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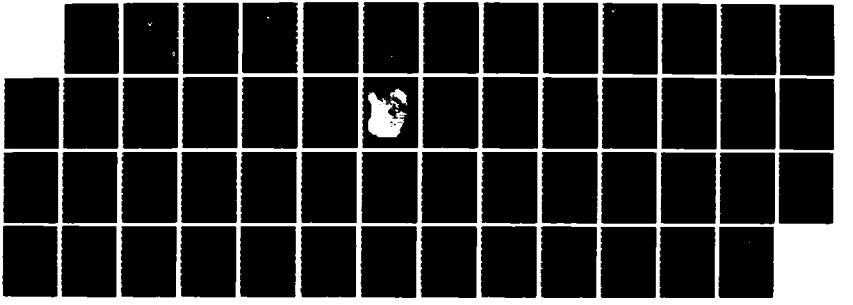

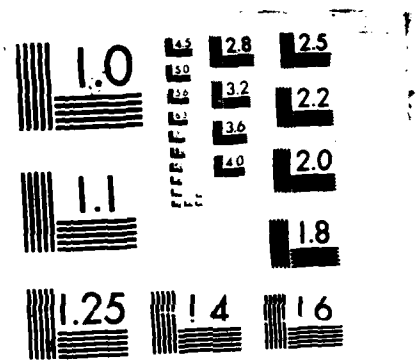

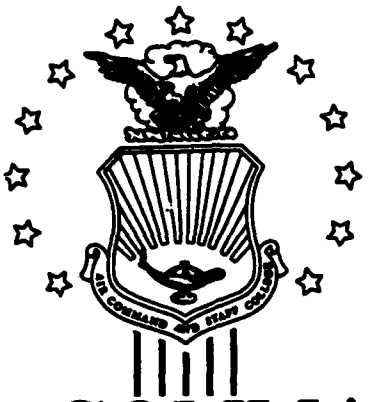

# AIR COMMAND AND STAFF COLLEGE

## STUDENT REPORT

**WEATHER WATCH: MAKING STRAIGHT THE WAY FOR AIR TRAVEL OVER THE NORTH ATLANTIC**

MAJOR DONALD S. DORR 87-1780

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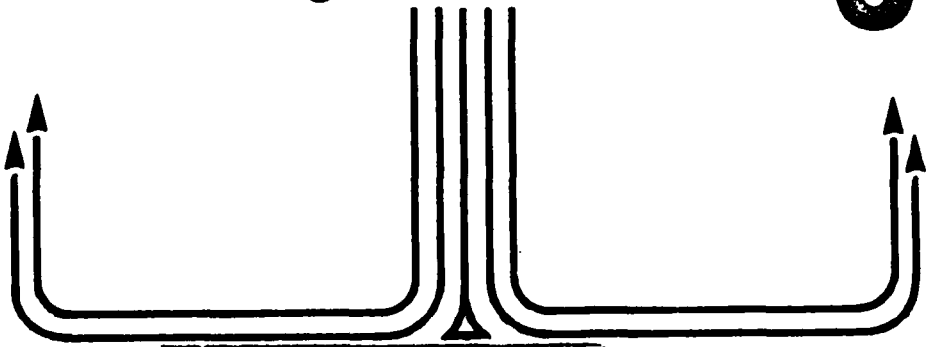

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TITLE WEATHER WATCH: MAKING STRAIGHT THE WAY FOR AIR TRAVEL OVER THE NORTH ATLANTIC

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**Submitted to the faculty in partial fulfillment of requirements for graduation.**

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One of the major unsung accomplishments of the Second World War was the creation and operation of the remote weather stations in the Arctic. This study traces the growth of the Army's Weather Service and the development of the weather stations which were organized to support the efforts of the North Atlantic Ferry Routes. The study describes the Weather Service's expansion, the many problems encountered in both establishing and operating these North Atlantic stations, as well as some of the evolutionary changes which occurred during the war years.

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# PREFACE

In today's high-tech world of 24-hour weather availability and 747 jetliners, it is often hard to imagine that it was not all that long ago when none of this existed. Today we can board a large jumbo-jet in New York and arrive non-stop in Europe only a few hours later, bored with the whole trip.

In 1940 transatlantic travel by airplane was by no means boring. It could still be considered one of the true adventures of the day. Only pilots having both experience and courage would even attempt such an effort. One can then imagine the reaction when the governments of Great Britain, Canada, and the United States announced they were planning to create an air bridge across the North Atlantic so an armada of aircraft, flown by proverbial neophytes, could be delivered for the war effort. It could not be done, at least not without losing a lot of men and airplanes. Or could it?

In this study the author examines the efforts to establish, man, maintain, and operate a network of weather observation and forecasting stations along, and in support of, the North Atlantic Ferry Route. The study fulfills a request from the US Air Force Historical Research Center (USAFHRC) for a historical report on the Weather Service's efforts in support of the North Atlantic Ferry Route. The study fills a void in Air Force historical records on this subject.

The author most gratefully acknowledges assistance from the staff of the USAFHRC, Maxwell AFB, Alabama. In addition, special thanks go to Major Thomas Jahnke, Air Command and Staff College, who acted as the advisor on this project and to Mr Cargill Hall, USAFHRC, for sponsoring this study.

# ABOUT THE AUTHOR

Major Donald S. Dorr graduated with a Bachelor of Arts degree in History from Florida State University in 1968. Upon graduation he was also commissioned a second lieutenant through the Air Force Reserve Officer Training Corps program. Following completion of the Air Intelligence Officer Course at Lowry AFB, Colorado in 1970, Major Dorr served one tour in Southeast Asia. Here he served as an intelligence officer, first with the 316th Tactical Airlift Wing, Phan Rang Air Base, Republic of Vietnam, then with the 19th Tactical Air Support Squadron, Bien Hoa Air Base, Republic of Vietnam. In 1971, Major Dorr was assigned to the 21st Air Division, Hancock Field, New York, as the intelligence representative for the Aerospace Defense Command. The next year, Major Dorr was reassigned as an intelligence watch officer to the Alaskan Command, Elmendorf AFB, Alaska. In 1973, Major Dorr left active duty to pursue a career in optometry, joining the Air Force Reserve in 1974. Since then, Major Dorr has served as an Individual Mobilization Augmentee assigned to the Air Force Intelligence Service/Reserve Forces for the Alaskan Air Command and currently for the Military Airlift Command, Aerospace Rescue and Recovery Service. He received his Doctor of Optometry degree from Southern College of Optometry in 1979. His professional military education includes Squadron Officer School, and he is presently a student at Air Command and Staff College. In civilian life Major Dorr is an Optometrist with a practice in St. Petersburg, Florida.

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REPORT NUMBER 87-1780

AUTHOR(S) MAJOR DONALD S. DORR, USAFR

TITLE WEATHER WATCH: MAKING STRAIGHT THE WAY FOR AIR TRAVEL OVER THE NORTH ATLANTIC

I. Purpose: This paper analyzes the development of the US Army Air Force Weather Service's system of meteorological stations which supported the North Atlantic Ferry Route for the period 1941-1945.

II. Objectives: The story of the Weather Service's World War II activities in support of the North Atlantic Ferry Route is told beginning with a review of pertinent historical events pertaining to the Weather Service prior to 1941. It then discusses how military leaders first envisioned the need for meteorological data from the North Atlantic region and where airbases and weather stations would be established. Next, problems associated with establishing these facilities is recounted. The discussion continues by describing some early administrative, operational, and personnel problems encountered at these weather stations. Also mentioned in this account are some technical innovations and other missions initiated during the war years. The story concludes with the role the Weather Service played in the massive and rapid demobilization efforts in 1945.

III. Conclusion: The inception and implementation of the system of North Atlantic weather stations made transatlantic air travel possible, thus ensuring victory during World War II.

## Chapter One

### THE PRE-WAR YEARS

The US Army Air Force (AAF) Weather Service, which was to play such a vital role in the success of Allied air forces during the Second World War, had a slow and shaky start. Following the end of the First World War the Army's Weather Service was called the Signal Corps Meteorological Service and derived its new peacetime role from Army Regulation 105-210 dated 12 November 1921 (2:42). For the next 15 years the Service would try to determine the type of service it was to provide and how it could best do it--all with a force that never exceeded 11 weather officers at any one time (2:42).

This period between the two world wars was marked by the efforts of its commanders to provide for the Service during times of great austerity and technological development (2:42). Army weather stations provided only the most rudimentary of information while the US Weather Bureau possessed the better weather forecasting abilities (2:43). By the mid-1920s, it was not uncommon for Army flyers to be given only generalized forecasts which might read: "The weather will be partly cloudy and warm over New England and east of the Appalachian Mountains . . . and cloudy with general rains in the region of the Great Lakes" (2:43).

Despite the shortcomings, little was done to upgrade the Army's Weather Service. In fact, as late as 1931, as demonstrated by aerial maneuvers in New England, the Signal Corps Weather Service was thought to be working out well (2:44). The meteorological arm was considered "the most capable ever available to a military organization" and that the "training of personnel and methods used in military meteorology are essentially correct" (2:44).

Only after a series of accidents, including an unfortunate affair following a fly-over at the Chicago World's Fair in 1933, did the Air Corps begin to consider the problem (2:44-45). Arrangements were made with both the Massachusetts Institute of Technology (MIT) and the California Institute of Technology (Cal Tech) to begin providing better weather training for two Air Corps pilots in an experimental project (2:45).

What really showed both the Air Corps and the nation as a whole that Army aviation was in trouble was in 1934 when President Roosevelt ordered the Army to begin flying the mail. This action followed a controversy over the awarding of air mail contracts to the commercial airlines. The result was a disaster. It was soon discovered that the Army was neither prepared for nor equipped to handle the job. The civilian air fleet had far outdistanced the Army in both equipment and training. As a result, ten Army pilots died in crashes in only the first three weeks of this abbreviated 12-week operation (2:45).

To try to discover the facts behind the Army's problems, the President formed a board headed by Newton D. Baker, a one-time secretary of war. The board's recommendations called for ". . . unity of command, as well as the immediate creation of a centralized Air Corps combat arm that would be called the General Headquarters Air Force" (2:45). This new commander would report directly to the Army General Staff and leave the Chief of the Air Corps with supply and manpower to control (2:45-46). The board also recommended that the Army's weather service be given more attention (2:45).

Continued in-house bickering between the Air Corps and the Weather Service's parent, the Signal Corps, was finally resolved on 1 July 1937 when the Air Corps assumed sponsorship (5:313). Under the new guidelines: (1) Weather service was to be provided by the Air Corps both to itself and to division level or higher ground forces. (2) Lower level Army units were to provide their own weather service. (3) The Signal Corps would remain responsible for development, supply, and logistics of meteorological equipment. (4) Regular Army weather officers in the Signal Corps could transfer to the Air Corps; however, for the transfer to be permanent, they would have to become rated pilots. (5) Enlisted meteorological personnel in the Signal Corps could also transfer to the Air Corps with no reduction in grade (2:46-47). In all, 6 officers and 100 enlisted men switched from the Signal Corps to the Air Corps. Only one officer, Captain Don McNeal, shifted permanently.

This increased the size of the Air Corps Weather Service to 22 officers and 280 enlisted men (2:47).

As the prospects of war in Europe began to materialize in 1939, the small Air Corps Weather Service cadre began to realize that if the United States should become directly involved, it would not be up to the task. At this time, expansion plans could be considered modest at best. Recruitment standards for both forecasters and observers were high with preference given to men who were already experienced pilots. Qualified pilots who applied to the Weather Service to become forecasters were sent to either MIT or Cal Tech, but at the rate of only eight students per year (5:313). For enlisted men wanting to become forecasters, a special school was opened at Patterson Field, Ohio, in September 1937. This 6-month school would handle 50 students per year. Men wishing to become weather observers were trained on the job (5:313-314).

In 1939, a special school for observers was established at Scott Field, Illinois, but by early 1940, both schools were moved to the Air Corps Technical School at Chanute Field, Illinois (5:313-314). In 1940, following the fall of France and with the Battle of Britain as yet undecided, the Weather Service began to realize that even its expanded training program was going to fall way short of needs if, indeed, the US did become more involved. A nationwide inventory of qualified forecasters which was made in July of that year showed there to be 150 in the US Weather Bureau, 94 with the civilian

airlines, 62 in the Army, 46 in the Navy, and 25 in various other capacities (5:314). At this time it was felt that, as a minimum, the Weather Bureau would need an additional 25 to 30 forecasters, the Army 175 more, and the Navy another 80 (5:314).

It was obvious that the educational programs at MIT and Cal Tech could not handle the increased numbers of forecaster students envisioned, so negotiations were inaugurated to include students in the meteorological programs at the University of California at Los Angeles, the University of New York, and at the University of Chicago. The original plan to take 40 students soon expanded even further to 150. Recruits were to come from the ranks of pilot "washouts" who possessed the proper qualifications and who were already in cadet status. Other students were given the promise that they too would be allowed to complete their training in cadet status (5:314).

By October 1940, 150 recruits had begun their 9-month courses of study for the Air Corps. And by the time the US entered the war in December 1941, the first class of forecasters had already graduated and were assigned to duty. With the war, the second class, this time with 180 students, was graduated six weeks early in February 1942 (5:314).

As the Air Corps Weather Service continued to gear up for the war, it also continued to revise upward its estimates of the number of personnel it thought it would need. Estimates of up to 10,000 weather officers were made and planned for before realizing that perhaps they had overdone it and revised the

projected need downward to about 4,500. As it eventually turned out, the Air Corps, now called the Army Air Force, trained 6,200 weather officers and had to assign 1,800 to other duties (5:315).

While the Army's weather service served in all theaters of the war, one of the most challenging areas of operation was in the North Atlantic region. In the next chapter we will look at how it was determined that there was a need for meteorological data from the North Atlantic, how the Weather Service became involved in providing this data, and where this data was to come from.

## Chapter Two

## BUILDING UP

When Great Britain found herself at war with Hitler's Germany in 1939, she knew that she would soon have to rely upon North America for the materials of war. By 1940, plans had already been made for ferrying aircraft to Britain from Canada via the northern route. Here the plans called for aircraft to fly from Gander in Newfoundland to some as yet to be built base in southern Greenland, then on to Iceland, and finally on to Britain herself (4:342-343).

In 1940, flying over the North Atlantic was still not an everyday occurrence. After all, it had been only 13 years since Lindbergh had made his famous flight in 1927. While aircraft had improved over the years, one of the most critical aspects of such flights had not--the ability to predict weather conditions along the route. The science of meteorology had made some dramatic breakthroughs during these years and one of them was that weather developed from large air masses forming frontal systems which are often hazardous to flight. If data could be obtained from these air masses, trained personnel could predict expected weather conditions. It was also known that weather which developed in the far north regions would determine weather conditions over the North Atlantic route.

The only way to obtain this data would be to establish a series of weather observation stations in the far north regions (4:345).

These facts were not known only to the Allies. From early on in the war Nazi Germany was well aware of the importance of such posts to their being able to predict weather conditions for Europe. Aircraft patrolling along the coasts of Greenland would send weather information to other aircraft, surface vessels, and submarines operating in the area. Data supplied from the northern regions was also instrumental in allowing the Germans to make accurate weather forecasts for their bombing efforts over England (8:95).

The Allies had no northern weather outposts at this time. As the US became more involved on the Allied side, with the instigation of the Lend-Lease program, things began to happen. Fifty obsolete destroyers were traded for a base in Newfoundland (8:95). With the fall of Denmark to the Germans on 9 April 1940, the US began to be concerned that Greenland, a Danish island, might also fall into Hitler's hands. A year later, on 9 April 1941, agreements were concluded wherein the United States would, in essence, provide protection to Greenland and, in turn, would be allowed to construct bases at several locations (8:96). A few months later a similar agreement was worked out with Iceland (8:96).

The year 1941 became a very busy one for the US. With the increase in US involvement with the Allied cause, it was soon realized that there would be a great increase in the volume of

air traffic along the North Atlantic route. To this end new airfields would be needed and more and better weather service would be expected. The Canadians already were operating a base at Gander, Newfoundland (Figure 1) (4:343). The first US Army Weather Service personnel sent to operate in the North Atlantic region arrived at Gander on 9 March 1941. This initial cadre consisted of three weather officers and ten enlisted men. Their mission was to support the 21st Reconnaissance Squadron which was operating from there on anti-submarine patrol. These men were to work alongside the Canadians until their own equipment arrived from the US (5:321). Gander, however, was already handling too much traffic and, besides, its location lay to the east of the desired direct air route to Britain and was plagued by poor weather. The US chose a new site at Goose Bay, Labrador for its new base. This location was both in a better position as concerned the direct air route, and it had appreciably better weather (4:343).

With the agreement entered into with the Danish in Greenland, a site for the first air base was selected at Narsarssuak (Figure 2) on the island's southern tip. The site was ideally located as it was situated almost exactly halfway between Goose Bay and the British base at Reykjavik, Iceland (approximately 775 miles) (4:343). The base was known as BLUIE WEST-1 (BW-1) and the weather personnel's mission was initially to support the flight operations which were to be based there (5:321).


Figure 1. Selected Bases and Weather Stations in the United States, Newfoundland, and Canada

# Greenland

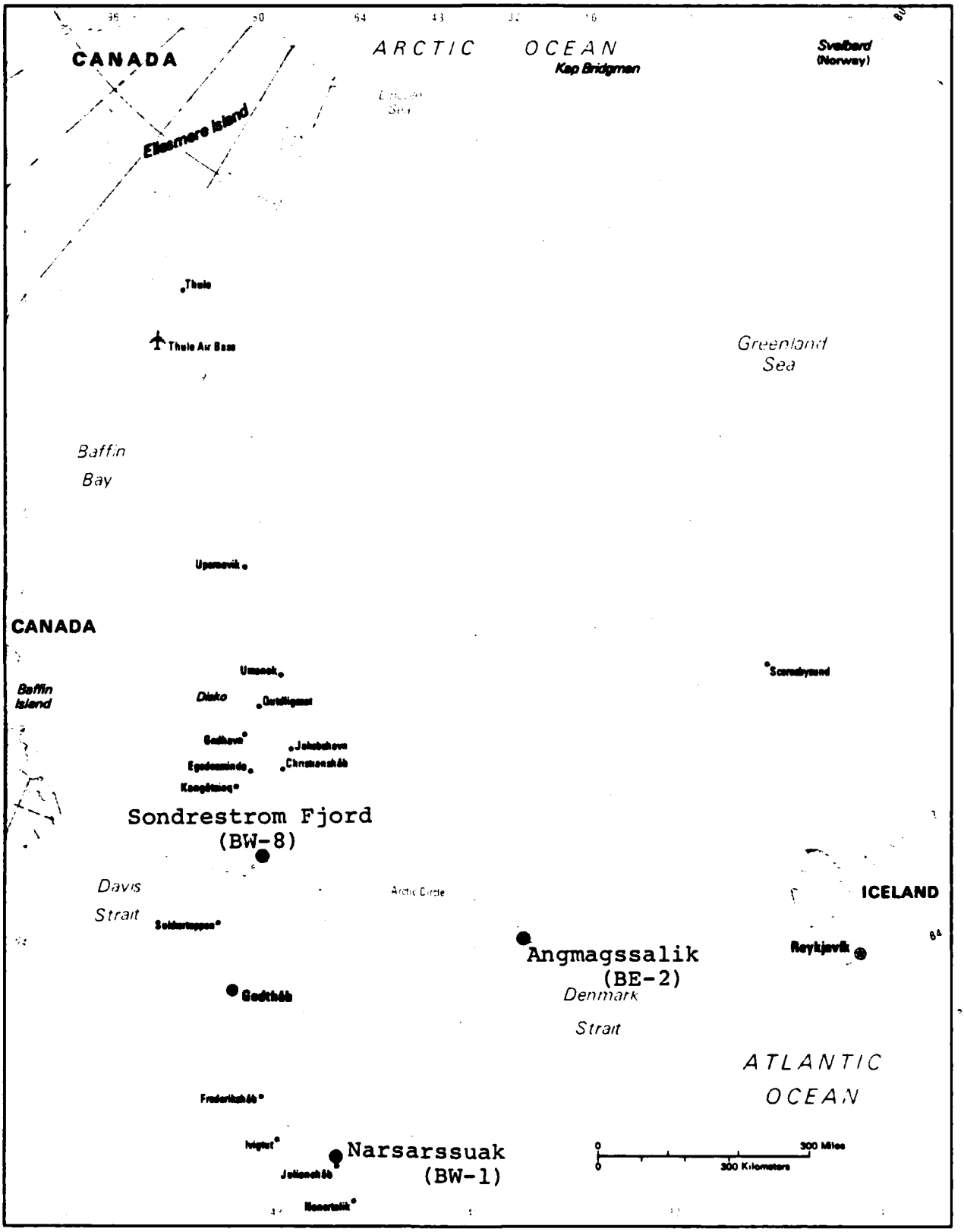


Figure 2. Selected Bases and Weather Stations in Greenland

Three months after establishing BW-1, a weather detachment moved up the west coast of Greenland to help establish a second base at Sondrestrom Fjord, or BLUIE WEST-8 (BW-8) (5:321; 14:3). The reason for establishing this second base was to have an alternate route available. If the situation at BW-1 became untenable due to either overcrowding or bad weather, aircraft could be diverted through BW-8. As fate would have it, the weather at BW-8 turned out to be better than at BW-1 further to the south (4:344). In 1942, a third base was established along the east coast at Angmagssalik, or BLUIE EAST-2 (BE-2) (5:321; 14:4).

The next step on the North Atlantic route was in Iceland where the British already had a base at Reykjavik (Figure 3). In the late summer of 1941, a weather detachment of seven men arrived with the first American task force at Reykjavik to share facilities with the British (5:321; 14:4). This arrangement was temporary because anticipated increases in heavy bomber traffic along this route, starting in 1942, was going to necessitate new bases being built. To meet this need, construction began on Meeks and Patterson Fields in the spring of 1942 (4:344).

Because of the proposed Crimson Route project, which was to allow aircraft to fly directly from the US West Coast aircraft factories to the British Isles via the Northern Great Circle route, weather stations were going to be needed in the Canadian Far North. In northeast Canada, expeditions were formed in the fall of 1941 to establish what became known as the CRYSTAL

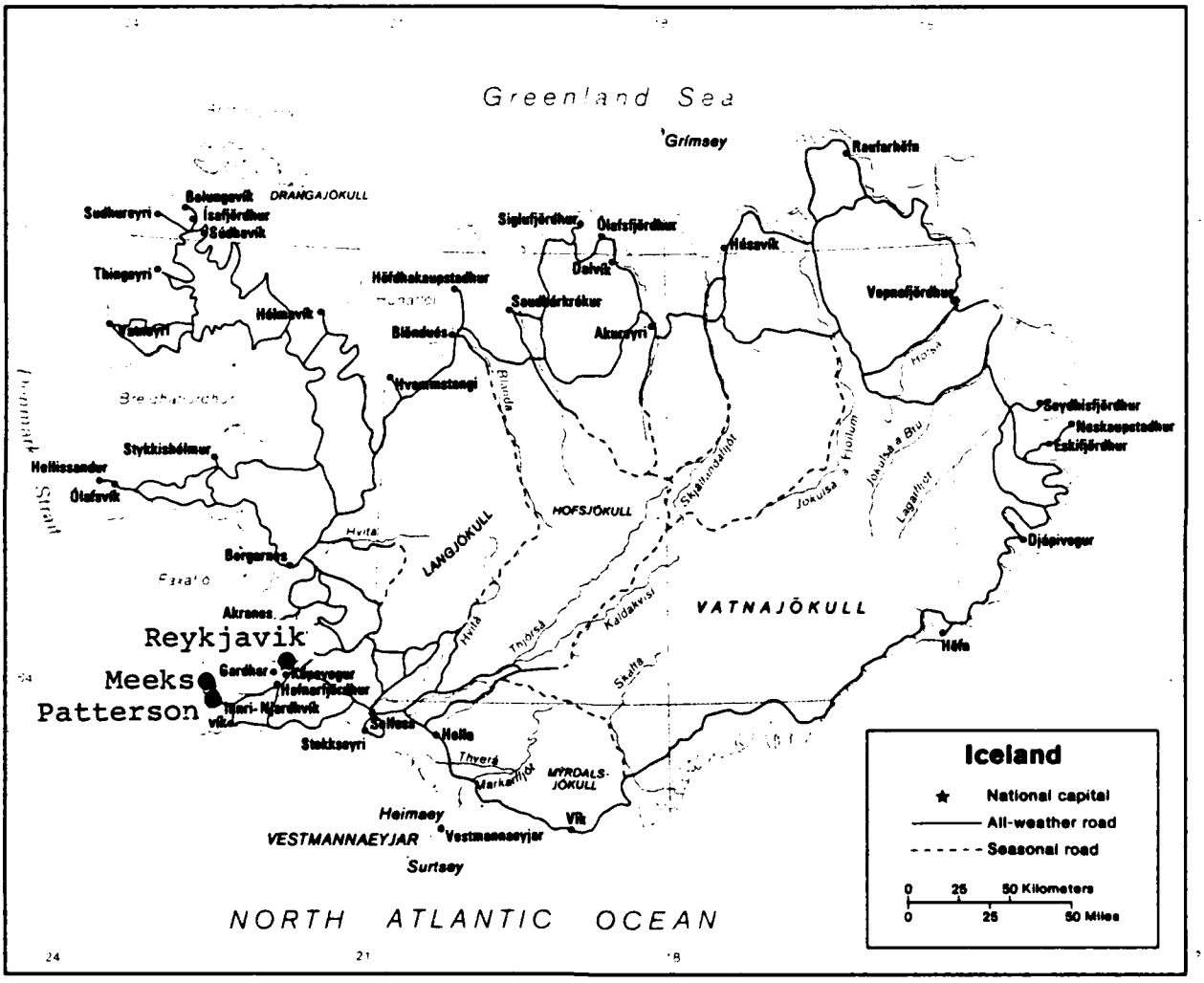


Figure 3. Selected Bases and Weather Stations in Iceland

stations. CRYSTAL I was located at Fort Chimo, Quebec, in early October 1941. At about the same time it was decided to locate CRYSTAL II at a site on Upper Forbisher, Baffin Island. And, finally, CRYSTAL III's site was located late in 1941 at Padloping Island, Baffin Island (14:5).

By the end of 1941, and as the US officially entered World War II, the Army Air Corps and its Weather Service had set the stage for being able to safely move great armadas of aircraft from American factories to the British Isles. But sending a few brave men into the wilderness to set up and operate weather stations was sometimes easier said than done. In the next chapter we will look at some of the problems associated with establishing the North Atlantic Ferry Route.

## Chapter Three

## ESTABLISHING THE SYSTEM

The establishment of US Army Air Corps Weather Service observation and forecasting stations on foreign territory was at times as difficult as overcoming the hostile environment in which they were needed. Even with the cooperative atmosphere generated by the overall war effort, problems among Allies existed. Both political and environmental problems had to be overcome before anything approaching an efficient meteorological system would exist to allow for safe air travel over the North Atlantic.

When the US decided in 1941 to create a system of airfields and weather stations stretching from North America to Great Britain, it chose Presque Isle in northern Maine to be the starting point in the US. Presque Isle became a very busy base and served as both the North Atlantic Division Headquarters for the Air Transport Command and as the Regional Control Office for the 8th Weather Region (until February 1944 when both moved to Grenier Field, Manchester, New Hampshire) (11:2; 14:13,20). During the war Presque Isle was supplemented by Houlton and Dow Fields, Maine (14:13).

Houlton was used before Pearl Harbor as the US terminus for aircraft headed to Great Britain as part of the Lend-Lease

program. It later became a minor clearing point for aircraft flying the Northern Ferry Route. The weather station there provided service for mostly local traffic unless problems existed at Presque Isle (14:13). Dow Field, Bangor, Maine was used mainly from the latter half of 1942 through 1943 to handle overflow traffic from Presque Isle. Traffic through here had ceased entirely by December 1943 (14:13).

The first major stop outside the United States was in Newfoundland. Here, again, the US wanted to establish both airfields and weather stations. The initial establishment of a US weather presence at Gander in 1941 caused the Canadians some apprehension. At the request of the Canadian Controller of Meteorological Services, an arrangement was agreed upon by which the Canadian station at Gander would provide the official forecasting services for both countries (6:190). After the US entered the war, operations at Gander grew to the point where it had the largest transatlantic forecasting center in existence on this side of the ocean. It was also the site of the Weather Service's Regional Control Office before it was moved to Presque Isle (14:7).

Even though Gander became one of the most important bases on the North Atlantic route, the US always experienced problems at Gander. There was always the problem of the base being Canadian and the US sharing facilities as tenants. Supplies and construction had to be coordinated with the Canadians.

US desires to expand and/or alter its facilities had to always have prior approval by their hosts. While these difficulties were relatively minor, they were a nuisance which was not evident at other bases in Canada that were solely US controlled (12:6).

Aside from the major facility at Gander, the US eventually erected other weather stations on Newfoundland. There was a combined Army-Navy station at Argentia and minor forecasting stations at both St. John's and at Stephenville (Harmon Field) (14:7-8). Stephenville served as an alternate when the burden of supplying long-range clearances overwhelmed the facilities at Gander. From the American perspective, it also had the advantage of being a totally American base which also happened to experience somewhat better overall weather conditions than Gander. By 1943, Stephenville had grown to become a regular stop for the many C-54 transports flying between the US and Great Britain (12:2,6; 14:15). In addition to St. John's and Stephenville, the US also had a network of small Signal Corps outposts which were noted for sending rather inaccurate, but sometimes helpful weather reports (14:8).

The next major base created for the Northern Ferry Route was the US-Canadian base at Goose Bay, Labrador (11:2). Chosen primarily for its strategic location and generally good weather, the base was literally carved out of the wilderness by a Canadian construction team in late 1941 (7:28). Following negotiations with the Canadians, the US was granted use of the airfield

(17:87). By April 1942, a contingent of weather and communications personnel arrived (9:121) and what was to become a major base and key stop along the transatlantic route was established (14:9).

As an essential element of the plan to construct major air facilities across the North Atlantic, the US also requested the authority to establish the three CRYSTAL weather stations. After some thought, Canada realized both the necessity of the request and the fact it would be unable to perform the task on its own. Canada, therefore, gave the US the authority to create the stations with the provision Canada be allowed to replace the US when it was able to (6:190). In September 1941, the initial expedition left the US to establish the weather stations at sites previously surveyed by Captain Elliot Roosevelt (4:345). On 11 October 1941, the expedition reached the CRYSTAL I site (Fort Chimo) and began construction (14:5). Part of the expedition continued on to the CRYSTAL II site on Baffin Island (Upper Forbisher) which they reached a few days later. Here the construction workers encountered problems with both 40-foot tides and blizzard conditions. Only three buildings could be built before winter set in and the ships were forced to leave. One weather observer remained at the station while the rest left with the ship (14:5). Farther to the north, the situation at CRYSTAL III (Padloping Island) was actually better than at CRYSTAL II. Here the selected site was better located and easier to supply by ship, which made the construction go much easier.

In fact, CRYSTAL III began broadcasting four synoptic weather observations per day starting on 30 November 1941 (14:5).

After leaving the North American continent behind, the next major stopping point was Narsarssuak, Greenland (BW-1). Greenland, as Canada, was important both for its location along the Northern Ferry Route as well as also being the source region for many an arctic storm and associated weather (14:5). For these reasons it was immediately apparent both weather forecasting and observation stations would be needed in Greenland if aircraft transiting the region were to have any reasonable chance of a safe journey.

The actual beginning of the Greenland weather stations started on the afternoon of 16 July 1941 when Major Arthur F. Merewether, who was Director of Weather, ordered Second Lieutenant Robert B. Sykes, Jr., to proceed to Greenland and take charge of establishing US weather facilities at Narsarssuak and other locations to be determined (13:1). The first group of weather personnel, led by Technical Sergeant Trojanoski, had previously arrived at what would become BW-1 on 6 July 1941. While others began constructing the actual base (spending their nights aboard the ship), four of the weathermen voyaged up the east coast of the island aboard the Coast Guard cutter Northland to install weather equipment at the Danish sites of Scoresbysund and Eskimoaes (4:345; 13:1). The first actual weather observations were made at BW-1 on 15 July 1941, the first synoptic weather message was sent on 30 July, and the transmission of

hourly weather observations began on 18 August. Lieutenant Sykes arrived to take command of the weather section at BW-1 on 26 July, having arrived onboard the transport Siboney (13:2). Under his able leadership the weather station at BW-1 became a first class operation at an important and busy base (14:8), which continued to grow as more weather personnel began arriving starting in September 1941 (13:6).

By October 1941, plans were put into operation to begin constructing a second airfield and facilities at Sondrestrom Fjord (BW-8). The selection of the site for BW-8 was not made without precedent. As far back as 1928 a small airstrip had been laid out here. In 1933, Charles Lindbergh had even selected the area as a possible site for use by Pan American Airways. To help in the actual planning of the installation, the US Coast Guard provided aerial photographs of the area (1:216). Captain Bernt Balchen was in command of the construction effort. The plan called for an initial task force of 1,500 men to build a runway at least a mile long, hangers, machine shops, fuel storage areas, warehouses for equipment, docking facilities, and barracks (1:218). The project was highly classified and those who volunteered had no idea where they were going (1:218).

Even before the remainder of BW-8 was completed, a weather station had been built near the port area. By November 1941, 24-hour weather observing services were being maintained. In May 1942, First Lieutenant A. C. Petersen arrived at BW-8 to become the station's first permanently assigned weather officer.

He was joined in June by Lieutenants Snead and Wilking (13:6-7).

With 1942 and the United States' official entry into the war, the military found itself in possession of two serviceable airfields in Greenland. Both, however, were on the west coast. Aerial expeditions in 1941 had found no suitable location for an east coast airfield and it was felt one needed to be found (4:349). Finally, in April 1942, the Coast Guard found what it felt was a suitable site near Angmagssalik. While the area was far from ideal, an emergency airfield and limited facilities were built. Construction was completed during the short arctic summer of 1942 and the base was designated BE-2 (5:321; 14:4). With the completion of this third base in Greenland, it was felt that safety considerations had been met.

The last link in the North Atlantic Ferry Route before reaching Prestwick, Scotland, was Iceland. In July 1941, prior to America's official involvement in the war, the US sent the 33rd Pursuit Squadron (P-40s), at Britain's request, to Reykjavik so as to relieve British defense units for more important duty elsewhere (4:158; 6:156; 14:4). With the squadron was a group of weathermen consisting of one officer and six enlisted men. Their mission was to establish weather stations in Iceland with the help of both the US Navy and the British, and to supply local forecasts for the 33rd Pursuit Squadron (4:158; 14:4). One of the weathermen was sent on to Keflavik to report on weather conditions from there (8:110). By 1 September 1941, the weather

station at Reykjavik was operational (10:39) and sharing weather information with BW-1 in Greenland (10:43).

Despite the rather impressive facilities already in existence at both Reykjavik and another British airbase at Kaldadarnes, US officials realized neither would be adequate to handle the large-scale influx of heavy bombers which were expected as part of the forthcoming BOLERO movement (the massive movement of aircraft and supplies to Britain by air). To alleviate this potential problem, in the spring of 1942, construction was begun at Keflavik on what would become Meeks and Patterson Fields (4:344). Construction went slowly and neither field was fully operational until the spring of 1943. Meeks Field, which went operational on 18 April 1943, eventually became the site of the primary weather forecasting center in all of Iceland. Even so, a small weather detachment remained at Reykjavik Field (14:17).

While the network of airfields and weather stations would continue to expand and improve throughout the war, by the spring of 1942, the roots of the system had been established. Now it was time to see if this fledgling system would be able to function. In the next chapter we will look at some of the initial problems which had to be addressed by the weather personnel stationed along the North Atlantic Ferry Route.

## Chapter Four

## EARLY PROBLEMS

Once the Army had established the sites for the desired arctic airbases, with their associated weather facilities and nucleus of men and equipment, all did not necessarily proceed like clockwork. It should come as no surprise that a few "bugs" were found to be in the system. Some were common to stations throughout the system, while others were more unique and affected specific locations.

Some of the first problems were caused by the Army itself. Difficult questions involving the command relationships existed within the Army and within the Air Corps itself (5:318). These problems over control continued throughout the early build up of the Weather Service. They diminished somewhat following the creation of the Army Air Force in June 1941 and even more following the reorganization act of March 1942 (5:318). Problems within the Weather Service itself resulted in additional, self-inflicted obstacles to be overcome. For instance, when the 8th Weather Squadron moved its headquarters from Gander to Presque Isle in June 1942, it did so without official activation orders. As a result, the station had great difficulty getting supplies, personnel, and promotions. This occurred even though the squadron was officially recognized by its supply organization (14:9).

Another of the early problems which the Weather Service encountered from an operational perspective concerned the security to be afforded weather data. This was most evident in US dealings with the British in Iceland. Where the US and Britain shared weather facilities, as they did in Reykjavik, the British insisted strict security be maintained on all weather data. The Americans felt security was fine, but it should not stand in the way of operations. If an aircrew needed enroute weather, they wanted to provide it without having to encode it first. The British, while sympathetic, objected to this practice. They were afraid the Germans would intercept vital weather information which they were no longer able to obtain for themselves. So as not to assist the Germans, all weather data was encoded using a system of complex ciphers. This, in turn, slowed down the transmission of data and, all too often, introduced errors into the message. Furthermore, the British insisted the US not use the British cipher system for their own messages. Instead, the US was to use a system requiring the use of special decoding pads which had to be distributed so as to be available at all North Atlantic bases. Even time sensitive weather data first had to be encoded for transmission, then decoded using that day's pad before it could be of any use. This was a time-consuming effort, especially considering the shortage of weather personnel which existed early on in the war. After all of these efforts, the resulting product was often completely useless because it had been sent in a code for which the user

had not yet received the proper decoding pads (14:11). By 1943 the system had improved, as a direct result of efforts arrived at through the Combined Meteorological Committee (5:317; 15:137-138; 16:Ch VI).

A second problem attributable to the British early in the war was their policy of maintaining for themselves complete operational control of all flights transiting between Iceland and Scotland, regardless of whose country or service the flights were from. One of the problems was the British simply did not present weather in the same manner that US aircrews were used to. This was very unnerving to US aircrews who were receiving only British style weather data from Reykjavik to Prestwick (5:323). To help solve this problem, a joint Royal Air Force-Army Air Force (AAF) board recommended bases along the North Atlantic Ferry Route offer both American and British weather services. After July 1943, American aircrews were finally able to fly the entire Northern route under AAF weather and operational control (5:323).

Aside from control, one of the biggest problems affecting the Weather Service's efforts in the North Atlantic region was communications. It was one thing to actually do weather observations and another to get this data into the hands of forecasters in order to process and analyze. Communications efforts in the arctic regions during 1941-1942 were, at best, erratic (14:10). Besides the more usual operator inexperience and equipment failure, these northern stations also had to contend with the disruptive electromagnetic effects of the northern

lights (aurora borealis). Compound these with the errors caused by both enciphering and deciphering message traffic and it becomes apparent how problems could exist. A study conducted 1-10 July 1942 showed ". . . 21% [of the messages sent] failed because of 'radio fade and radio operational difficulties.' Of the 79% received, approximately 9% contained errors in transmission. Of all possible reports, 44.4% were either missing or in error" (14:10). While this was considered to be high, it still showed a "considerable improvement" over what it had been only four months before (14:10). Only the previous May, Lieutenant Colonel Milton Arnold, of the Weather Service, while on a survey flight in the region, was dismayed to find little weather information being relayed between stations in Iceland, Greenland, and eastern Canada. In a letter to the commanding general, Air Transport Command, Colonel Arnold reported "Actual messages were found in which forecasts were requested from Gander and Presque Isle and were delivered fifteen days later to Greenland, and in another case, twenty-nine days later" (4:348). In response to these problems, Colonel Arnold issued directives to develop training programs for inexperienced weather and radio personnel. In some cases personnel were simply replaced. Efforts were also undertaken to try to install new and better radio equipment and to develop and use simpler weather codes (4:348). Unfortunately, it was not until 1943, when more powerful radio equipment was actually installed along the entire route, that communications became less of a problem (14:17-18).

The station at Goose Bay, supervised by Major Ben Holzman, was especially plagued by communciations problems through 1943. Here the problem was broadcasting station WSY's (LaGuardia Field, New York) failure to provide enough continental weather reports to allow preparation of accurate forecasts. Even with only scattered reports at their disposal, the weather station tried as best it could to distribute usable forecasts for BW-1 and Meeks Field. As incomplete as these reports sometimes were, they were often further degraded by ever present garbling in transmission (12:7; 14:16).

The problems at WSY were lessened following a visit by Captains Remick and Daniels and the subsequent establishment of a Weather Service detachment at the field (12:8). While this action did improve the broadcasts from WSY, communciations from the station remained less than totally satisfactory (14:18). However, from the latter part of 1943 onward, the station at Goose Bay was able to prepare much better quality forecasts (14:16).

Helping to improve on the problems at WSY also helped with another problem Captain Daniels had been troubled with for the better part of a year. From January 1943, when he became the first full-time weather officer and forecaster at CRYSTAL I, he too had been plagued by receiving erratic and garbled weather data. While this was not a major forecasting station within the system, the personnel there had tried to draw and analyze two weather maps each day. Often, however, the data they received

was upwards of 12 hours old and of questionable value. Fortunately for those concerned, the station quite frequently went for days or even weeks without a plane--which might need current weather--landing there (14:19-20).

Communications difficulties and the corresponding forecasting problems were not the only problems to haunt the North Atlantic weather system. The base at Narsarssuak, Greenland (BW-1) had its own interesting problems to deal with. Narsarssuak was located in a fjord with rugged mountains surrounding the airfield. For aircraft flying into BW-1, position was critical and instrument approaches were forbidden. The minimum ceiling for landing at Narsarssuak was 8,000 feet (2:66). The base was constantly hampered by the formation of sea fog which could turn the sky from clear to completely overcast, without warning, in only a matter of minutes (14:18). It was for this reason the base at BW-8 became so important as an alternate airfield. In addition to the fog, the base at BW-1 was also bothered by another problem. During construction the fragile moss cover which had covered the surrounding plain was destroyed. This allowed strong winds to blow clouds of loose sand, gravel, and even stones, which could create serious problems for both air traffic and the base itself (13:11-12). Despite these difficulties, the forecasters and observers at BW-1 maintained one of the best weather stations to be found in the region (14:18).

An example of what could happen trying to fly into BW-1 occurred on 25 June 1942. On that day a flight of B-17s was

coming in from Goose Bay when unexpectedly the airfield at Narsarssuak was forced to close because of poor weather. Short on fuel, the flight did as best it could. Three of the B-17s were forced to crash-land at various points throughout Greenland. Fortunately, in this instance, all the crews were rescued; however, the planes were lost (13:10). It was instances such as this that forced officials to urgently recommend additional weather installations be established in Greenland so as to better predict local base weather conditions (13:10).

While problems with operational control, concerns over weather security, and difficulties with communications may have been paramount concerns to those responsible for establishing a workable weather system in the Arctic, the human side of the effort could not be ignored. Men to be sent to these harsh environs, to spend many a lonely month at these isolated weather stations, had to be specially selected for both emotional stability and physical stamina (5:322). Because most of the stations were situated along the coasts, men and supplies most often arrived by ship. Supply by air was very limited, although there were at least two isolated stations at Mecatina and Indian House Lake, Quebec, which were both originally established and then totally resupplied by air alone (4:346-347; 5:322).

Larger airbases with associated weather personnel fared better than the more remote weather observation stations.

Living and working standards at either were far from deluxe. While the base was being constructed at Narsarssuak in July 1941, all personnel lived aboard ship. This lasted for three weeks (13:2). When the men finally moved ashore, weather personnel had only a single 12- by 12-foot pyramidal tent for their weather station. This allowed for few instruments and little furniture (13:3). By 4 September 1941, the weather station had expanded to a 10- by 19-foot tarpaper shack--the old tent then serving as a supply tent (13:5).

Tents were of questionable value, however, since they were easily destroyed by heavy winds which accompanied North Atlantic storms (13:5). Until September, when a small one-kilowatt gasoline generator arrived, supplemental lighting was supplied by candles or lanterns (13:6). By October, all personnel had moved from their vulnerable living tents into more substantial wooden barracks (13:9). The men stationed at BW-8 were not as fortunate. Even as late as October 1942, some of the men were still living in tents and doing without running water, having electric lights that worked only half of the time, and relying on small stoves and candles for both heat and light (13:27).

By the end of 1943, the Weather Service's expanding operation in support of the North Atlantic Ferry Route had at last overcome the hardships and growing pains which characterized the system for the two previous years. The system still had problems, but it now was accomplishing its mission as originally intended. In the next chapter we will look at some of the

technical developments, lifestyles, and later operations which were used in this region.

## Chapter Five

## THE INTERIM YEARS

After the Weather Service's awkward beginning in 1941, the North Atlantic region was being well served by 1943. By that year Weather Service objectives were being met with near "production line" efficiency (14:11). While the network of weather stations had started as a few, minimally manned stations, it had become a system of both large and small stations with many hundreds of men scattered throughout the Arctic. During 1943 alone, the 8th Weather Squadron grew from 29 officers and 256 enlisted to 95 officers, 1 warrant officer, and 456 enlisted (14:12).

This expansion was not only in the numbers of stations and men, but included some new technical innovations and other missions. Despite the fact that the Weather Service continually had difficulty in obtaining modern weather instruments and equipment from the Signal Corps, which was responsible for providing such equipment, a total of 75 new or improved pieces of meteorological equipment were developed during the war (2:58). Some were even used in the Arctic.

Aside from the more traditional surface observations, by the end of 1943, no fewer than 23 North Atlantic stations were equipped to make pibal (pilot balloon) runs to measure winds

aloft (2:16; 14:12). For providing additional information, seven stations were capable of making use of radiosonde balloons (14:12). To be able to use these balloons, the Weather Service needed hydrogen gas, which was in short supply. In Greenland, hydrogen gas generating equipment had to be obtained through the facilities of Pan American Airways (15:110). Starting in 1944, rawin (radar wind) winds aloft runs slowly began to replace the older pibal runs at the larger bases. The older-fashioned balloon runs were continued at the smaller and more isolated weather stations (14:22). Additional rawin information was received from the US Coast Artillery unit at St. John's and from the Canadian Army at Gander (14:22).

Other weather-related equipment which was used or tested in the region included the first cooperative radar wind station which was established at Meeks Field on 17 October 1943 (14:18). Another was the effort to install automatic weather stations in Greenland. In July 1943, the first contingent consisting of four small Friez SCM-17 units, two large Friez SCM-19 units, and the Bendix SCM-19 unit arrived. The operation of all units was less than satisfactory and they all were eventually returned (13:21-22). Automatic weather stations were not yet ready to match the Arctic.

Food, clothing, and mail from home were also of importance to these North Atlantic weathermen. As with much modern equipment, the men soon realized "When you fight [in] the Arctic, you fight on the Arctic's terms" (1:228). Living itself could well

be a fight. Because most bases had few, if any, storage facilities for meat, butter, or vegetables, meals would often consist only of what was currently on hand. In one instance at BW-1, men eating in the base mess hall were treated to a menu consisting mainly of frankfurters for nine or ten meals within a single week (13:9). There were occasions, however, when there were compensations for trying to survive in the wilderness. Hunters were sometimes able to provide wild game to supplement the dinner table (5:322). When spring would finally come to the Arctic, the area would become alive with game. At BW-8 "Duck hunting became a popular sport and there were many duck feasts" (13:27).

Aside from diet, proper arctic dress was often a totally foreign experience for many of the weather personnel. Many men were unfamiliar with the rigors of severe cold weather. Most learned through experience. Generally, as winter approached and the temperature began its seasonal plunge, the men began wearing all the clothing they had--sometimes six woolen shirts at once. Eventually, they learned more was not necessarily better. The optimum outfit usually consisted of "shoes with felt soles, regulation ski-trooper pants with knitted cuffs to keep out wind, [a] single GI woolen shirt, [a] windproof gabardine parka and pants, and most important, [a] one-piece union suit" (1:226).

If the military was successful providing clothing for the men, it was at first unsuccessful at bringing in the mail. It was not unusual for mail calls to be separated by intervals of

up to four months, especially during winter (5:322). That first year saw the majority of Christmas mail not arriving at Narsarssuak until April or May 1942 (13:9). Even the forces in Iceland experienced delays in mail delivery. While it was nowhere as slow as it was to the stations in Greenland or the CRYSTAL stations in Canada, it was delayed. What made this delay in delivery less understandable to the men stationed in Iceland was the fact that supply ships arrived there with much greater frequency (3:509-510). Regardless of the long intervals between mail deliveries, the overall poor living conditions where "Entertainment was card playing--and more card playing" (13:26), and where food was less than might be hoped for, overall morale at these weather stations remained "phenomenally good" (13:9).

As the major bases grew, the living conditions and facilities associated with them improved too. At BW-8 the Post Exchange expanded to sell a variety of canned goods, cakes, and candies, as well as an assortment of other articles. Dayrooms were built. A theater, gymnasium with both basketball and handball courts, and even a beer parlor were opened by the fall of 1943. It was even reported by some that "The social life of the [weather] detachment took on a club atmosphere" (13:29).

All had not become simply "fun and games" at the weather stations, though. A variation of the more traditional weather observer's role occurred with the decision to use airborne weather observers and the eventual formation of weather

reconnaissance squadrons. To assist fighter aircraft across the Atlantic during the BOLERO movement of 1942, an initial system of weather reconnaissance flights was tried. This practice proved to be so successful the experiment was expanded to allow weather reconnaissance for all flights (5:322). By 1943 the Weather Service had a small number of its own aircraft assigned to the North Atlantic Ferry Route. Three B-25s were used between Presque Isle, Maine; Goose Bay, Labrador; and Gander, Newfoundland (5:322; 14:21). From Newfoundland, three B-17s were used to provide weather coverage from 500-800 miles eastward (5:322-323; 14:21). Beginning in January 1944, three specially equipped C-54s flew between the North American bases and Britain. These aircraft could fill the gap on weather maps where mid-ocean storms were likely to hide unnoticed by conventional meteorological detection (5:323). Because these flights were manned by professional weather officers and forecasters, as well as observers, they were able to provide much more accurate and complete data than was normally obtained from pilot post-flight reports (14:21). Qualified weather observers were also included aboard regularly scheduled transatlantic C-54 aircraft to make in-flight observations (5:323). Naval and Coast Guard ships stationed along the airway also provided weather data as observed from the ocean's surface (5:323).

As 1944 came to a close, the men of the Weather Service's North Atlantic Ferry Route had essentially completed their job. The war in Europe was going well and victory seemed assured.

In the next chapter we will look at how the Weather Service handled victory in Europe.

## Chapter Six

### WIND DOWN

By 1945, the great influx of men and materiel which had arrived in the Arctic to support the North Atlantic Ferry Route came to an end. Weather reconnaissance flights, as well as forecasting and observing activities, were all functioning at optimum levels. Communications problems still persisted, but they were much less troublesome. In addition to normal activities, efforts were being made to begin training both native Greenlanders and Canadians so they could begin taking over weather observation and radio communications duties when the American forces left (14:24).

Following V-E Day (8 May 1945), large-scale demobilization was expected. Some weather services were discontinued and several smaller observation stations were either deactivated or turned over to the host governments. Even the weather facility at Gander, once such a major operation, closed up shop (14:25).

While some of the men in the region might be going home, the Weather Service mission was not yet complete. Thousands of men and aircraft would be returning to America from Europe and they would require weather services to make their return journey.

With the advent of the long-range C-54 transport, the once vital bases at Narsarssuak, Goose Bay, and Presque Isle were

now only important as weather forecast centers and as alternate airfields (14:26). Now it was the bases at Meeks Field, Stephenville, and LaGuardia Field which would carry the brunt of the North Atlantic air traffic to the US (14:26).

To accomplish this redeployment of aircraft and personnel from the European theater, the AAF developed both the White and Green Projects (14:27). The White Project was designed to return tactical aircraft for possible further deployment to the Pacific theater while the Green Project was designed to transport, by air, those US servicemen who were eligible for immediate discharge from active duty (6:192). By mid-July 1945, 3,004 aircraft and over 50,000 personnel had been returned to the US under the White Project with the loss of only one aircraft and no lives. By mid-September, that figure had grown to over 80,000 passengers under the White Project and 160,000 passengers under the Green Project (6:192).

After V-J Day (2 September 1945), the Weather Service began its rapid demobilization efforts too. Based on an eligibility system, the more senior and experienced weather personnel were the first to be released. This left the more inexperienced newcomers to operate the Weather Service as best they could (2:133). The war was over and the world was different from what it had been only a few short years before. The Weather Service, too, had changed and now a new and equally challenging chapter was about to be written.

## Chapter Seven

## CONCLUSION

The monumental accomplishments of the Weather Service during World War II have for many faded with the equally monumental achievements of the past 42 years. Even before the war in Europe was over, the advances in aviation technology had diminished the value of many of the hard-fought-for arctic bases. Where once the mere existence of these bases meant the difference between success or failure, life or death for many aircrews, by 1945 they had been relegated to auxiliary status only.

As the world of aviation was dramatically advanced by the equipment and developments of the war, so too was meteorology. The pressures and needs of war had advanced both the science and art of weather forecasting. Scientific advancements were providing weather specialists with more and better data from which to make their forecasts and predictions. With the introduction of space-oriented weather systems in the 1960s, the discipline literally reached new heights.

With today's readily available weather information and near real-time weather observations worldwide via satellite, it can be difficult to remember that it was not so long ago when a relatively small group of carefully selected men were bundled

off to the far reaches of the globe. Here they were asked to live and work in what was often a frozen wilderness, far removed from the type of civilization they had known, in order to provide weather data to groups of fliers most would never see. They were up to the mission. Their efforts played a part, in no small way, to the massive air armadas which helped crush Nazi Germany. Their efforts also helped advance the system of weather forecasting which most of us take so much for granted today.

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