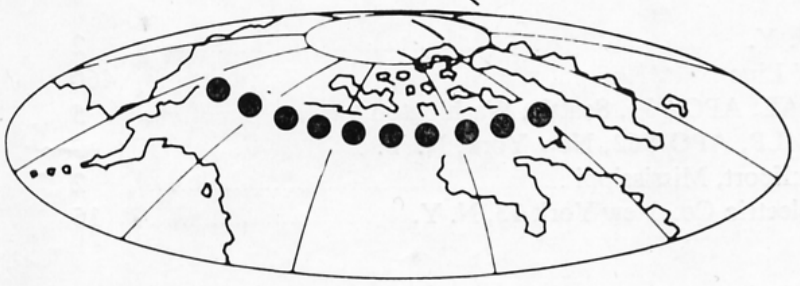

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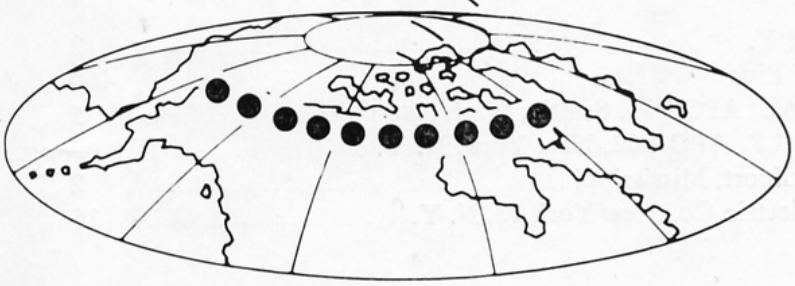

INTRODUCTION TO THE DEW LINE

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DEW LINE TRAINING PUBLICATION
TM-18 INTRODUCTION TO THE DEW LINE

UNITED STATES AIR FORCE
DEW Project Office, New York, N.Y.
December, 1957

Foreword

Duty on the DEW Line, the importance of the future job, the environment, the varied assignments, aspects of living on the Arctic Circle, and an employee's working arrangements on the Line are described in this publication.

The need for the DEW Line as a countermeasure to the Communist threat is the first subject discussed. Consideration of the land, the weather, and the people of the Arctic leads into the story of the tremendous task of building the Line across the North American Arctic. The balance of the publication is devoted to coverage of working and living on the DEW Line today.

Recommendations or suggestions for the improvement of the publication are invited. Such recommendations or suggestions should be forwarded to The Director, Personnel Procurement and Training, Operation and Maintenance Contractor.

Approved for Publication
by Chief, DEW Project Office

Distribution

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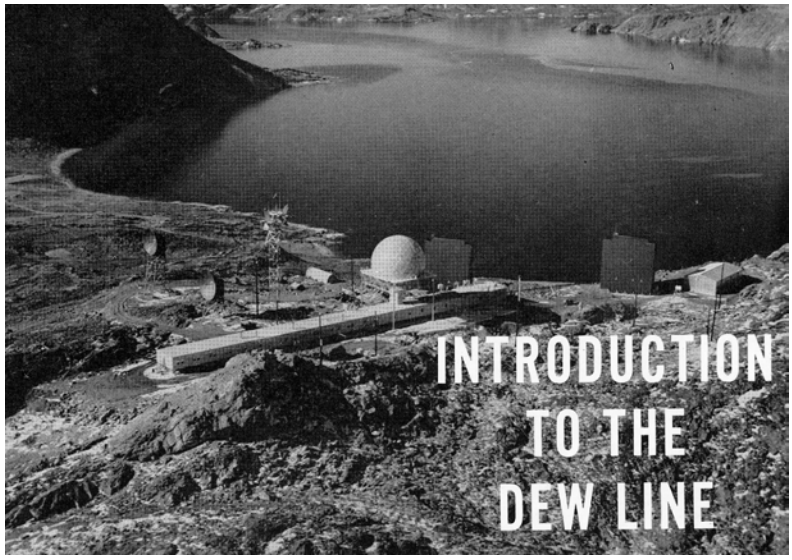

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CHAPTER 1

DEFENDING THE NORTHERN RIM

MEET THE DEW LINE

This manual will introduce you to the DEW Line, one of the most stupendous engineering tasks ever accomplished by man. More important, however, the DEW Line is a vital part of our system of national defense.

The name "DEW Line" is simply a short way of saying "Distant Early Warning Line". The Line itself is a series of radar posts, alert sentinels stationed along the cold, northern edge of the North American continent.

The DEW Line serves as an early warning net, defending our entire continent and, to a large extent, our entire hemisphere. Every minute, every hour, by day and by night, its radar beams sweep the arctic skies. It will flash to us warning signals of enemy aircraft which may approach our part of the world.

The story of the DEW Line is a thrilling story, but most remarkable of all, it is a true story. As we shall see in this book, it is a story of adventure and secrecy, of bold imagination, of heroics and tragedy. It is, finally, a story of the successful completion of a modern miracle, an amazing network of radar defense.

WHY WAS IT BUILT?

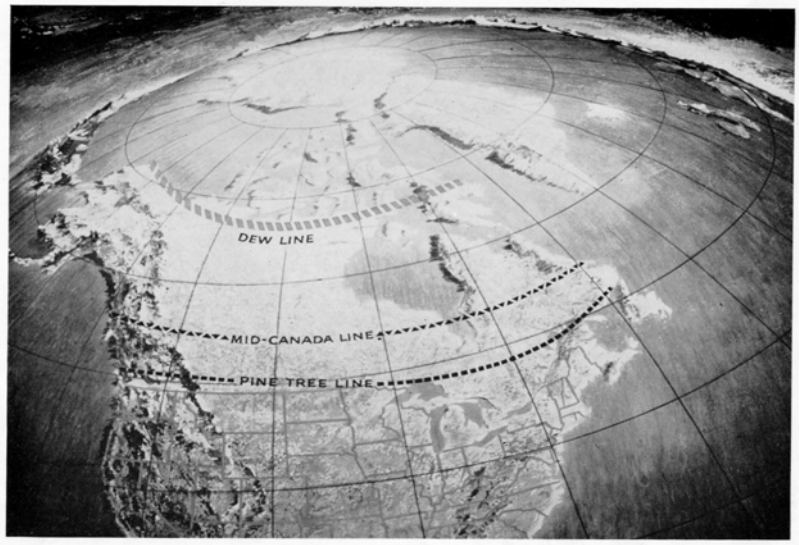
What brought the DEW Line into being? How did it happen that this gigantic project was planned at all?

Since World War II, many countries have made great advances in the aircraft field. Planes of tremendous speeds now slash through the skies. Because they are so swift and can fly so high, these planes have the ability to make a deadly sneak attack. Within a few short hours after take-off, these planes can deliver a crippling atomic blow to a distant continent.

Our military and civilian leaders foresaw these developments. They recognized that our national security, our very lives depended upon taking swift, defensive steps against the aerial threat.

Thus, in secrecy, in the summer of 1952, a group of civilian and military scientists was called together at the Lincoln Laboratories of the Massachusetts Institute of Technology. To preserve secrecy, they were called the "Summer Study Group". Their problem: "What steps must be taken to protect North America from an atomic attack by high-speed bombers?"

The hard facts were these: Every hour, every minute of early warning was critical to our defense. Time was the vital factor. An early warning of enemy aircraft would give us precious time



Warning Lines of North American Defense

to intercept enemy bombers with attack planes of our own, time to man our antiaircraft defenses, time to alert the civilian population to seek shelter, time to retaliate with our armed might against the aggressor.

The arctic route is the shortest route between the continents of Eurasia and America. An aggressor's bombers would naturally be expected to fly the shortest route to reach the industrial heart of America. The enemy bombers could easily soar across the polar regions to deliver a swift and deadly atomic attack.

Carefully reviewing these hard facts, the Summer Study Group reached these conclusions: We must build a Distant Early Warning Line along the far, northern rim of our continent. We must gain those precious few hours of an early warning.

Also, the Study Group concluded, the DEW Line would even help to discourage aggression. How was this possible? Any nation would hesitate to attack us if that nation knew that a radar network would flash an early warning of an attack and would trigger an immediate and powerful counterattack by our own bombers. The DEW Line thus could be more than a mere defense measure; it could also be a positive force for peace.

And so the DEW Line was born.

Of course, other defensive steps besides the DEW Line have been taken to guard against a potential enemy attack. Let us see how the DEW Line fits into the overall picture of our national defense.

The DEW Line stretches 3,000 miles along the seventieth parallel, the polar rim of our continent. From Baffin Bay on the eastern coast to Alaska on the west, the Line girds the polar approaches to America. On a more southerly lati-

tude, the Mid-Canada Line extends for 2,700 miles. Preliminary information of attack already received by the DEW Line will be confirmed by the Mid-Canada Line. Still further south runs the Pine Tree Line, along the United States-Canadian border. This Line will provide information for the control of our intercepting jet fighters.

The DEW Line, the Mid-Canada Line, and the Pine Tree Line are radar lines. The word "radar" means "Radio Detection and Ranging". So these three radar lines will seek out an enemy plane in the arctic skies and will provide information as to the distance, direction, height and speed of that aircraft.

The rest of our continent is also girded by elaborate warning systems. All these systems comprise the North American Air Defense system, or briefly, NORAD.

Security permits only a brief discussion of the intricate system of NORAD.

HOW NORAD WORKS

To be effective, an air defense system must provide its people with the following vital items of information: detection, identification and interpretation. Of course, the function of the DEW Line is to aid in detection.

For detection of enemy aircraft, NORAD has a gigantic belt of radar centers circling the entire continent. The illustration shows the North American Early Warning System, a radar belt that includes the DEW Line across the north. The warning network of radar stations extends down the east and west coasts and around the Gulf of Mexico. It includes the "Texas towers", which are radar stations built similarly to the oil-drilling rigs used in the Gulf of Mexico. These radar towers are being anchored off the continental shelf, 125 miles at sea, between Newfoundland and Norfolk. They will provide an extra 15 minutes of warning time along these approaches.

The overall detection network also includes picket ships of the United States Navy. Radar picket planes, each crammed with five and a half tons of electronic detection gear, fly a regular "fence" pattern along both coasts.

Finally, to complete the detection network, there is the Ground Observer Corps, composed of some 40,000 civilian volunteers, which fills in the gaps in the radar screen. This corps detects planes by eye and by ear, and relays this information to one of 49 filter centers.

Imagine now that a plane has been detected. A warning is quickly received by a filter and control center. Volunteer workers at this center accept the reports, plot the information on a grid map and evaluate it. This is the identification and interpretation of the data received.

If the plane is not identified as our own, its path is established, and this track data is reported to an Air Defense Direction Center. Now the Direction Center goes into action, to intercept the plane.

Today, these centers are rapidly being converted to the use of high-speed, extremely effective computer equipment. In "direction centers" and in "combat centers", these amazing digital computers will almost instantaneously digest and coordinate the track data. Furthermore, they will issue instructions to guide our defensive weapons. This program of converting to computer equipment is known as the SAGE Project (for Semi-Automatic Ground Environment).

HOW WAS THE DEW LINE BUILT?

Between the plan and the achievement, how did the DEW Line become a reality? Earlier, we saw how the DEW Line was conceived by an alert, prophetic gathering of scientists known as the Summer Study Group.

The Department of Defense already had accepted the basic idea of the Summer Study Group as an important objective. First, a trial installation would have to be made, consisting of one segment of a distant early warning line in the Arctic. If this experimental line was successful, construction of the rest of the DEW Line might proceed.

The U. S. Air Force asked the Bell System to conduct and complete the experimental project within one year. The project called for three huge tasks: one, to set up an operating section of the DEW Line in Alaska; two, to survey sites along the Arctic for the rest of the DEW Line to follow, and, three, to develop solutions to the logistic and construction problems involved in setting up this distant radar line.

Building the experimental line alone meant undertaking the full responsibility for the engineering, construction, installation and operation


NORTH AMERICAN
EARLY WARNING SYSTEM
ALEUTIAN LINE
WEST WALL LINE
DEW
LINE
POLE VAULT LINE
MID-CANADA LINE
TEXAS TOWERS, AIRCRAFT, AND SHIPS
AIRCRAFT AND SHIPS
AIRCRAFT AND PICKET SHIPS
PANAMA CANAL AND ISLAND BASES

of a chain of radar and communications stations on Alaska's northern coast. It was a most unusual, difficult, and challenging assignment. It meant installing and testing new electronic and communications techniques under actual arctic conditions.

Consider the magnitude of the project! Every single item that men would need to enable them to live and work in the Arctic would have to be purchased and transported to utterly barren, uninhabited, and almost inaccessible locations in the cold Arctic. Every ounce of food and fuel, each board and nail, must be bought and transported. And more — all the heavy construction machinery, and, of course, all the electronic equipment itself, must be bought and delivered. Then, under the severest weather conditions at the frozen, desolate and inaccessible outposts of the far north, this equipment must be assembled and put into operation!

It was an enormous undertaking for so short a time. The Bell System accepted the task and assigned the project to a subsidiary, the Western Electric Company. Other Bell subsidiaries also participated.

Quickly the job was organized. Qualified men were chosen — men skilled in management, research, engineering, purchasing, packaging, shipping, communications — men with hundreds of different abilities.

Working closely with the Bell Telephone Laboratories, the Lincoln Laboratory began to develop new communications equipment. Prototypes of a new kind of radar came into being.

Plans were made, materials purchased and assembled. Using every means of transportation that could be devised, the precious cargoes were delivered. Supply ships plowed through the Arctic Ocean during the few summer weeks when the ice was broken. Civilian and military planes brought supplies and personnel. Giant tractors pulled five to eight loaded box cars on sled runners (called "cat trains") across the ice and frozen tundra. For thousands of miles, the supplies and equipment were transported. Through the long days and nights the men worked to build the experimental line.

Then the snows came again and the Arctic was locked in an icy, winter grip. But the remote outposts had been planted. In the wavering glow of the Northern Lights, each radar station was a small cluster of low buildings crowned by a large rubber dome. Here was housed the radar antenna which would ceaselessly scan the cold, bleak northern skies. This was the dream come true. It was 1953, and the experimental line was completed, right on schedule!

All during 1954, the experimental line was tested and operated. Improvements were made and techniques revised. Then, at last, the entire project was evaluated. Was the new radar effective in the far north? What about the problems of transportation, of construction, of living in the Arctic? Were these problems solved on the experimental line? Should the Distant Early Warning Line be extended across the entire continent? And could it be done? In short, was the experimental line a success?

Sea-Lift Convoy

The answers to these questions reached the newspapers in February, 1955 in such articles as the following:

D.E.W. Radar Network Is in Operation Today

WASHINGTON, July 30 (AP) —North America's air warning system was extended to a 3,000-mile radar chain across the Arctic fringe of the continent today. The Air Force pronounced the D. E. W. line ready for operation.

The electronically connected system of detection and warning devices, costing more than $600,000,000, will go into full scale operation tomorrow. It rounds out a vast array of devices installed to give America maximum warning of the approach of hostile aircraft by the short route across the Arctic between the centers of the Communist and free worlds.

The D. E. W. line, so named in a contraction of the words "Distant Early Warning," was begun late in 1954. It stretches from western Alaska across the upper rim of the continent, through Canada to Baffin Island. The line is actually a series of radar posts isolated from each other in the northern wastes except for electronic connections.

The United States and Canada had agreed on the extension of the radar net across the upper reaches of Canada. Yes, the experimental line had been a success! Now the world knew that the full DEW Line was under construction. Now Western Electric was faced with a new undertaking that was even more staggering in its size and complexity. The experimental line had been an enormous task, but it was dwarfed in comparison with the job that lay ahead.

Accepting the job as prime contractor, Western Electric was responsible for engineering, procurement, transportation, construction, installation and testing of equipment, and even the training of personnel. This was a project which for sheer size, originality and boldness of concept ranks with the greatest wonders of the world.

Promptly the project was launched. Personnel were recruited. Arrangements were made with many hundreds of suppliers and subcontractors.

In another chapter, we shall see in more detail how the gigantic DEW Line was built. By plane, by sea and by cat trains, the supplies and equipment were brought to the arctic sites. There, while the world celebrated its Happy New Year of 1956, men worked at the sites, performing miracles of construction in the bitter arctic weather. The gruelling work continued through the rest of 1956. Soon the DEW Line would be in full operation. Soon our northern defenses would be complete.

Then, in 1957, another news item modestly informed the world of this amazing fact: the DEW Line was completed and in operation!

22, 55.

CONTRACTOR CHOSEN FOR RADAR IN ARCTIC

Special to The New York Times.

WASHINGTON, Feb. 21—The Air Force announced today selection of the Western Electric Company, Inc., to build the radar warning system across the Canadian Arctic.

The system, the Distant Early Warning (D. E. W.) Line will stretch 3,000 miles across the top of the continent. It is designed to alert the United States and Canada speedily in the event any bomber attack over the Polar Cap.

The United States will meet the full construction cost of the project. Estimates of the cost vary from $200,000,000 to $1,000,000,000.

The terms of

Well done, men of America! Across the roof of the world, the DEW Line is now standing guard. The northern defenses of America are complete.

In April, 1956, by contract with our government, the Federal Electric Company was chosen to operate this northern warning system. For 15 months, the Federal Electric Company recruited, trained and supplied men to the radar stations, while arranging for the constant flow of supplies and equipment to the far north.

In July, 1957, the Air Force accepted the completed DEW Line from the Western Electric Company, and promptly delivered control to the Federal Electric Company.

The years of planning, the years of building will not be in vain. The radar warning may come. The defensive weapons will be poised. The approaching enemy bomber will be blasted out of the skies.

CHAPTER 2

THE NORTH AMERICAN ARCTIC

Many problems faced the men who planned the construction of the DEW Line, but these problems were the greatest: How can we build in the Arctic? How can we transport materials to such inaccessible places? How can we live in the Arctic? In summary, what do we know of the arctic regions at all? Clearly, it was necessary to study the Arctic, to examine the knowledge that explorers and scientists had made available to the men of our generation. We shall answer some of these questions in this chapter, and others in later chapters.

ARCTIC EXPLORATION

No one knows who first discovered the Arctic, because no records exist of the first explorations. Today we believe that some peoples lived there

as long ago as 25,000 B.C. But no traces of early civilization have been found.

While daring to explore many unknown regions of the world, the world's civilized population was for many centuries influenced by beliefs that no man could live in the very hot or very cold climates. Gradually, however, the pioneers of exploration ventured into the hot lands and into the cold Arctic, learning that those beliefs were false.

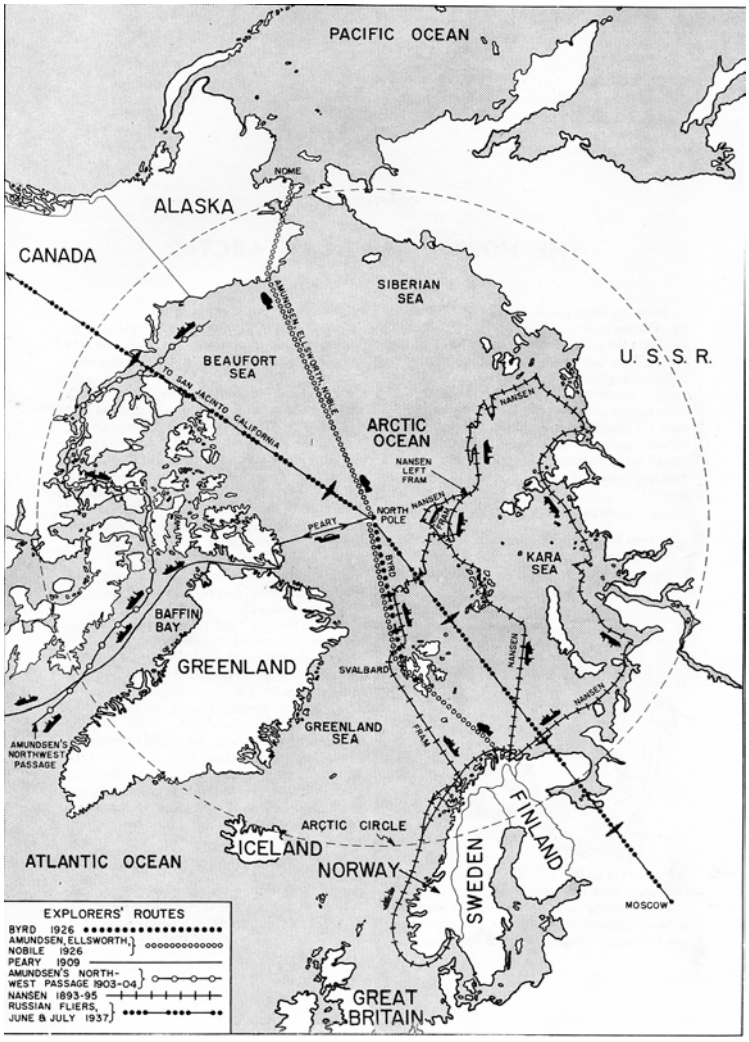
Pytheas of Massilia sailed north in 325 B.C. and returned to Rome to tell of a "congealed sea" (probably the Arctic Ocean), of a region of sludge, ice and fog, of endless summer days followed by endless winter nights. The Romans ridiculed him and his reports were ignored for centuries.

It is known that the Norsemen sailed into the polar regions, but there is very little record of Norse explorations. We do know of Ottar, who crossed the Arctic Circle, and of Eric the Red, who discovered Greenland and established a settlement there. Eric's son, Lief, returning from Norway, discovered part of the coast of the North American continent.

About the year 1500, three voyages of discovery were made toward the polar regions. Giovanni Caboto (English translation: John Cabot) reached Nova Scotia and Newfoundland and came in contact with polar ice; Joao Fernandez reached Greenland; the brothers Gaspar and Miguel Cortereal explored Newfoundland.

Soon, all the seafaring nations of Europe were anxious to find a short sea route to Asia and the East, to fabulous Cathay, which Marco Polo had described as a wealthy land of spices, silk and gold. Explorers sailed westward, like Columbus, hoping to reach the wealth of the Indies, and discovered hitherto unknown areas of the American continents instead.

To the Europeans, the New World was a barrier to navigation between Europe and Asia, a barrier that had to be skirted. So the explorers turned north, seeking either a northwest sea passage to Asia over the top of America, or a northeast sea passage over Scandinavia, Russia and Siberia.



For centuries, the arctic ice sealed its secrets. The present names of the islands, the straits and the seas of the polar region perpetuate the memory of the brave explorers who continued the search for a northwest passage, a passage that was free of the impenetrable ice.

There was Martin Frobisher who, in 1576 and 1578, carried back a sample of iron ore from his northwest voyage to Baffin Island. Henry Hudson in 1607 and 1611 discovered Hudson Bay. Baffin and Bylot reached more northerly latitudes in the year 1616.

Cook in 1778 passed through the Bering Straits. Many voyagers tried to crash through the ice in the early 1800's and failed. In 1845, Sir John Franklin's two ships reached a point 12 miles north of King William Island, where the pack ice cornered him. Helpless for three years, starving and scurvy-ridden, his crew attempted a march to safety, but never made it. This tragedy emphasized the need for more knowledge of arctic living conditions—knowledge that would enable men to live off the country itself, if necessary, as the natives did. For 11 years, many expeditions, sailing in search of Franklin and his men, explored the Canadian Arctic and made important observations about the whole region. And still the northwest passage continued to be but a dream.

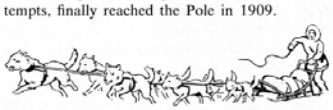
Success in the Far North

Finally after years of exploration, bravery and human sacrifice, explorers in the far north began to reach some of their centuries-old goals. In 1903-1904, Roald Amundsen completed a difficult northwest passage. His ship "Gjoa" sailed from the Atlantic to the Pacific, along the top of the North American continent. Then, as is often the case once a great pioneer has succeeded, his accomplishment was repeated by several other explorers within a few years.

While the search for the northwest passage led explorers along the coast of northern Canada, a northeast passage was sought by men like Bering, who discovered that Asia and America were two separate continents. Nordenskiold finally completed the northeast passage in 1878, sailing from Sweden across the top of Europe and Asia to the Bering Strait.

Other explorers, meanwhile, were seeking to reach the North Pole.

De Long, a young Navy lieutenant, and his men perished on foot near Siberia, never knowing that the abandoned ice-bound wreck of their ship would be carried in the moving ice pack all the way around the North Pole and down the southeast coast of Greenland! This amazing occurrence established the knowledge of a great polar current. A young Norwegian named Nansen hoped to reach the Pole, using this current. He designed a special hull, allowed his ship, the "Fram," to become frozen in the ice cap, and drifted with the ice around the Pole. But then the current carried him down the North Atlantic and away from the Pole. Peary, after 23 years of unsuccessful attempts, finally reached the Pole in 1909.



The early explorers of the Arctic had one thing in common—they regarded the polar regions as an enemy to be conquered. They knew little of the Arctic and how to live there, how to survive as the natives did. These explorers burdened their expeditions with provisions, and when their food was gone they starved to death.

Stefansson contributed greatly to the knowledge of the Arctic by his crossing of the Beaufort Sea in 1913. But greater still, he proved that men could live off the country. By his own example, living for five years in the polar regions, he showed that the land could provide food, clothing and shelter—that it could be a "friendly Arctic".

Exploration by Air

In the modern world, polar exploration continues by air. Airborne explorers have traveled the polar region since 1897, when Andree attempted to reach the Pole by balloon from Spitzbergen. Amundsen tried with a dirigible in 1925. At last, in 1926, Byrd and his pilot Floyd Bennett flew over the North Pole. Again, in that year, Amundsen, Ellsworth and Nobile crossed that region in a semirigid airship. In 1937, Russian fliers crossed the Pole and landed in the United States.

Today, polar crossings by plane are not unusual, especially from Ladd Field in Alaska. Weather reconnaisance flights of the USAF cross the North Pole almost daily. Trans-polar flights are made in mid-winter darkness as well as in the daylight. The remarkable has become commonplace. The dangerous has become routine.

But through the years, the many expeditions seeking the northwest passage had only lightly explored the far north. The areas where the DEW Line would stand someday were still largely untouched. Knowledge of the Arctic was still meagre. Some of the DEW Line sites would be in remote, unexplored wastelands, where no man had ever been before. These sites would be located on a 3,000-mile line of arctic terrain, between Alaska and Baffin Island. What kind of a land was this? What was known of this land, its bounty and its perils, in the far north?

LANDS AND WATERS OF THE ARCTIC

Most people think of the far north as a region that is unendurably cold, permanently covered with ice and snow, and inhabited by a few Eskimos and polar bears.

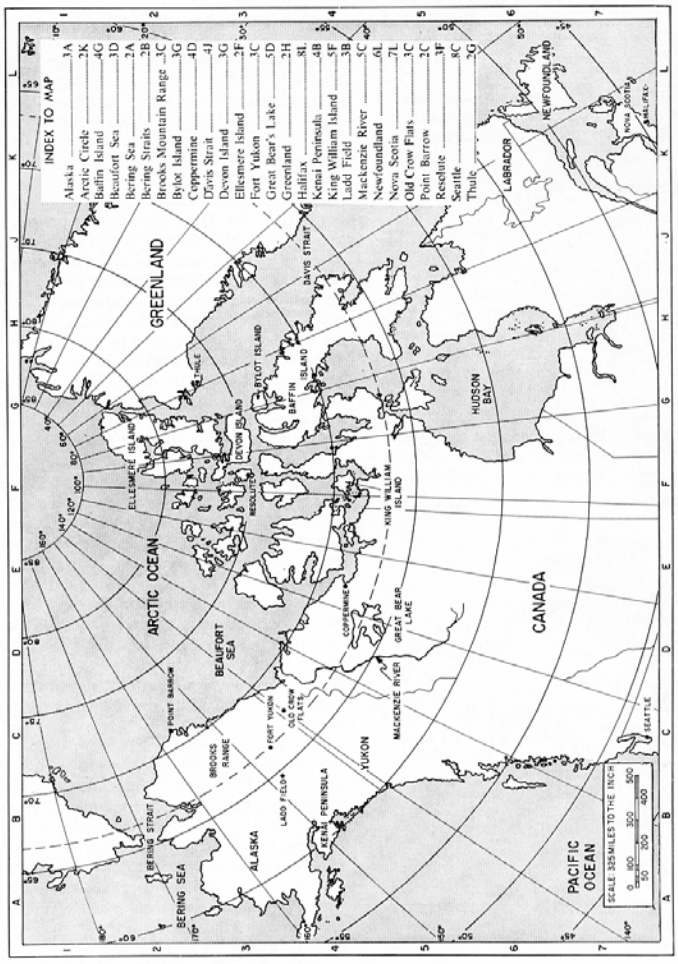
Actually, the polar regions are quite different from this conception. Certainly, the polar regions are cold, but there are areas in the far north that in summer are warmer than certain places in the United States. Some areas in the far north are covered with ice and snow all year round, but other places have meadowlands, flowering plants and a great variety of trees. Of course, polar bears do inhabit many parts of the far north, but so do rabbits, birds, goats—and even mosquitoes.

There are, in fact, many kinds of lands and many kinds of climates in the polar regions. There you will find much that is familiar and much that is strange.

The North Pole, of course, has no special landmark. The North Pole is merely a spot on the earth where all the imaginary longitude lines intersect at the highest point of latitude. One could stand on this spot and, without instruments to indicate it, never know it was the North Pole. The Pole is located at the middle of a vast body of water, the Arctic Ocean. Two-thirds of the Arctic Ocean is permanently covered with ice, but it is never frozen solid. Its ice floes, or sea ice (10 to 100 feet thick) drift around the Pole in slow but constant motion. The Arctic Ocean is surrounded by Canada and its many arctic islands, Alaska, Siberia, the Scandinavian countries, and Greenland. The North Atlantic Ocean and the Arctic Ocean meet in a deep-water channel between Spitzbergen and Greenland.

In this manual, we will limit our discussion to the Far North of the Western Hemisphere, because, of course, this is the region in which the

Ice Floes



Map of Arctic Regions in the Western Hemisphere

DEW Line stands. A map of these arctic regions is shown. All places in these regions which are named in this book can be located by means of this map and its accompanying index. In the extreme polar regions, snow and ice never vanish—that is, in most of the polar sea, in most of Greenland and in some arctic islands. However, in other areas of the far north, there are striking differences in the climate and environment.

Climatic Regions

Traveling northward from our homes in the United States and Canada, we pass through three main climatic areas: the forest, the taiga, and the tundra. Of course, the end of one climatic region and the beginning of another are not always sharply defined. Also, as we shall see, some places are exceptions and do not fall into the general classifications which identify or describe the areas just named.

One convenient way to identify each of the northern regions is by the vegetation that grows on it. The forest, or boreal, area has vast, unbroken stretches of forests, mostly needle-leaved evergreens. Here also are scattered shrubs, herbs and moss.

Map of the Tundra and Taiga Regions

The taiga, also called the sub-arctic or sub-polar area, is heavily forested land, covered with small trees, low shrubs, mosses, and an abundance of the flat, rootless plants called lichens. The taiga regions are in Newfoundland, southwest Labrador, the interior of Alaska, and most of the interior of Canada. Also, although the Aleutians are completely barren of trees, these islands are part of the taiga area.

The taiga ends at the irregular northern forest line. Here the Arctic begins, at the forest line—not at the Arctic Circle, as is commonly supposed.

North of the tree line lies the tundra. The tundra, also called the arctic or polar region, is by far the most intriguing and the most changeable area of the far north. The tundra is a mucky, treeless land—a flat, empty prairie encircling the polar sea. It covers as much as one-twentieth of the entire surface of the earth. The tundra covers the northern coast of Alaska and Canada, the Canadian Arctic islands (called the Canadian Arctic Archipelago), much of Labrador, and most of Greenland.

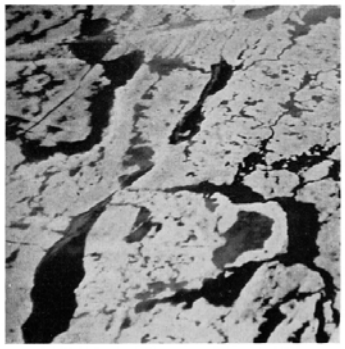
Many centuries ago, when titanic glaciers lay on the earth, the moving ice sheets ground away and leveled the face of this land. Now, only innumerable lakes, ponds, and shallow, aimless rivers break the monotony of the flat, almost featureless tundra.

Occasionally, this land is wrinkled by mountains and active rivers. In a few places in Canada, the tundra is a vast plain of frost-shattered rock. But most of the tundra is bleak and barren.

For nine winter months of the year, the tundra is a frozen desert stretching endlessly into the long arctic night. But finally May comes and the miracle of new life begins. Now for three months there is no night. The snows melt. A mist hangs over the air as the ground begins to thaw. Noisily the ice breaks. The restless waters thrust oddly shaped chunks of ice upon the muddy shores.

June brings swift changes to the tundra. The muddy land turns green. Nourished by the constant sunlight, bright, multi-colored flowers appear—even in northern Greenland, only 400 miles from the Pole! Birds flock in from the south, and all of life quickens in the summer sun.

When July passes, the first, light snows begin to fall. The world becomes a monochrome of



Aerial View of Tundra

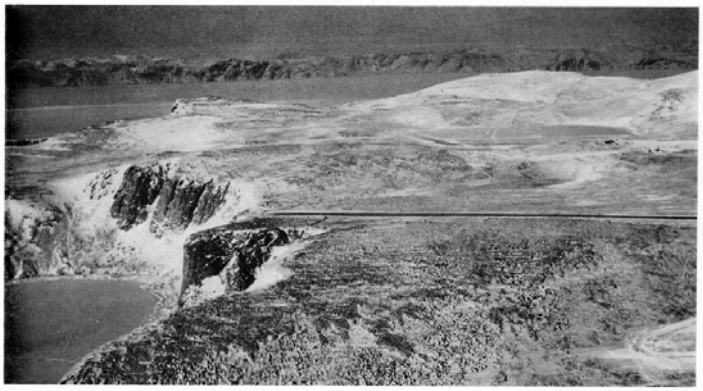
white land and white sky. And then again, the long winter night descends on the lonely, desolate wilderness of the tundra.

Permafrost

The strange and unique appearance of the tundra, winter and summer, is due largely to a special phenomenon of its land, which the scientists call "permafrost". As its name implies, permafrost is permanently frozen ground. Earlier we saw that only the extremely northern arctic regions, like the Arctic Ocean, are permanently covered with ice and snow. In much of the arctic and sub-arctic areas, however, the limited summer thaw melts only the top foot or so of the muddy ground. Arctic vegetation flourishes in the short summer interval on this shallow, swampy surface. The ground below the few feet of shallow water and mud is permanently frozen—a solid, resistant land-ice which never thaws. The depth of this permafrost may be 100 to 2,000 feet.

The surface waters remain on the top, never seeping into the concrete-like ground, forming instead marshy ponds and shallow, lazy rivers. Every slight depression in the tundra fills with water. Even a caribou's hoofprint becomes a tiny pond. The rains and snows, of course, are also trapped. This water table of lakes and ponds covers half of the tundra surface.

Tundra in Summer



Arctic Coastline

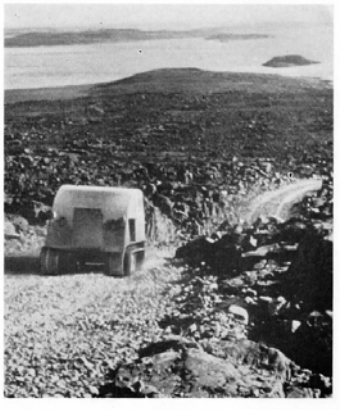
Although permafrost is hard and resistant, it does undergo internal changes. Even while temperature changes occur in the permafrost soil itself, the normal ground water pushes up from below the permafrost. Tremendous pressures result, sometimes as great as 28,000 pounds per square inch. Sometimes, under this pressure, the ground itself blows up, forming a huge icy mound, like a frozen volcano. At other times, the great pressures on the permafrost cause a horizontal movement of the sub-soil which, in turn, opens up huge cracks in the earth.

Obviously, building on this swampy, permafrost wilderness presented special problems for the men at the DEW Line. We shall discuss these problems in a later chapter.

Glaciers

The glacier is another striking characteristic of the far north. A glacier is a gigantic layer of ice, formed by rains and snows and covering a large area of land. Glaciers are found most frequently in mountainous areas, for there the rain and snow are usually the heaviest.

In slow, steady motion, the deep glacier ice scrapes across the land surface. When the bed of the glacier meets the resistance of the land, the brittle surface of the glacier may split wide open. This crack is called a crevasse. Most crevasses



Rocky Glacial Area

A Glacier

are formed where the land surface is steep and irregular. Often, the new-fallen snow will build a natural bridge across a crevasse. These bridges are extremely dangerous because they appear strong but frequently cannot support the weight of a man.

The main types of glaciers are ice caps and valley glaciers. Valley glaciers, which are like rivers of ice, are—as might be surmised—found in valleys only. Ice caps, however, may cover any other land surface. Wherever there is an ice cap, valley glaciers stem from it, but a valley glacier is sometimes found alone.

The Greenland ice cap is the largest in the northern hemisphere. Smaller ice caps cover parts of Baffin, Bylot, Devon and Ellesmere Islands. The western part of the Canadian Arctic is rather flat, and is free of ice caps.

THE ARCTIC CLIMATE

Such is the nature of the land in the far north. But the builders of the DEW Line needed to know much more. Data on the weather, for example, would be important to the operation of the DEW Line. What were the arctic seasons, the climate changes, and temperature? How were these affected by the snowfall, the winds, and the fog?

The temperature of any region of the earth is determined largely by the amount of heat that a region receives from the sun. Of course, a land will be hotter if the sun's rays strike the area more directly and for a longer period of time. The sunlight is least direct on the northern portion of the earth. Therefore, the polar region is the coldest in the northern hemisphere.

It is interesting to note here that the regions of the far north are slowly becoming warmer. Within the past few decades, temperatures in the arctic and sub-arctic have been noticeably less cold, in all seasons of the year. (Perhaps this is the effect of sun-spot activity.)

Arctic Seasons

Most of us are accustomed to enjoying a year with four seasons, all of approximately equal length. In the Arctic, the longest season by far is the winter, which lasts for nine months, from about August to May. Then, in an abrupt two weeks, most of the snow disappears from the ground, rivers open up, then lakes, and finally sea-

water bays and harbors. During the summer months of July and August, most of the ice has gone from the sea lanes.

At the end of August, huge fog banks over the open waters announce the quick onset of winter. Now the temperature drops sharply. New ice begins to form on the lakes and ponds. The bays, the harbors and channels freeze up. As the ice spreads, the fog dispels. Soon most of the waters are frozen over for winter.

The arctic navigation season ends early in September, but near Resolute it ends in October. There is some open water near the center of large lakes and channels as late as November. Great Bear Lake and Hudson Bay do not freeze over until after Christmas.

In midwinter, most of the arctic waters are frozen over. However, there is always open water along the west coast of Greenland to latitude 70°, and usually open water between southern Ellesmere and Thule.

Arctic Temperatures

Various factors affect weather conditions, such as the wind, the shape of the land, and the nearness of large bodies of water. So the coldest spot in the far north is not in the polar region, but, oddly enough, in a sub-polar region 200 miles south of the Arctic Circle. Sometimes areas in the United States, like Wyoming, Montana and North Dakota, have lower temperatures than are usually met in the polar regions. By contrast, in many polar places, 80° F. in the shade is not unusual in summer. At Fort Yukon, Alaska, right on the Arctic Circle, a temperature has been recorded of 100° F. in the shade!

Of course, considered all-year 'round, the polar region is quite cold. But the sub-polar coastal areas have relatively warm winters and cool summers because the adjacent large bodies of water tend to stabilize the temperature. The interior sub-polar regions have the coldest winters and warmest summers.

The temperature of the air depends to a large extent upon the nature of the earth surface which the air covers. Winter and summer, this is true in the Arctic: the warmest air is over the open water, cooler air over pack ice, and coldest air over the land.

A statement of the record highs and lows of temperature experienced at a given place does not give a true picture of the usual temperature at that place. Mean temperature (which is similar to average temperature) gives a more accurate view of the weather of a particular region. The following mean temperatures are typical of the far north:

Region	*Winter Mean Temperature*	*Summer Mean Temperature*
Polar ice pack	−30° F	12° to 50° F
Polar coastal areas	−20° F	12° to 50° F
Sub-polar interiors	−11° F to −21° F	60° to 61° F
Sub-polar coastal areas	16° to 36° F	49° to 57° F
Aleutian Islands	16° to 36° F	43° to 49° F

For each of these regions, we could also spell out a mean annual temperature. However, such mean temperatures could be misleading. For example, although the mean annual temperature in the Aleutians is low, its summer is relatively cold and its winter is relatively warm. In Fort Yukon, Alaska, although the mean annual temperature is surprisingly high, the hot summers are followed by extremely cold winters. A temperature of −80° F. has been recorded on the Alaska-Yukon border!

Along the DEW Line, the thermometer generally stays below zero for most of the winter. A temperature of −55° F. may occur at some DEW Line stations, but such a low reading is rather infrequent.

Snowfall and Rainfall

There is generally very little rain or snowfall in the polar regions. This will surprise many people who think of the Arctic as an icy, wintery place. Most polar regions have from 5 to 10 inches of snowfall in a year, but the snows do not melt for months, if at all. Since 10 inches of snowfall is comparable to 1 inch of rainfall, most of

the polar regions have the equivalent of only 1 inch or less of precipitation per year. This is amazingly little. Even the desert at Phoenix, Arizona, receives a mean rainfall of 7.6 inches per year.

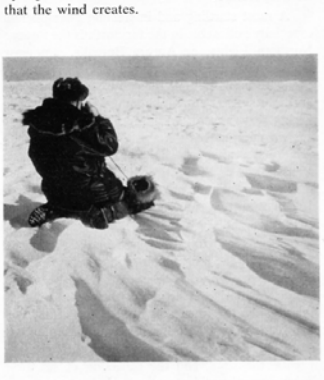
By comparison, the snowfall and rainfall of the sub-polar region is typically as follows:

Region	*Mean Annual Precipitation*
Sub-polar interior	10 to 20 inches
Aleutian Islands	29 to 76 inches
Sub-polar coastal	15.5 to 230.5 inches

For another comparison, Mobile, Alabama, has 60.7 inches.

Why is there so little rain and snow in the far north? A main reason is that the temperatures are generally low, and such cold air cannot hold much moisture. Also, though winds might be expected to deliver moisture from neighboring waters, this is prevented by the ice, which covers most of the polar waters for much of the year.

The snows in the far north are not like the snows we know in the United States. The snows in the north look like table salt. In a gale, this snow stings like wind-blown sand. Anything left outdoors during a storm will soon be buried, not by a great snowfall, but by the huge drifts of snow that the wind creates.



Arctic Snow

Winds and Fog

Certain regions of the north have strong winds, but the strongest winds on record occur outside of the far north.

Over the polar ice pack, all seasons tend to be stormy. High winds are often the most noticeable feature of that area, especially during the summer. Over the polar land areas, some gales occur during the late fall and winter.

The sub-polar inlands have the least wind. But on the coastal sub-polar areas, winds are often severe, with gales occurring during all seasons. Winds of 150 miles per hour have been reported on Baffin and Ellesmere Islands and on Greenland. On the DEW Line, construction problems were aggravated by wind-blown snow and ice.

Fog is another characteristic of weather in the far north. It can be a menace to navigation and travelling in the north. Fog covers the polar ice pack at least half of the summer.

A fog formed of extremely fine ice crystals, called spicule fog, occurs over the Greenland ice pack and the northern interior regions. The ice crystals of this fog may glisten in the sun or moonlight.

A man-made fog may occur over large installations. This fog is caused by moisture in the air from the presence of large numbers of people, animals, and moisture-producing apparatus. Such fog may restrict aircraft operations because of poor visibility. Ladd Field in Alaska was once shut down for 22 days because of man-made fog.

Cold bodies of open waters also generate clouds of mist. Such clouds, rising from flooded rivers or from open water in an ice-filled sea, resemble the smoke of forest fires and are called sea smoke or steam fog.

Tricks of the Arctic Weather

The weather and climatic conditions of the far north have combined to make experiences there at times startling, unique and even awesome. You have probably had the experience on a wintery day of your breath condensing in the cold, dry air, and a cloud or fog hovering near your nose and mouth. In the far north, the condensation of moisture in the dry air forms a white fringe of frost on eyelashes, on beards, and on one's parka hood. Water vaporizes almost instantly in this

Vaporization of Water at — 52 F.

dry climate. The illustration shows the dramatic effect of vaporization when a glass of water is hurled into the air at 52 below.

The cold in the far north affects sound waves. Sometimes on a still day in the polar winter, the barking of dogs or an axe striking wood can be heard from a distance of several miles. On the other hand, snow may be so absorbent of sound that, in a snow cave, a man would have to shout at the top of his lungs to be heard only ten feet away.

Cold, dry weather greatly improves visibility. However, visual judgment tends to become very unreliable, especially in a desolate area where there are no houses or trees to serve as guides to relative sizes and distances. At times, when there is no direct sunlight, a bright glow filters through the clouds seemingly from all directions. There are no shadows. Men cannot distinguish snowdrifts. Distance is almost impossible to estimate. A nearby seal may look like a far-off island!

Sometimes when the light reflected from the snow is as great as the light coming from the sun, this is a land of great brilliance. Then the horizon vanishes. Ground and sky are fused into a thick, white cloud. Everything appears hazy and milky. This is called a "white-out".

Strange tricks of vision, caused by the sun, snow and air, have been reported by men who worked to survey and build the DEW Line stations:

". . . When the sun is below the horizon, the light can still be blinding – and absolutely shadowless. Which makes flying – and even walking – dangerous sometimes. You can walk into a 15-foot snowdrift without even seeing it. With no sun, a white, wraith-like mist seems to be a background for everything."

". . . A twig on top of snow a few feet away looks like a tree a half-mile off. . . . The sun shining on water has a way of creating what looks like a cliff. You know it's an illusion, but everyone standing there with you will see the same thing."

Certain mirages are common in the far north. Objects that are normally hidden below the horizon may suddenly appear on the horizon or even in the sky. Sometimes the images in the sky appear upside down, and as if floating above the horizon or resting on a pedestal. Such sights are called "looming". Just as uncanny is the opposite visual effect; nearby objects which should normally be in clear view may disappear from sight. These strange visual effects are caused by light rays which are bent because of abrupt changes of air temperature.

A most startling and interesting phenomenon especially noticeable in the far north is the famous Northern Lights, or Aurora Borealis. Immense fluorescent bands of colored light, constantly changing in shape and intensity, flash across the northern skies. A great shimmering rainbow, the Lights may appear at times like an undulating curtain flung across the sky. At other times, the Aurora Borealis may change to a luminous haze, or again, to bright darting shafts of color across the heavens. Sometimes a faint glow, the Northern Lights at other times can be as bright and clear as full moonlight.

There is no total darkness in the far north. Even during the long winter night, there is considerable light. For one thing, although the sun is below the horizon, the arctic temperature bends the rays, so that men actually see the sunlight of the hidden sun. Good visibility is aided in the arctic night by the bright moonlight, the Northern Lights, the stars, and the reflection of all these lights upon the wide, snowy landscape.

NATIVE PEOPLES

The builders of the DEW Line had to know still more of the Arctic. They had to know about life in this northern region. Who were the native peoples? How did they live and what animals did they hunt?

In the far north, the native peoples are Eskimos and Indians.

The Eskimos are a friendly people and very intelligent. When they are treated well, Eskimos are extremely helpful, hospitable and trustworthy. Some Eskimos still have a primitive way of life. They depend exclusively on land and sea animals for food, for clothing and for fats which yield the vital heat- and light-giving oils. Their diet is very scarce in vegetable foods.

But most Eskimos today have a more advanced way of life. Some Eskimos in Alaska and in west Greenland have well-ordered, civilized communities. Most Eskimos have now had some contact with white men, and almost all have been converted to the Christian faith.

Hunting or fishing is more than a sport for these people; it is their means of existence. Most Eskimos make seasonal migrations, following the game they hunt. Skilled travelers on land and on sea, Eskimos are expert hunters, trappers, and fishermen.

Eskimos are mostly coastal dwellers. Many parts of the polar and even sub-polar wooded country are uninhabited and are rarely visited even by Eskimo hunters.

The Eskimo language is difficult to learn, but dialects differ very little from tribe to tribe. Rassmussen and his co-explorers were able to converse with all the Eskimos they met on their long journey from Greenland to the Bering Sea. Today, many Eskimos understand English, and many in Greenland understand Danish.

Like the primitive Eskimos, the primitive northern Indians live mostly on a meat and fish diet. Today, these Indians have adopted many customs of the white men, including his types of food.

The native Indians are an inland, forest people, and they seldom venture far into the barren grounds. They are expert in woodcraft and have an uncanny knowledge of animal habits. As compared to Eskimos, Indians appear less friendly and straightforward towards strangers. But to anyone in need, the Indians, too, are friendly and helpful.

The Indian language is difficult, too, and tribal dialects differ so much that members of distant tribes rarely can communicate with each other. Fortunately, most Indians today understand at least some English.

The Eskimo population is concentrated mainly in Greenland, polar Canada, Labrador and Alaska. The Indians live mainly in sub-polar Canada and sub-polar Alaska.

Only the Eskimos of the west coast of Greenland, Frobisher, and Point Barrow have permanent winter settlements, and even these Eskimos disperse in the summer for hunting. Eskimos on the Canadian polar shores move inland in summer to hunt caribou, to get timber for tent poles and spears, and to seek salmon, ducks and geese.

The total native population, Eskimo and Indian, in the far north is approximately 132,000. Obviously, then, the vast stretches of the far north have a sparse native population. Communities are small, and are generally located on a waterfront. This is suitable to travel by boat, and is the best location for most forms of fishing and hunting.

ANIMAL LIFE IN THE FAR NORTH

Here in the polar and sub-polar regions, the primitive, animal struggle for existence is sharply drawn. The seals feed on fish, polar bears feed on the seals, and foxes feed on the seal blubber abandoned by the polar bears. The maritime areas of the far north have all these animals in common — seals, fish, polar bears, and foxes.

In the eastern arctic areas where the terrain is often high, rocky, and glacial, mussels are found on the rocky shores and fish at the mouth of a river.

In the spring and early fall, seals lie exposed on the ice. Currents cause some holes in the ice which remain open all winter. Favorite breathing places for seals, these holes are also favorite hunting spots of the Eskimos.

In the eastern region roam the caribou, the musk-ox, and the polar bear. Arctic owls and white and blue foxes are hunted here for food and furs as well. In this rocky country, hares may be numerous. Lemmings may be found under rocks, among the grass, or under the snow.

Geese and ducks are common along the coast in summer. Colonies of gulls settle on the cliffs, and on some islands may be found numerous murres, which are northern diving birds. Ptarmigan, a northern species of grouse, are numerous in both summer and fall, both inland and on the rocky coast.

In contrast to the east, the western region of the Arctic is flat and low-lying land. Along the island shores, clams and crabs may be found.

Large herds of caribou roam most of the western islands. Polar bears may be found within the area bounded by the 69th and 77th parallel of latitude. Ptarmigan are available, especially in late winter, when they flock together. Here, too, are the arctic hare, the owl, wolf, white and blue fox, and the lemming.

Much of the same animal life is found on the barren mainlands; herds of caribou, musk-oxen, and sometimes moose. Again, the ptarmigan, arctic hare, fox and lemming are hunted. Some grizzly bears inhabit the region.

Fish abound in almost all the waters. From Coppermine west to Point Barrow, the coastline yields char, white fish, herring, flounder, sole, and some crabs. East of Coppermine, the lakes bear char and white fish in winter. The rivers offer char, white fish and herring.

Distinctive mud huts on the lake ice reveal the presence of muskrats, especially in the Mackenzie River Delta, and the northern portion of Old Crow Flats in the Yukon.

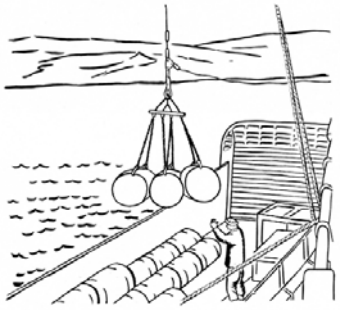
THE HOME OF THE DEW LINE

This, then, is the Arctic. Spreading eastward with the vastness of a great continent, spreading from the fringe of Alaskan tundra, across the Yukon and the great Mackenzie River emptying into the Arctic Ocean, past the flat permafrost wilderness of western Canada, climbing to the hills and crags of the east, climbing and reaching the icy peaks of mountainous Baffin Island—this was the land on which the DEW Line was to be built.

CHAPTER 3

BUILDING THE RADAR FENCE

When the momentous decision was made, back in 1952, to construct the DEW Line across the top of the North American continent, immediate steps were taken to accomplish the gigantic task.



The great project, of course, involved planning, recruiting and training of personnel, designing and testing of new equipment, and ordering and packing of vast amounts of supplies. All of this, and more, was done "at home" in the States.

But the first true test of this magnificent effort was the construction of the experimental line across the top of Alaska. That was the proving ground of the whole undertaking. There, on the frozen tundra of Alaska's northern coast, brave and hardy men established the first functioning part of the DEW Line. Ferried into this wilderness by Air Force cargo planes, they encamped in tents and crude buildings facing the frigid Arctic Ocean, the Brooks Mountain Range at their backs.

The successful experimental line proved that the newly-developed DEW Line equipment would function in the Arctic. It proved also that the bigger job could be done. Now the DEW Line must be extended across the whole continent.

SELECTING THE SITES

First, the location for the rest of the DEW Line had to be chosen. Of course, the farther north the Line could be located, the earlier warning our country would receive. But many technical factors affected the decision on this location. Would it allow good radar coverage and good communications? Could it be supplied by the annual sea-lift? Could men work there? Could they erect buildings, construct airstrips? Were there gravel deposits nearby for road-building and construction of buildings on permafrost?

The geography of the land presented special problems, too. In western Canada the terrain of the Yukon Territory was rugged. The rocky coastline dropped away at the mouth of the Mackenzie River to become level land. The vast Canadian territories sweeping eastward afforded a flat, watery tundra of lakes and ponds on the permafrost. In eastern Canada was a land of countless lakes and mountainous terrain, a land of rugged islands fringed with fiords and crowned with glaciers.

Somewhere on this terrain, the future DEW Line must be erected.

Before the location of the Line could be chosen, every available map of the North American Arctic was examined. Every report of previous arctic explorers was studied. Every likely location was scouted by plane and further explored. Thousands of new aerial photographs

Mountainous Terrain

were taken, and the geography of the land was carefully examined.

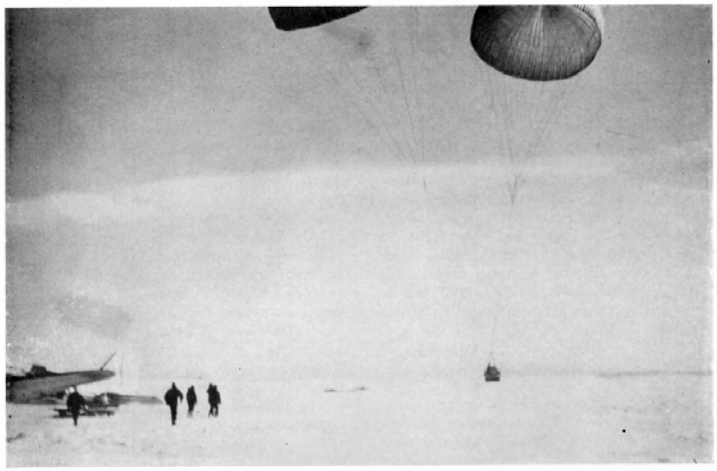
After the best possible location for the Line was chosen, it was necessary to select the best specific sites for the individual radar stations. Actually, the sites could be chosen in only one way: on-the-spot tests and surveys must be made at the specific locations under consideration. So expeditions were made into this unexplored and hazardous wilderness by modern-day pioneers, the site selectors.

This was terrain that even few Eskimos had seen. Existing maps were often inaccurate or incomplete, and the site selectors had to make new maps, naming new islands, capes, and bays as they explored them.

Of course, the exact location of the DEW Line sites was secret information, and it still is, for security reasons.

The siting engineers, usually the first to arrive at the tentative sites, were deposited at the sites by ski-equipped planes. They lived and worked on a new frontier under extremely primitive conditions. Theirs was one of the most rigorous tasks

Surveying



Paradrop of Supplies and Equipment

in the construction of the DEW Line. They staked down their tents against the savage Arctic winds, made electrical tests, surveyed the area for landing strips and building locations. If it was tundra region, they searched for gravel or for rock that could be crunched into gravel to make the roads, airstrips, building foundations and pads on the permafrost.

Furthermore, these men were pressed for time. The DEW Line must be built without delay. Stringent deadlines were imposed by an urgent need for defense. The weather also made it necessary to rush the job to completion, for only during a few weeks in late summer are the waters free of ice to allow ships to pass through the Arctic Ocean.

All during the winter the site-selectors worked, even while the ground was covered with snow and the visibility was poor.

PREPARING THE SITES

Finally, the sites were selected. In the trackless wastes of the far north, solitary flags were planted to mark the sites of the future radar stations. Then, the brutal, back-breaking work began – to clear away the snow for an airstrip which would be long enough to permit a single

Clearing an Ice Strip

engine cargo plane to land with vital supplies and equipment. Small tractors and other supplies were sometimes dropped by parachute at the otherwise inaccessible locations. The early airstrips were cleared by hand, or sometimes by the small tractors. Too often, 100-mile winds swept huge snowdrifts upon the newly cleared airstrip, and the grueling work had to be re-done.

When at last the winter ice was cleared and the cargo planes could land, more construction personnel, powerful snow-removal machinery, and other welcome equipment and supplies arrived. Each plane brought heavier equipment to the site to enable construction and the clearing of larger airstrips; these airstrips, in turn, accommodated larger planes which would bring still heavier equipment. Thus the foothold in the Arctic was achieved.

SUPPLIES FOR THE DEW LINE

Next, a steady stream of supplies and equipment had to be poured into the sites. A long line of supply had to be established – supplies shipped from all over the United States to stateside harbors, then convoyed to materiel depots, and finally routed to these isolated outposts in the far north.

Such problems of transportation and supply are known in military language as *logistics*. The logistic problems were, in fact, as great and as urgent as in a wartime undertaking. Also, as in a beachhead invasion, the supply problem required detailed advance planning and accurate timing of operations. The enemy was time and the weather, for the DEW Line must be speedily erected; the approaching arctic winter would create special difficulties in construction and transportation.

The loads of supplies and equipment that had to be brought to the DEW Line sites were staggering in size. For each station, there must eventually be main buildings to house the equipment, the power plants and the men who would operate them. There must be a garage for motor vehicles and tractors, towers for antennas, fuel storage facilities, roadways, airstrips – and, at some locations, even hangars for planes.

To build all this required all sorts of heavy construction equipment, giant tractors, bulldozers and cranes. Construction in the Arctic also called for specialized equipment, like snowmobiles, wan-

Plane Coming into a Cleared Runway

Unloading a Plane

nigans, Nelson heaters, and steam-pointers for melting holes in the frozen ground.

And the job was done. During the winter and spring of 1955, the sites received 30,000 tons of heavy machinery, building materials, fuel oil, and other supplies. In the late summer months, another 200,000 tons of supplies followed. So many fuel-oil drums were delivered to this land where heat means survival that, if they were laid end to end, they would have extended 180 miles!

To deliver the vital supplies, every available means of transportation was used – planes, ships, and "cat trains." Cat trains are trains of wannigan sleds drawn by caterpillar tractors.

Supplies by Air

At the western or Alaskan end of the DEW Line, the supply problem was less difficult than elsewhere. In that area, experience on the experimental line proved that it was possible to fly materials to the airstrip at Point Barrow. There, an abandoned Navy camp which had been built for oil exploration work during World War II, was reactivated. The airlift to Point Barrow began in February, 1955. From there, supplies were hauled by cat trains, sometimes as much as hundreds of miles over the ice and tundra to the lonely, secret sites.

Along the eastern areas of Canada, the problem of transportation was complicated by terrain which was too rugged for cat trains. Here, the sites could be supplied only by an airlift – a gigantic operation requiring the greatest armada of planes ever seen in that part of the world.

Hundreds of aircraft of all types were used, from small bushtype planes to the giant, four-engine C-124 Globemasters, capable of carrying 20-ton bulldozers in their bellies and weighing 90 tons each after loading. Thousands of flights were made by the U. S. and the Royal Canadian Air Forces, and by commercial aircraft. Nearly every available cargo plane of every type and size was

Helicopter Carrying a Console

called upon for the job of delivering supplies and equipment. Helicopters were used. Some planes arrived even from the tropics, and this created additional problems because these planes had not been winterized for arctic flying.

Along the Line there were no maintenance facilities whatsoever, and even at airplane bases maintenance was meagre. Servicing and repairs were done outdoors in the wind and cold. Once, in sub-zero weather, an engine change was performed inside a specially built igloo which the Eskimos erected around the disabled plane. One airlift pilot was unable to locate a certain construction site because the radio beacon which should have been guiding him there was part of the cargo he was trying to deliver!

It was expected that the winter airlift would be a tough, grueling task – and it was. The entire airlift operation was a bitter struggle, a race against time and the weather. Many flights were made during long, exhausting hours in the bitter cold, wind, fog, and snow. Six pilots and co-pilots of commercial planes were killed. Many planes were damaged.

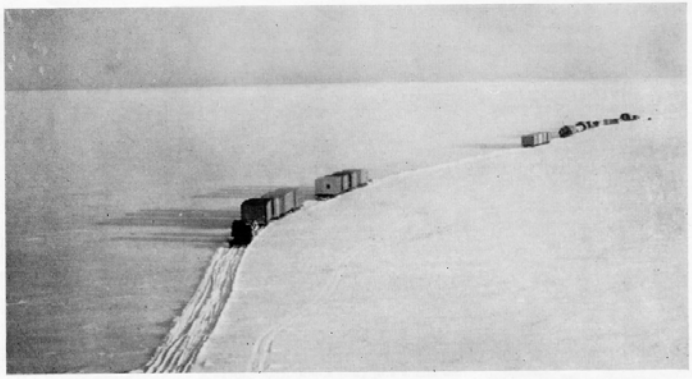
But despite all the hardships and hazards, the courage and perseverance of these men prevailed. When the spring thaws settled over the Arctic, great stores of material stood among the snow drifts at appointed spots along the Line. The airlift was a success.

Landing Craft Delivers a Vehicle

Supplies by Sea

Meanwhile, from all over the United States, streams of other supplies were converging at two great harbors, Seattle on the west coast, and Halifax on the east. For many months, thousands of tons of materials had been assembled and loaded onto the hulls of waiting ships. Then, in early July, a great convoy of loaded ships left each of

POL on a Beach



Cat Train Following the Leader

these ports, swung its bows northward, and began a mighty sea-lift through the icy waters. From Seattle through the Bering Strait and on to the Beaufort Sea, they sailed; northward, too, from Halifax, skirting Newfoundland, and into the Davis Strait.

Each fleet was comprised of about 60 ships – ice-breakers, tugs, repair vessels, victory ships, LST's, and many other kinds of large and small craft. It was a gratifying and impressive sight, this great convoy of heavily laden gray hulls heading towards the northern horizon.

But it was also a dangerous and difficult mission. Sometimes buffeted and harrassed by ice, fog and vicious storms, these ships sailed into arctic waters that were largely uncharted. At times, perverse onshore winds swept the ice fields against the ships and threatened to crush them against the shore. At other places, cargoes could land only after hidden rocks and reefs were cleared away by Navy demolition experts who plunged into the cold water in rubber skin-diver suits to emplace the explosives. Landing craft of all types were used to deposit cargoes on the shores.

Not every ship reached its goal. Some were damaged, some had to be towed out of the ice. Two ships lost rudders and propellers; another, rammed by ice, had its engine room flooded.

But Operation Sealift fulfilled its mission. Almost all of the precious cargo was delivered to the assigned locations. Where certain sites could not be reached by ship, their shares of the materials were left at nearby beaches to be hauled to the sites themselves by air or by cat train.

The cat train was often the last leg of the haul. Powerful tractors pulled sleds loaded with grease, gasoline, and diesel fuel. Like freight cars on runners, the cat train was sometimes composed of a cook's car, a bunk car, and a shop car with tools and welding equipment. Other cat trains hauled hundreds of oil drums to the radar stations.

Tractor in the Arctic Mud

Tent Shelters in Early Construction Days

Thus, mountains of supplies were transported to the DEW Line, and the arctic stillness was shattered by the roar of powerful machinery and shouts of construction workers. The tractor treads churned snow and mud into deep brown slush and new difficulties arose. But the construction of the DEW Line had begun.

SOLVING THE CONSTRUCTION PROBLEMS

In the early days on the experimental line, housing was, of course, temporary and crude. The early shelters, serving to house and protect the men and the experimental radar equipment, were mere tents, wooden shacks, or pre-fabricated metal-clad structures.

The original pre-fabricated shelters were laid out with a main corridor having sections or arms extending at right angles from it. Several module units were connected by metal corridors, which served as heated, protective passageways.

Housing on the DEW Line today reflects the valuable experience gained from the experimental line. Permanent buildings on the DEW Line now are designed to fulfill the following requirements: to be habitable for at least 20 years; to have maximum insulation; to be as fire-resistant as possible; to be a light foundation load; to withstand high winds and snow and ice loads on the roof, and to be easy to maintain and repair.

The modules are now snug, well-insulated buildings made of prefabricated plastic-coated plywood panels, as described in the next chapter. The modules are arranged in trains that are placed with their fronts facing into the prevailing wind. This avoids a fault of the earlier arrangement, which permitted the wind to pile heavy drifts of snow in and around the spread-out modules. Enclosed overhead corridors are used between trains to avoid snow pile-up, and to allow vehicles to pass between the trains.

The modules in today's DEW Line station are standardized – one module for dining room, another for dormitory, another for shop, and so forth. This uniform arrangement allowed the modules to be assembled at a more convenient, populated location than the station itself. The whole module train then could be, and was, hauled in sections by cat train to the radar site.

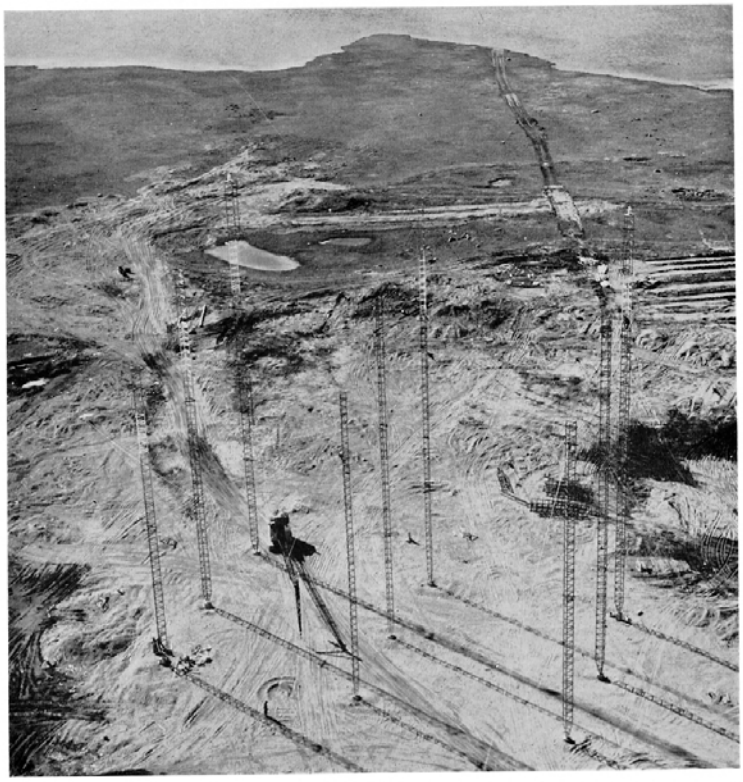
Construction on Permafrost

The permafrost presents special construction problems in the far north. To meet these problems, new construction techniques were developed. Permafrost can be a serious hazard, or an aid to construction. Men on the DEW Line have learned that it is wiser to build on undisturbed permafrost than to upset the natural balance of temperature and pressure forces.

For one thing, it is not feasible to excavate in the permafrost. Fuel-oil pipes, drains and other lines are therefore run above ground.

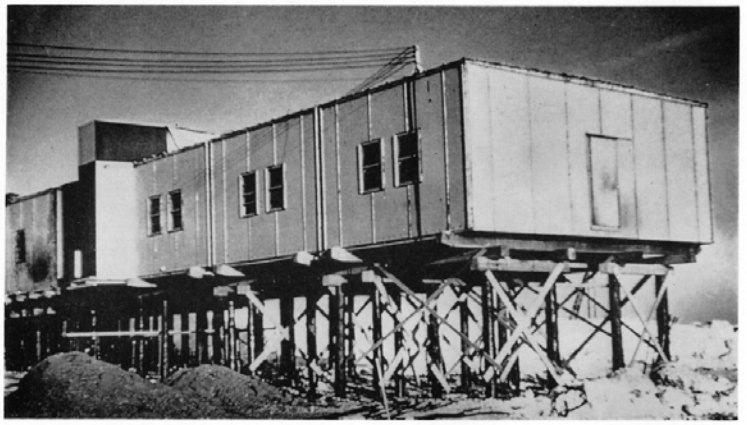
Pilings can be placed in the permafrost by means of a technique called "steam-pointing." By this arduous method, a live jet of steam is used to melt a hole in the tundra. The permafrost is softened, and a piling, guy anchor, or a construction pole is placed in the ground. The earth and water rapidly freeze again around the pole, which now is firmly gripped by the permafrost. Properly anchored on such pilings, buildings will remain stable and undamaged. Steam-pointing also was used in erecting some of the huge reflector towers.

Most of the buildings on the tundra are set upon pilings. Elevating the buildings from the ground allows the fine, dry snow to blow freely beneath them, but most important of all, cuts



Putting up Reflector Towers

Steam-pointing



Construction on Pilings

down the loss of heat from the buildings to the ground. The natural stability of permafrost ground is upset by man-made heat. Heated buildings situated directly on the ground would transfer their own heat and would gradually melt their way down into the yielding earth.

Another method of insulating the ground from the heat of the buildings is the use of a gravel layer or pad. This insulation is effective, not only for buildings, but for airstrips and roads as well, to keep anything built upon them from sinking into the tundra. Insulated in this way, the permafrost layer of ground retains its low temperature and remains frozen and hard.

Airstrips and roads are the life lines of the DEW Line. Without them, there would be no adequate means of transporting men and materials, and the DEW Line operations would be seriously curtailed. Since the roads and airstrips must be kept clear and open, snowdrifts could present a serious problem.

An important construction technique which overcomes this problem is the building of roads and airstrips higher than the surrounding ground. The winds which might otherwise cause snowdrifts, continually scour the high, exposed surfaces, and actually blow the snow away. However, the slope that is formed by the elevated roads and runways must not itself promote the formation of other snowdrifts. Experience shows that a gentle slope will best assist the wind to blow away the snow.

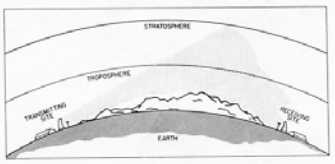
SOLVING THE COMMUNICATIONS PROBLEM

When, in 1952, the Line was in its early planning stage, a major problem was that of message communication to the Line and along it. High-frequency radio-wave bands which normally are used for long-range communications are extremely unreliable in the Arctic. Sunspots, the aurora borealis, and other disturbances in the atmosphere and ionosphere often cause high-frequency radio messages to be garbled beyond recognition, or to be completely blacked out.

Of course, communications on the DEW Line must be completely reliable. Using the usual remedy for such a communications problem would mean installing thousands of miles of telephone and telegraph wires. Obviously, this was economically impractical, and, in the far north, likely to be impossible.

Fortunately, just at this time, scientists at the Lincoln Laboratory, the Air Force Cambridge Research Center, and the National Bureau of Standards succeeded in developing a wholly new method of radio communications. This wonderful technological "breakthrough" in the field of communications makes use of "scatter propagation" or "scatter communications."

This discovery involved the use of very-high frequency (VHF) and ultra-high frequency (UHF) bands. By employing vastly higher transmitter power, huge antennas, and extremely sensitive receivers, enough VHF or UHF energy could be bounced or scattered off the upper atmosphere to



Scatter Propagation

achieve reliable communications over several hundred miles. Thus, long-distance communications were achieved in the far north.

Now individual radar stations on the DEW Line are connected to each other with this UHF lateral communications system. With VHF communications (UHF on one rearward link) the entire DEW Line is now linked to our defense centers in the United States and Canada. In the UHF lateral system, auxiliary stations of the DEW Line pass detection data to the nearest main stations. The main stations then transmit the detection data via VHF or UHF back to the base stations. All circuits provide transmission in both directions, and can handle administrative message traffic as well as detection data.

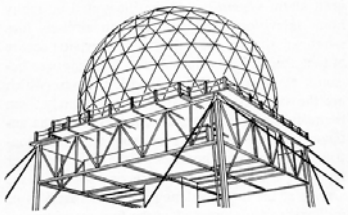
Each station also can communicate with aircraft, with vehicles and with intermediate stations. The main and auxiliary stations are further equipped with radio for the guidance of aircraft and vehicles.

"Scatter communications" is but one of the electronic wonders on the DEW Line. It is, however, an example of the latest techniques and the advanced scientific knowledge which is placed at the command of the DEW Line operating personnel.

CHAPTER 4

THE DEW LINE TODAY

In the preceding chapters of this book, we have discussed the history and background of the DEW Line. Now let's take a look at the completed DEW Line—what are the stations like, and how do they operate?



The DEW Line is divided into six sectors, each guarding approximately 500 miles of the northern rim of our continent. Each section is responsible for all operations, administration, and communications within its area.

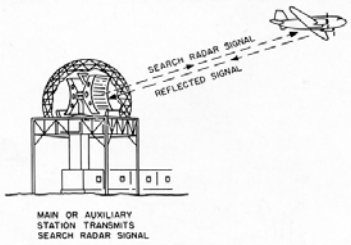
There are three kinds of radar stations on the DEW Line: main, auxiliary, and intermediate. As we shall see later on, these stations differ in size, functions, equipment, and manpower. Behind the line itself, the base and relay stations complete the communications network which provides the early warning alarm.

HOW THE DEW LINE OPERATES

The Radar Fence

The basic purpose of the DEW Line is, of course, the detection of enemy aircraft by radar. Radar operates on much the same principles as radio; radio-frequency (RF) waves are sent out by a transmitting antenna and are picked up by a receiving antenna. In radar, both antennas are usually located at the same site. In fact, in most radar sets, one antenna is used for both transmitting and receiving. Transmitted waves which strike a reflective object, such as an airplane, are reflected, or "bounced," in many directions. Some of the wave energy is reflected back to the radar station where it is picked up by the receiving antenna. Detection is thus accomplished, since the transmitted waves which do not strike any reflective object are not received back.

Electronic circuits in the radar set measure the time interval required for the transmitted



How Search Radar Works

wave to reach the aircraft and be reflected back. This time interval, measured in millionths of a second, or *microseconds*, reveals the distance to the aircraft, since radio waves travel at a known speed. (Speed × time = distance.)

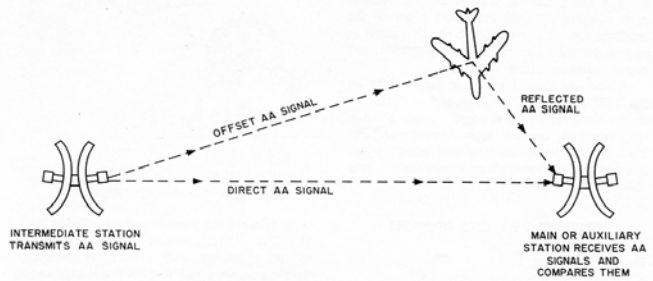
Search Radar. Search radar, the more conventional type of radar used on the DEW Line, is a powerful, long-range radar. The DEW Line search radar set detects the presence of a plane by the use of one antenna. Inside the radar dome, or *radome*, at the main or auxilary station, this antenna resolves constantly, sweeping its beam around the area guarded by that station. When the beam of the search-radar antenna strikes an aircraft, it bounces back from the plane, and the same antenna picks up the "echo" or returning RF energy. This echo is used to trigger an automatic alarm, called radalarm. The radar scopes provide additional data from which speed, course, and altitude of the detected plane can be determined.

By means of a reflector or "dish," the search radar concentrates its RF energy into a narrow beam, like a searchlight, into the sky. This concentration extends the range of the search radar, but in a single moment, the radar can scan only one portion of the skies. That is why a search radar antenna must always rotate. Its narrow beam sweeps around the DEW Line station in less than a minute, day and night, constantly on the alert.

On the DEW Line, the probing RF waves of the search radars overlap, so that no plane can fly between them. However, the beam is concentrated so much in a straight direction that it does not follow the curvature of the earth, and a gap results below this beam. A special type of electronic detection, the aircraft alarm (AA) system, is used specifically to fill in this gap by detecting low-flying planes.

Aircraft Alarm System. Aircraft alarm (AA) is a semi-radar system which employs pairs of transmitting and receiving sets. The transmitter set is located in intermediate stations and the receiver set at the adjacent main or auxiliary stations. The intermediate station transmits a beam, part of which goes directly to the main or auxiliary station and part of which goes out at an offset angle to any intercepting objects. Some of the wave energy striking an aircraft from the offset part is reflected to the main or auxiliary station where comparisons are made with the waves received from the direct part of the beam. The "push" given to the waves by the plane's motion is detected and measured, a bell rings, and the indicators reveal the plane's general area and its direction of crossing that area.

The two sets of waves compared by the aircraft alarm system have been illustrated on many home television screens. When an airplane flies overhead, the image on the home television screen may flicker or become doubled. This happens because, while some of the television waves (which are the same as radio waves) travel directly from the television-transmitter antenna to the home antenna, another set of waves from the television-transmitter antenna bounces off the airplane. After traveling a longer path, the second set of waves arrives at the home antenna a few thousandths or millionths of a second after the first set of waves.



How Aircraft Alarm Radar Works

The two sets of waves supply two sets of images, and both appear as a jumbled picture on the television screen.

On the DEW Line, this kind of wave reflection is not a nuisance, but serves a very useful purpose.

AA waves travel in a straight line. For a signal to be received, the DEW Line antennas must be able to "see" each other from distances of about 50 miles. To accomplish this, the AA antennas are mounted on tall towers, as high as 400 feet. These towers are the tallest structures on the DEW Line.

There are two AA antennas at almost every DEW Line site; one faces the next station on the east, the other faces the next station on the west.

Together, the search radar and AA systems form a radar fence through which it is very difficult for an airplane to pass without setting off an alarm.

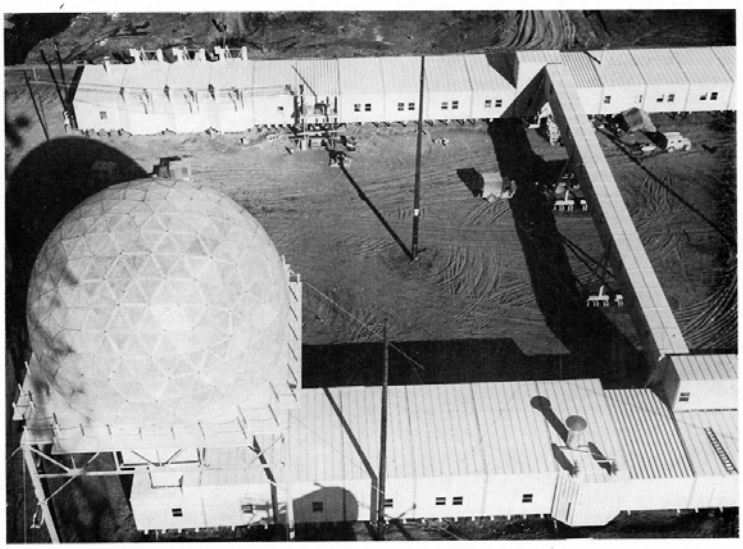
When an aircraft is detected, the Console Operator immediately transmits the information to a Controller who may be hundreds of miles away. The Controller is an officer of either the United States Air Force or the Royal Canadian Air Force. If the aircraft is not identified as friendly (FR), the Controller sends a warning to rearward Air Defense Command centers.

Swift and reliable communications tie together the whole DEW Line operation. Communications run laterally along the Line, and rearward to the military and civilian authorities in Canada, the United States, and Alaska.

TYPES OF DEW LINE STATIONS

The Main Station

There are six main stations, each the heart of a DEW Line sector. The main station is the hub of personnel activities and of all messages—military, administrative or personal—rearward to



Typical Main Station

Typical Auxiliary Station

Canada and the United States. The main station distributes all supplies to the outlying sites, except for those supplies which are delivered by the annual summer sea-lift to some of the smaller stations.

At the main station are the largest airstrips, the biggest fuel tanks, and the greatest number of men. Its airstrip can accommodate the largest four-engined transport airplanes.

The main station has two building trains, each composed of 25 to 30 modules joined together in a prescribed order. The two trains lie side by side and are connected by an enclosed overhead bridge. The modules contain the interior equipment necessary for surveillance and communications, the living quarters, the administrative offices, and some of the supplies. Towering above these trains and dominating the landscape is the giant, balloon-shaped radome, which houses the large antenna that ceaselessly searches the skies.

The Auxiliary Station

Between each of the six main stations on the DEW Line there are several auxiliary stations. Smaller than the main station, the auxiliary station nevertheless has the same surveillance equipment. Here, too, the familiar radome is silhouetted against the arctic sky. Tall antenna towers for communications equipment rise near the great dome.

Communications facilities are fewer at the auxiliary station. From here there is no direct contact with the rear. Instead, all communications are sent to the main station to be relayed.

The auxiliary station has one building train composed of 25 modules, in which usually 12 men live. If more maintenance men are needed, the main station provides one of the roving crews which serves that particular sector. Fewer vehicles and smaller supply areas are maintained at the auxiliary station.

The Intermediate Station

The intermediate station, also called the I-site, is the smallest radar unit on the DEW Line, but its importance should not be underestimated. As we have already seen, the aircraft alarm (AA) of the intermediate station performs an important function by filling a gap beneath the search beams

Typical Intermediate Station

of the main and auxiliary stations. Here there is no radome and no communications antenna. Instead, at the I-site, tall AA transmitting towers thrust themselves skyward, as shown.

One small building train houses the personnel and equipment at the I-site. Two radicians tend this station, and they are replaced at frequent intervals by men from the main or auxiliary stations.

The Base Station

Five base stations are located to the rear of the radar stations on the DEW Line. The base stations receive rearward communication from the main stations, and forward them to administrative and military authorities in the United States and Canada.

The Relay Station

The relay station, like the base station, has no detection equipment. Because of the great distances between main and base stations, the relay stations act as boosters to relay the communication data.

HOUSING ON THE DEW LINE

As mentioned in Chapter 3, housing for the men and equipment on the DEW Line is standardized. Where they serve identical functions, the prefabricated housing modules are constructed and furnished identically at the different stations, and at each site the modules are arranged in a standard pattern.

The modules of a building train are individual compartments, 28 feet long, 16 feet wide, and 10 feet high. Within the building train, the modules are so arranged that equipment, facilities, and personnel quarters are as efficiently and conveniently located as possible. At the main station, one of the two parallel trains contains electronic equipment, ventilating fans, dormitories, first aid and recreation rooms, toilet and laundry facilities,

kitchen and dining areas, a water supply, and waste-water and other storage space. (Waste water must be stored, at least temporarily, because its sanitary disposal is a special problem in the far north.) Two special fire-barrier modules divide the train into three sections to minimize the hazard of fire spreading.

The other train at the main station contains a water supply, power rooms, shops, toilet and laundry facilities, and living quarters. In this train there are three fire barrier modules which divide the train into four fire zones.

The modules in the single train at the auxiliary station provide for the necessary equipment and the facilities and personnel quarters required by the smaller crew.

The five modules at the intermediate station are grouped in a short train which is not accompanied by any radome structure. Except for the garage, the modules provide all of the necessary housing for this small station—aircraft-detection, power, and heating equipment, water supply, kitchen and toilet facilities, and living quarters.

OTHER STRUCTURES AT THE RADAR STATION

The central point of every radar site is the building train. The landmark of the main and auxiliary stations is the radome which rests on a platform, directly over the surveillance room of the train.

Some distance from the housing train of the DEW Line station stands the garage, and sometimes an airplane hanger. All of these structures are spaced far enough apart to prevent the spreading of fire. Also removed at a safe distance are the storage tanks for petroleum, oil, and lubricants (called POL). Generally, the structures are set upon a gravel bed or pad to prevent their sinking into the permafrost ground. Gravel roadways link the structures together and also lead to the airstrip.

Garages at all of the radar stations are essentially alike. A typical garage is constructed of a steel frame mounted on a concrete footing. The structure is enclosed by prefabricated panels composed of sheet steel on the interior and aluminum on the exterior. The roof is slightly peaked and provides attic storage space. The flooring is concrete. There are five bays in the garage at the main station, three bays at the auxiliary station, one bay at the intermediate station. Besides vehicle space, each garage has room for a shop, heating facilities, and floor storage.

Hangars are uniform in shape and construc-

Garage

Hangar Interior

tion at the stations along the DEW Line. Construction is similar to that of the garages. The hangar has two heater rooms, a peaked roof, and large sliding doors. It accommodates the largest plane used on its sector of the DEW Line.

ROADS AND AIRSTRIPS

Roads and airstrips are the life lines of the DEW Line. They are vital to the transportation of men and supplies to the sites and within them.

The layout of roads and airstrips varies at the different stations since the terrain differs so greatly at the station locations. At most sites, the roads connect the module train which is located on higher ground with the beach where ships may land their late summer cargo, and with the airstrip where arrivals occur all the year 'round. The roads also run to other outlying locations such as the water supply area.

It was planned, of course, that roads would be laid out in the most direct routes between the facilities of a station. But this was not always possible. Many factors affected the route—the shape of the land, drainage and soil conditions, availability of deposits of fill material, crevasses in the ground, and the movement of surface and subsurface water.

The airstrips are located as closely as possible to the radar stations. At some locations, however, the airfield had to be built as distant as 10 miles from the radar site. Like most construction on the DEW Line, these airstrips required tremendous quantities of gravel. It has been computed that enough gravel was used in the DEW Line construction to build a road 18 feet wide and 1 foot thick from New York to Los Angeles!

The roads and airstrips on the DEW Line, raised above ground level, are constructed for long use. Although not used extensively, they must support heavy vehicles and transport planes. As in the construction of buildings, insulation is used to preserve the permafrost table, and care is taken not to clear the ground of its natural cover nor to change the drainage of water. These precautions prevent the softening of the surface ground and the settling of roads and airstrips.

Airstrips are aligned with the prevailing wind, since a cross-wind tends to pile up snowdrifts.

PETROLEUM, OIL AND LUBRICANTS

Even as the life lines of the DEW Line are

its roads and airstrips, its life blood is petroleum, oil, and lubricants (POL). These precious fuels keep the gasoline pumps, the motor vehicles, the airplanes, and the power supply equipment operating. Most of the POL is brought to the DEW Line by the summer sea-lift. A 2-year reserve supply of these fuels is stored at each station. This supply requires large storage tanks and convenient methods of transferring the POL from the storage area to the point of use.

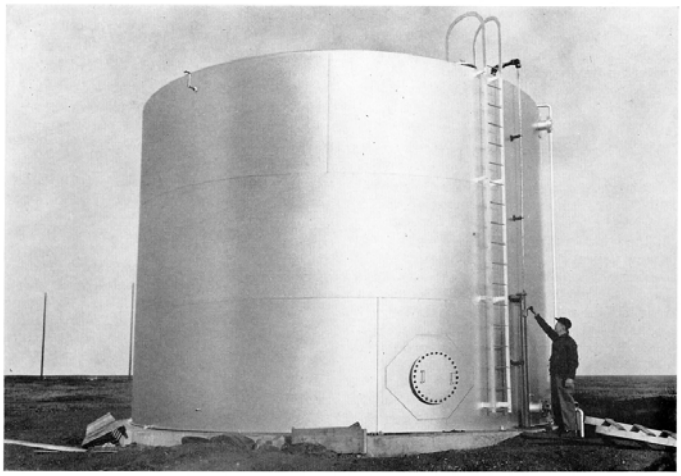
Only the main stations receive bulk aviation fuel, which is stored in one or two tanks, each tank with a capacity of 250,000 gallons. A trailer equipped with a refueling pump carries this gasoline from the storage tank to the airstrip. If aviation fuel is required at an auxiliary or intermediate station, it is stored there in drums, and is pumped directly from the drum into the aircraft.

Bulk diesel fuel is stored in tanks of three sizes accommodating 20,000, 65,000, and 250,000 gallons. The main station usually has a total storage capacity of 500,000 to 1 million gallons; the auxiliary station usually stores 250,000 gallons; the intermediate station, 80,000 gallons.

The location of the storage tanks depends upon the elevation of the radar site and the distance from the station to the beach. Where the station is close to the beach, all of the main tanks are grouped nearby. Where the station is located at some distance from the beach, some of the fuel tanks are located at the beach and some at the station.

Pumps of the rotary gear type force the diesel fuel from beach tanks to site tanks through welded steel pipelines which run along the surface of the ground. The pipelines, of course, are drained after use. Pumps also fill the day tanks located inside the buildings. Daily operations keep the day tanks filled as a safeguard against any interruption of normal routine by a weather hazard such as a blizzard.

The vital fuel flows from the site storage tank to its neighboring pump house. Then the POL pump, like the heart of a human body, forces the



Fuel Storage Tanks

life blood of the station through two-inch steel pipelines to the building trains, garages and hangars. The fill line, which is also drained after use, lies outdoors on the ground, except where it hangs beneath the sills of the building train or under the roof beams of a garage or hangar.

The summer ships also deliever lubrication oil, gasoline for vehicles, and low octane aviation gasoline in 55-gallon drums. Then, as it is needed, each drum, weighing 400 pounds, is hauled to a building from the drum storage dump. The drums are moved by plank ramps, fork-lifts, or cranes.

Sometimes a cat train hauls the bulk diesel fuel to a station in mobile transfer tanks. These 2,500-gallon tanks are permanently fixed to steel skid beams on the wannigan sleds. Some stations in the eastern sector of the DEW Line are supplied with POL by air. Where the intermediate station has no airstrip because of mountainous terrain, drums of POL are delivered by a helicopter airlift.

At some stations, the fuel is unloaded from the tanker aircraft directly into receiving tanks at the airstrip. At other stations where the need is small, the fuel is piped from the tanker aircraft into mobile transfer tanks which then are carried to the site storage tanks.

SERVICES AND FACILITIES ON THE DEW LINE

The buildings on the DEW Line contain modern and efficient service facilities. The buildings are weather-tight, insulated and vaporproof. For the physical health and comfort of the DEW Line personnel, the stations provide effective and safe systems for water supply, waste disposal, heating, ventilation, fire protection, and refrigeration. The facilities for fuel supply were discussed in an earlier part of this chapter. Of course, a continuance of these services requires regular inspection and maintenance of the equipment. Ease of inspection and maintenance is assured by the fact that all fixtures, pipelines, pumps, and other facilities equipment are mounted "in the clear" inside the buildings. We will mention here some highlights of the service facilities at the DEW Line stations.

Water Supply

The main sources of fresh water at the DEW Line stations are the nearby lakes, streams, and ponds. Since water pipes would freeze outdoors at certain times of the year, other techniques of supply are used. Water is pumped from the source through a hose into an enclosed water wagon, mounted on a wannigan, which delivers it to the station storage tanks.

When the surface of a lake is frozen, a hole is cut in the ice, and water is drawn from beneath the ice. In winter, blocks of ice also are cut and hauled to the station where an ice crusher planes the ice into small chunks and deposits them in the 2,500-gallon water storage tanks.

Water at most of the stations is "hard" water, high in minerals, sometimes cloudy, slightly brown in color, and off-taste. The entire water supply is filtered through fine, porous material and is chlorinated to destroy any harmful bacteria. At certain locations, a softener is added to the water, to remove some of the minerals and to allow soap to form a lather.

Hot and cold water are provided. The water is heated by electric hot-water storage heaters. The water pipes are made of half-hard copper with brazed bronze fittings. The water lines are suspended by pipe hangers from the ceilings. All pipes and fittings are covered with felting and canvas which serve as insulation and prevent condensation drip.

Waste Disposal

Despite the cold winters, disease bacteria could be active during the arctic summer weather. A safe, hygienic technique of waste disposal is as vital in the far north as elsewhere in the world.

Since pipelines are impractical because of the freezing weather and underground septic tanks are impractical because of the permafrost, waste is accumulated in large drums, sumps, or tanks. These tanks are carted away to a location remote from the station where the sewage is dumped. Only designated dumping sites are used, to insure that the water supply will not be polluted.

Heating

One would expect that providing heat in the northern regions would be a difficult and costly procedure. At the DEW Line stations, however,

the heat of the diesel engines which drive the electrical power generators is trapped and utilized. Elsewhere in the world engine heat is a waste product; at the DEW Line stations this heat is all that is required for most of the year.

One heat exchanger extracts heat from the engine coolant; another, when needed, extracts heat from the engine exhaust. The water warmed by this heat extracting system circulates through the building train and to the hot-water heaters. Some interior areas of the train have no hot-water heating but instead are heated directly by electrical units.

At auxiliary stations, electric heaters add more heat to the water circulating through the train. Since the electric heaters add a greater load on the generators, more heat is reclaimed from the coolant and from the exhaust of the diesel engines.

Water circulates constantly in the heating system. Each train has both an active and a standby pump to force water through the pipes. In addition, there is an emergency hot-water boiler in each train.

Garages and hangars are heated by warm air provided by oil-fired space heaters. Exhaust gases from these heaters are conducted to the outside. A supply of fresh air from the outside is mixed into the heated air by continuously operating fans.

Ventilation

The ventilation system in the building trains is designed to provide the modules with both fresh and warm air, as needed. The power modules need fresh air, which is used for engine combustion. The power and electronics modules require the elimination of excess heat which radiates from the operating equipment.

Fans force the air through ducts, which convey the air into the building from outdoors, carry it from one part of the train to another, and exhaust it outdoors. Dampers regulate the flow. Fuses on some of the registers will melt at a certain temperature to shut off the air flow to help prevent the spread of any fire.

The following ventilating arrangements are typical of the efficient system in operation at all the DEW Line sites. Fresh air enters the sleeping quarters through an opening in the door. (The occupants may also open windows.) In the fan room adjoining the electronic modules, ducts, fans and dampers mix the heated air around the equipment with fresh outside air which re-supplies the electronic modules and the adjacent areas. In the power modules, each diesel engine has an air cooling system with fans, dampers, and thermostats.

Fire Protection

Fire is a great hazard in the far north, because the strong winds can spread the blaze rapidly. Each DEW Line station, due to its isolation, must function as a complete, self-contained fire-protection unit. It must detect, control, and extinguish fires without outside assistance. The stations are prepared to do this because they are equipped with fire detection and alarm systems and with extinguishing equipment for all types of fires.

The modules, constructed with fire-breaks at the building joints, are finished with fire-resistant paint. Special modules in the train serve as fire barriers. Fire mains carry water to hose boxes located throughout the train. When the water is turned on at a hose box, high-pressure nitrogen forces the water through the fire main to the box from one of three 225-gallon tanks. There a hose and nozzle make it possible to direct the spray. The power and electronic modules have no hose boxes because a fire in electrical equipment is best extinguished by carbon dioxide.

A fixed deluge system of carbon dioxide (CO_2) protects the modules in areas where water would be less effective. The liquid CO_2, contained in cylinders, is piped to nozzles which are mounted on the ceilings of the fire-barrier corridors, the power modules, the water-supply modules, and the shops in garages and hangars. Jets of liquid CO_2 can form a smothering blanket in those areas. All areas have automatic sprinkler systems, except the fire barrier corridors and power modules, which are manually operated.

A main DEW Line station has about 30 portable CO_2 extinguishers, each weighing 15 pounds, which are hung on wall brackets at various locations in the module train. In addition, there are other portable dry-chemical extinguishers – 20 pound hand portables in all buildings, and 150-pound wheeled portables in the hangars. Stations with hangars also have dry-chemical fire trucks.

An electrical fire alarm system with coded bells and horns operates at every station.

Refrigeration

Since the DEW Line stations experience a wide range of weather and temperatures, refrigeration and freezing equipment are a necessity. The refrigerated storage is maintained at a temperature of 35°F., which is just above freezing. Fresh vegetables, fruits, and meats are kept in the refrigerators. The freezer equipment is held at 0°F., a temperature which is low enough to keep foods frozen, but not so low as to be uneconomical to maintain.

Two walk-in refrigerators, two freezers, and one 45-cubic-foot refrigerator are provided at each main station. The same equipments, but only one of each, are found at the auxiliary station. Each intermediate station has a 9-cubic-foot refrigerator and a 19-cubic-foot freezer. In all cases, the refrigeration equipment is adequate for the size of the station.

Freon is the refrigerant used in the DEW Line equipment. Freon is best suited for the far north because of its low boiling point and non-toxic, non-flammable qualities.

WEATHER OBSERVATION ON THE DEW LINE

Aside from the DEW Line, there are very few weather stations in the Arctic. At the DEW Line stations, trained persons serve as weather observers. Their work is important because data regarding the weather lend efficient support to flight operations and to the programming of all outdoor activities in the area.

Arctic weather phenomena have a powerful influence on weather in other parts of the world. A cold arctic air mass descending to more southerly latitudes affects surface temperatures and moisture conditions of the atmosphere. Therefore, weather observation on the DEW Line provides important information which helps the United States and Canada to forecast local weather conditions.

Over the years, also, accurate, general knowledge of weather information from the Arctic increases the reliability of long-range weather forecasts in other parts of the world.

NAVIGATIONAL AIDS FOR AIR TRAFFIC

Air and land travelers face abnormal hazards near the DEW Line, due to the arctic climate and terrain. Storms, fog, strong winds, flat terrain and erratic compass readings make it difficult to establish a geographical position. Compasses are virtually useless because the DEW Line is so close to the North Magnetic Pole.

The DEW Line stations help to lessen these hazards by providing weather information, communications, landing directions, airfield illumination, and, in emergencies, search and rescue assistance. When the required flight plans are made, all available data is provided to travelers regarding weather conditions on the planned route. In flight, the plane is followed by radio communications which check its compliance with the flight plan. At the destination, the pilot is guided to a safe landing by airfield illumination, runway lights, beacons, and warning lights.

The DEW Line search radars seek out lost planes, and the communications facilities serve as a guide to rescue operations. All along the Line, the DEW Line stations serve as a relay team which offers guidance to aircraft in the area.

EMERGENCIES

From all of the above, it should be clear that the health, comfort, and safety of the DEW Line personnel are of prime importance. Of course, the best program for safety is one which safeguards against emergencies. For that reason, every precaution is taken on the DEW Line to avoid health problems, breakdown of equipment, and situations requiring emergency measures.

But emergencies do happen, and plans have been made for the safety of personnel to be insured and operation of the Line to be kept uninterrupted. These emergency measures cover every aspect of life on the DEW Line.

In earlier parts of this book, some of the emergency plans and programs were mentioned. We enumerate others at this point to emphasize the wide range of planning for emergencies at the DEW Line and the thoroughness with which the program is carried out.

Of course, a station would be unable to function long without heat. If it is not possible to reclaim the heat from the diesel engines, an emergency hot water boiler can service each building train. Other emergency heating is provided by the Herman Nelson heaters. These are portable

space heaters – some models operated by electricity and others by gasoline – which normally are used to pre-heat aircraft and vehicular engines for ease in starting.

In the event of power failure, a standby type engine-alternator is available in every garage. It is possible to connect this equipment to the station power-distribution system.

If the regular electric current fails, emergency lights will automatically go on, powered by standby batteries.

Should fire break out despite the care with which the modules are constructed and arranged, the station has an automatic fire alarm system, water standby system, CO_2 sprinklers, portable fire extinguishers, and fire barrier modules with corridor doors that automatically close to seal off a blaze. Fire drills, assigned fire stations, and fire duties are part of the preparedness program.

Vehicles especially equipped for the arctic weather and terrain allow for operations in deep snow or mud, and these can be used for emergency search and rescue operations. Some vehicles are equipped with fire-fighting apparatus, and also serve as crash trucks at the airstrips.

Strict precautions are enforced to guarantee personal safety in the outdoors. Persons leaving the DEW Line station must carry full arctic clothing. Their vehicles must bear firearms and a carefully prepared survival kit for each traveler. Some vehicles are equipped with mobile transmitter-receivers for communication with the home station. Emergency shelters are located at some of the airstrips and along certain roads.

Each garage contains a reserve store of food for emergencies, as well as a radio transmitter and a standby engine for generating power. This communications equipment is one of the two emergency systems available to site personnel when the standard communications equipment cannot operate.

Sometimes firearms are needed for use against dangerous animals. In Canadian areas of the DEW Line, the Canadian government supervises the issuance of rifles. The rifles are sealed in a manner which does not interfere with firing in an emergency. If a rifle is fired for any reason, the Royal Canadian Mounted Police is notified of the circumstances, and will reseal the rifle.

GOVERNMENTAL RELATIONS

Part of the DEW Line is in Alaska, but most of it is located in Canada.

Alaskan regulations are very much like the laws of a state in the U. S. The law enforcement body in Alaska is the Territorial Police.

In Canada, most of the DEW Line lies in areas governed by Canada's Department of Northern Affairs and Natural Resources. The law-enforcement body is the Royal Canadian Mounted Police. This body regulates such matters as employment of Eskimos, hunting, and other uses of firearms.

In the years since the DEW Line was built, not a single "international incident" has occurred. This is to the credit of all the DEW Line personnel and to the friendly people of Canada.

THE BUSY DEW LINE

We have seen how the DEW Line operates today. Of course, the greatest activity occurs when supplies arrive from the rear. Airplanes land at the DEW Line stations frequently during the year. With summer, the annual sea-lift comes. Then the landing beaches become impressive scenes of thousands upon thousands of crates and oil drums. Between the beach and station, jeeps, snowmobiles, and other strange vehicles born of the Arctic hustle back and forth. These are the exciting, active days.

But all year long, there is much else to do. The great antenna constantly revolves within the radar dome. Beside it are poised the vigilant antenna towers of the aircraft alarm system. Every moment of every day, men are busily on duty. Twenty-four hours a day, search and communications continue. The DEW Line never sleeps.

CHAPTER 5

LIVING ON THE DEW LINE

THE MEN ON THE DEW LINE

In the earlier chapters of this book, we marvelled at the men who, against the pressure of time and the hazards of distance, weather, and wild terrain, so successfully planned and built the DEW Line. The success of the DEW Line now rests in the hands of the men who operate and maintain it. As a guardian of our continent, the Line must continue to function effectively and uninterruptedly. And it does so because of the high calibre of its men – carefully chosen men who meet the special demands of this critical work.

The man who serves on the DEW Line has been screened to meet strict security requirements. His loyalty to the United States and Canada must be unquestionable; he must have no criminal record; he must never have been a member of a subversive group nor involved in any activities endangering our national security.

The man on the DEW Line has been selected because of the special knowledge or skill he contributes to the operation or maintenance of the Line. In personal interviews, this man has shown that he does not regard his DEW Line assignment as just another job. He recognizes the need for the DEW Line. He is proud of the part he plays in our national defense.

He must be a healthy man, in excellent physical condition. And he must be able to adjust himself to a life in the Arctic.

The men on the DEW Line function as a team. They keep the radar station on an operational basis every hour around the clock so that aircraft will be detected and the information promptly relayed through established channels to the rear.

The men employed on the DEW Line have basic skills and know-how to do particular jobs. When they arrive at the Line, they receive additional training on the job, so that they can perform better in their assigned tasks.

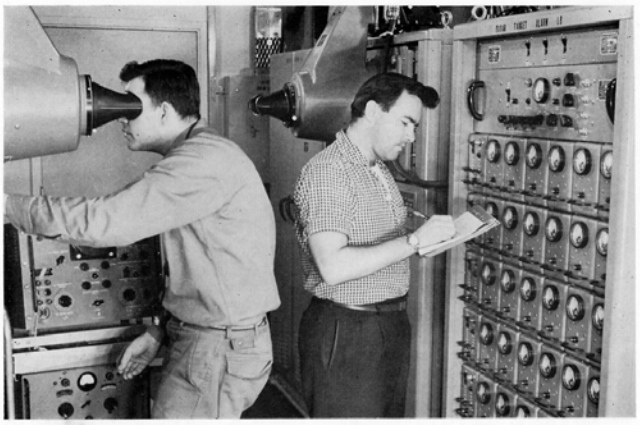
In the early days, all men hired to work on the DEW Line were given training in the States to supplement their basic skills. The training was given – and it may continue for one or more skills – at Streator, Illinois, where there exists a functioning model station, similar to a main station in the far north. If preliminary examination reveals that a refresher course is needed, basic electronic theory is reviewed with the trainee Radicians. Other Streator courses for the Radicians deal with the operation and maintenance of the DEW Line radar and communications equipment.

AN IMPORTANT JOB FOR EACH MAN

What kind of jobs are filled at the DEW Line radar stations by these carefully chosen men?

As in every well organized and well disciplined group, a chain of command exists which defines each man's duties and responsibilities. The six main stations are the largest on the Line, and logically, they have the most personnel. At each main station, there is a Station Chief who has charge of the operation of the entire main station. His assistant, the Equipment Supervisor, is concerned chiefly with communications and electronics operations of the station.

The Radicians have a dual role; they both maintain and operate the surveillance and communications equipment. While one or more are performing maintenance in the equipment rooms,



Radicians at Work

another will be on duty in the surveillance room. As Console Operator, the Radician operates the search radar and the aircraft alarm system and, when an aircraft approaches, spreads the alarm to the military Controller.

Two kinds of mechanics live at the main station, a Ground Maintenance Mechanic and a Rigger Mechanic. The Ground Maintenance Mechanic is responsible for the power-generating equipment, and for the vehicles. He also performs general maintenance work on the station buildings. The Rigger Mechanic keeps the antennas repaired, works on the transmission lines, power lines, towers, and other outside structures.

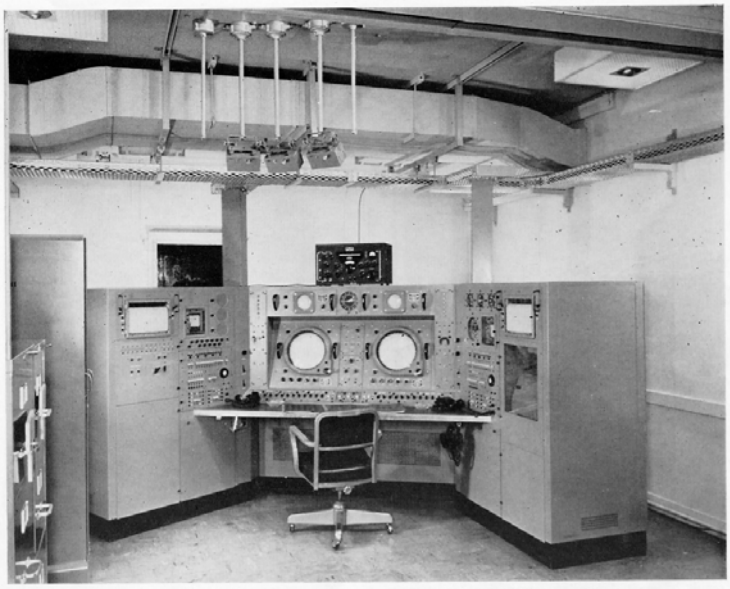
The DEW Line Clerk is responsible for all reports to and from his site, for the office and clerical operations, record-keeping, filing, and official correspondence. He also operates the various office equipment at the Station.

The function of the Cook on the DEW Line is self-apparent – to operate the kitchen and to prepare and serve the fine meals for which the DEW Line is noted.

This is the permanent corps of men at a main station: Chief, Supervisor, Radicians, Mechanics, Clerks, and Cooks. Each man's job is important in the operation of the Line. The crew is compact; the isolation is great. So each man in the group must be capable, reliable and "worth his salt" in the operation of the station.

Other men located at the main station are sector personnel, men who hold sector-wide jobs on the DEW Line. In overall charge of the sector is the Sector Superintendent. He is responsible for the operation and maintenance of several stations, the main station at which he lives, as well as all the auxiliary and intermediate stations in that sector. Responsible to him are two Sector Chiefs in charge of the roving sector crews of Mechanics and Radicians who travel as needed to the smaller stations. One Sector Chief supervises the roving crews who service communications and electronics equipment. The other Sector Chief supervises crews whose jobs cover the maintenance of other equipment and facilities, such as vehicles, buildings and grounds.

At the main-station data center, a USAF or RCAF military Controller receives information



A Control Console

from each of the Console Operators in his sector.

The Sector Office Manager, with the assistance of the Sector Clerks, is responsible for all of the record-keeping, filing and correspondence of the sector.

At the auxiliary station, the same type of jobs are filled. Of course, there are fewer men at the auxiliary station because there is less equipment to maintain and no sector personnel are permanently housed there.

These are men of the DEW Line – a thousand or so in all – who operate the vital warning system on our northern frontier. These men come from the cities, villages, and farms in all parts of the United States and Canada. They have made the far north their home so that the homes of all Americans may be more secure.

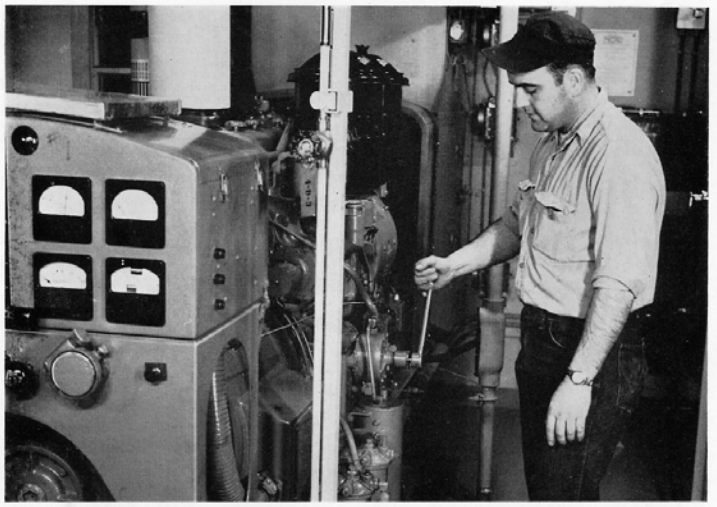
SECURITY ON THE DEW LINE

The purpose of DEW Line security is clear: no potential enemy must learn what the DEW Line can do, nor how well it does it.

The men on the DEW Line have been carefully chosen for their loyalty and discretion. They have all been cleared for access to SECRET information. They are entrusted with information that means the safety of North America. They must live up to that trust.

Each man must guard every bit of classified information to which he has access. A scrap of classified information, perhaps harmless in itself, may reveal valuable data when pieced together with other "harmless" bits of information.

The man on the DEW Line is told the classification of all of the data he is given. Information that is SECRET, if in the wrong hands, could result in great danger to our nation, or even its destruction. The capabilities and limitations of the electronic equipment used on the Line is SECRET information that must be very carefully guarded. CONFIDENTIAL information, if improperly disclosed, could be prejudicial to the defense interests of our nation.



A Ground Maintenance Mechanic at Work

Unauthorized persons are not allowed to visit a DEW Line station. All visitors, including authorized administrative or military personnel, must comply with the security regulations at the Line.

The DEW Line men recognize the need for strict compliance with the security requirements. They discuss their work or their training only with persons cleared for SECRET and who have a need to know the matters being talked about. When away from the station, the DEW Line men do not talk about their job. They carry no classified data away from the station. They reveal no classified information in letters home, nor in their amateur radio operations. When they leave the DEW Line, they remember that the need to maintain security precautions continues.

SAFETY ON THE DEW LINE

The DEW Line station is a safe place to live and work, because safety instructions are obeyed and proper practices are followed.

Men who work on the DEW Line receive safety instructions at regular meetings. Safety is emphasized in the various DEW Line Instructions issued to personnel. The DEW Line Training Manuals, which cover the different types of work men do on the Line, stress the hazards of each type of work and the need for safety precautions. All of the DEW Line electronics equipment is designed for safety, with features such as interlock switches, below-chassis mounting of terminals, and internal metering of circuits on high-voltage equipment.

Safety practices are each man's job. A safe,

Rigger Mechanics at Work Atop 30' Dish

healthy environment makes for high morale and efficiency. No man-made hazard must be allowed to cause injury or inconvenience or interruption of the mighty defense effort on the DEW Line.

LIFE ON THE DEW LINE

Each of the stations on the DEW Line is a community of its own, providing living quarters, dining facilities, and recreational opportunities for the men there. These men are away from home and are doing a vitally important job. Both the permanent and transient personnel must have food, shelter and recreation at each station so that they may perform their duties properly.

The building train modules at main or auxiliary stations have bedrooms with dressers, lamps, comfortable arm chairs, rugs, curtains, snug-fitting windows and adjustable heating.

Spare rooms or dormitories are provided for visitors and other personnel at all stations, sometimes in other buildings separated from the main building train. There may be radicians or mechanics for special jobs, pilots of aircraft temporarily weathered in, corporation personnel, visiting military personnel, visiting missionaries or chaplains; all of whom must have adequate quarters.

A Clerk at Work

The finest of meals are served on the DEW Line. The annual sea-lift brings in tons of bulk foods, enough to provide excellent and hearty meals for all the men who may be there. Large quantities of fresh and perishable foods are flown in to each station regularly. All the foods are selected for quality and variety from the best available sources.

The dining room at DEW Line stations is kept clean and cheerful by the cooks, who also work in well-equipped kitchens, equal to any in a big-city restaurant.

A Cook Preparing a Choice Meal

A Controller at the Plotting Board

RECREATION

The man on the DEW Line has plenty of privacy, and time for hobbies, studies, games, sports – whatever recreation he likes. There are wonderful outdoor activities to engage in, and excellent indoor facilities for games, hobbies, and other recreations.

At certain times and places along the Line, one can hunt, fish, ski, hike, camp out, or just "play ball".

Hunting and Fishing

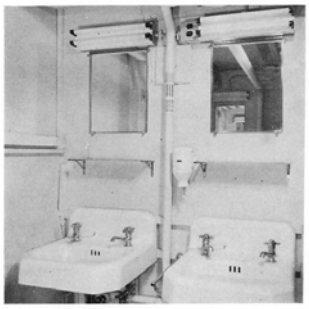
In Alaska, a hunting permit for large game costs 50 dollars for non-residents. A permit for small game, fowl, and fishing costs seven dollars.

In Canada, the government takes precautions to preserve certain wildlife which is important to the existence of the Eskimos. Canadian law states: "No game or wildlife shall be taken or molested in the Northwest Territories. Licenses to hunt in Yukon territory may be purchased from representatives of the Yukon Territories Government."

The following governmental agencies furnish copies of the game laws of Alaska and Canada, respectively:

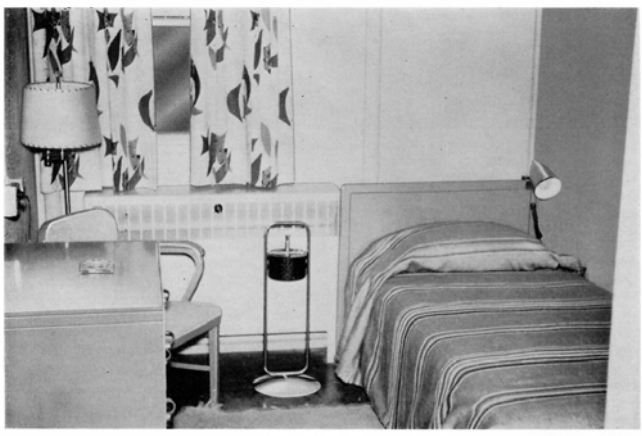
Alaska Game Commission
U. S. Department of Agriculture
Washington, D. C.
and
Department of Mines and Resources
Ottawa, Canada

Many of the arctic waters are rich in sea life.



Washing Facilities

Shower and Toilet Facilities



A Typical Bedroom

Dinner Time in the Dining Room

Winter ice-fishing – through the ice – is a pleasant sport. The station library carries good reference books on fishing, such as *The Standard Book of Fishing*, the *Angler's Handbook*, and the *Arctic Manual*. Also, the *DEW Line Survival Manual* is rich with information on how to catch fish, and it even tells how to grab them bare-handed.

Hiking and Camping

The terrain at certain sites is excellent for hiking and camping. Men who enjoy the outdoors learn of new, stimulating camping techniques along the DEW Line. Before leaving the station on a camping trip, the men follow the precautions stressed in the *DEW Line Survival Manual*. They tell others of their hiking plans. On every trip, each man carries a copy of the Manual and a pocket survival kit.

Skiing

Certain sites have excellent skiing terrain. Each station has skis and snowshoes. The *Survival Manual* shows how to make one's own snowshoes.

Other outdoor sports can be enjoyed at the DEW Line sites: softball, football, volley ball, horseshoe pitching, archery, boxing and tetherball (a game in which two opponents vie to slam a captive ball past each other to cause a cord attached to the ball to wrap around a pole). For all of these sports, the equipment is available in the hobby room of the station. Outdoor sports and activities are welcomed by the Dew Line men to help remove the extra weight caused by hearty eating of excellent foods.

Photography

Many DEW Line men are good photographers. They have leisure time, excellent opportunities to take unusual pictures, and fine darkroom equipment for black and white photography. Many of the men use their 35-mm cameras, and wisely bring a plentiful supply of film to the far north. Of course, film may be purchased at the station P.X. when it is in stock.

An ordinary box camera is inadequate for many of the extreme lighting conditions in the far north. The station darkroom can handle 5x7-inch negatives but none larger. Color film is

The P. X.

sent to the rear for developing. When returned, the color film may be exhibited by using the station's 500-watt projector.

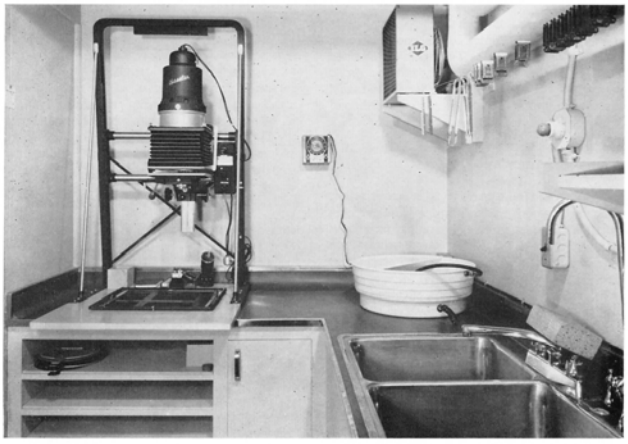
A movie camera can provide interest and entertainment on the Line. However, the camera should be pre-winterized in the States, since the oil in the camera may freeze in the arctic cold. A good still camera may not need winterization. A light meter and a range finder are convenient in the Arctic, but these may often be borrowed from other photography fans at the station.

For security reasons, certain subjects may not be photographed on the DEW Line. Regulations issued by the Station Supervisor define the items which may not be photographed.

In the station library, there are good reference books on photography. Special tips on photography in cold weather are found in such books as the *Kodak Handbook* and Femminger's *Successful Photography*.

Indoor Recreation

Indoor recreational activities are an important



A Typical Photo Darkroom

part of life on the DEW Line, because there are many days when the fierce weather keeps the men indoors.

At each main and auxiliary station, there are two lounges, a hobby room, a photographic darkroom, a library, and an amateur radio ("ham") station. In one comfortable lounge which shares a module with the library and writing room, the men can read, relax, and listen to music. The other lounge shares a module with the card room.

Table tennis is one of the favorite indoor games on the DEW Line. Also available are quoits and darts. A basketball court can be set up in the hangar or the garage. The men also enjoy using other DEW Line game equipment, such as cards, poker chips, cribbage boards, Scrabble and Monopoly sets, and checker and chess sets.

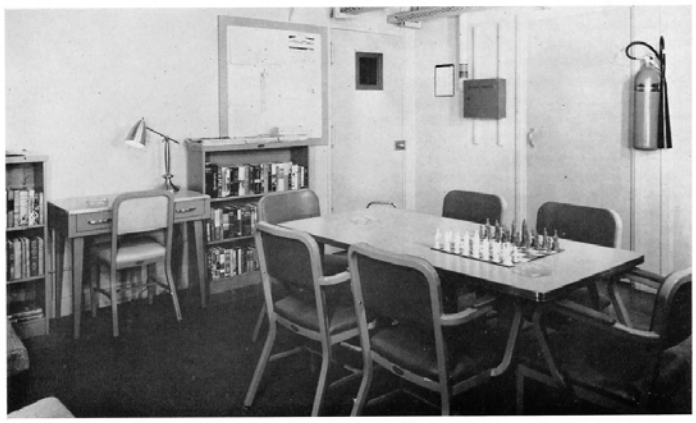
Movies. All DEW Line stations have projection equipments for 16-mm sound movies. Sometimes, full-length feature films are flown in from the States. Since the men work on different shifts to keep the DEW Line operating at all times, the movies are shown at several times so everyone can enjoy them.

Amateur radio. Each main and auxiliary station is equipped with an excellent amateur radio outfit composed of a Collins 431B transmitter and 51J4 receiver.

Only licensed amateurs may operate the transmitter, but others may speak through it if a licensed operator is present to turn the transmitter on and off, and to make any necessary adjustments of controls. Only authorized personnel may touch the circuits in the transmitter or receiver, which together make up a valuable emergency radio station that must not be disabled.

On amateur radio, the best communication is with the Midwest, but when "skip conditions" are right, the east- or west-coast states may also be reached. Sometimes a "ham" operator may be reached who lives near the home of a DEW Line employee and will relay a message to his family. If this "ham" has a phone patch which hooks up his amateur radio station to his home telephone, the DEW Line employee may talk directly with his family. In some instances, several "ham" operators may participate by relaying a message clear across the continent.

Music and Recordings. At some DEW Line sites, it is possible to receive radio broadcasts from the States. For musical entertainment, how-



The Library and Lounge

Recreation Time

ever, most of the DEW Line stations depend upon their high-fidelity phonograph hook-ups. Every main and auxiliary station has a fine hi-fi set, consisting of a Garrard record changer, a Scott 99 amplifier, and a Jensen speaker. The intermediate stations are equipped with Pilot record players.

All DEW Line stations have well-stocked and varied record libraries planned to satisfy many different musical tastes. Of course, the men may bring their own records to the Line.

Main and auxiliary sites are equipped with Webcor "Educator" tape recorders. The DEW Line employee supplies his own tape, and may record the songs or conversations of his friends on the Line. Strips of tape may be mailed to and from the DEW Line employee's family so that personally recorded monologues may be substituted for letters.

The Library. To fill the long indoor leisure hours, each station on the Line has a library of several hundred books. There are books of fiction – the classics, such as the works of Poe, and the best writings of recent years, such as *The Caine Mutiny*. There are latest best sellers, song books, puzzle books, ghost stories, and murder mysteries.

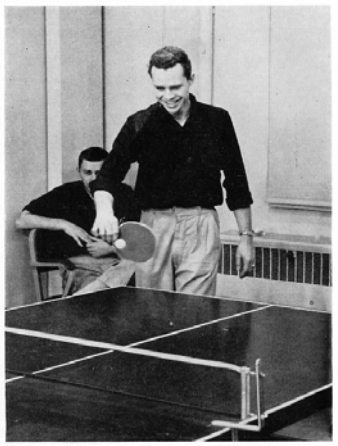


Table Tennis

Movie Time

There are dictionaries, atlases, grammar books of foreign languages, books on chess and taxidermy, how-to-do-it books, and many more.

In short, there is heavy reading and light reading, to meet every taste. Magazines are delivered to DEW Line men who place subscriptions.

Hobbies. The DEW Line hobbyist fully enjoys his spare time activity, because he has leisure hours and fine hobby equipment. The hobby shop at each main and auxiliary station has a large variety of tools, such as soldering equipment, drills, pliers, wrenches, chisels, planes, and carving sets. The intermediate station has fewer hobby tools. In their hobby time, men on the Line have produced some outstanding work, including radio-controlled model airplanes.

CORRESPONDENCE COURSES

Leisure time on the DEW Line creates an excellent opportunity for men to pursue correspondence courses. Some courses are free; some call for a small fee. Many correspondence schools offer worthwhile courses in a wide variety of subjects, from air-conditioning to Latin. University extension courses are available, too, and sometimes these earn college credits.

Interest in a correspondence course is sustained when friends on the Line enroll together.

PERSONAL COMMUNICATIONS

Mail from the DEW Line reaches the States in about a week. The mail plane arrives at the Line every week or at even shorter intervals. Purchases may be made by mail, but men on the Canadian part of the Line must check on customs fees and other taxes before placing an order.

A teletype system is always open to the rear of the DEW Line. Although not intended for personal traffic, the teletype may be used for personal messages to and from the Line in emergencies.

The Hobby Room

DEW LINE NEIGHBORS — THE ESKIMOS

Does the DEW Line employee visit his neighbors, the Eskimos? No. Friendly as the Eskimos are, the DEW Line men are advised to avoid contact with them. This advice is not unfriendly; instead, it is intended to protect the Eskimos from diseases carried by white men – diseases to which the Eskimos have little body resistance.

Even a short friendly visit to the Eskimos can produce disastrous results. On frequent occasions, Eskimos have been known to die from whooping cough and influenza soon after contact with white men. Recently, polio wiped out an entire village in the Hudson Bay area.

Most Eskimos have never drunk alcoholic beverages, nor have they learned of their harmful effects. After being introduced to alcoholic beverages, many Eskimos have become alcoholics. Nowadays, strict laws ban the sale of alcohol to Eskimos.

DRESSING IN THE ARCTIC

In the far north, you should keep your hands, head and feet warm, for then other parts of the body feel warmer, too. Good advice on dressing and the care of one's clothing is given in the *DEW Line Survival Manual*.

Dressing for the arctic winter should be done in a prescribed manner. Your body is kept warm by the insulating properties of the air trapped by your clothing, not by the weight of the clothing. Clothing is worn in layers, as many as are needed. The procedure of dressing for arctic outdoor weather is illustrated.

Special winter clothing for outdoors is distributed on a loan basis by the Air Force to the men of the DEW Line. The list of issued clothing is given below. This list may vary slightly according to the location of your assigned site and the duties you will perform.

LIST OF CLOTHING ISSUED BY THE AIR FORCE

Item	*Quantity*
Boots, bunny (white felt)	1 pair
Gloves, leather, flying, with woolen liners	1 pair
Hat, pile-lined, field arctic, with earlaps	1
Mittens, arctic	1 pair
Mukluks (canvas)	1 pair
Pants, inner, flying (light wool)	1 pair
Pants, outer, flying (heavy)	1 pair
Parka, hooded, with ruff	1 each
Shirt, flying A-1 (light wool)	1 each
Shoe pacs (rubber bottoms with leather tops)	1 pair
Sock kit, consisting of	
Booties, felt	1 pair
Insoles, felt	3 pairs
Socks, light woolen	3 pairs
Socks, heavy woolen	1 pair

BEFORE LEAVING FOR THE DEW LINE

A man needs advice on some things he should do before leaving for a tour of duty on the DEW Line. Based upon the experience of other men on the Line, these are some wise suggestions:

Visit a dentist. A toothache can be especially annoying when you are far from a dentist. Dental work should be completed before you leave for the far north.

Opening a checking account. If he deposits part of his pay in a checking account, the man on the Line will find it more convenient to purchase personal supplies from merchants in the States.

Learn about taxes. Many states require payment of state taxes even from men on the DEW Line. Duties may be levied on mail order purchases. Also, although customs and immigration authorities are cooperative, duties may be placed on material taken home from the DEW Line areas.

Get an amateur's radio license. If eligible, you should get a "ham" license. Only licensed operators may operate the amateur radio equipment without supervision in DEW Line stations. Amateur licenses are obtained through district offices of the Federal Communications Commission.

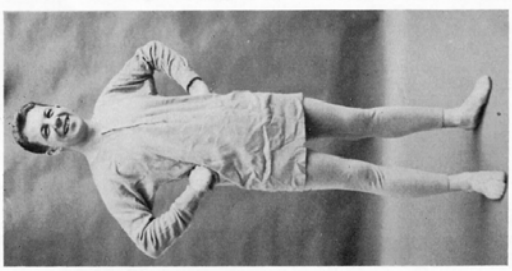
Take proper clothing to the far north. The proper amount and type of clothing are important. In the past, men have taken too much clothing or the wrong type of clothing to the DEW Line.

No special clothing is needed for indoor wear since a temperature of about 75° F. is maintained indoors at all DEW Line stations. Most of the men wear khaki work pants and long-sleeved cotton shirts indoors throughout the year.

During the summer months, it is usually warm

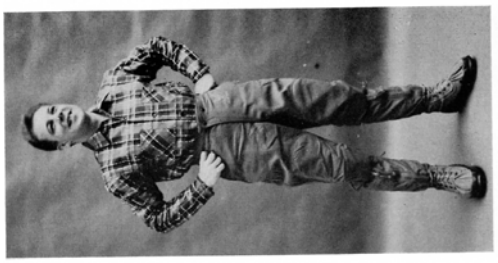
Next comes sage-grey pants, double-weight and lined

A flannel shirt is added

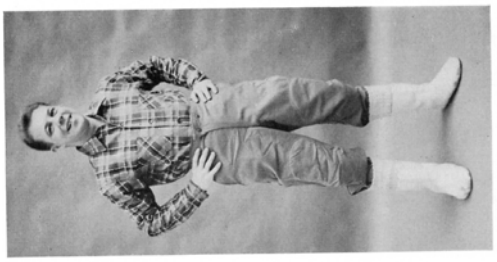


The undergarment is a warm woolen "long john"

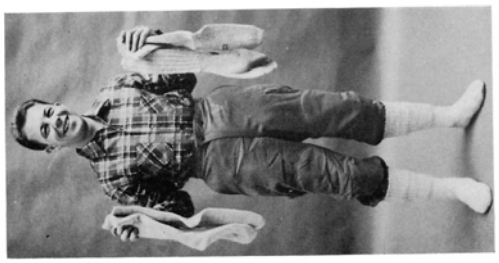
How to Dress for the Arctic Winter



Then mukloks are put on as the Eskimos do; these are porous, rubber-soled canvas boots, knee-length



Over the socks go heavy felt boots



Then three pairs of heavy woolen socks

Then a blue nylon parka studded with down, and woolen gloves

The real insulation is provided by nylon overalls padded with down

Next is the Air Force woolen jacket with many useful pockets

Dark glasses complete the attire of the well-dressed man in the arctic; of course, the sleeping bag is only emergency equipment; the wolverine fur trim on the parka wards off arctic wind and resists moisture, allowing the wearer to see

The nylon mitts have fur backs for arctic sniffle

enough to wear indoor-type clothing outdoors, but sometimes a light jacket will be needed. Where flies are numerous, a hat, headnet, and gloves are useful.

For the trip to the north, you can pack much equipment in an inexpensive but useful canvas sea-bag. You may be greeted by the fierce arctic cold when you step off the plane at the DEW Line. Therefore, except in mid-summer, you should be prepared for this with a warm hat and gloves.

The following list of recommended clothing was prepared from the suggestions of men who have returned from duty on the DEW Line.

LIST OF RECOMMENDED PERSONAL CLOTHING

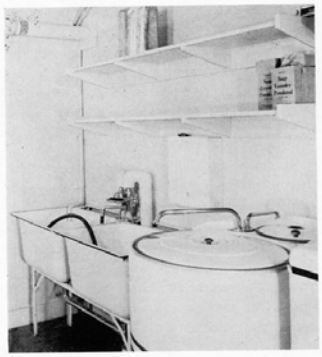
Item	*Required for Indoor Workers*	*Required for Outdoor Workers*	*Suggested*
Belts	2	2	
Boots, 8-inch, leather			1 pair
Caps, with earlaps	1	2	
Jacket, light (for +20° F.)	1		
Handkerchiefs (bandanna)	6	12	
Overshoes (four-buckle)			1 pair
Pajamas			4 pair
Pants, light work (khaki)	6 pair	3 pair	
Pants, heavy work (wool-lined khaki)	1 pair	3 pair	
Pants (slacks)			2 pair
Robe, dressing			1
Shirts, light flannel	6	3	
Shirts, heavy flannel or wool	1	4	
Shirts, sports or dress			2
Shoes, low quarter	2	2	
Slippers, house (wool-lined)			1 pair
Socks, athletic or cotton	6 pair	3 pair	
Socks, light wool, long tops	3 pair	6 pair	
Socks, heavy wool, long tops	2 pair	6 pair	
Sweater			1
Underwear, shorts and T-shirts	10 pair	10 pair	
Underwear (long johns)	2 pair	4 pair	

Most men gain weight at the DEW Line. Anticipating this before you leave for the Line, you should buy oversize clothing. Gaining some weight is actually advisable because the layer of fat helps to protect a man's body from the cold.

You may buy additional clothing while on the Line. A check sent as payment to a mail order house will bring new clothing by first-class mail in about 6 or 8 weeks.

HEALTH ON THE DEW LINE

The men chosen for DEW Line work are in fine physical condition at the time they are hired. On the Line, they may receive an occasional physical check-up, but no doctor is assigned to regular duty on the Line. It is extremely important, therefore, for the men on the Line to maintain their good health by following sensible precautions, by keeping their environment clean,



The Laundry Room

and by applying first-aid techniques, when necessary.

There is little sickness on the DEW Line. The air is pure and clear; cold weather can harm no one, when proper care is taken. Limited contact with people practically eliminates germ-carried illnesses. To facilitate personal cleanliness, the laundry room provides washing machines and dryers for clothing.

Each station on the Line has a well-stocked first-aid room. Every man receives a copy of the *DEW Line First Aid Manual*, and he studies it to be prepared to administer first aid without delay.

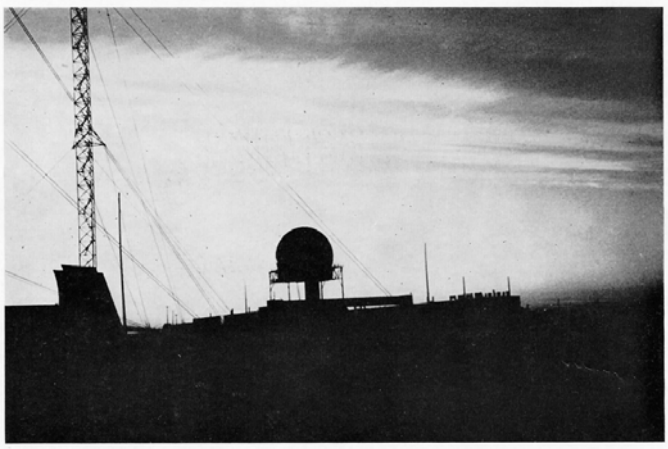
Most medical problems in a given sector can be handled by the Sector Office Manager, who has received special training in first aid. Weather permitting, the Sector Office Manager can be flown to an auxiliary or intermediate site to lend medical assistance.

The First Aid Room

CONCLUSION

And so you have met the DEW Line. This book was written to acquaint the reader with the Line, the country in which it was built, how it was built, and with the men who operate it. We also have seen brief glimpses of how one lives in the Arctic.

If this book lives up to its name and purpose, it serves as an introduction to the DEW Line. The word "introduction" implies that there is more to follow, and that's exactly what's intended. This book should be followed by further studies of the Arctic and the DEW Line. The DEW Line manuals, among other good books, contain a treasure of knowledge. The men who read and study about the DEW Line will be more at home there. They will be happier, healthier, more efficient workers. And last, but certainly not least, they will be better able to help fulfill the important DEW Line mission—to scan the cold, vast, northern skies in defense of North America.



Medical advice can be procured promptly through the excellent network of DEW Line communications. If Line personnel need advice on a medical problem, a doctor can be immediately contacted and his instructions forwarded by radio or teletype to the line.

A doctor can be flown to the Line when necessary. Every site is but a short flight from a doctor or hospital—at most, 4 hours away. If a man needs hospital treatment, he can be safely transported by commercial or military aircraft guided by swift and reliable communications. At his service are all the transportation and communication resources of the DEW Line to help him when he needs help in a hurry.

But health emergencies are rare on the Line. Despite the severe climate and rugged surroundings, DEW Line men have been much healthier than the people back home in the United States and Canada. Minor medical treatment is nearly all that has been required since the DEW Line began operation.

Health problems. Although minor, health problems are annoying, and may even become serious. Therefore, men on the DEW Line take heed of health hazards.

Although they will have plenty of good food at all times, men on the Line know they should not gain too much weight, for then they might strain themselves at heavy work.

Natural skin oils should not be washed away and not replaced or the dry winter air will cause chapped lips and dandruff. Various skin lotions are available at the stations to correct a dry skin condition.

In this dry air, also, one's skin may become too sensitive for shaving with a regular safety razor. Using an electric razor will solve this problem.

SOME TIPS ON HEALTH IN THE EXTREME COLD

Frostbite may occur almost instantly in the far north, unless care is taken to avoid it. In one brief minute, the cold blast of an airplane's propwash may cause serious injury to bare hands or face.

In the Arctic, sudden changes in body temperature are dangerous. Conditions which cause such sudden changes should be carefully avoided. For example, since gasoline evaporates rapidly when spilled on the skin, it will quickly cool the skin below the freezing point. If gasoline is spilled on a man, he should get indoors at once, wash off the gasoline, and watch for any signs of injury from the cold.

Alcoholic drinks are dangerous in the Arctic. Alcohol causes an increase in surface blood circulation and makes a man feel warmer, while the interior, vital organs are robbed of the blood. In such a condition, a man is more susceptible to cold injuries. In the Arctic, it is best to avoid alcoholic drinks.

Sunglasses should be worn outdoors when the ground is covered with snow, whether the day is clear or cloudy. The reflected glare of the sun may cause snowblindness, a painful sunburn of the eyes. Other parts of the face, too, are affected when exposed to the reflected sunlight. To prevent this, a chapstick is rubbed over the exposed parts of the face, especially the lips, nostrils, and the skin around the eyes.

The DEW Line employee wisely follows the instructions and precautions given in the DEW Line Manuals. In the *DEW Line First Aid Manual*, the types of cold injuries and their treatments are discussed. The *DEW Line Survival Manual* has valuable information on safety practices which should be followed to avoid injuries from cold. The *DEW Line Outside Plant Manual* contains a list of health precautions for the men who work outdoors.