THE CANADIAN BOMBER COMMAND EXPERIENCE

-In Photos-

Dave Birrell

BOMBER COMMAND MUSEUM OF CANADA

During the Second World War, some 40,000 young Canadians were trained in Canada and sent overseas to serve in the massive effort that was Bomber Command. 10,400 were killed.

Through four hundred archival photos, this book presents their experience -from their recruitment and joining the Royal Canadian Air Force, through their training in Canada and in the United Kingdom, and finally their service with Bomber Command Squadrons in the UK and in combat in the skies over Europe.

As well as telling the story of these men and women, the book and its photos also describe the development and operation of the British Commonwealth Air Training Plan, the huge effort to operate and support the strategic bombing offensive, and the development of the Royal Canadian Air Force.

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CANADIAN
BOMBER COMMAND EXPERIENCE

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Bomber Command Museum of Canada
Nanton, Alberta, Canada

Three thousand miles across a hunted ocean they came, wearing on the shoulder of their tunics the treasured name, 'Canada', telling the world their origin. Young men and women they were, some still in their teens, fashioned by their Maker to love, not to kill, but proud and earnest in their mission to stand, and if it had to be, to die, for their country and for freedom.

One day, when the history of the twentieth century is finally written, it will be recorded that when human society stood at the crossroads and civilization itself was under siege, the Royal Canadian Air Force was there to fill the breach and help give humanity the victory. And all those who had a part in it will have left to posterity a legacy of honour, of courage, and of valour that time can never despoil.

-Father John P. Lardie,
Chaplain 419, 428 Squadron RCAF

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The Nanton Lancaster Society is a non-profit, volunteer-driven society which is registered with Revenue Canada as a charitable organization. Formed in 1986, the Society has the goals of honouring all those associated with Bomber Command and the British Commonwealth Air Training Plan.
The Nanton Lancaster Society established and operates the Bomber Command Museum of Canada in Nanton, Alberta.

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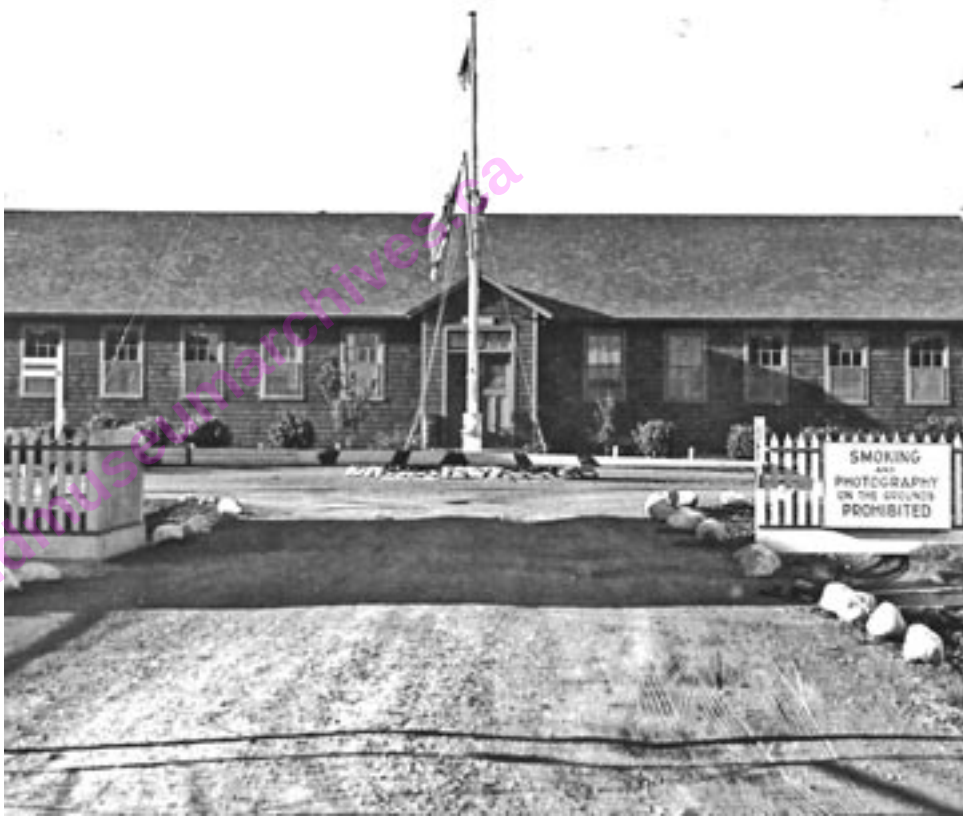
INTRODUCTION

As a young Royal Canadian Air Force recruit entered his first flying school, a sign at the entrance made it very clear that activities on the site were not to be photographed. This policy was in place throughout his training and the use of cameras on Bomber Command stations in the UK was limited as well. So it is not surprising that, even given the huge efforts that the British Commonwealth Air Training Plan and Bomber Command were, photos are relatively few and often of poor quality.

There was an 'official' RCAF photography unit which operated in a limited way to document what ocurred and other authorized and un-authorized photography was done. Some aircrew acquired small cameras that were smuggled onto the schools and stations, and sometimes taken in the aircraft, concealed in flying boots. Later in the war, at least one Canadian pilot brought a primitive home-movie camera along on a daylight bombing raid.

This book includes clearly unauthorized photos taken by a Canadian Prisoner of War. Wireless Operator/Air Gunner Bill Lawrence secretly made a camera from a Red Cross biscuit tin with the aid of two lenses which were smuggled into the prison camp by prisoners who were doing labour outside the camp. He had friends in the prison who had access to the camp hospital and they obtained film and x-ray chemicals for developing it. After each shot, he had to move the film frame manually under the blanket of his bed while an accomplice watched out for the guards. Bill turned his bed into a darkroom, developing film under the blanket. For the shots outside of his 'hut', Bill's camera was concealed in a Red Cross food parcel box. The box had a hole cut in one end which he covered with his hand.

Through four hundred photographs from the Bomber Command Museum of Canada's archives, 'The Canadian Bomber Command Experience -In Photos' presents the experiences that the young Canadians had as they trained in Canada, and then were part of Bomber Command's war overseas.



The main entrance to 5 Elementary Training School at High River, Alberta

ACKNOWLEDGEMENT: 'A Thousand Shall Fall' was written by Murray Peden, a pilot who trained at 5 EFTS and went on to fly with Bomber Command. His highly regarded book is clearly the best account of the Canadian Bomber Command experience ever written. The reader will find several quotations, some lengthy, from 'A Thousand Shall Fall'. Murray was an enthusiastic supporter of the Bomber Command Museum of Canada.

AIRCRAFT, AERODROMES, AND SCHOOLS

THE BRITISH COMMONWEALTH AIR TRAINING PLAN (BCATP)

As the focus of a Commonwealth-wide effort to instruct aircrew, Canada made a major contribution to Allied air superiority during World War II. Called the 'Aerodrome of Democracy' by US President Roosevelt, Canada had an abundance of training space beyond the range of enemy aircraft, excellent climatic conditions for flying, access to American industry, and proximity to the UK via the North Atlantic.

At the plan's peak, ninety-four schools operated at 231 sites across Canada, 10,840 aircraft were involved, the ground organization numbered 104,113 men and women, and three thousand trainees graduated each month. A total of 131,553 aircrew graduated.

With the massive presence in the Country of the BCATP, the RCAF was the service of choice for tens of thousands of young Canadians and of the total graduates of the Plan, 55% were Canadians with the others being primarily Britons, Australians, and New Zealanders. This major commitment to the air war, and particularly to Bomber Command, inevitably exacted a very heavy toll in Canadian casualties.

Although Canada provided the facilities, some BCATP schools were operated by the Royal Air Force

The official opening of 2 Flying Instructor School near Vulcan, Alberta, one of ninety-four schools operated by the British Commonwealth Air Training Plan

BUILDING AERODROMES AND SCHOOLS

The construction of training schools for the BCATP was a massive undertaking. Eighty new airfields were required in addition to upgrading and utilizing forty existing ones. Of the thirty-eight elementary and service flying schools scheduled for opening in 1940 and 1941, all but three opened four to twenty-four weeks ahead of schedule.

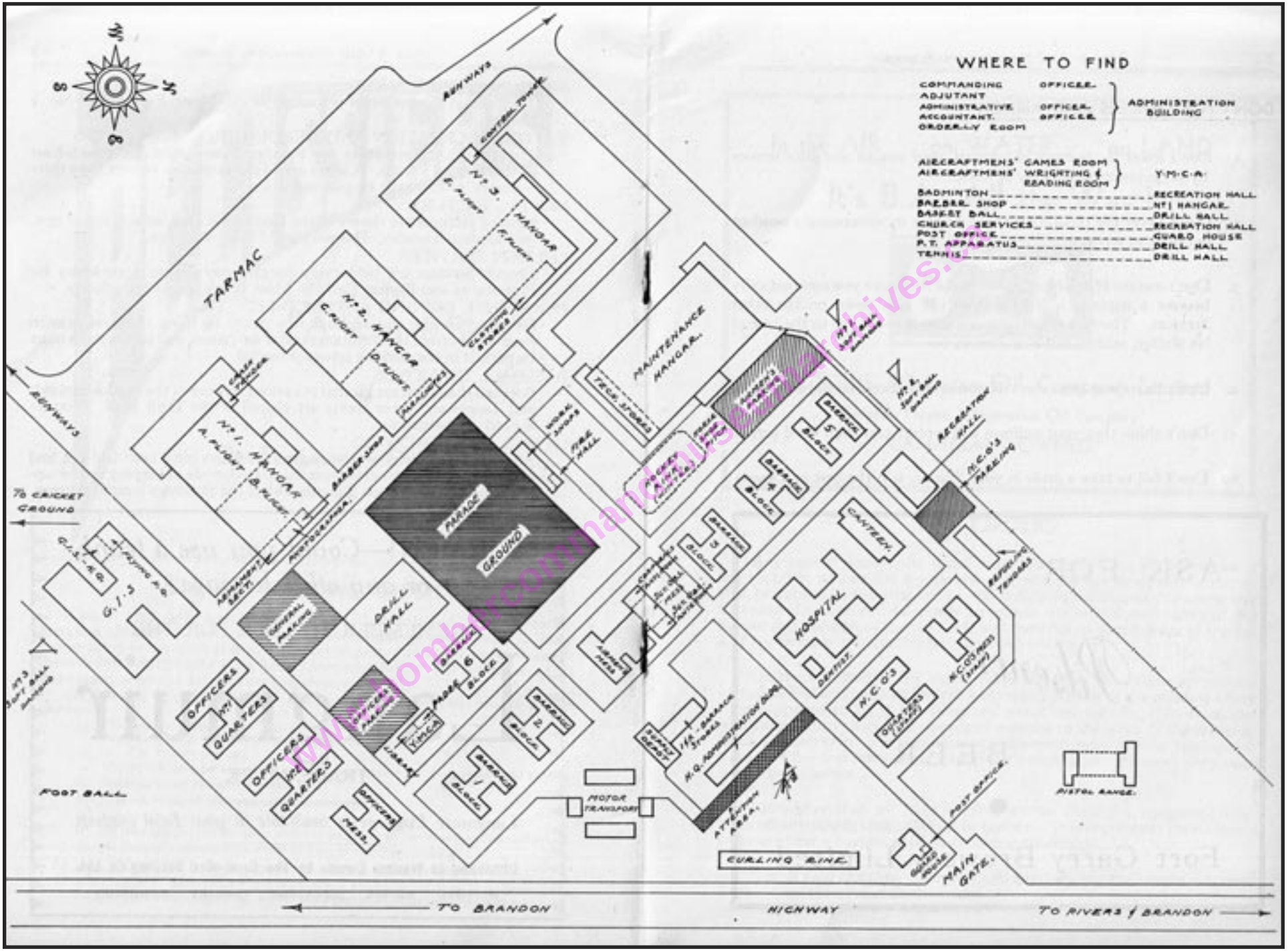
On the prairies, farmer's fields were transformed in a matter of a few months into operational schools. This involved the levelling and paving of runways, taxiways, and tarmacs as well as the construction of several large hangars and dozens of other buildings, sewage systems, water systems, and heating and lighting systems required for the accommodation, teaching and other services required by the young airmen, instructors, and support staff.

A major accomplishment was the substitution of wood for steel in the construction of the hangars. Wooden trusses spanning more than 30 meters were developed. Approximately 7000 buildings were erected, most of these in the first two years.

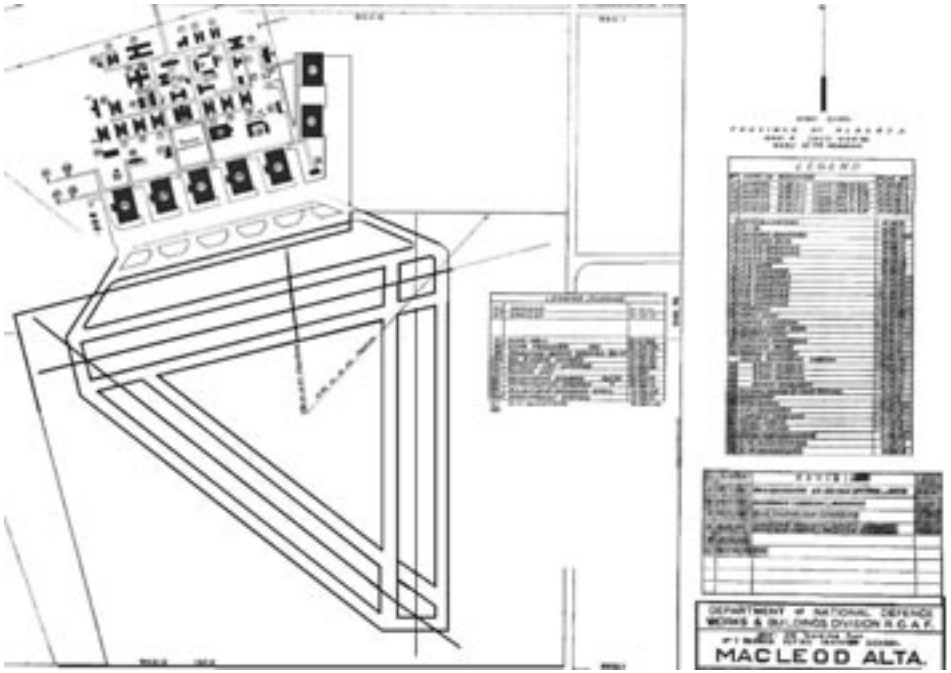
Perhaps the most significant Canadian contribution to victory in the Second World War, the BCATP was the largest project ever undertaken by the Canadian government up to that time.

A BCATP drafting office where the plans for aerodromes were finalized. 33,000 drawings and more than 750,000 blueprints and were produced.

Horse-drawn wagons hauling loads of dirt during the construction of 2 Bombing and Gunnery School near Moose Jaw, Saskatchewan

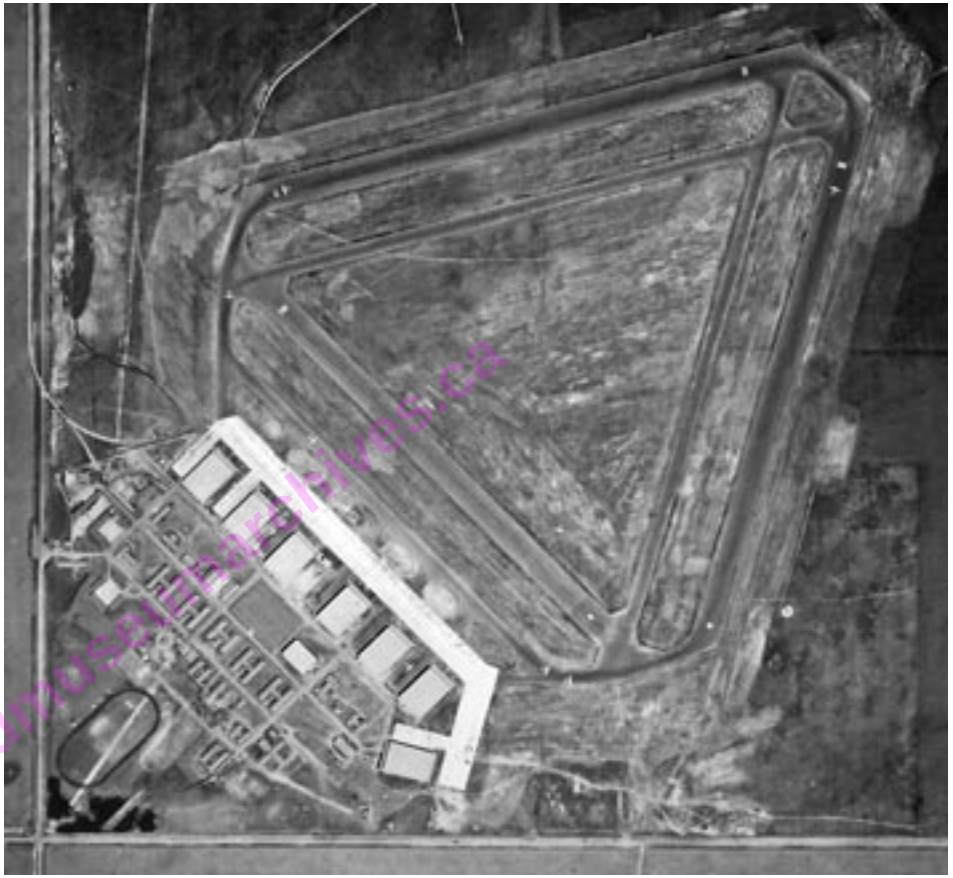


A map of 12 Service Flying Training School near Brandon, Manitoba. The BCATP operated twenty-nine SFTS's during the Second World War.

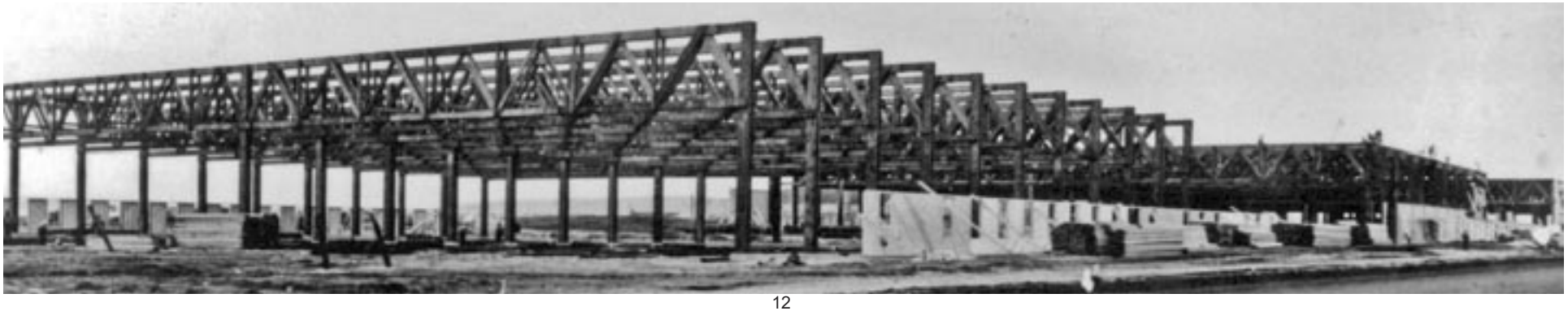


A planning document for 7 SFTS near Fort Macleod, Alberta

Newly constructed 13 SFTS near North Battleford, Saskatchewan opened in the fall of 1941. The aerodrome is now the Cameron McIntosh Airport. All that remains of the wartime school is the old hangar pads, the gunnery backstop and the vehicle maintenance shop.



19 SFTS near Vulcan, Alberta in operation. Note the aircraft on the runways.



BUILDING AIRCRAFT

Although at the beginning of the Second World War Canada still had a largely agrarian economy that was recovering from the Depression, a massive effort developed to build aircraft to support the Royal Canadian Air Force. During the war, the Canadian aircraft industry grew to employ 116,000 workers, 30,000 of whom were women.

By 1945, aircraft manufacturing was the fourth largest industry in Canada. It delivered 16,418 aircraft including front-line fighters and bombers as well as training aircraft for the BCATP. This was the foundation for an aircraft manufacturing industry that has thrived in Canada ever since.

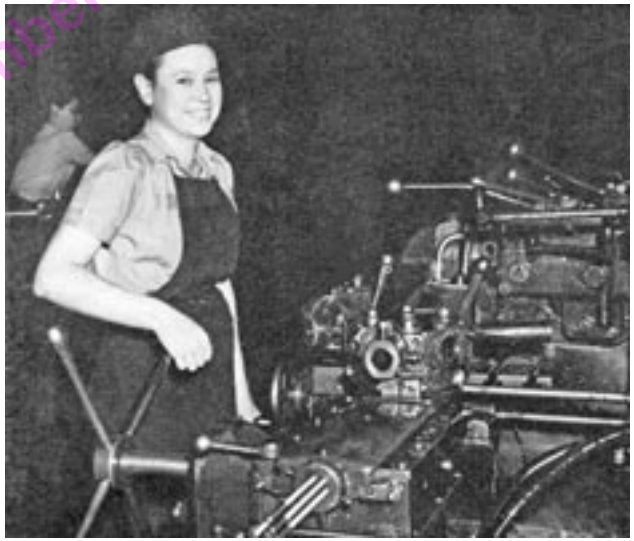
Avro Anson assembly line. 2470 Ansons were built in Montreal by Canadian Federal Aircraft Ltd.

160 Hampden Bombers were built in Canada

Assembling an Avro Anson

430 Lancaster Bombers were built in Canada by Victory Aircraft Ltd. When the first drawings arrived in January 1942, the complexity of the project seemed daunting. Some 500,000 manufacturing operations were involved in manufacturing over 55,000 separate components that went into a Lancaster (excluding engines and turrets and small items such as rivets, nuts and bolts). Eventually, Lancaster production at Victory Aircraft Ltd. reached the impressive mark of one aircraft per day.

Mosquito assembly line. 1134 De Havilland Mosquitoes were built at Downsview Park, in what is now Toronto. Canadian-built Mosquitoes were flown in combat in Europe and North Africa by the RCAF, Royal Air Force, and U.S. Army Air Force.



Building Cornell primary trainers at Fort Erie, Ontario. The Fleet Cornells eventually replaced the De Havilland Tiger Moth and Fleet Finch bi-planes at Elementary Flying Training Schools.

RCAF WOMEN'S DIVISION (WD'S)

When Canada declared war, there was little interest in harnessing the skills of women for military service. It was a time when a woman's place was thought to be at home. However as the war progressed, women were required to satisfy the ever-increasing demands for personnel.

In June 1941, women began to fill non-combatant roles in the Canadian Military and the first WD's began training. By January 1942, WD's were being posted to BCATP schools. With the formation of 6 Group in 1943, WD's began to serve overseas.

Women joined the RCAF for the same reasons as men -to serve their country in a time of need, for adventure, and a chance to travel. Thousands of other Canadian women served in the army and navy. Many more worked as civilians in factories that built aircraft and other military equipment.

WD's served in a wide variety of roles including radio operators, nurses, drivers, clerical staff, air-photo interpreters, radar operators, meteorological technicians, parachute packers, and instrument technicians.

Over 17,000 Canadian women served as WD's. 1500 served overseas and thirty were killed on active service.

The Women's Auxiliary Air Force (WAAF) was the female auxiliary of the Royal Air Force during World War II. Many WAAF's served alongside Canadians on Bomber Command Stations.

A WD records take-off times at the RCAF station at Linton-on Ouse

A WD hauling bombs from the bomb dump to be loaded on the bombers for an operation

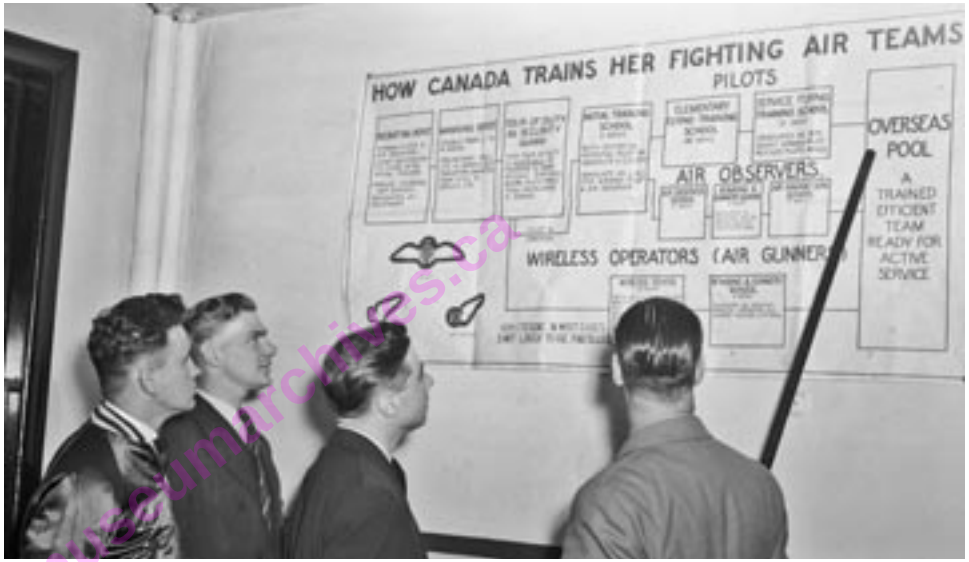
Canadian women pilots delivered bombers from the factories to the stations

JOINING THE ROYAL CANADIAN AIR FORCE

RECRUITING FOR THE RCAF

Bomber Command pilot and author Murray Peden was one of thousands of young Canadians inspired to become pilots by the legendary Billy Bishop. Murray's book opens with, "I saw Air Marshal William Avery Bishop only once -at a recruiting rally in the Winnipeg Auditorium in the spring of 1941. I was seventeen, impatiently awaiting my eighteenth birthday so that I could join up. My classmate at Gordon Bell High, Rod Dunphy, sat beside me, both of us exhilarated by the pugnacious speech of the short, stocky flyer who, at that moment, was the greatest fighter pilot alive, with a score of seventy-two confirmed victories."

During the Second World War, most young men such as Murray and Rod eagerly volunteered to serve Canada, and for many the service of choice was the RCAF, to some extent because the BCATP had such a huge presence across the country.



MANNING DEPOT

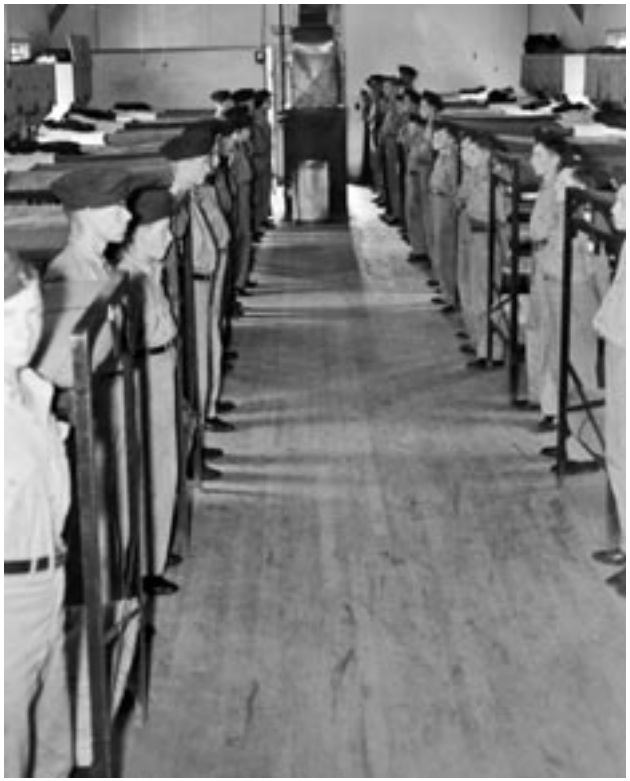
Recruits began their air force career with a four to eight week posting to a Manning Depot where they were issued with uniforms and experienced the basics of military life such as polishing boots and buttons, saluting, marching drills, physical training, cleaning, and performing guard duty. Remedial high school education was offered to bring the youngest trainees up to the RCAF's required academic level.

Pilot candidates were then sent to Initial Training Schools. If it was clear that a recruit was not suitable to be a pilot or navigator, they were sent directly to train at bombing and gunnery, or wireless (radio) schools.

Those who demonstrated mechanical ability were sent to 1 Technical Training School at St. Thomas, Ontario where ground crew personnel were trained. Equipped to handle more than 2000 students at a time, the school offered six-month courses to train aircraft electricians, aero-engine, airframe and instrument mechanics, and fabric and sheet metal workers.

1 Manning Depot was located at the Canadian National Exposition Grounds in Toronto that, prior to the war, hosted agricultural events. It could accomodate up to 5000 personnel.

These recruits from 3 Manning Depot (Edmonton) were sent to 5 Elementary Flying Training School near High River, Alberta to perform guard duty.



Barracks inspection

AIRCREW TRAINING IN CANADA

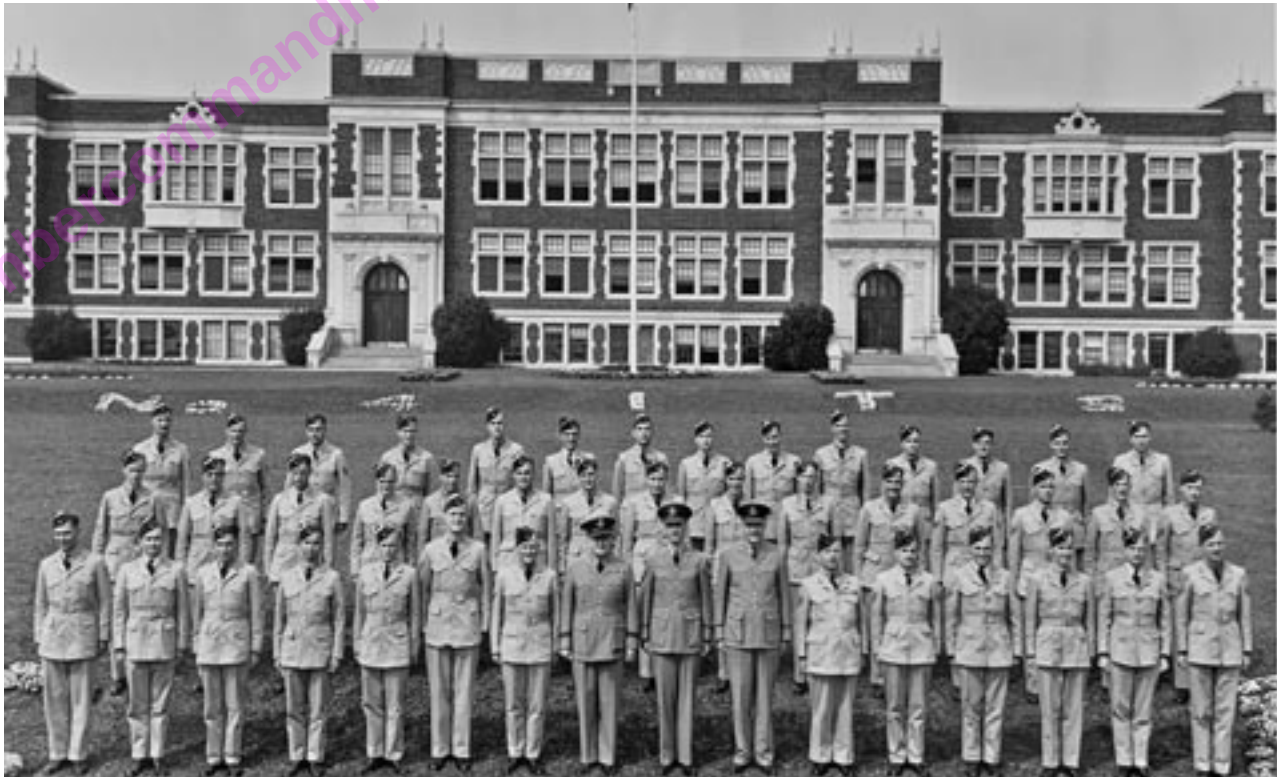
INITIAL TRAINING SCHOOL (ITS)

After their experience at a Manning Depot, prospective pilots and navigators were posted to an Initial Training School for ten weeks. Ground school subjects such as theory of flight, meteorology, algebra, trigonometry, navigation, and aerodynamics were studied. There was no flying, although students did spend some time in Link Trainer simulators.

The ITS courses were demanding and often required an academic background beyond the limits of high school graduates. A student's results at Initial Training School determined their next posting, some being considered suitable for flying training and others were posted to Air Observer (navigator), or other schools.

Of the seven ITS's operated by the BCATP, only one was in Alberta.

'Flying' a Link Trainer at ITS evaluated a student's aptitude for pilot training



A graduating ITS class at Edmonton, Alberta. Prior to the war, the facility was used for teacher education.

ELEMENTARY FLYING TRAINING SCHOOL (EFTS)

Following time spent at a Manning Depot and Initial Training School, those students who were selected for pilot training were posted to an Elementary Flying Training School (EFTS). An eight-week course involved all aspects of basic flight and navigation taught in 'ground-school' courses and about fifty hours of flying in a single-engined, 'primary' training aircraft. Although the pilots were able to 'solo', they did not receive their 'Wings'. RCAF EFTS's were generally operated by civilian flying clubs under contract to the RCAF and most of the instructors were civilians

There were thirty-two EFTS's in Canada, six of which were in Alberta.

For much of the war, most student pilots learned to fly on the De Havilland Tiger Moth

The Fleet Finch was used primarily at EFTS's in central Canada

Later in the war, the Fleet Cornell replaced the Tiger Moth at many of the EFTS's. On warm days at some high-altitude training schools such as High River, the Cornell's performance was less than adequate with long takeoff runs being required.

American-built Boeing Stearmans were flown at three Alberta EFTS's during 1942. Following problems operating the aircraft, the trainers were returned in exchange for Cornells.

Nine Cornells during a 'Carnival and Air Show' at 5 EFTS High River, Alberta

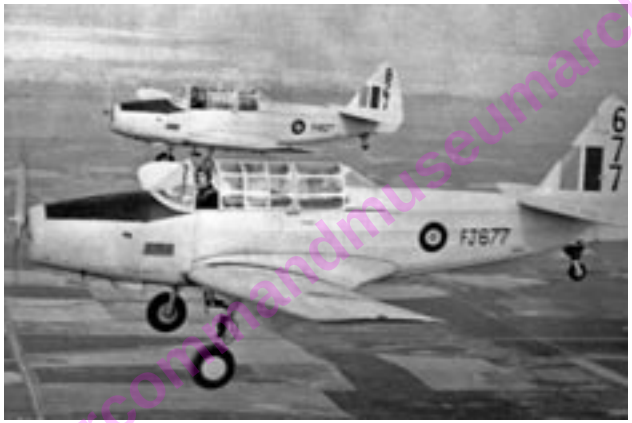
Cornells at 5 EFTS High River, Alberta

Student pilots at 31 EFTS De Winton, Alberta

Schools whose numbers were in the 30's were operated by the Royal Air Force. 32 EFTS was located in Bowden, Alerta

Tiger Moth flight line at 5 EFTS High River, Alberta

Although flight safety was a priority at the flying schools, there were accidents.



Like the Tiger Moths, Fleet Cornells had fixed undercarriage

5 EFTS Graduation Banquet Program, autographed and kept as a souvenir

An EFTS graduating class

SERVICE FLYING TRAINING SCHOOL (SFTS)

Graduates of an EFTS would be posted to a Service Flying Training School where student-pilots were expected to improve their navigational skills, master instrument and night flying, and participate in formation flying exercises. There were twenty-nine SFTS's in Canada, seven of which were in Alberta.

Those who were destined to become bomber pilots were posted to an SFTS where they learned multi-engine technique flying larger, twin-engined aircraft. Pilots who would become fighter pilots were sent to schools that flew the single-engined Harvard aircraft. All the SFTS aircraft were more powerful and demanding than those at EFTS's.

Although the time spent at an SFTS varied, it was generally about twenty-four weeks. Upon graduation, the pilots were awarded the coveted RCAF Flying Wings and were ready to continue their training in the UK.

Student pilots in an Anson at 7 SFTS Fort Macleod

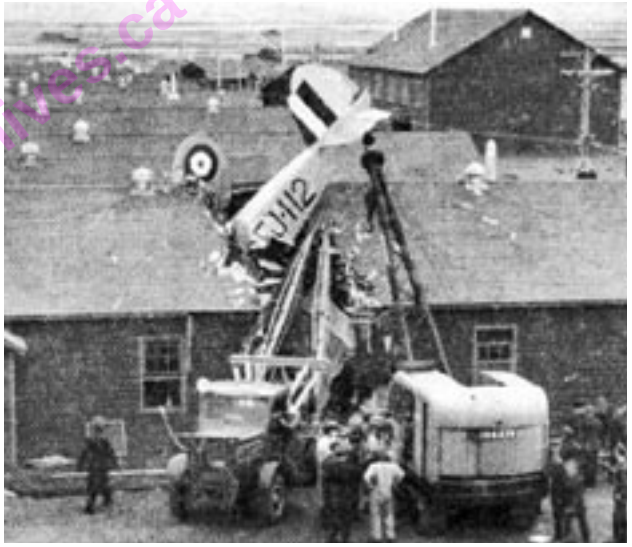
Referred to by the airmen as the 'Ox-box', Airspeed Oxfords were built in the UK. In Alberta, the Oxford served at 36 SFTS (Penhold).

Cessna Cranes were built in the United States. Commonly seen in southern Alberta, 3 SFTS Calgary and 15 SFTS Claresholm, each had about one hundred Cranes on strength. 2 Flying Instructor School at Vulcan had about fifty.

Avro Anson Mk I's were built in the UK and had a mid-upper gun turret. Anson Mk II's, such as in the photo above, were built in Canada. They earned the nickname, 'Faithful Annie'.

Avro Ansons

Servicing an Avro Anson at an SFTS. Unlike ground crew who serviced the bombers in the UK, BCATP ground crew generally worked on the aircraft inside a hangar.



WD's at 19 SFTS near Vulcan, Alberta

WD's and Cessna Cranes at 3 SFTS in Calgary. The former school is now the site of Mount Royal University.

RCAF Wings being presented to an SFTS graduate

Wings Dinner at an SFTS

Wings Parade at 15 SFTS in Claresholm, Alberta

Anson flypast at 19 SFTS near Vulcan, Alberta

BOMBING AND GUNNERY SCHOOL (B&G)

Students selected to be air gunners received twelve weeks of ground training and air-firing practice. Student Bomb Aimers were stationed at a B&G School for eight to twelve weeks. They also spent time at an Air Observer (Navigator) School where their focus was on map reading and navigation skills.

These schools required large areas to accommodate their bombing and gunnery ranges. Of the eleven Bombing and Gunnery Schools operated by the BCATP in Canada, 8 B&G in Lethbridge was the only one in Alberta.

Eighty years later, there is occasionally much excitement and media attention when a harmless practice bomb is found in a southern Alberta pasture.

This painting depicts a Lysander towing a target drogue that is being targeted by a student air gunner in the Bolingbroke

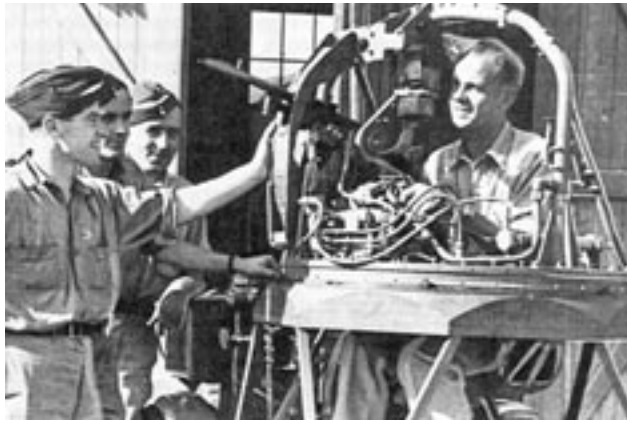
Built in Canada and used widely at B&G's, Bristol Bolingbrokes were identical in design to the Blenheim Mk. IV bomber

Fairey Battle. This aircraft was briefly used as an operational bomber early in the war.

Westland Lysanders used to tow target drogues were generally painted with a striking yellow and black, spiral pattern

A WD with .303 ammunition for the Bolingbroke gun turret

Student bomb aimer and bombsight

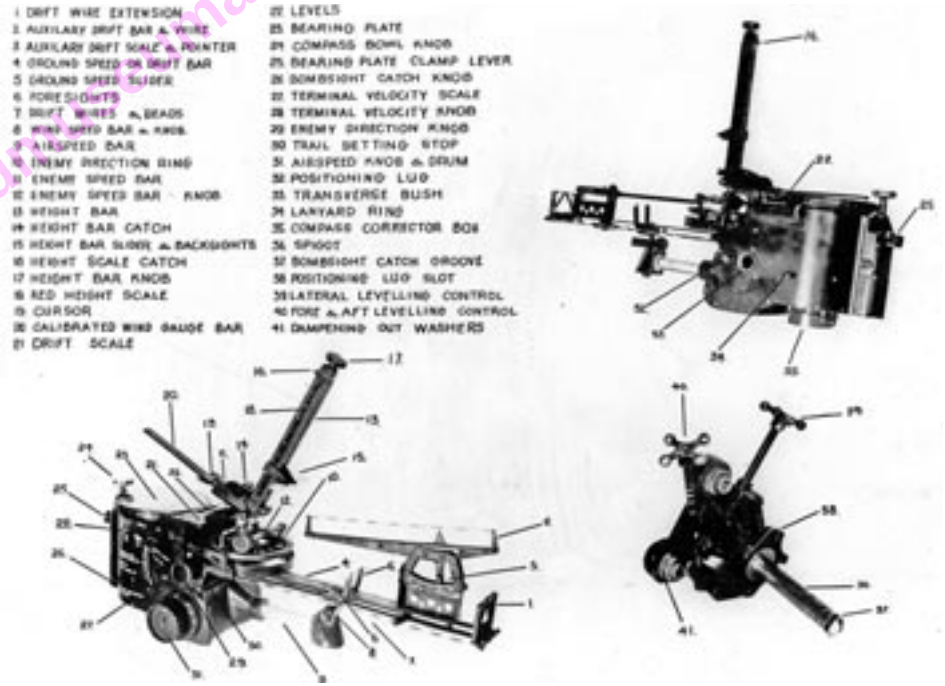


Bristol mid-upper gun turrets were used on Bolingbroke training aircraft

During the early years of the BCATP, Fairey Battles were used as gunnery trainers using obsolete, single Vickers guns on a flexible mounting in an open cockpit

Bristol Bolingbrokes, that were equipped with hydraulic-powered gun turrets, gradually replaced the Battles as gunnery trainers.

Practice bombs under the wing of a Bolingbroke. When the bomb struck the ground, it emitted coloured smoke. As there was more than one bomb aimer in the aircraft, observers on the ground used the different colours of smoke to determine the accuracy and the identity of each bomb aimer.



Student Bomb Aimers would become familiar with the Mk. IX bombsight

Bombing theory class. In addition to the facilities at Lethbridge, the school leased 100 square miles on the Blood Indian Reserve to use for bombing and gunnery practice.

air gunner students are introduced to the Browning machine gun that was installed in Bomber Command aircraft

air gunner students examining the drogue that they were shooting at. Each student's hits were made with bullets that left different coloured marks.

Card games helped student air gunners with aircraft identification

Graduate air gunners pose in front of a Fairey Battle with their air gunner wings.

8 B&G softball team. The permanent staff at BCATP Schools participated in various sports and activities with nearby schools and communities.

Graduate air gunners received their AG-Wing. Early in the war, 'WAG' Wings were awarded to students who had received both wireless (radio) training and air gunner training.

Graduate bomb aimers received their B-Wing

AIR OBSERVER SCHOOL (AOS)

Students determined to be suitable for training as navigators were posted to an Air Observer School. Later in the war, 'Air Observers' were referred to as navigators.

Navigation training began at an ITS where all students were introduced to the basic tools such as compasses, sextants, drift recorders, and manual computers. Concepts such as air-speed relative to ground-speed, track, and drift were introduced.

At AOS, the student's most challenging task was to master the art of 'dead-reckoning' -a combination of careful calculations and accurate measurement by which a navigator could determine the position of an aircraft in flight and plot its course from point to point. The work became progressively more difficult as cross-winds, variable airspeeds, variable altitudes, compass bearings, wind-speeds and direction had to be measured and properly accounted for. More advanced techniques utilized direction-finding radio and star-based observations and calculations. During the twelve weeks at AOS, students logged some seventy hours in the air, developing their skills in increasingly challenging scenarios.

Of the ten Air Observer Schools, only one was in Alberta -2 AOS at Edmonton.

Student navigators

Avro Ansons and student navigators at 4 AOS in London, Ontario

2 Air Observer School in Edmonton, Alberta

AOS students taking an exam

AOS graduates proudly displaying their navigator wings

AOS students taking sunshots

2 AOS graduating class in Edmonton, Alberta

WIRELESS SCHOOL (WS)

The main function of a Wireless (Radio) Operator on Bomber Command aircraft was to maintain contact with base stations, using Morse code. It was a great deal more difficult to send and receive code while airborne, than in stable, land-based radio stations, and airborne wireless training was necessary.

Initially, the training for those selected to become a Wireless Operator was twenty weeks, but this was soon increased to twenty-eight weeks due to the greater complexities of equipment and procedures in overseas bombing operations. Towards the end of classroom training, students were tested in an 'aircraft simulator'. Small cubicles were constructed in a classroom, complete with aircraft wireless equipment that were meant to simulate the restricted working space for wireless operators on an actual aircraft. In-flight operating conditions and procedures were replicated as far as possible. Following the 'aircraft simulator' experience, the students completed actual airborne training with current wireless equipment.

There were four Wireless Schools under the BCATP, one of which was in Alberta -No. 2 in Calgary.

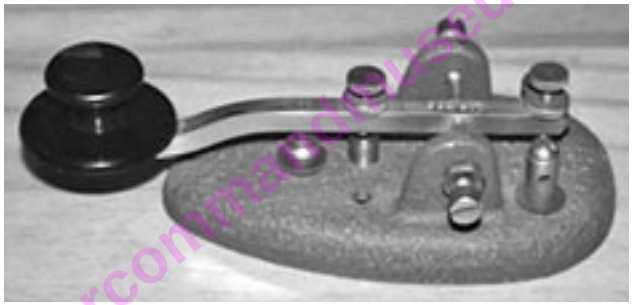
Airborne wireless operator training

Student wireless operators receiving and translating Morse Code. Students also received rudimentary courses in signaling with lights. The major component, however, was developing a good working understanding and feel for the Morse Code's series of 'dits' and 'dahs'.

Beginning in early 1942, Fleet Forts were used at 2 Wireless School. However, the Forts made fourteen engine-related forced landings in a three month period. As well, they were under-powered given the weight of two crew members, and the heavy radio equipment. They were replaced by Harvards.

Student wireless operators transmitting Morse Code

No. 2 Wireless School officers and instructors. The school was located at what is now the Southern Alberta Institute of Technology



Morse code key

The North American Yale was used at some Wireless Schools

A Shetland pony, 'Midget' was the mascot at 2 Wireless School in Calgary

In some Bomber Command aircraft the wireless operator and air gunner positions were combined

CROSSING THE ATLANTIC

Following their training and generally three weeks of 'leave', the young airmen would travel by train to Halifax, Nova Scotia, the location of the RCAF's No. 1 'Y' Depot, a holding unit. Here they would be assigned to ships, hopefully avoid the U-Boats as they crossed the Atlantic Ocean, and disembark, generally at Liverpool. They then proceeded by train to the RCAF's No. 3 Personnel Reception Centre (PRC) at Bournemouth on the south coast of England. The function of the PRC was to act as a holding unit until space was available for the airmen to continue their training.

It was at Bournemouth that the airmen were introduced to wartime life in Britain. It was formerly a restful resort whose up-scale hotels catered to the upper class who came to enjoy its beaches, warm climate, stately gardens, and lush parks.

Now war had transformed the city. The airmen would notice that the beaches were heavily mined and access to them barred by coils of rust-encrusted barbed wire. They would hear air raid sirens and there were blackouts at night. Bournemouth suffered its share of bombing attacks during the war with more than fifty air raids leaving 219 people dead and 726 injured.

As well as the signs of war, the young Canadians were introduced to wartime English breakfasts that generally featured powdered eggs on a slice of parched toast with a small piece of grease drenched spam and perhaps some brussel sprouts.

Formerly an ocean-liner, HMS Strathnaver became a troopship. It was one of the vessels that took Canadians across the Atlantic.

Enjoying the beach at Bournemouth -amongst the barbed wire

AIRCRAFT OF BOMBER COMMAND -TWIN-ENGINED

HAMPDEN

The Handley Page Hampden was said to have been, “a great aircraft to fly with excellent visibility from the cockpit, had superior handling characteristics and good range. However, it was very cold and did not have powered gun turrets.” As well, the Hampden became known as the ‘Flying Suitcase’ because of its shape and cramped crew conditions.The bomber was considered ideal for placing aerial mines.

Eight squadrons of Hampdens were operational at the beginning of the war and were in action immediately, raiding enemy naval installations and ships until the daylight operations began to suffer major losses and Bomber Command was forced to switch to flying at night.

Although withdrawn from Bomber Command in 1942, Hampdens operated with Coastal Command through 1943 as a long-range torpedo bomber.

Two RCAF squadrons, 408 and 420, flew Hampdens. 160 Hampdens were manufactured in Canada.

This trio of Hampdens were part of 14 Operational Training Unit.

BLENHEIM

Just one minute after Britain’s formal declaration of war, a Blenheim IV of 139 Squadron took off to fly the RAF’s first sortie of the war, a photo-reconnaissance operation. The next day, Blenheims made the first Bomber Command attack by bombing enemy warships at the German naval base at Wilhelmshaven on Germany's north coast.. From these earliest operations until early 1942, the Blenheim IV served in a variety of roles.

Squadrons were based in France in the early months of the war, other squadrons based in Britain were assigned to intercept enemy shipping, and Blenheims served with Bomber Command, carrying on offensive operations over Europe for almost two years before they were replaced by superior aircraft.

A fighter version of the Blenheim IV was involved in the defence of London and served with Coastal Command in anti-shipping, reconnaissance, and a variety of other roles.

A pilot, navigator/bomb aimer, and wireless operator/gunner comprised the crew of the Blenheim IV.

The Blenheim IV featured a ‘scalloped’ nose for better visibility.

WHITLEY

Characterized by its distinctive, nose-down attitude in level flight, the Armstrong-Whitworth Whitley entered service in 1937. It was the first British bomber to have retractable undercarriage and gun turrets and the first to operate over Germany.

The only twin-engined bomber designed from the outset for night bombing, the Whitley played a key role in Bomber Command's early operations. They were in action over Germany from the first night of the war during which they participated in a so-called 'nickel' sortie, dropping leaflets over the Ruhr Valley, tackling the problems of night navigation and operations over enemy territory.

The Whitley was a sturdy airplane with few vices although somewhat underpowered, extremely drafty, and cold. It was capable of carrying a very impressive bomb-load of 7000 pounds, significantly more than the other twin-engined bombers. With the advent of the four-engined bombers, the Whitley bowed out of front line operations in April 1942. However, it continued to serve until the end of the war with training units, Coastal Command, and as a glider tug.

Although the early Whitleys had radial engines (as above), the vast majority were powered by Rolls-Royce V-12 Merlins.

MANCHESTER

The twin-engined Avro Manchester first flew in 1940 and completed its first operation during the night of 24/25 February the following year. Eventually, 209 Manchesters entered service before production was stopped in November 1941.

The Manchester flew 1269 operations with Bomber Command, losing seventy-eight aircraft in action and a further forty-five due to non-operational losses of which thirty involved engine failure. The aircraft was an operational failure due to its underdeveloped, underpowered, and unreliable engines and was withdrawn from operations in mid-1942.

The legendary aircraft designer, Roy Chadwick, had designed the Manchester and he had faith in the aircraft's basic design and other characteristics. He determined that the solution was simply to use four of the proven Rolls-Royce Merlin engines rather than the two Vulture engines together with some related modifications that became necessary. The result was the Avro Lancaster.

408 Squadron RCAF flew two operations utilizing the Manchester.

WELLINGTON

Many Canadian airmen flew in the Vickers Wellington, some during training and others during the early years of the war prior to four-engined aircraft became available. Although more of the Canadians were killed in the four-engined aircraft (Halifax 33%, Lancaster 30%, and Stirling 5%), 23% were lost in Wellingtons.

The twin-engined Wellington featured geodetic construction, a ‘basket weave’ system that gave the aircraft's structural framework tremendous strength because any one of the stringers could support some of the weight from even the opposite side of the aircraft. Blowing out one side's beams would still leave the aircraft as a whole intact. This framework was covered by fabric.

First entering service in October 1938, a total of 11,461 Wellingtons were built, considerably more than any other British-built bomber. During peak wartime production in 1942, 302 were being built each month. The Wellington was referre to as the ‘Wimpy’ -after J. Wellington Wimpy, a ‘Popeye’ cartoon character.

The Wellington had a crew of five.

MOSQUITO

An example of engineering ingenuity inspired by the challenges of war; the De Havilland Mosquito's all-wooden design was a major advantage during a time of acute shortages of light metal alloys. The fuselage was a frameless, plywood shell made of balsa wood sandwiched between sheets of birch. The sleek, Merlin-powered design, and lack of any defensive armament or armour, allowed the Mosquito to travel at speeds in excess of 400 miles per hour. Until the advent of the Luftwaffe’s Me 262 jet-poered fighter in late 1944, the Mosquito was the fastest aircraft in the sky on either side. The Mosquito could deliver the same bomb-load to distant targets as the heavily armoured, four-engined B-17 flown by the American Air Force.

Mosquitoes played a major role with the Pathfinders, the Bomber Command group that used flares to mark the targets for the main force aircraft. They were fitted with the latest top secret electronic navigational aids for night and overcast conditions. Often Mosquito crews flew to the targets at low altitude, visually identifying and then marking them.

The Mosquito’s crew of two, pilot and navigator, sat side by side.

AIRCRAFT OF BOMBER COMMAND -FOUR-ENGINED

STIRLING

The Short Stirling was the first of the four-engined Bomber Command aircraft to fly, the prototype taking to the air in May of 1939. However, its undercarriage collapsed on landing and it was not until February 1941 that the Stirling flew its first operation against the enemy. The largest of the British-built bombers, the Stirling towered to a height of almost twenty-three feet. Like the Halifax and Lancaster, the Stirling had seven crewmembers.

Unfortunately, the aircraft was needlessly limited in its design. The engineers at Short's were faced with the restriction that the wingspan had to be less than one hundred feet so that it could fit into the standard RAF hangars of the day. This resulted in poor high altitude performance and a low ceiling. At low altitudes however, the Stirling was the fastest of the heavy bombers.

During the autumn of 1943, the Stirling's loss rate was seen to be much higher than that of the Halifax and Lancaster, so it was removed from operations. The Stirling continued to serve as a transport and glider tug until the end of the war.

The Short Stirling was eighteen feet longer than the Avro Lancaster.

HALIFAX

Entering combat service in November 1940, the Halifax was the second of the four-engined bombers to fly with Bomber Command. As the war progressed, some significant design problems became apparent. Significant modifications were made including the redesign of its vertical stabilizers and replacing the Rolls-Royce Merlin engines with the more powerful Bristol Hercules radial engines. Although the Halifax's performance now matched the Lancaster's, Bomber Command's c/o, Arthur Harris, retained a preference for the Lancaster.

Affectionately referred to as the 'Halibag', the Halifax operated successfully in Bomber Command until the end of the war, flying bombing operations and making use of its multi-role capability as well. A sturdy and reliable aircraft, the Halifax was generally well liked by its crews.

Canadians flew more operations in Halifaxes than in any other bomber. It was the only aircraft that was operated by all fifteen of the RCAF's squadrons.

405 Squadron RCAF Halifax Mk II

LANCASTER

The Avro Lancaster was the result of major design changes to the twin-engined Avro Manchester bomber which was plagued by instability and problems with its complex, 24-cylinder Rolls Royce Vulture engines. The wingspan was increased by twelve feet to 102 feet and the two Vulture engines replaced with four of the proven Rolls Royce Merlins V-12's.

The Lancaster made its maiden flight in January 1941, and first flew operationally in March 1942. It had speed, ceiling, and lifting power that no heavy bomber of the day could match. The Lancaster carried 64% of the tonnage dropped by Bomber Command during the war and was also utilized for special operations such as the 'Dambusters' raid, delivering the large 'Tallboy' bombs that sunk the German Battleship Tirpitz and the 22,400 pound 'Grand Slam'.

A total of 7377 Lancasters built of which 430 Lancaster Mk X's were built in Canada. 3932 were lost in action.

Reconfigured versions of the aircraft were flown by the RCAF during the 1950's, primarily as maritime patrol aircraft.

424 Squadron Lancaster 'Picadilly Princess'

An impressive line-up of 426 Squadron RCAF Wellingtons. Of the fifteen RCAF Bomber Command Squadrons, eleven were equipped with Wellingtons at the beginning of their service

TRAINING FOR COMBAT IN THE U.K.

OPERATIONAL TRAINING UNIT (OTU)

If an airman was to fly in bombers, he would be posted to an OTU for ten weeks. Here, the training was more serious and the flying was much more dangerous than previously experienced, to some extent because of the dangerous mix of the novice crews and 'clapped out' aircraft that had previously flown operationally. The novice airmen were now training as members of a bomber crew and learning to fly operationally on an actual warplane, not a training aircraft. About 10% of Bomber Command's losses occurred while training, almost all at OTU's.

Prior to being posted to an OTU, pilots spent time at an Advanced Flying Unit (AFU) where they became familiar with flying in the UK. Here the weather was more often a factor and the navigation more challenging than in western Canada where the farm fields were neatly laid out in squares and a railway track would lead to grain elevators with a town's name on it.

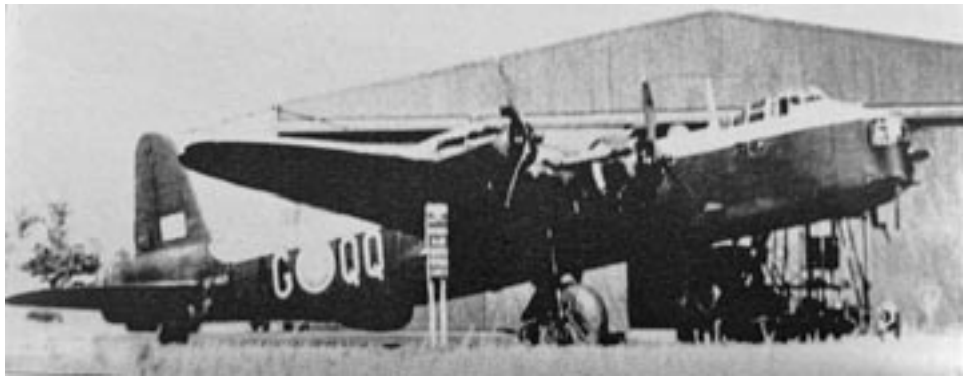
Following training at an OTU or, later in the war, at an HCU, the crew would be posted to an operational bomber squadron. Although most Canadians who served with Bomber Command did so with an RAF squadron, many were attached to one of the fourteen RCAF squadrons that were part of Bomber Command.

Vickers Wellington bombers at 30 Operational Training Unit. Almost all Canadian aircrew flew Wellingtons during their OTU training.

HEAVY CONVERSION UNIT (HCU)

By 1943, a second stage of operational training was required to follow the initial stage of operational training that was provided at a Bomber Command OTU. The OTU training was generally done on twin-engined Wellington aircraft which, following 1942, were being removed from front-line service and available for the OTU's.

Over a five week period, the Heavy Conversion Unit familiarized the crews with the four-engined Halifaxes or Lancasters that they would be flying on operations when posted to a squadron. At the HCU, the crews also acquired two additional members -a mid-upper gunner and a flight engineer, positions not required on the Wellingtons. Like the OTU's, the HCU's suffered from the dangerous mix of 'clapped-out' aircraft and the inexperienced crews.



This Short Stirling flew a total of twenty-seven operations with 75 and 513 Squadrons before being transferred to training duties with 1651 and 1657 Heavy Conversion Units.

CREWING UP

Upon arrival at an Operational Training Unit, the RCAF airmen were combined with others from the Commonwealth, mostly British but with a considerable number of Australians and New Zealanders. Later in the war, most of the Canadian airmen who would become part of the 6 Group Squadrons were posted to 22 OTU at Wellesbourne.

The manner in which most bomber crews came together was quite informal. Murray Peden, a Canadian pilot, wrote of his 'crewing-up' at the OTU,

"The instructors and admin officers, who wasted no time getting hold of us, organized the group into classes and laid out our syllabus. They dropped the word that within about ten days we would be teamed up in crews of five, each consisting of a pilot, bomb aimer, navigator, wireless operator, and air gunner. Equal numbers of each of these trades had been brought together to form our course, and we were told that if any five could agree amongst themselves that they wanted to form a crew and fly together, the Air Force would oblige and crew them up officially. But at the end of the ten-day period, all those who had not made their own arrangements would be crewed up arbitrarily by the staff and probably, we guessed, by purely random selection."

Almost all the airmen were very young, even a man of twenty-five would likely be referred to as the 'Old Man' or 'Grandpa'. Within a crew, there were generally different ranks and nationalities, and they came from different walks of life. However, the men quickly bonded together to form a very special, tightly-knit crew. This bond was based on mutual trust, dependence, and shared experiences -both terrifying ones in the air and enjoyable ones while off duty.

This camaraderie was crucial to maintaining morale and efficiency in the air. Most felt that their crew was one of the best in Bomber Command. They generally spent many of their off-duty hours together as well as the first day or two of a leave.

A 408 Squadron Lancaster crew

This crew has just returned from their thirtieth operation, including nine trips to the most dangerous target of all, Berlin. They are elated as their tour of operations is over and they have beaten the odds. Five of the crew went on to serve a second tour together. This particular aircraft was lost the following night after an operational life of only nine days.

BOMBER COMMAND STATIONS AND SQUADRONS

Bomber Command utilized 101 airfields and operated 126 squadrons during WW II. Typically, two squadrons would operate from an airfield, each capable of launching up to twenty bombers.

The Royal Canadian Air Force operated eleven stations, all of which were northwest of the City of York in northeastern England: Croft, Dalton, Dishforth, East Moor, Leeming, Linton-on-Ouse, Middleton St. George, Skipton-on-Swale, Tholthorpe, Topcliffe, and Wombleton.

Accommodation for between 1500 and 3000 personnel included mess halls and recreational facilities. Most were located on the station with additional facilities in the adjacent countryside. The rapid construction of new Bomber Command stations required the use of prefabricated buildings such as the Nissen Hut which combined ease of erection with cost-effectiveness and durability.

RCAF Linton-on-Ouse from a Lancaster Mk II

Accommodation at RCAF Skipton-on-Swale. The round-roofed 'Nissen Huts' are where the personnel slept; other nearby buildings are washroom and toilet facilities.

Nissen Hut interior

Aircrew living quarters

A squadron of twenty Lancasters

RCAF Croft on 23 May 1943 -Typically, a Bomber Command airfield included a main runway of 2000 yards (1829 m) and two subsidiaries of 1400 yards (1280 m). A perimeter track (three miles in length) encircled the runway layout to allow access to 36 or more dispersal pans. The dispersal system allowed aircraft to be scattered about the airfield's perimeter to minimize damage in the event of an enemy air attack. Note the aircraft at the dispersal sites (pans) in the lower portion of the photo.

An RCAF Lancaster at a dispersal site

4000 pound 'Cookies' at the 'Bomb Dump'

The station's Operations Room

Control Tower personnel

High explosives at the 'Bomb Dump'

Control Tower

All routine maintenance was done at the aircraft's dispersal, the bombers only being moved to the hangars for major repairs.

A 'Technical Site' adjacent to one of the hangars included buildings used as workshops, storage facilities, and for specialized training purposes.

6 GROUP AND THE CANADIAN SQUADRONS

With the massive presence of the BCATP in Canada, the number of Canadians in Bomber Command grew significantly. On October 25 1942, 6 Group was formed, to be commanded by and operated by the RCAF. 6 Group began operations with just eight squadrons. There were fifteen RCAF bomber squadrons by war's end. 405 Squadron was not part of 6 Group as it was assigned to 8 Group, the Pathfinders Force that marked the targets for the main force aircraft.

6 Group flew 271,981 hours to complete 40,822 sorties. 126,122 tons of bombs were dropped. 814 aircraft were lost. 8000 awards for bravery were presented to No. 6 Group aircrew. The Group's ground-crew maintained the highest serviceability (80%) in Bomber Command.

The eleven airfields operated by 6 Group were located in North Yorkshire.

6 Group Lancasters and Halifaxes from several RCAF squadrons assembled for a special ceremony

The 6 Group stations were located in a valley. This often resulted in the airfields being fogged-in when the bombers returned.

RCAF officers at 6 Group Headquarters

6 Group Headquarters was located at Allerton Park that was referred to by the Canadians as 'Castle Dismal'.

6 Group staff at Allerton Park

405 SQUADRON (LQ)

The squadron's motto, 'We Lead', reflects the facts that it was both the first RCAF Squadron to be formed (April 23, 1941) and that it later became part of 8 Group, the Pathfinders. Flying Wellingtons, Halifaxes, and Lancasters, 405 carried out more operations than any other Canadian Squadron.

408 SQUADRON (EQ)

The 'Goose' Squadron operated twin-engined Hampden Bombers when it was formed in June 1941. The squadron also flew two sorties, one of which was the 'Thousand Bomber' raid on Cologne, using a Manchester that evolved into the Lancaster. 408 was one of three RCAF squadrons that flew the Bristol Hercules powered Mk. II Lancaster.

415 SQUADRON (6U)

415 Squadron initially served as a torpedo-bombing unit with Coastal Command. The squadron transferred to 6 Group of Bomber Command in July, 1944 and was based out of East Moor. The unit assumed a heavy bomber role when equipped with the Halifax at the same time. The motto reads, 'Ad Metam', or 'To the mark' in English.

419 SQUADRON (VR)

''Moose' Squadron's motto is 'Moosa Aswayita' -Beware the Moose. 419 flew Wellingtons, Halifaxes, and Lancasters as it carried out 4325 sorties and suffered the most losses (685 airmen including 538 Canadians) of 6 Group's squadrons. 419 Sqn P/O Andrew Mynarski was the only RCAF airman awarded the Victoria Cross during WW II.

420 SQUADRON (PT)

420 was the only RCAF unit to fly four different bombers -Hampdens, Wellingtons, Halifaxes, and Lancasters. Together with 424 and 425 Squadrons, 420 served for four months in North Africa as part of the RCAF's 331 Wing that participated in the invasion of Italy. Some 'Snowy Owl' squadron aircraft featured paintings of the owls on their vertical stabilizers.

424 SQUADRON (QB)

The 'Tiger' Squadron was adopted by the City of Hamilton. Squadron members didn't like their official 'heraldic' squadron crest and so created their own with a tiger's head. This related to the city's rugby team that become the Hamilton Tiger Cats football club. 424 flew Wellingtons in North Africa, converting to Halifax bombers on their return to the UK.

425 SQUADRON (KW)

425 Squadron had a French-Canadian focus. The crest is derived from the squadron nickname 'Alouette', and the motto comes from the refrain of the French Canadian folk song. The lark is shown in hovering position, indicative of a bomber over the target. Aircrew of 425 Squadron logged 3,649 sorties in Wellington and Halifax bombers.

426 SQUADRON (OW)

The 'Thunderbird' Squadron's motto was 'On Wings of Fire'. 426 squadron lost sixteen Hercules-powered Mk II Lancasters during the Battle of Berlin between December 1943 until March 1944. They then converted to Halifaxes which they flew until the end of the war.

427 SQUADRON (ZL)

The 'Lion' Squadron flew 2800 operations utilizing the Halifax bomber, more than any other 6 Group Squadron. They logged 3277 operational sorties in total, with over half of them occurring during 1944. Their motto 'Ferte manus certas' translates to 'Strike Sure'. This may have been derived from Bomber Command's motto, 'Strike Hard, Strike Sure'.

428 SQUADRON (NA)

The 'Ghost' Squadron has as its crest a human skull within a shroud. The ghost idea relates to the numerous hours of night-bombing that the squadron carried out. Over its course of operations, over 9,500 tons of bombs and mines were dropped/laid on 283 separate operations. About 200 decorations for bravery were awarded to the aircrew of 428 Squadron.

429 SQUADRON (AL)

The 'Bison; Squadron's motto translates to 'Nothing to Chance'. Following the war, the squadron re-formed as an air transport unit. In 2007, 429 began operating the CC-177 Globemaster, performing a wide range of air transport roles including the supporting Canadian troops and suppying humanitarian aid to disaster zones around the world.

431 SQUADRON (SE)

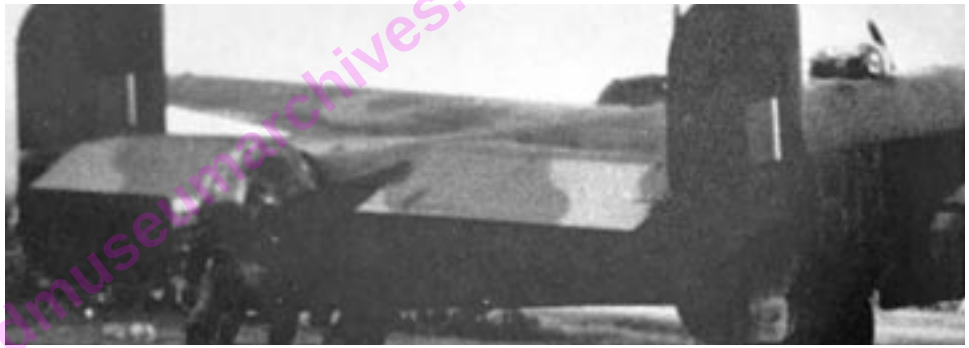
The 'Iroquois' Squadron suffered the highest percentage losses of all the 6 Group squadrons as it completed over 3000 operations across the European Theatre. In 1977, the squadron was reformed as 431 Air Demonstration Squadron -'The Snowbirds' which have become a Canadian icon.

432 SQUADRON (QO)

432 Squadron flew 494 operations utilizing the Wellington Bomber, more than any other 6 Group Squadron. The town of Leaside, Ontario 'adopted' the squadron which then took the town's name as its nickname, becoming 432 'Leaside' Squadron. Its last operational mission occurred on April 25 1945, when nineteen 432 Squadron Halifaxes bombed gun batteries on the island of Wangerooge.

433 SQUADRON (BM)

The 'Porcupine' Squadron was the last of the 6 Group Squadrons to be formed. Their first losses occurred on December 19 1943 and a total of 149 Canadian airmen were killed while flying with 433. Its motto 'Quis'y frotte s'y pique' translates to 'Who opposes it gets hurt' and is derived from the porcupine that also demonstrates this characteristic.



434 SQUADRON (WL)

Known as the 'Bluenose' Squadron, 434 was adopted by the Rotary Club of Halifax. The squadron's first operational sortie was a bombing raid across the Alps to Milan, Italy. The design for the crest originated from the Canadian ten-cent coin, which features the schooner 'Bluenose'.

425 Squadron Halifaxes

BOMBER NOSE ART

During World War II, the personalization of an aircraft by giving it a name, painting an image on it, and in many cases doing both began in the early months of the war, increased in frequency as the war progressed and reached its peak in 1945. A bomb tally was often added as well and this provided a powerful visual record of the success and longevity of the aircraft. If a bomber crew was assigned a particular aircraft, they were sometimes able to choose the name and artwork and this enabled a powerful bond to develop between the men and their machine.

Often, but not always, the name and the artwork were directly related to the letter designation for the particular aircraft within the squadron. The markings on the fuselages were made up of a two letter squadron code, such as 'EQ', that in combination with a single letter designator for the aircraft, such as 'N', produced a unique identifier, in this case 'EQ-N'.

Although some were aircrew, most nose artists were ground crew who had an interest in art, an idea, and the motivation.

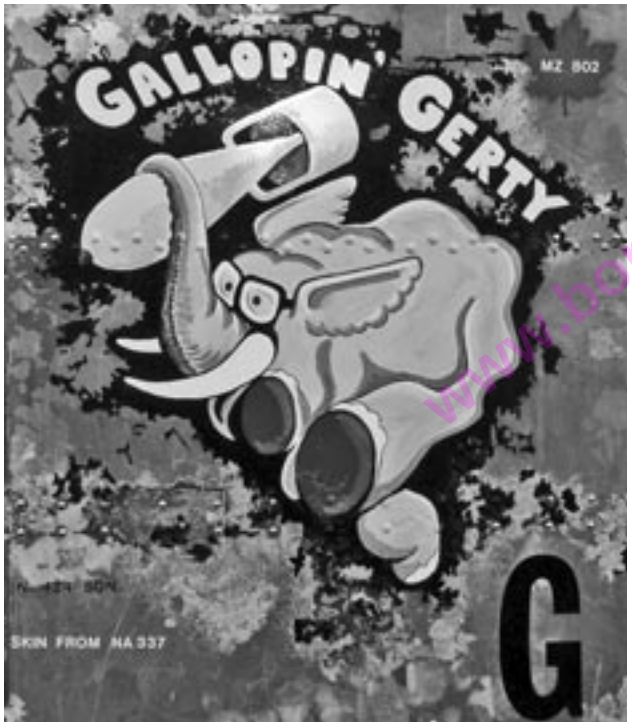
424 Squadron pilot Jack Dundas recalled the reason he chose his nose art, "I thought, dainty little Bambi, bloody great Halifax, what a contrast!"

420 Squadron nose artist 'Skip' Rutledge with his RCAF suitcase

'Moonlight Mermaid' was one of 432 Squadron's longest-serving aircraft but was eventually shot down after completing over eighty operations.

This name was taken from the 1943 movie, 'Riding High' starring Dorothy Lamour which featured a song titled, 'Willie the Wolf of the West'. 426 Squadron S/L Donald Patterson appears to have modified the title by substituting 'from' for 'of' as he was from the west -Calgary, Alberta.

Jack McIntosh, the pilot of 'Medicine Hat', recalled, "The name and nose art made it feel she was 'our' aircraft and would always bring us home."



424 Squadron's C/O was shot down while flying 'Gerty', and became a POW.

Likely the most detailed nose art painted during the war, 'Still Going Strong' featured the Johnny Walker whiskey symbol.

Joan Crawford was an MGM movie star.

408 Squadron nose artist George Oliver

The 'Ell Cat' has a direct connection to the Hamilton Tigercats footballl club.

This nose art was painted on a 420 Squadron Wellington

BOMBER COMMAND AIRCREW

PILOT

Bomber Command aircraft, in almost all cases, had only a single pilot but he had a duel responsibility. In addition to flying his bomber, he was also the leader of his crew, regardless of rank. While it was the duty of the captain to be in charge, he was wise to make the fullest use of his crew's specialized knowledge. But the pilot was the one to make decisions in sudden emergencies.

The pilot could hold any rank from Sergeant up to Group Captain. Officers of higher rank did occasionally fly operationally but were discouraged from doing so due to concerns that they may be taken prisoner. Captains were often informally referred to by their crews as 'Skipper' or 'Skip'.

Flying a four-engined bomber was hard work. Although they were equipped with primitive auto-pilots, most pilots didn't trust them and never turned them on. There were no power-assisted controls and it took considerable muscle to physically wrestle the bomber in and out of evasive manoeuvres.

In no other branch of wartime service did so great a responsibility fall on such young men, at times still in their teens and often not licensed to drive a car.

Lancaster pilot -note the armour plate behind his head

Halifax pilot

Halifax cockpit

Lancaster cockpit

FLIGHT ENGINEER

Apart from the wireless operator, the flight engineer of a heavy bomber crew was probably the most unsung member. Yet in many ways, he was the most knowledgeable for he had to know his aircraft inside-and-out and be prepared for any emergency caused by enemy action or mechanical/electrical malfunctions.

The twin-engined bombers did not have flight engineers but with the coming of the four-engined bombers, the aircraft's equipment became more numerous and more complicated. The four engines with their total of some twenty gauges, four propellers and throttle controls, plus the associated fuel and electrical systems required full-time monitoring, so a full-time technical crewmember was required.

In addition to being an airborne trouble-shooter, the flight engineer was also the pilot's 'right-hand man', handling fuel management, undercarriage, flaps, throttles, and props, directly assisting the pilot during take-offs and landings. He was also capable of flying the aircraft at least straight and level and possibly even landing it if the pilot was disabled. On the ground, the flight engineer was the primary contact with the ground crew.

Until late in the war, the flight engineers for the Canadian squadrons came primarily from the RAF. When a flight engineer school finally opened at Aylmer, Ontario, it graduated nearly two thousand flight engineers, all of whom went to 6 Group. But for much of the war, it was often the case on Canadian Squadrons that an RAF flight engineer was part of what was otherwise, an all-Canadian crew.

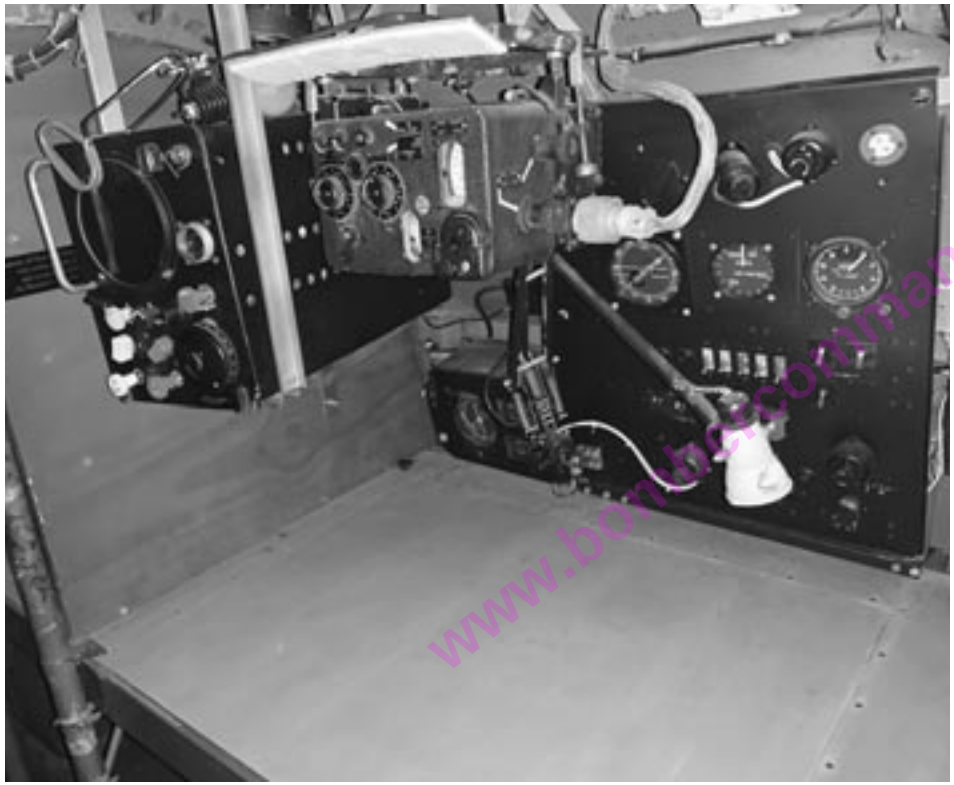
A Lancaster flight engineer sat on a folding seat that could be flipped up to allow access to the Bomb Aimer's compartment in the nose. He assisted the pilot on take off by operating the throttles.

A Halifax flight engineer at his station

NAVIGATOR

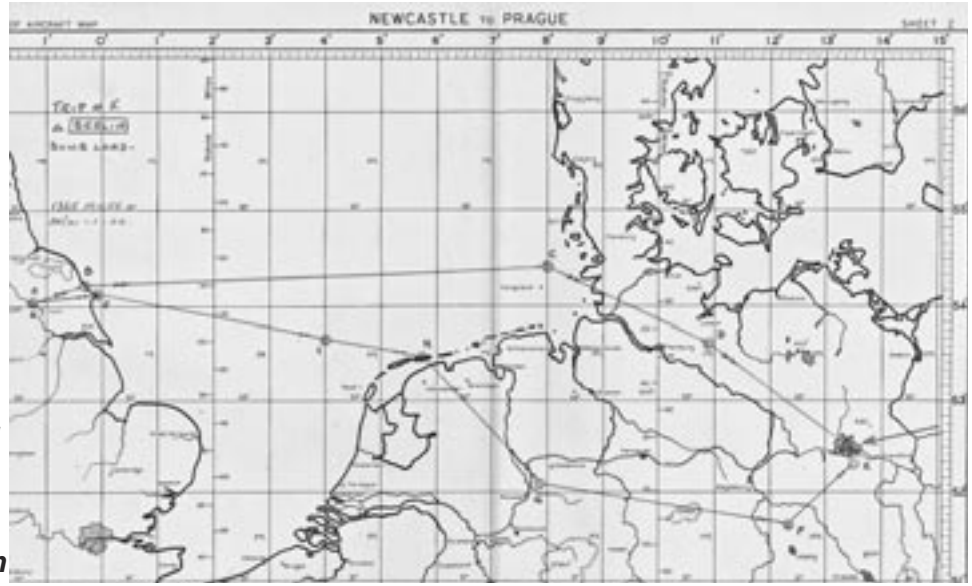
Next to the pilot, the navigator was undoubtedly the key man of the crew. His was an exacting role, demanding a nimble, adaptable mind for, in addition to the prime aim of getting to and from the target, he had to know his aircraft's position at any time regardless of adverse weather or enemy action.

The navigator operated in a completely blacked out compartment behind a black curtain. He sat on a narrow bench and unless he made an effort to pull back the blackout curtain and stand up to have a look around, saw nothing but his instruments for hours on end. Constantly working, his intercom comments were generally restricted to terse instructions to the pilot.



The navigator's positon in a Lancaster bomber. At left is a GEE unit, an electronic navigational aid first used during 1942. Beyond the table is the navigator's instrument panel that corresponded to similar instruments that the pilot had available in the cockpit. The navigator and his table and equipment were surrounded by a curtain so than light from the navigator's angle-poise lamp would not make the aircraft visible to enemy night-fighters.

As almost all Bomber Command operations were flown at 18,000 to 20,000 feet, the aircrew wore oxygen maps for the entire sortie.



This navigator's map shows the route that he plotted to Berlin and back to base.

WIRELESS OPERATOR

Arguable having the most unglamorous role in the crew, the wireless operator, often referred to as ‘Sparks’, was like the flight engineer, a virtual jack of all trades.

In addition to his duties with the radios, he was expected to have a working knowledge of the navigator’s equipment, understand the aircraft’s electrical and intercom systems, and administer first aid when necessary. Later in the war, the wireless operator also became responsible for additional electronics such as ‘Fishpond’ that was designed to detect enemy night-fighters.

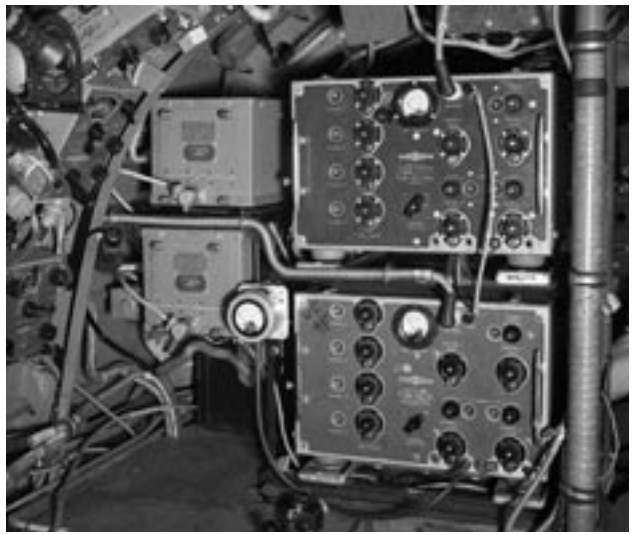
En-route to the target, the wireless operator regularly received ‘broadcast winds’, updates that headquarters received from selected aircraft on the raid so that all the bombers could navigate using the same wind speeds and directions.

The wireless operator also pushed the bundles of ‘window’ down the flare chute and was required to act as a lookout, perched in the astrodome that protruded above the fuselage to direct the pilot and air gunners in the event of visual sightings and combat with enemy fighters. With vigilance the key to survival, the wireless operator would rarely leave the astrodome when in the target area.

A wireless operator in front of the Marconi T1154/R1155 transmitter/receiver set that was widely used in Bomber Command aircraft

Note the morse code key to the right of the wireless operator’s right hand

The operator in a Lancaster sat with his back to the main wing spar. Note the cockpit at right and the ‘Very’ flare pistol at left.



Bendix wireless (radio) equipment in a Canadian-built Mk X Lancaster

BOMB AIMER

The large, plexiglass blister in the nose of a bomber provided the view of the ground below that the bomb aimer required. As the target was approached, the bomb aimer lay prone in the nose compartment and, looking through the bomb sight, guided the aircraft during its 'bomb-run' by calling our orders to the pilot such as, "Right, steady, left, left, steady . . . bombs gone!" The pilot then had to maintain his course for about twenty seconds to allow the 'photo-flash' and on-board camera to record where the bombs struck.

The bomb aimer had the added responsibility of manning the front turret, directly above the bomb aimer's position.

In a Lancaster, the bomb aimer's 'chest cushion' was above the aircraft's escape hatch.

This bomb aimer has his right thumb on the button that releases the bombs.

AIR GUNNER

No other members of a Bomber Command crew experienced the same sense of detachment as the air gunners. Suspended in space, the rear gunner suffered from a lack of leg room and temperatures that commonly reached -40 degrees. His colleague in the mid-upper turret had the disadvantage of sitting on a canvas sling, his head and shoulders in the turret dome and his lower body in the draughty fuselage.

Required to stay in their cramped quarters for up to nine hours, the air gunners constantly rotated their turrets, searching the night sky for enemy fighters and prepared to instantly direct the aircraft's evasive actions. Their primary role was that of a 'look-out' and many air gunners never fired their guns at an enemy fighter.

It was a cold, lonely and harrowing pursuit, but as the war progressed, the air gunners became recognized as highly trained specialists, skilled in the theories of air gunnery, bullet trajectory, deflection and aircraft recognition.

Many rear gunners removed a section of the plexiglass to improve their view, so with temperatures at 20,000' reaching -40 degrees, frostbite was a regular occurrence. The air gunners were isolated from their fellow crewmembers and any heating system although some wore electrically heated flight suits. Suspended in space at the extreme end of the fuselage, the rear gunner was subject to the most violent movements of the aircraft.

air gunners inspecting the tracks that carried ammunition to the rear turret

Peter Engbrecht DFM -424 Squadron mid-upper gunner

A 'battle-damaged' mid-upper gun turret

BOMBER COMMAND GROUND CREW

The operational success of a squadron and the safety of its aircrew rested on the shoulders of the ground crew. A close bond formed between the ground and flight crews -each taking pride in the accomplishments of the other. A dedicated maintenance team of skilled and hightly trained tradesmen serviced and repaired their assigned aircraft. Other, specialized ground crew serviced specific items on all the squadron's aircraft.

Ground crew serviced and repaired the bombers in all types of weather, generally at the exposed aircraft dispersal points, but occasionally in draughty hangars. It was not uncommon for them to work through the night under black-out conditions. Accidents during bomb and fuel loading or assisting at crash-landings often had fatal consequences and enemy intruder aircraft attacked the airfields. 530 Bomber Command ground crew lost their lives during the war.

Ground crew consisted of armourers (bombs), armourers (guns), aero-engine mechanics, instrument technicians, fabric workers, metal workers, electricians, riggers, and others.

Armourers and the munitions required for a Bomber Command squadron's operation

Aero-engine mechanics working on a Lancaster's Rolls-Royce Merlin engine

Servicing a Bristol Hercules radial engine

408 Squadron's Halifax 'Zombie IV's' ground crew at work at the dispersal. The aircraft is a Mk II Halifax and the crew is servicing its Rolls-Royce V-12 Merlin engines.

This 419 Squadron ground crew had a temporary structure at 'D-Dog's' dispersal

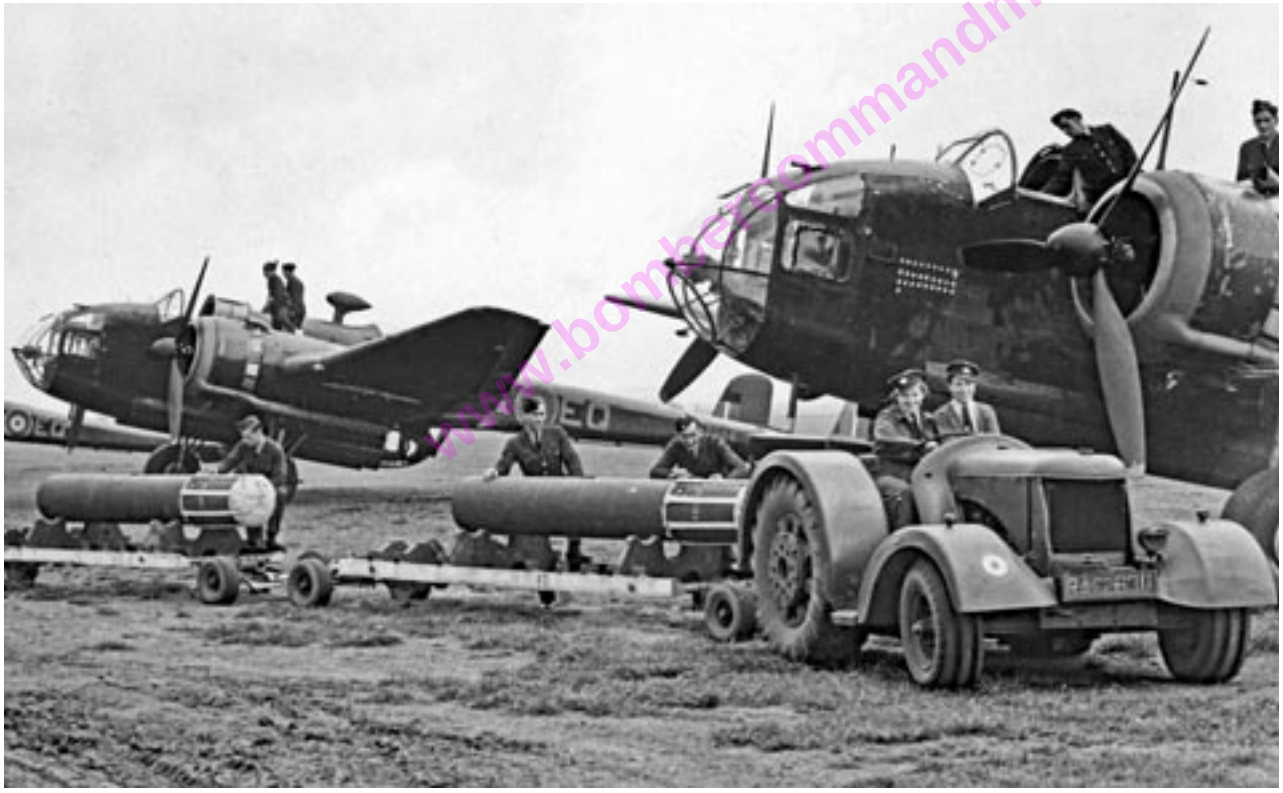
GARDENING

The placing of air-dropped sea mines into enemy-used waters was a lesser known aspect of Bomber Command's role. Over 18,000 'gardening' flights were made and some 47,000 mines were 'sown' near ports and in enemy-used shipping lanes, denying the Nazis the use of much of the Baltic Sea. This regular mining forced the enemy to deploy upwards of 20,000 military personnel and associated ships and equipment to deal with the mines.

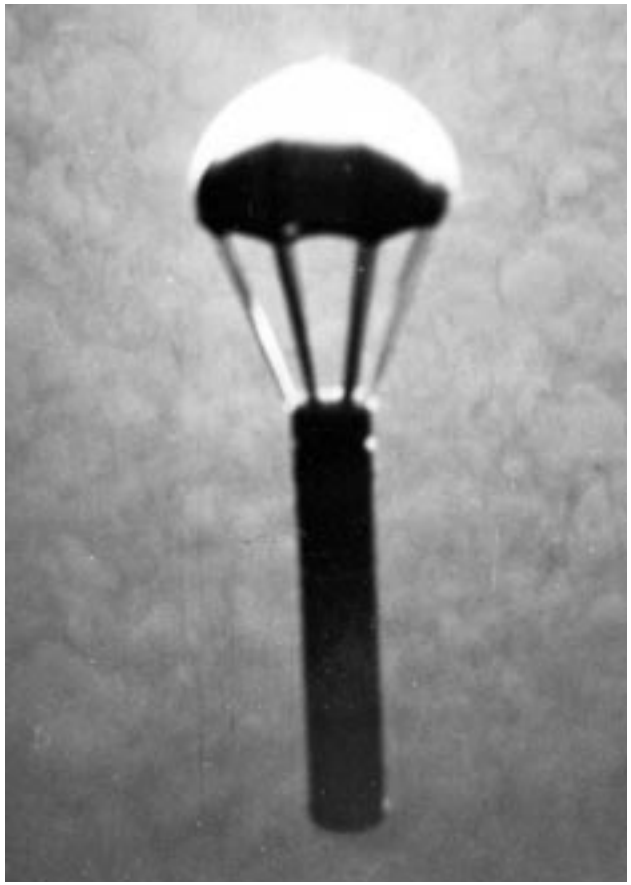
The coastlines were split into various targets and were given distinct code names, most (but not all) the names of trees and plants.

The mines weighed 1500 or 2000 pounds and were robustly designed so that they could be deployed from an aircraft flying at 200 miles per hour from altitudes of between 100 and 15,000 feet.

Although not as dangerous as a raid to a heavily defended enemy city, hundreds of Bomber Command aircraft and crews failed to return from mine-laying operations.



WD or WAAF drivers delivering sea mines to 408 Squadron Hampden bombers

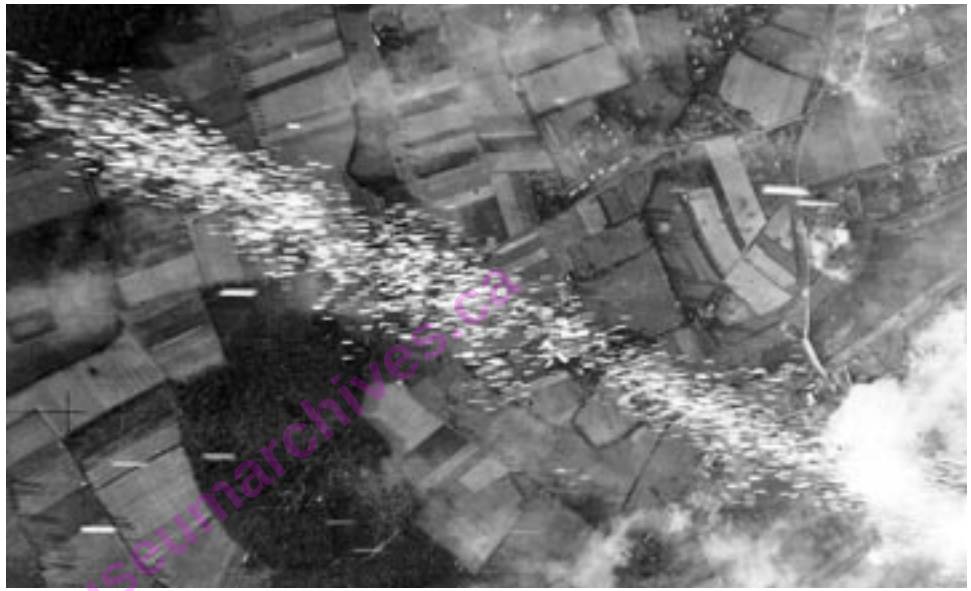


BOMBER COMMAND TECHNOLOGY

During 1942 and early in 1943, research into the development of electronic/radio navigational aids reached fruition and were incorporated into Bomber Command operations. The first of these was GEE which was first used during March 1942. The second was OBOE which was first used in December and became a very valuable tool for the Pathfinder Force. The third which, like GEE, was installed on almost all aircraft, was H2S. These three systems were able to significantly improve navigational and bombing accuracy.

WINDOW

'Window' was the most successful technique devised to jam enemy radar systems. It involved large volumes of small strips of metal foil, cut to a specific length. This disbursed from bundles that were dropped at designated locations along the route to the target, producing a confused response to enemy radar pulses.



Window being a disbursed during a daylight raid

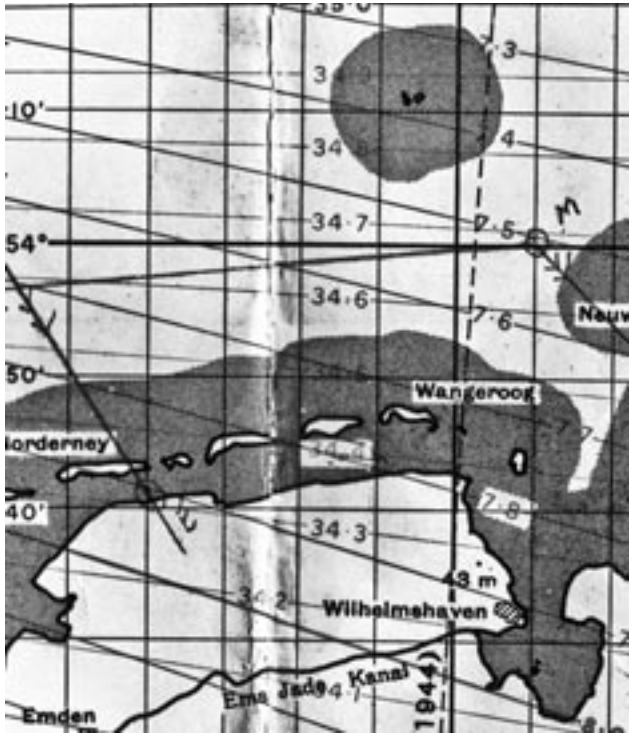
GEE

Bomber Command's first electronic navigational aid, GEE utilized two widely spaced ground-based transmitters that each generated a series of sequential radio pulses to create a grid which corresponded to maps carried within the aircraft.

As well as assisting navigators to find their way to their target, the system was extremely useful while returning from a raid, as the navigator attempted to locate their squadron's base when cloud and fog often obscured the ground.

An Important advantage was that GEE was 'passive', requiring only a receiver aboard the aircraft so there were no transmissions that could give the bomber's presence away to the enemy.

The system operated by 'line-of-sight' and so was limited in range to about 350 miles.



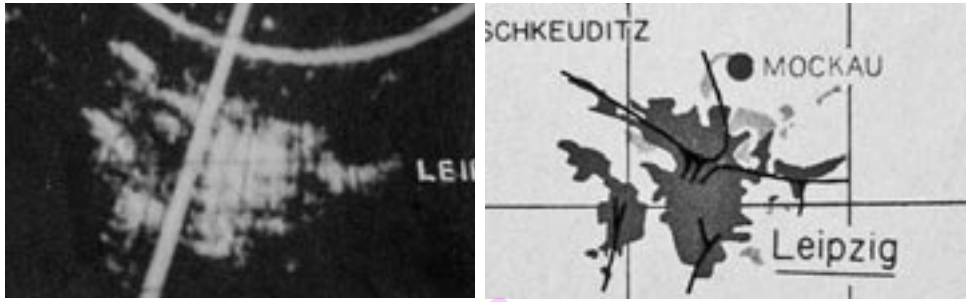
The GEE map's grid was defined by intersecting green and red lines.

H2S -USING RADAR TO SEE THROUGH THE CLOUDS

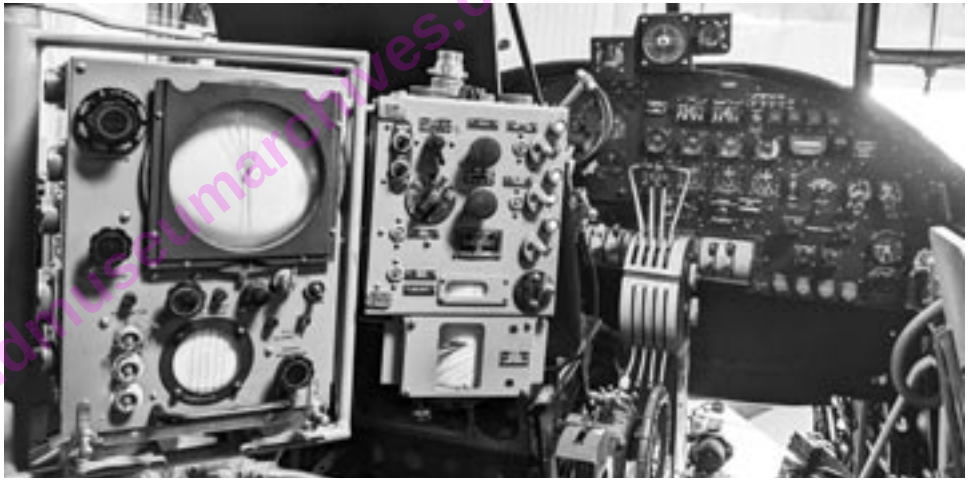
H2S utilized radar signals that were emitted from a downward-looking, rotating radar transmitter fitted into a perspex blister that was placed below the rear fuselage of the aircraft. These scanned the terrain below and the reflections that were returned to the bomber were displayed on a screen in the navigator's compartment, thus displaying a 'picture' of the terrain over which the aircraft was passing. The contrast between water and land was generally very distinct. As well, it was often possible to distinguish between built-up areas (cities) and countryside. As both the transmitting and receiving devices were carried in the aircraft, there were no range limitations as with GEE and Oboe.

H2S provided the crews with a way of navigating to a target at night and 'seeing' through cloud cover. However, there was a significant disadvantage to the system in that the H2S transmissions could be detected by the enemy, enabling Luftwaffe night-fighters fitted with specialized equipment to home in on individual aircraft.

Bomber Command began using H2S early in 1943 and improvements to the system continued into the 1950's. H2S was last used operationally during the Falklands War in 1982 on the Avro Vulcan.



An H2S image and corresponding map area (at right)



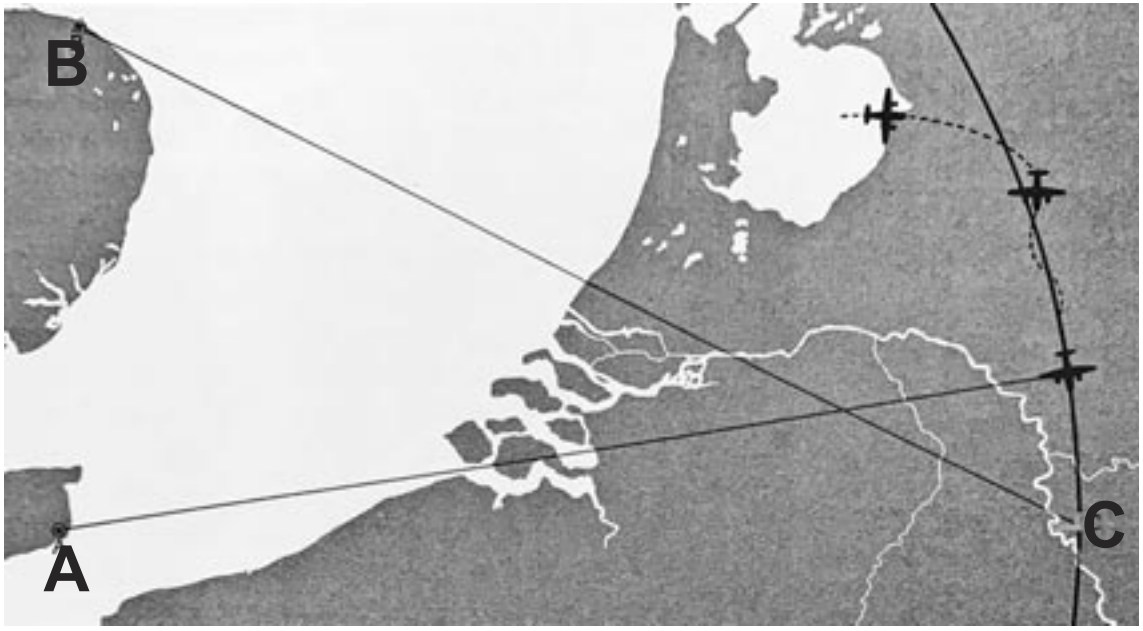
The H2S equipment located to the right of the navigator's positon

OBOE -GUIDING THE 'PATHFINDERS'

Largely utilized by the Pathfinder Force, OBOE became operational in 1943. It utilized two ground-based radar stations to guide a single bomber (generally a Pathfinder Force Mosquito at high altitude) to its target. OBOE was very accurate but, like GEE, limited in range.

As shown in the diagram (at right), a bomber guided by OBOE flies along a circle centred on point 'A'. The radar station there signals the pilot when he is on course. A second radar station at 'B' also tracks the aircraft. When the bomber reaches a prearranged distance from 'B', the station there signals to the pilot that he is over the target factory, 'C', and should drop his target markers.

The main force bombers then attack the target.



THE PATHFINDERS

The idea of having an elite corps of crews with proven navigational abilities evolved from the somewhat limited accuracy of bomber crews during the early years of the war together with the development of more sophisticated and difficult to use electronic navigational aids such as Oboe and H2S. Hand-picked crews from operational bomber squadrons were transferred to the Pathfinder Force (PFF) which was officially formed during August 1942.

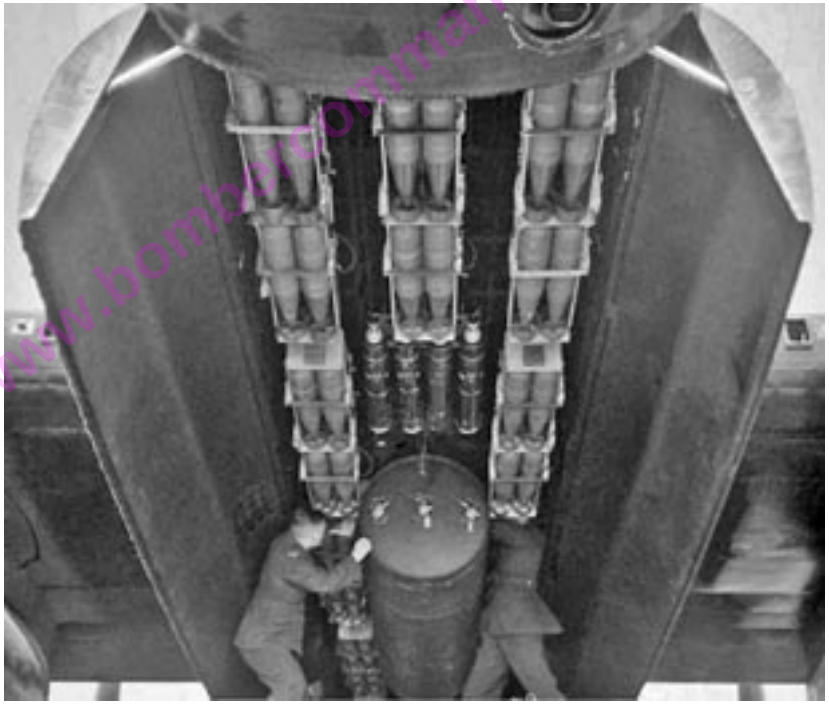
Veteran Australian bomber pilot Donald C.T. Bennett was appointed the commanding officer of the Pathfinders and retained command until the end of the war.

A variety of techniques for marking targets were used, the type being dependent on cloud conditions. Green, red, and yellow Target Indicator (T.I.) flares were utilized. Generally, an initial marking of the target was improved upon or altered as the raid progressed. Often a 'Master Bomber' would circle over the target, transmitting radio instructions to other Pathfinders as well as to the main force aircraft.

The gallantry of the Pathfinder Force is legendary and its contribution to the war effort immense as it significantly improved the accuracy of the main force's bombing.

405 Squadron RCAF became part of the PFF during April 1943 and 405 Squadron's C/O, 'Johnny' Fauquier, became known in the press as the 'King of the Pathfinders'.

AVM Don Bennett (left) and 405 Squadron C/O 'Johnny' Fauquier



Four 150 pound Target Indicators have been placed immediately ahead of the 4000 pound 'Cookie'.

BOMBER COMMAND OPERATIONS
PREPARING THE AIRCRAFT FOR AN OPERATION

Oil and fuel being delivered to a Stirling

Winching bombs into a Lancaster's bomb-bay

Rolling an 8000 pound 'Cookie' into position

A Lancaster bomb-bay loaded with a high-explosive, 4000 pound 'cookie' and 'small bomb containers' packed with incendiaries

BATTLE ORDERS, BRIEFINGS, AND PRE-FLIGHT

No. 431 (R.C.A.F.) [illegible] DATED: 6th May 1944

A/C LETTER & NUMBER	1st PILOT	Trips	2nd PILOT	Trips	NAVIGATOR	AIR [illegible]	[illegible]/GUNNER	M/U GUNNER	R/GUNNER	F/ENGINEER
"[illegible]"	J19424 P/O				J20923 P/O	R157745 P/S	1454040 Sgt.	R19708 0 Sgt.	(968983 Sgt.	118679[illegible] Sgt.
[illegible]	T.O. Johnson	7			R.C.B. Garrity	G.R. Rose	T.R. Chapman	V.P. O'Bright	W. Thornes	D. Shenton.
"C"	31183 F/L				148462 P/O	135113 P/O	169153 P/O	R115513 W/O2	51603 P/O	1205035 Sgt.
LL173	J. Valentine	20			R. McAdam	R.D. Lawson	J.T. Cable	R. MacDonald	W.N. Lawrence	C.D. Little
"[illegible]"	J3486 F/L				1525031 F/S	129679 P/O	1168173 W/O	R223415 Sgt.	516794 F/S	1814772 Sgt.
LL 142	C.G. Bull	3			W. Abbott	F.T. Mitchell	I. Robin	J. [illegible] Blasko	P.L. Alp	L.D. Brown
"J"	AUS412558 P/O				1511382 Sgt.	136910 P/O	1320555 F/S	R159383 Sgt.	1309586 Sgt.	1583055 Sgt.
LL25[illegible]	J.C. King	12			A. Barnes	O.M. Gilmour	F.D. Tym	J.D. Lamoureux	I.M. Black	J.T.H. Beech
[illegible]	C983 W/C				J9766 F/L	135360 P/O	J18988 P/O	J18328 P/O	J18293 P/O	168996 P/O
LW952	W.F.M. Newson	23			W.J. Harris	G.O. Gurney	A.D. Johnston	W. Conley	D.M. McArter	H.G. Young
"O"	J[illegible]761 F/L				J14513 P/O	R125180 F/S	1337592 Sgt.	J27317 P/O	R163503 Sgt.	R59997 Sgt.
LL17[illegible]	J.M. Hill	10			J. Stoyko	A.C. Donnell	G.C.M. Gage	C.O. Roole	J.L. Leyne	J.B. Millar
"P"	R142713 F/S				J[illegible]354 P/O	J22230 P/O	1031744 Sgt.	R192770 Sgt.	R186155 Sgt.	1833587 Sgt.
LL151	M. McNillan	8			A.N. Forstmann	J.L. Thory	R.A. Clyne	E.W. Barefoot	F.G. Lewis	F.G. Banbury
"R"	159047 P/O	21			120068 P/O	120886 P/O	148778 P/O	J11131 P/O	160853 P/O	1490037 Sgt.
LL 232	R. Hemby				R.A. Gibson	R.C. Instrall	D. Prosser	D.P. Wiley	T. Henry	D. Heald
"U"	R72201 F/S				R117029 F/S	R139871 F/S	1095553 Sgt.	R198477 Sgt.	1434385 Sgt.	R139963 Sgt.
LL 252	F.M. Skoaff	3			H.J. McNenly	J.F. Magnusson	S.A. Grey	R.G. Tomlin	R. H. Aimo	R.M. Fronoon
"V"	AUS416549 P/O				168976 P/O	151373 P/O	171503 P/O	R151466 Sgt.	151127 Sgt.	1567379 Sgt.
LK 658	T.G. Craig	9			G. Collins	R.T. Jones	C.A. Young	J.C.Loubert	J.R. Dixon	L. Keir
"[illegible]"	AUS412565 P/O				168975 P/O	151076 P/O	1575595 F/S	R164486 Sgt.	15689 71 Sgt.	1601722 Sgt.
LL 258	F.A. Badgery	7			A. Pitt	J.T. Page	D. Noddings.	P.J. MacIntyre	A.R. Horon	W.S Sparkes
"A"	C28448 P/O				168954 P/O	J19402 P/O	1385623 Sgt.	145467 P/O	642850 F/S	1804654 Sgt.
LL175	F.T. Guillevan	8			J. Geddes	G.T. Wilson	S. Morris	T.Lainchbury	N. Mar ris	P.C. Howe

MAIN BRIEFING: 15:00 Hours
TOP BRIEFING: 1430 Hours
W/V. Briefing: 1500 Hours

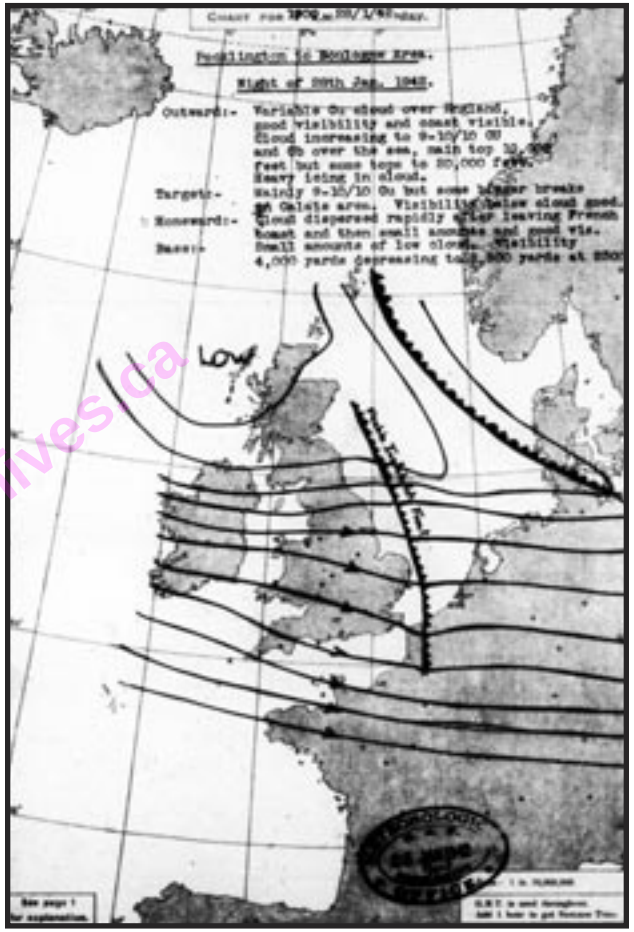
Flying Meals & Rations & Thermos Of Tea:
Officers' & Sergeants' Mess: 1230-1330 hours

T.R. Walker F/L
(T.R. WALKER) ADJUTANT F/Lt.,
for WING COMMANDER, COMMANDING,
NO. 431 RCAF SQUADRON.

Typically, Battle Orders were posted in the morning to advise the airmen that operations were 'on' for the upcoming night. They listed the aircraft to be flown, the crews who would be flying, and the number of 'trips' they had completed towards their 'tour' of thirty operations. Canadian bomber pilot and author Murray Peden recalled, "Each time I found myself on the battle order, the ordeal of waiting, an ordeal punctuated by the ritual of air test, briefing, and flying meal, seemed intensified, the muscles of the abdomen hardening until they felt like the extended ribs of a miniature umbrella."

Following the traditional pre-operational meal of bacon and eggs, the crews were issued their flying gear, escape kits, and parachutes. Crews were driven out to their aircraft's dispersal pan. Once on board, the airmen stowed their gear, and then settled down to the long pre-flight checklists. If all is well, the flight engineer gave the traditional thumbs up to the ground crew.

The aircrew gathered in the briefing room, sitting together facing a stage, a map with the target hidden behind a curtain. The c/o began by pulling back the curtain to reveal the target. The crews then received their information including precise courses, known defences, tactics to be employed, timing, operating altitudes, permissible radio frequencies, and weather forecasts. Maps were issued to navigators and bomb aimers.



Crews were briefed on the weather and winds to be expected

Packing parachutes

As a good luck charm, this little panda bear flew two tours of operations, including the 'Dambusters' Raid, in Canadian flight engineer Bill Radcliffe's boot.

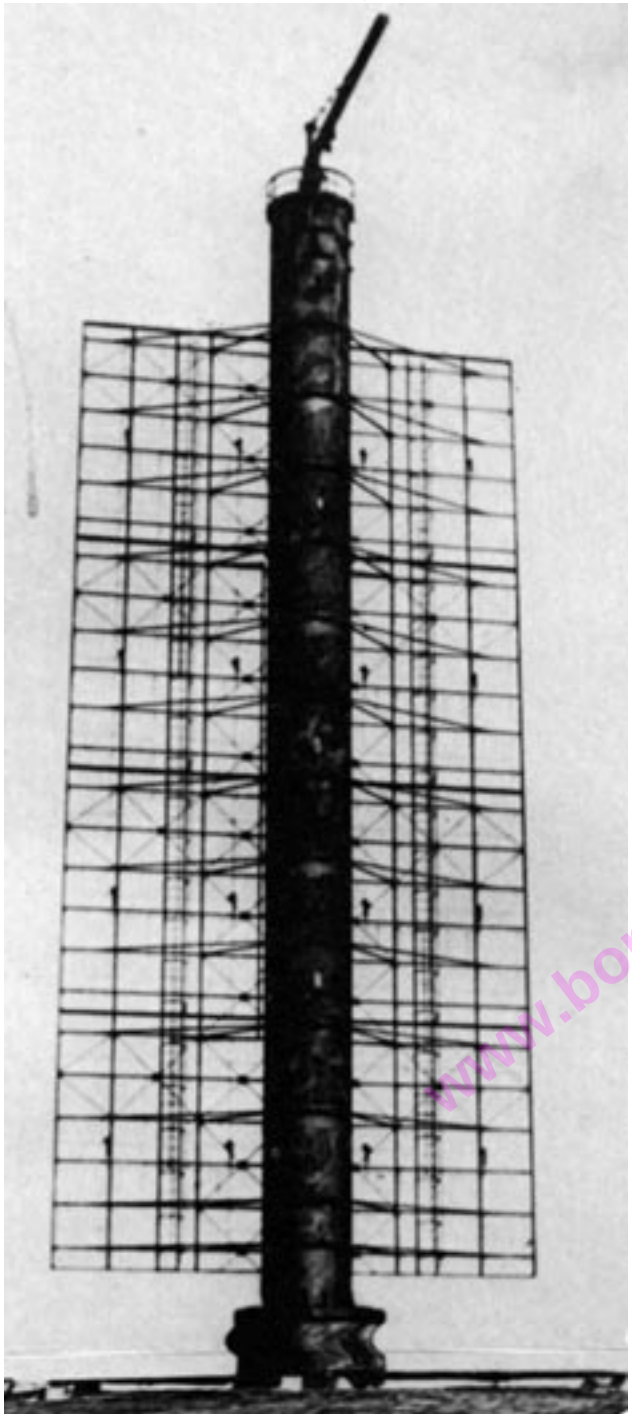
Minnie Simcoe flew eighteen operations with 431 Squadron as a good luck charm, more than many of the aircrewthat she flew with.

Homing pigeons were carried aboard Bomber Command aircraft until some time in 1943. If the crew survived being shot down, messages could be placed in special containers on the pigeon's legs or in small pouches on their backs.

Jean Weir was a WAAF who drove 405 Squadron crews out to the dispersal pads where their aircraft were waiting. Both Jeannie and the crews knew there was a good chance that these young men wouldn't be returning. Jeannie recalled, "They were usually a little on the sombre side. We would usually shake hands with them or pat them on the shoulder or something like that and wish them all luck. There were some sayings that we had like, 'Go get the . . .' Most of them sort of looked 'half-happy'. They had a little smile or some quip to say when they got on but you could sense the feeling. There was a tension, quite a tension.

Father Lardie, a padre at RCAF Middleton-St. George, used a motorcycle to travel around the perimeter track to visit the crews as they were preparing to take off.

ENEMY RADAR, SEARCHLIGHTS, AND FLAK



Wassermann long-range, radar gave plenty of warning that a raid was coming.

Radar-directed searchlight

This post-war photo is of a huge 'flak tower, three of which were built in Berlin. As well as anti-aircraft guns, each included a radar installation with a radar dish which could be retracted behind a thick concrete and steel dome for protection.

LUFTWAFFE FIGHTERS

Bomber Command lost a total of 12,330 aircraft. The Nazi's air force (The Luftwaffe) accounted for the majority of the 8655 that were brought down over Germany and occupied Europe.

THE KAMMHUBER LINE

During the early years of Bomber Command's offensive the Luftwaffe established a series of radar stations and fighter bases across eastern France. Areas called 'boxes' were created, each covering about twenty miles of the line. Within each box, an operator controlled a single nightfighter. When a bomber approached the box, the fighter took off and was guided to the bomber by the ground-based controller.

ZAHME SAU (TAME BOAR)

When Bomber Command began sending large numbers of bombers in tightly-packed 'streams', the Kammhuber system was no longer effective. 'Tame Boar' was devised to attack the bomber stream en-route to the target. Guided by ground-based radar system operators, two-seater, twin-engined fighters closed in on the bombers utilizing on-board radar systems.

WILDE SAU (WILD BOAR)

This technique took advantage of illumination over the targets provided by searchlights, ground fires, target markers, and flares dropped by Luftwaffe aircraft. When viewed by the fighter pilots from above, the bombers were silhouetted and extremely vulnerable. Single engine, single-seat aircraft could be used.

The Focke-Wulf Fw 190 combined excellent maneuverability with a heavy armament of two machine guns in the engine cowling, two 20 mm cannons on the wing roots, and two 20-mm cannons at mid-wing. Like the Bf 109, it served as a day-fighter, fighter-bomber, night-fighter and ground-attack aircraft.

A radar-equiped Messerschmitt Bf 110. The Luftwaffe's top night fighter ace, Major Heinz-Wolfgang Schnaufer, flew the Me 110 exclusively, shooting down 121 aircraft.

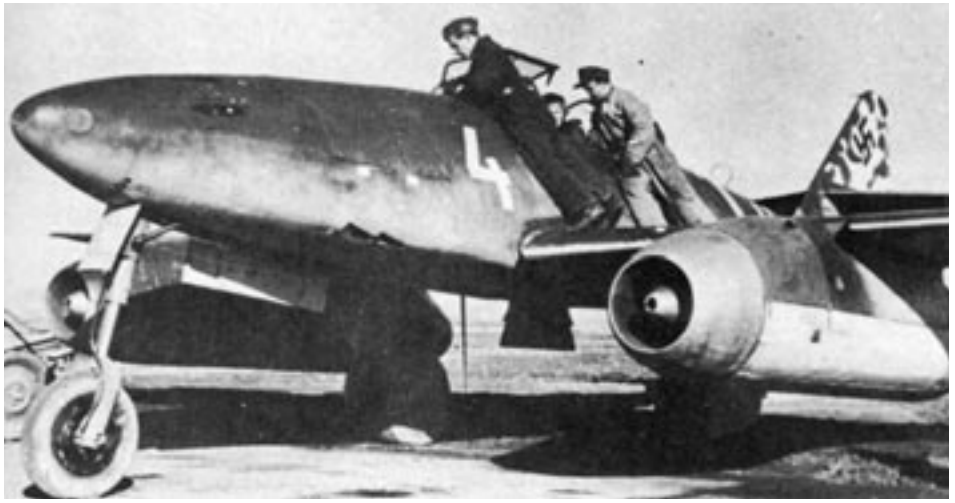
Like the Bf 110, the Junkers Ju 88 night-fighter required a navigator/radar operator. It was one of the most versatile combat aircraft of the war, serving as a bomber, dive bomber, night fighter, and torpedo bomber.

Single engine fighters such as the Messerschmitt Bf 109 participated in 'Wild Boar' operations. The Bf 109 is the most-produced fighter aircraft in history with almost 35,000 of all versions being built.

The Heinkel He 219 was known as the 'Eagle-Owl'. A relatively sophisticated design, it was the first operational military aircraft to be equipped with ejection seats and the first operational German World War II-era aircraft with tricycle landing gear. Had the He 219 been available in quantity, it might have had a significant effect on Bomber Command's operations but only 294 were built by the end of the war.

Very few Bomber Command aircraft had ventral turrets. The Luftwaffe took advantage of this by approaching from behind and below until directly beneath the bomber. Schrage Musik was two or more 20 or 30 mm cannons mounted on the fighter's fuselage and positioned to fire upward and slightly ahead, the target generally being the bomber's fuel tanks in the wings between the engines. Tracers were not used so the crews being attacked and those in other aircraft nearby had no idea where the fire was coming from.

A Bomber Command aircraft silhouetted during a Wild Boar operation.



The Me 262 jet fighter attacked Bomber Command aircraft during the closing months of the war.

FLYING TO THE TARGET AND BACK

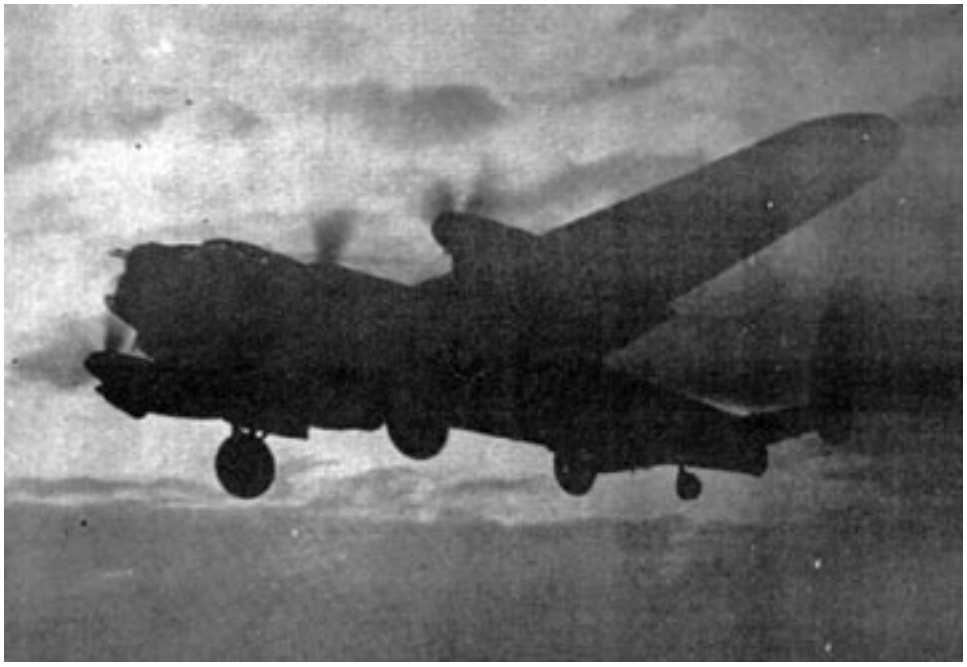
Canadian bomber pilot and author Murray Peden described what it was like,

"To a person wanting to visualize how intense the strain could become, how suppressed fear could swell and gnaw inside, I offer the following as a comparison, perhaps easier to imagine than the unfamiliar surroundings of a darkened bomber cockpit framed in faintly luminous dials.

"Imagine yourself in a building of enormous size, pitch black inside. You are ordered to walk very slowly from one side to the other, then back. This walk in the dark will take you perhaps five or six hours. You know that in various nooks and crannies along your route killers armed with machine guns are lurking. They will quickly become aware that you have started your journey, and will be trying to find you the whole time you are in the course of it. There is another rather important psychological factor: the continuous roar emanating from nearby machinery. It precludes the possibility of your getting any audible warning of danger's approach. You are thus aware that if the trouble you are expecting does come, it will burst upon you with the startling surprise one can experience standing in the shower and having someone abruptly jerk open the door of the steamy cubicle and shout over the noise. If the killers stalking you on your walk should happen to detect you, they will leap at you out of the darkness firing flaming tracers from their machine guns. Compared with the armament they are carrying, you are virtually defenceless. Moreover, you must carry a pail of gasoline and a shopping bag full of dynamite in one hand. If someone rushes at you and begins firing, about all you can do is fire a small calibre pistol in his direction and try to elude him in the dark. But these killers can run twice as fast as you, and if one stalks and catches you, the odds are that he will wound and then incinerate you, or blow you into eternity. You are acutely aware of these possibilities for every second of the five or six hours you walk in the darkness, braced always, consciously or subconsciously, for a murderous burst of fire, and reminded of the stakes of the game periodically by the sight of guns flashing in the dark and great volcanic eruptions of flaming gasoline. You repeat this experience many times -if you live."

As daylight fades, the bombers taxi along the perimeter track to the end of the runway. As many as forty bombers would take off from a single Bomber Command station

It was a nerve-wracking affair for the crew as the bomber strained to lift its tremendous bomb and fuel loads. Often, dusk was gathering as the bomber flew to a position where all aircraft on the operation from all squadrons would rendez-vous, and then continue to the target, climbing on track. In the hope of overwhelming the defences, the bombers usually travelled in a 'stream' of many hundreds of aircraft, very close together and all travelling the same course, accepting the danger of mid-air collision. Although they rarely saw the other aircraft, their turbulence was often felt as they flew in the darkness.



The climax of every trip was the 'run' over the target, often through searchlights, enemy fighters and flak. The bomb aimers, spotting the red, green, or yellow target indicators dropped by the Pathfinder Force to mark their targets, give instructions for the bomb-bay doors to be opened and guided the pilot for the final few minutes of the bomb run. The aircraft lifted a hundred or more feet as their loads were released. Then the doors were closed and, the weaving to avoid fighters began again as the aircraft turn on to a westerly course for home. However, the crews had to remain vigilant for the entire flight. Even in the landing circuit, bombers fell victim to enemy intruder aircraft and safety only really returned once the aircraft had returned to its dispersal.

Over the target

Arthur Godfrey described his vivid memories of being over Berlin which was similar to other heavily defended Bomber Command targets, writing,

"Berlin was an angry, glaring, writhing enormity of a target. We rarely caught a glimpse of the city beneath the unbroken cloud cover, but there seemed to be thousands of searchlights. They did not move, they pointed upwards and illuminated the clouds. It was like flying across a vast, bubbling cauldron into which was poured the sky-markers and above which burst the 'scarecrow' flares. We have since discovered that there were no 'scarecrow' flares, only exploding and burning aircraft.
It was a target so bright that the spread of the bomber stream could be seen above, below, and around you. One was part of a vast armada of aircraft moving relentlessly across the target. Bomb doors could be seen opening. The black crosses on the fighters were clearly visible as they dived into the bomber stream, oblivious to the bursting flak, whose muffled crump could be heard above the roar of our engines."

Bomber Command aircraft during daylight raids -the vast majority of operations were at night. The bombers' best defence was staying in the bomber stream, cloud, and darkness. Their .303 calibre gunswere no match for the 20 mm cannon of the Luftwaffe night fighters.

In this remarkable photo, a Bomber Command aircraft has been 'coned' by a dozen or more searchlights. Anti-aircraft guns are directing flak which can be seen exploding near where the searchlights are converging.

Being 'coned' was terrifying. In his book, 'Boys, Bombs, and Brussels Sprouts', 408 Squadron pilot Doug Harvey wrote,

"I had just closed the bomb doors when I went blind. Absolutely blind. Terrified, I realized we had been coned. The world was a dazzling white, as though a giant flashlight was aimed directly into my eyes. I couldn't see my hands on the control column, couldn't see the instrument panel, couldn't see outside the cockpit. I was naked, totally exposed, helpless. We were a very bright and shiny target in the apex of fifty or more beams that were radar directed. They weren't going to let go easily."

EVASIVE ACTION -THE 'CORKSCREW'

This evasive action involved constant, rapid changes in direction, altitude, and speed and was very effective in hampering accurate shooting by a pursuing fighter pilot.

An alert air gunner would shout, "Corkscrew port now," or "Corkscrew starboard now." The pilot would immediately begin the corkscrew technique.

Often, if his initial approach failed, the fighter pilot would, utilizing his on-board radar, find another aircraft in the bomber stream whose gunners were not as vigilant.

The corkscrew manoeuvre required a huge physical effort by the pilot as he used the manual controls to force the bomber to make all the rapid changes required. The manoueuvre, which was sometimes repeated a number of times, together with the shock and fear, often left the pilot drenched in sweat and with his arms aching.

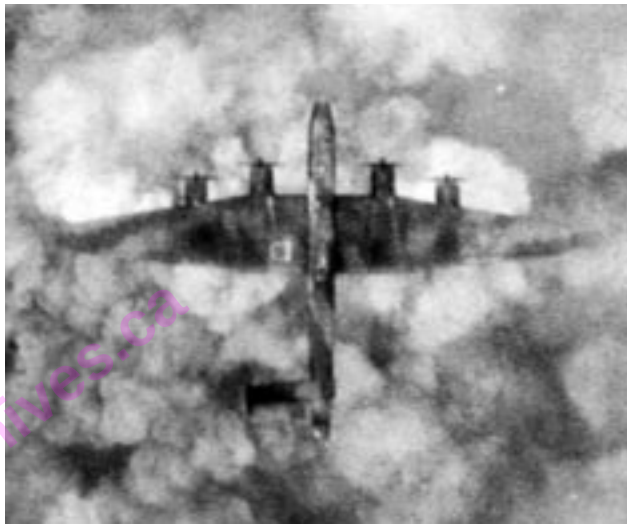
A 6 Group Halifax touches down after an operation. Flights to eastern Germany often exceeded eight hours.

SHOT DOWN -ABANDONING A BOMBER

The crew of a badly hit bomber had a one-in-five chance of escaping. The G-forces of a diving or spiralling aircraft were often overwhelming as the aircrew attempted to reach their parachutes, clip them on, and move to the escape hatch at the nose of the aircraft.

With the fuel tanks in its wings on fire, this bomber is doomed.

A Halifax bomber in two pieces



This 429 Squadron Halifax has just had its starboard horizontal stabilizer knocked off, likely by a bomb dropped by a bomber flying above. Only four of the seven aircrew aboard survived.

A Halifax bomber with the fuel tanks in both wings on fire.

A Bomber Command aircraft explodes following a direct hit by anti-aircraft fire.

An air gunner demonstrates how he would rotate his turret to the beam and roll out if the aircraft had to be abandoned

DITCHING

Hundreds of bomber crews were forced to ditch their aircraft, at night, in the North Sea. The crews were all trained to do this and practiced their 'dinghy-drill' regularly. There were RAF search aircraft and rescue launches whose crews were trained to complete rescues of downed Bomber Command airmen. However, the chances of good weather, a relatively calm sea, there being no injuries from the landing, a successful entry into the dinghy, and the crew surviving until being located and rescued were very low.

Supermarine 'Walrus' search and rescue aircraft

Royal Air Force rescue launch


Survivors: R.A.F. men await rescue after their bomber has been shot down

Survivors from Halifax Bomber JD165 of 102 SQUADRON R.A.F. POCKLINGTON - severely damaged by flak over BERLIN 28th Jan 1944. and ditched in North Sea 90mls from land.

Flt Sergt. (Pilot) D. Pugh (centre)
Sergt. (W/Op) A. Cohen
Sergt. (Mid/gunner) C. Williams
} survived three days in dinghy.

Sergt. (Flt. Engineer) R. Purkiss
Sergt (Bomb Aimer) E. Campbell
Sergt (Rear Gunner) Jock BURGESS
} drowned

Flying Officer (Navigator) J. Graham - died of exposure in the dinghy.

FIDO, DIVERTING, AND DAMAGED AIRCRAFT THAT RETURNED

BERLIN 18/19 Nov 1943.

A/C W/T LETTER	CAPTAIN	BOMB LOAD	CALL SIGN	FIXES ETC	ATO	ETI	ATI
1st Wave O	ADAMS		NHY	LANDED WARBOYS	1657		0134
" A	DAY		"	" TANGMERE	1658		0140
" G	CUTTINGHAM		"	" DUNSFOLD	1700		0115
" N	FRY		"		1702		0122
" C	HALES		"		1704		0139
" T	BLACKMORE		"		1705		0121
" M	TUPP		"		1706		0116
" H	BRIERLEY		"		1710		0147
2nd Wave F	REYNOLDS		"		1708		0125
" V	LANCRED		"		1707		0137
" S	PALMER		"		1706		0131
" R	FOSTER		"	LANDED CRANWELL	1711		0135
" J	BACON		"	" WOODHALL	1714		0151
" U	WEBB		"	" GRANTHAM	1715		0225
" K	JONES		"		1716		0142
" Q	BARNES		"		1717		0148
3rd Wave E	SIMPSON		"	LANDED MANSTON	1719		0100
" B	GEORGE		"	" W. MALLING	1720		0139
" D	ROANTREE		"		1713		0143

OFFICER I/C A/C GRINDELL-MATT AFC

All the bombers successfully returned from this raid to Berlin but eight were diverted to other stations.

Returning from an operation only to find their airfield hidden by fog was a regular occurrence for Bomber Command crews. FIDO (Fog, Intensive, Dispersal Of) was a network of pipes and fuel burners installed on the sides of the runway that was capable of clearing fog. The system was installed at fifteen airfields -most of them at Bomber Command Stations. Between 1943 and 1945, 2500 aircraft landed safely in fog thanks to FIDO.

Following a nine hour trip to Cologne, fog forced F/Lt Stewart Robertson to crash-land his 78 Squadron Whitley in a pasture.

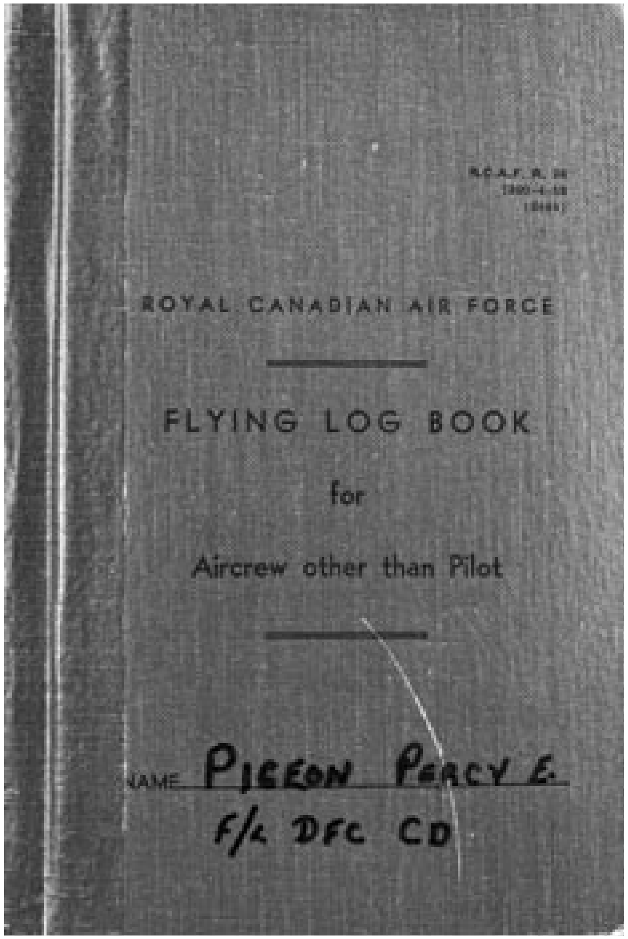
Mid-air collisions often occurred within the bomber stream, particularly at turning points on the route to the target. This Halifax had about nine feet of its nose section chopped away in an aerial collision. F/O A.L. Wilson lost his navigator and bomb aimer, both of whom were at their stations in the nose.

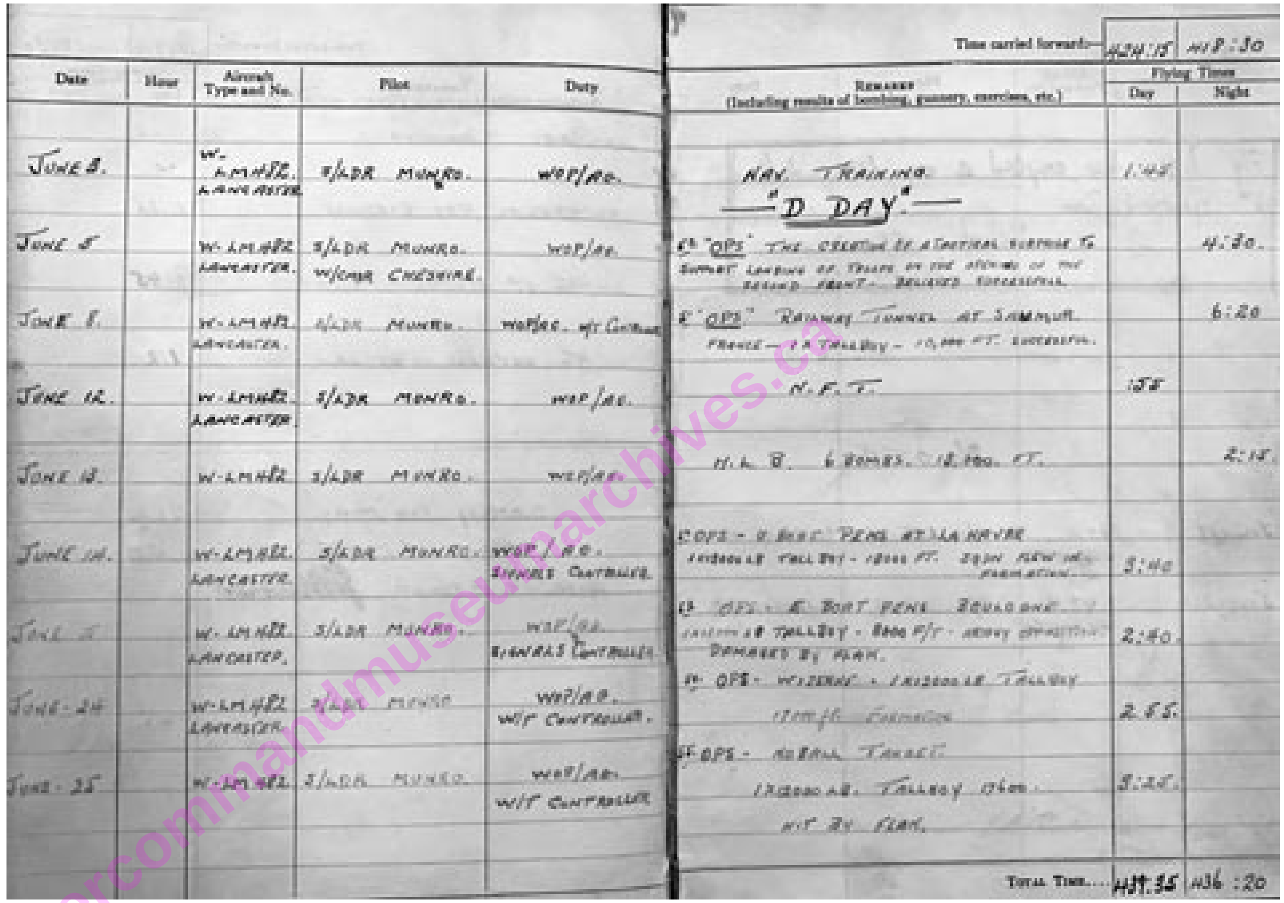
DEBRIEFING

Once safely back on the ground, often after over eight hours in the air, the pilot taxied the aircraft to its dispersal, shut down the engines, and the exhausted crew climbed out of their bomber. They were picked up and taken by crew bus or truck to the briefing room to be interrogated by the station intelligence staff.

The crews answered a lengthy list of questions, providing details of the operation they had just flown while enjoying a welcome mug of tea or coffee laced with rum, and likely a cigarette. The debriefing results were incorporated into the Operation Record Books, both the squadron's summary on the Form 540 and the Form 541 entries for each aircraft.

The crews then returned their flying kit to the lockers before heading to their billets for a well-earned sleep. They often woke up to find another 'Battle Order' with their name on it and were operating again the next night.





Time carried forward— 424:15 | 418:30

Date	Hour	Aircraft Type and No.	Pilot	Duty	Remarks (Including results of bombing, gunnery, exercises, etc.)	Flying Times Day	Flying Times Night
JUNE 3.		W-LM482. LANCASTER.	S/LDR MUNRO.	WOP/AG.	NAV. TRAINING "D DAY"	1:45	
JUNE 5		W-LM482 LANCASTER.	S/LDR MUNRO. W/CMDR CHESHIRE.	WOP/AG.	"OPS" THE CREATION OF A TACTICAL SURPRISE TO SUPPORT LANDING OF TROOPS ON THE OPENING OF THE SECOND FRONT - BELIEVED SUCCESSFUL		4:30.
JUNE 8.		W-LM482 LANCASTER.	S/LDR MUNRO.	WOP/AG. W/T CONTROLLER	"OPS" RAILWAY TUNNEL AT SAUMUR FRANCE — 1 x TALLBOY – 10,000 FT. SUCCESSFUL.		6:20
JUNE 12.		W-LM482. LANCASTER.	S/LDR MUNRO.	WOP/AG.	N.F.T.	:55	
JUNE 13.		W-LM482	S/LDR MUNRO.	WOP/AG.	H.L.B. 6 BOMBS. 18,000 FT.		2:15.
JUNE 14.		W-LM482. LANCASTER.	S/LDR MUNRO.	WOP/AG. SIGNALS CONTROLLER.	OPS - E BOAT PENS AT LA HAVRE 1x12000 LB TALLBOY - 18000 FT. SQDN FLEW IN FORMATION.	3:40	
JUNE [illegible]		W-LM482. LANCASTER.	S/LDR MUNRO.	WOP/AG. SIGNALS CONTROLLER	OPS - E BOAT PENS BOULOGNE 1x12000 LB TALLBOY - 8000 F/T - HEAVY OPPOSITION DAMAGED BY FLAK.	2:40.	
JUNE - 24		W-LM482 LANCASTER.	S/LDR MUNRO	WOP/AG. W/T CONTROLLER.	OPS - WIZERNE - 1x12000 LB TALLBOY 17000 ft FORMATION	2.55.	
JUNE - 25		W-LM482.	S/LDR MUNRO.	WOP/AG. W/T CONTROLLER	OPS - NOBALL TARGET 1x12000 LB. TALLBOY 17000. HIT BY FLAK.	3:25.	

TOTAL TIME.... 431:35 | 436:20

Following each flight, aircrew entered the details into their logbook. The above page is from Percy Pigeon's logbook. F/Lt Pigeon was a 617 Squadron wireless operator who flew on D-Day, the Dams Raid and many other special operations.

Examining target photos

EVADING

Aircrew had only a 17% chance of surviving a mortal wound to their aircraft over enemy territory. The bombers often exploded or the crew had only seconds to escape exposure to fire, structural failure of the aircraft, or being trapped and unable to move inside a wildly-gyrating or spinning bomber. If the airmen landed safely by parachute over enemy territory, they were often attacked and killed by enemy civilians.

Bomber Command aircrew were given training as to what to do if they found themselves in enemy territory and were issued with an escape kit -a small, sealed container that included razor blades, matches in a waterproof case, fishing line and hooks, concentrated food tablets, water-purifying tablets, fire starter, and a small compass. They also carried silk maps and some currency of the countries over which they would be flying.

Many wore ‘escape boots’. These were sheepskin-lined, high flight boots but the lower part looked like ordinary shoes with laces. Some had secret compartments inside the heels. On one side of the upper part, a steel pocketknife fit tightly in a sheath. The two parts of the boot could be separated by cutting along a groove designed specifically for this purpose.

Compasses were vital and miniature ones of various shapes and sizes were hidden inside uniform buttons, belt buckles, lighters, or smoking pipes.

Escape boots

Escape Kit -Note the compass at lower-right

Silk escape map

PRISONERS OF WAR

Most aircrew did not survive abandoning their aircraft over enemy territory. The vast majority of downed airmen became POW's. Most air force POW's were kept in separate camps administered by the Luftwaffe, the German air force. These camps were labeled ‘Stalag Luft's’.

In most cases, the prisoners were treated quite fairly while in the hands of the Luftwaffe. At best, life as a POW was at least bearable until the forced marches that occurred as the war was ending. At worst, it could be degrading, depressing, and debilitating. There are many stories of Canadian POW's being mistreated, forced to live under cruel conditions, tortured, and murdered, particularly when they were held by the SS or Gestapo.

At most camps, food, while not available in quantity or variety, generally met minimum standards and Red Cross parcels, with their chocolate and other ‘luxuries’, were delivered to the prisoners for much of the war.

Most POW's did not make any efforts to escape, learning to cope with their situation by determining to make the most of it. Although some longed to be free, statistically there was only a slender chance of escape -fewer than thirty successfully reached England or a neutral country.

Some saw the barbed wire as a symbol of security. There were no responsibilities and they could read, paint, act in plays, and sleep or eat whenever they wished. Rules were rigid but easy to understand.

Of the 125,000 aircrew who served with Bomber Command, about 10,000 (8%) became Prisoners of War.

One of fifty-five POW Camps, Stalag Luft III was the largest of the air force-only facilities. Between the double wire of the perimeter fence, loose coils of barbed wire lay thick on the ground so that it was impossible to walk across the intervening space. Above the fence, at intervals of about a hundred yards, stood watch-towers on each of which was a machine gun covering the interior of the camp. Immediately inside the wire was an area of dead ground six to fifteen yards wide, bounded by a low guard rail. If any prisoner crossed it, he could be shot without warning. At night, boundary lights lit the perimeter … and from each guard tower, searchlights swept the compounds.

A captured Bomber Command airman

"There was a fellow in camp who knew Conne Smythe and I knew Mayor Don Mackay in Calgary. We decided to see if they could send equipment to us through the Red Cross. We got enough equipment to make up two pretty good hockey teams. We had guys there who had played with some of the top pro teams, so we had some real good hockey games. The Germans loved to watch. -Barry Davidson, Stalag Luft III

Alberta pilots Hardie De Forest (left) and Barry Davidson at Stalug Luft III

The photos below were secretly taken within Stalug Luft VIIIB by Bill Lawrence with a 'homemade' camera he built in the POW camp.

At times in Stalug Luft VIIIB, some of the prisoners were shackled.

An illegal crystal radio set built in the camp

Showering during a thunderstorm

One section of the 'Forty Holer'

Bruce Hutchinson (left) died during the 'Long March' of early 1945

SPECIAL OPERATIONS

DAMS RAID

Canadian airmen played a major role in the legendary 'bouncing-bomb' attack on the dams of the Ruhr Valley. Despite heavy losses, this impressive, tactical success provided a significant morale boost to the Allies and Bomber Command.

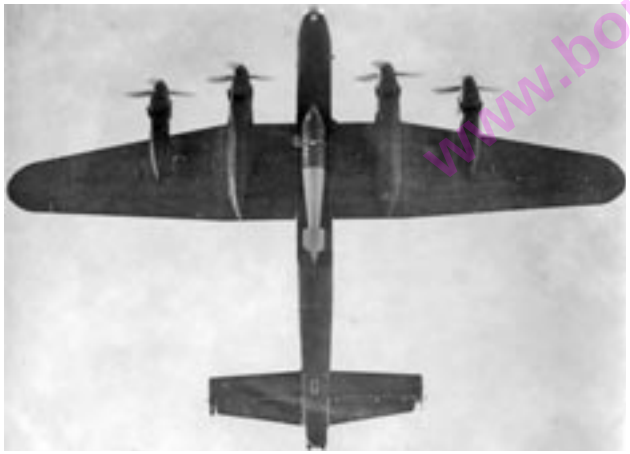
Of the 133 airmen that set out on the raid, thirty were Canadian and six were from Alberta. Fourteen were killed during the raid and one became a Prisoner of War. Exactly 50% of the Canadians who took off did not return.

The Eder Dam -breached by the Dambusters

The Canadians who returned from the Dams Raid

TALLBOYS AND GRAND SLAMS

The Tallboy (12,000 pounds) and Grand Slam (22,400 pounds) bombs were designed to be dropped from 16,000 to 18,000 feet, exceed the speed of sound, penetrate into the ground near their target, and then explode. The earthquake-like waves would then fracture and destroy enemy concrete structures such as railway tunnels, submarine pens, V-2 rocket facilities, and viaducts.



A 617 Squadron Lancaster with a Grand Slam

Grand Slam damage to the reinforced concrete roof of a submarine pen

Canadian 'Johnny' Fauquier led 617 Squadron when they dropped the Grand Slam bombs.

OPERATION MANNA

In April of 1945 the Canadian Army had liberated much of the Netherlands, but 120,000 well-armed enemy soldiers were cut off in the western part of the country. The Allies did not have enough troops available to conquer the area without terrible losses. Allied commanders called on Bomber Command to drop food to the 3.5 million Dutch citizens who were starving after four years of occupation, including the recent difficult winter.

The approaches to the drop zones were made at very low altitude in order not to damage the food any more than necessary as it was dropped in gunny sacks without parachutes. Over 11,000 tons of food were dropped in the ten days of the operation

OPERATION EXODUS

By April 1945, thousands of ex-Prisoners of War were stranded in Europe, having been liberated from POW camps several hundreds of miles from their homeland. They had travelled to collection points all over Europe but had no means of coming home. Many of these young men were sick, under-nourished, and had been wounded so it was obvious that they needed help and quickly. The Canadian Squadrons participated in 'Operation Exodus', flying 4329 liberated Prisoners of War to the UK. Many of them were fellow Bomber Command aircrew who had been shot down and captured.

427 Squadron Lancaster and ex-POW's

BOMBER COMMAND CANADIANS -OFF DUTY

V-E Day Celebrations at a 6 Group Bomber Command Station -Canadians had been at war for 2070 days.

HOME TO CANADA ON LANCASTER Mk X's

Following V-E Day, the Canadians of Bomber Command began to return to Canada -most via passenger ship but some flew across the Atlantic in Lancasters. Canadians, both aircrew and ground crew, were among the thousands of Commonwealth personnel who had volunteered to serve against Japan as the war in the Pacific was not over. However, it finally ended with the dropping of the atomic bombs before 'Tiger Force', a new strategic bombing formation, could roar off into the Pacific.

The Canadians had flown most of their operations in British-owned aircraft but 430 Lancaster Mk X's had been built by Victory Aircraft Ltd. in Malton, Ontario and were Canadian property. Between May 31 and June 18, 1945, the RCAF repatriated eight squadrons that had been equipped with the Canadian-built aircraft.

The Lancasters flew first to the Azores, then Gander, Newfoundland, and finally to RCAF stations in New Brunswick and Nova Scotia. A total of 165 Lancasters were dispatched and 164 made the crossing. KB764 was ditched in the sea off of the Azores after losing two engines. All aboard were rescued.

Sadly, one of the Lancasters collided with another while taxiing for takeoff from the Azores. Both Lancasters were damaged and F/Sgt W. Halloway, a rear gunner, was killed.

419 and 428 Squadron Lancasters prepare for departure from the RCAF station at Middleton-St. George

The first Lancaster Mk X taking off for Canada from RCAF Middleton-St. George

Arthur Harris, C/O of Bomber Command (centre) and AVM 'Black Mike' McEwen, C/O of 6 Group RCAF (right), attended the departure ceremony

RCAF Middleton-St. George personnel waving good-bye to the Canadian-built Lancasters and their crews

Lancaster Mk X's at RCAF Scoudouc, New Brunswick after their Trans-Atlantic flight to Canada

BOMBER COMMAND LOSSES

A total of 364,514 operational sorties were flown by Bomber Command. The contribution to victory was purchased at a terrible cost. Of every one hundred airmen who joined Bomber Command, forty-five were killed, six were seriously wounded, eight became Prisoners of War, and only forty-one escaped unscathed (at least physically). Of the 125,000 who served with Bomber Command, 58,000 were killed. Of the 40,000 Canadians who served, 10,400 were killed. Of those who were flying at the beginning of the war, only ten percent survived. It is a loss rate comparable only to the worst slaughter of the First World War trenches. Only the Nazi U-Boat force suffered a higher casualty rate.

Canadian bomber pilot and author Murray Peden recalled, "The crews faced formidable odds, odds seldom appreciated outside the Command. At times in the great offensives of 1943 and 1944 the short-term statistics foretold that fewer than twenty-five out of each one hundred crews would survive their first tour of thirty operations. On a single night Bomber Command lost more aircrew than Fighter Command lost during the Battle of Britain.

"Yet the crews buckled on their chutes and set out with unshakeable resolution night after night. They fell prey to the hazards of icing, lightning, storm and structural failure, and they perished amidst the bursting shells of the flak batteries. But by far the greater number died in desperately unequal combat under the overwhelming firepower of the tenacious German night fighter defenders.

"Despite the chilling odds, the flow of volunteers never faltered. The price was known to be enormous, but it was a price which continued to be paid with unquestioning courage. If today it represents a debt which can never be repaid, it is at least a debt which must never be forgotten."

The first of over 10,400 Canadians to be killed serving in Bomber Command, Sgt. Albert Prince lost his life on the second day of the war.

The Author

A geophysicist, teacher, and interpretive guide in the Canadian Rockies, Dave was a founding director of the Nanton Lancaster Society which operates the Bomber Command Museum of Canada. One of hundreds of the museum's volunteers, he has been primarily involved with the development of its library and archives, of display material for the museum, and with the research associated with its special events.

Dave is also the author of: *Baz -The Biography of S/Ldr Ian Bazalgette VC, People and Planes*, *FM-159 -The Lucky Lancaster*, *Nose Art -The Clarence Simonsen Collection*, *The Canadian Air Force at High River*, *Big Joe McCarthy -The RCAF's American Dambuster, Leading the Stearmans, Johnny -The Biography of Air Commodore John Fauquier,* and *The Canadian Bomber Command Squadrons.*

Dave is also the author of several books regarding the Canadian Rockies, the website 'www.CdnRockiesDatabases.ca', and a number of mobile device applications for the Canadian Rockies.