



KNOWING YOUR PLACE ON THE TEAM

There have been times when the war in the air was a battle between individuals, each using his own aircraft as a weapon with which to fight," the cadets at the Air-Crew Receiving Centres (ACRC) were told, "but, as you know, in this war the air battle is largely fought by teams operating large and complicated aircraft, and not by individual pilots. In a large modern aircraft there are many different jobs to be done, and each must be done quickly and efficiently by specially-trained men."¹

Each cadet must have wondered just which job they would be selected for. Though many would likely have joined the RAF to become pilots, the reality was that only one individual in every crew was needed to fly the plane and not every cadet would have the aptitude for that role. "Just as in football," they were told, "everybody cannot be a centre-forward or a half-back, so in modern warfare everyone cannot be a Pilot."

As the cadets were also made aware, not only would their "category" not necessarily be the one they wanted, it might not even be the one for which they were best suited. What came first was the "needs of the Service". The RAF had to train its future crews in the correct proportions to ensure it could properly man its aircraft. So, the cadets were told,

The crews of Bomber Command, as with the rest of the RAF, variously consisted of specialist gunners, navigators, bomb aimers, engineers, wireless operators and of course pilots. By the winter of 1943/1944, which job the raw aircrew cadets would eventually be trained to perform was decided by a carefully-designed program of tests. John Grehan outlines the process of selection at this stage of the war.

this would be the first consideration that would influence their classification.

The second consideration was that of aptitude. There was no point in training someone in a role for which they were clearly unsuited. In order to establish each individual's ability a series of aptitude tests were given to the cadets. These, it was stated, would "gauge your skill in solving the sort of problems you will meet in training".

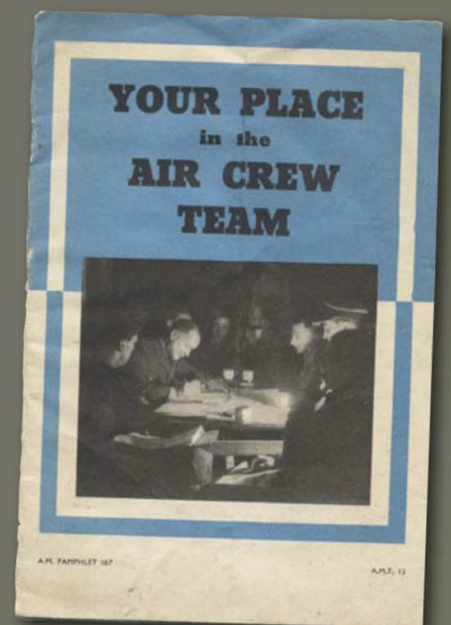
After the results of the tests, the cadets' own views were then taken into account – after all, noted the Air Ministry, "a man is likely to work hardest at that in which he is most interested". The positions available were the six basic air-crew categories of Air Bomber, Air

Gunner, Flight Engineer, Navigator, Pilot, and Wireless-Operator.

They were warned that they would be wise to be realistic about their aspirations. They would only be offered a choice of category if the aptitude tests indicated that they might be suitable for more than one position. This was explained as follows: "Suppose you are found to have enough aptitude to become either a Navigator or an Air Bomber and you would rather become an Air Bomber. Then, provided cadets with even greater aptitude for Air Bomber training are not available to fill the vacancy – you will be classified for training as an Air Bomber."

For those who wanted to become pilots, special advice was given. They were informed that being a pilot in a combat aircraft was not something that

TOP: The seven man crew of an Avro Lancaster, each carefully selected and trained to undertake their respective roles, wait near the crew room at RAF Waddington, Lincolnshire for transport out to their aircraft in October 1942. Note the homing pigeons in the boxes in the foreground that are carried for communication purposes in case of ditching or radio failure. (Imperial War Museum; TR186)





RAF AIRCREW SELECTION PROCESS

1943/1944

- AFU(P) and AFU(O)** Advanced Flying Unit (Pilot) and Advanced Flying Unit (Observer). Latter for Air Bombers, Wireless Operators (air), Navigators and Navigators (B). To provide air crew who have been trained overseas with means of becoming accustomed to the flying conditions and procedure in the United Kingdom.
- AGS** Air-Gunnery School. Complete ground and air training in air gunnery. Air Gunners qualify here for AG badge. Also attended by FEs and W/Ops for Coastal Command.
- ANS and AOS** Air Navigation School and Air Observation School. Ground instruction and air exercises in navigation for Navigators and Air Bombers. Both categories qualify here for their badges.
- B&GS** Bombing and Gunnery School. Theoretical and practical training in bombs and bomb aiming; map-reading experience; air-gunnery training.
- EANS** Elementary Air-Navigation School. Ground training in general navigation subjects; this completes the cadet's theoretical training.
- EFTS** Elementary Flying Training School. Elementary flying training for pilots on aircraft similar to those on which they were graded. Equal time on ground subjects.
- FIS** Flying Instructors' School. Training pilots to become flying instructors; successful students awarded a flying instructor's category.
- HCU** Heavy Conversion Unit. Run and staffed by operational commands. Converts operationally trained crews on to four-engine bombers, since heavy bomber OTUs normally use Wellingtons.
- ITW** Initial Training Wing. Different ITWs for each category. General service training combined with an introduction to subjects important in each category's future training.
- OTU** Operational Training Unit. Run and staffed by the operational commands; here categories are crewed up, made familiar with an operational type and prepared in every way for their operational role and eventually posted as crews to operational squadrons except in the case of heavy bomber OTUs, which are followed by HCU.
- PRC** Personnel Reception Unit. Air crew received from overseas training, held pending posting to AFUs etc.
- PRE-OTU** A short course for navigators and wireless operators before posting to Coastal Command OTUs. Comparable in function to AFU.
- RADIO SCHOOL** Basic training in signals for wireless operators and navigators. First half of course mainly theoretical, second half includes ample flying experience. W/Ops qualify here for badge.
- RADIO COURSE** A course for straight Navigators who have volunteered and been selected for special training after which they are qualified as Navigators (Radio) and posted to Beaufighter and Mosquito night fighter and intruder squadrons.
- SFTS** Service Flying Training School. Basic principles of flying for war purposes taught on advanced trainers, combined with full syllabuses of ground subjects. Pilots qualify here for flying badge.
- SofGR** School of General Reconnaissance. Pilots and Navigators for Coastal Command receive full training in the additional navigational and tactical subjects necessary for Coastal work.
- TTS** Technical Training School. Full technical training for Flight Engineers, who qualify here for FE badge.

had anything to do with intelligence nor was it something one could acquire by dint of trying – pilots were born with that special skill.

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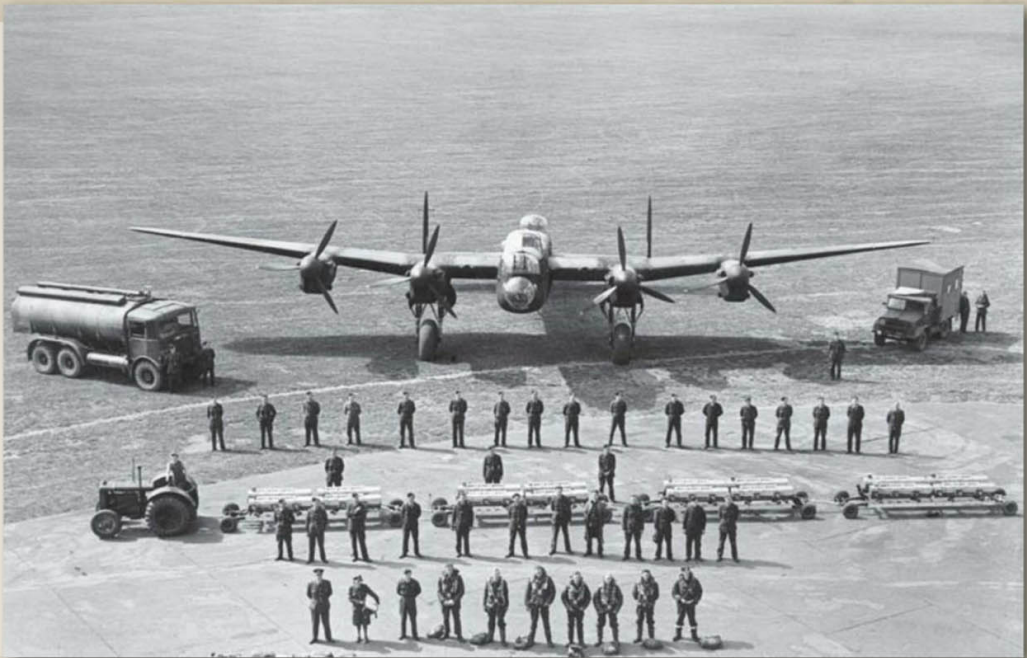
The cadets remained at the ACRC for six weeks. During the first two weeks they were registered, medically examined and kitted-out. Throughout their stay they were drilled and given lessons in RAF law, administration, mathematics, signals, and taught to use weapons. They were also expected to play organised games and perform physical training. Those that could not swim, received swimming lessons.

In the third week they sat their aptitude tests. These measured such things as their quickness to learn, the ease with which they could solve mathematical problems, the accuracy and speed with which they could observe things, their understanding of everyday mechanical problems, and their capacity to learn to perform tasks which required eye-hand-foot co-ordination.

The cadets were told that the tests were not difficult, and that given unlimited time, most people would be able to do well. But they had to perform the test under strict time limits, therefore putting pressure on them to complete the tests quickly. The tests included problems that few people could solve in the time allowed. "Do not let this surprise you, and do not expect to get a perfect score," they were told. "They are designed to disclose what are your special strengths and weaknesses."

The cadets were also advised that if they wished they could talk to others about the tests but that it would do them no good. Firstly there were so many tests they would be unlikely to remember many of them, and, secondly, anything

RIGHT: Taken at RAF Scampton on 11 June 1942, this picture shows the personnel required to keep one Avro Lancaster flying on operations. In the front row (left to right) are: Flying Control Officer; WAAF parachute packer; Meteorological Officer; and the seven members of aircrew (Pilot and Captain, Navigator and Observer, Air Bomber, Flight Engineer, Wireless Operator/Air Gunner and two Air Gunners). In the second row are twelve members of the flight maintenance crew (left to right: NCO fitter, flight maintenance mechanic, NCO fitter, five flight maintenance mechanics, electrical mechanic, instrument repairer, and two radio mechanics). In the third row, meanwhile, is the bombing-up team: WAAF tractor driver with a bomb train of sixteen Small Bomb Containers (SBC), each loaded with 236 x 4lb No.15 incendiaries and, behind, three bombing-up crew. The fourth row comprises seventeen members of the ground servicing crew (left to right: corporal mechanic; four aircraft mechanics; engineer officer; fitter/armourer; three armourers; radio mechanic; two instrument repairers; three bomb handlers; and machine-gun belt fitter). Lastly, in the back row are (left to right): AEC Matador fuel bowser and two crew; an Avro Lancaster B Mk.I heavy bomber; and a mobile workshop and three crew. (Imperial War Museum; CH15362)



that produced a skewed result would not be to their advantage if it meant they were categorised incorrectly. The latter, however, was unlikely to happen as there were so many tests, the aptitude of each person would be clearly revealed. This was explained to them by using this example:

"Each test has a dual or multiple purpose so that by it your aptitude for more than one air-crew category can be measured. Do not be misled by the superficial appearance of some of the tests. For example, a test with aerial photographs may seem to you to be a test of navigator aptitude, and one involving the manipulation of what looks like an Air Gunner's turret to be a measure of the co-ordination required by an Air Gunner. So they are, but the former is also a measure of pilot-aptitude and the latter of pilot-co-ordination ability."

After the tests the cadets continued their general service training, and in their final week at the ACRC the Flight Commander would inform them which air-crew category they had

been placed in – and that was where they would serve whether they liked it or not. "It is the best position for you, because it is the one for which you are most needed by the Service and to which you are best suited."

The men then went from the ACRC to either a Grading School and then to an Initial Training Wing (ITW) or straight to one of the ITWs. "At the ITW," the briefing states, "you will begin specialized training with other men of the same air-crew category."

Those that were considered suitable for pilot training went to a Grading School.

respective ITWs in the category chosen for them, at the end of the course they were given seven days' leave, with pay, and a free travel-warrant to their leave address.

After their period of leave, the various specialized training courses began. At the same time, the cadets were briefed about the possibilities of postponements and hold-ups: "Everything humanly possible is done to prevent delays, but if you find that you have to wait between training courses, remember that in a war of this gigantic size and scope it is not always possible to keep training running neatly and smoothly to a standard blue-print."

For their part, after their leave a few of the potential air bombers, navigators and pilots who were to be trained in the UK were posted to units there. The great majority, however, were sent to an Air-Crew Despatch Centre to await an overseas posting to continue their training. Wireless Operators were directed to a Technical Training School in the UK to undertake a specialized signals course, following which subsequent training was completed either in Britain or overseas. Flight Engineers were posted to a Technical Training School, whilst

Air Gunners to Air Gunnery Schools, all of which were UK-based.²

Even then it would be a long time, a year or more, before the men would have completed their training and finally sent off to face the enemy. ■



ABOVE: A typical wartime Lancaster crew. Like so many others from Bomber Command, this 12 Squadron crew failed to return from operations following an attack on Berlin on 25 March 1944. All seven men on board Mk.III JB359 lost their lives – including Flying Officer Donald Arthur Colombo DFC who is third from the right. (Courtesy of Mike Abbott)

This represented approximately fifty per cent of all cadets. Though a cadet might have been selected for pilot training it did not necessarily mean that they would become pilots, just that they appeared to possess the necessary qualities – "some half of the cadets leaving ACRC at any given time have proved by their tests that they would be likely to do well in pilot-training".

If the cadets qualified at their

NOTE:

1. "Your Place in the Air Crew Team", Air Ministry pamphlet 167, April 1944.
2. *Ibid.*

THE PILOT

(Image © B5 Marketing. Tel: 0781 444 8687. See inside back cover for more information)



Such was the role of a Bomber Command pilot by the winter of 1943/1944, cadets arriving at the Air-Crew Receiving Centres were not given an introduction to this aircrew category. Instead, they were simply greeted with the words: "The various duties of an RAF pilot in war are too well known to require a description."

Most of the heavy bombers operated by Bomber Command on the front line only had one Pilot who sat on the left hand side, the exception to this rule being the Short Stirling which was fitted with full dual controls. In the Lancaster, the Pilot was seated on the left hand side of the cockpit. Behind his head was the only piece of armour plating that a Lancaster carried. Regardless of rank, the Pilot was always in command of the aircraft.

The instrument panel was made up of the standard RAF blind flying panel, which was added to as various navigation and bombing aids were developed. The centre and right panels were largely taken up with engine instruments. The centre-mounted throttles could be reached by both the Pilot and Flight Engineer, on take-off the Flight Engineer handled these while the Pilot concentrated on keeping the heavily laden aircraft straight.

The Pilot, therefore, operated all the flying controls. These include the ailerons, elevators, rudders, aileron trim, elevator trim, rudder trim and flaps. The detailed Haynes Avro Lancaster Owner's Workshop Manual, provides the following detail:

ABOVE: The cockpit instrument panel of the Lincolnshire Aviation Heritage Centre's Avro Lancaster B Mk VII NX611, *Just Jane*. Note the brake lever on the left-hand side of the control yoke. (HMP)

BELOW LEFT: The pilot's position in *Just Jane* – note the Flight Engineer's fold-out seat on the right. The instrument on top of the panel is the gyro compass remote indicator. (HMP)

BELOW RIGHT: The engine controls. The pair of levers with circular tops are the throttle controls for the No.1 and No.4 engines. The throttle levers for the No.2 and No.3 engines are below these. Below the throttle levers are the propeller speed (pitch) control levers. The red lever on the left is the boost control cut out.

"The ailerons are operated by a series of cable, chains, tie-rods and control tubes. The system runs along the port side of the fuselage and at the rear wing section it enters the port and starboard mainplanes, where it connects to the aileron outer wing bell crank. From there it travels to the aileron input rod and onto the aileron, which is a metal framework covered with Irish linen."¹

Meanwhile, the elevator and rudder are operated by control rods that run down the port side of the fuselage to the tailplane where they are connected to the controls. These are of metal construction. All the trim systems on a Lancaster are cable-operated, connecting to the trim tabs via a screw jack and operating rods. Most of the wartime British heavy bombers had relatively heavy controls, so the long range raids that became

more frequent as the war progressed could have been exhausting without the simple auto-pilots fitted to most types.

The challenges that faced so many Bomber Command Pilots during the war are graphically illustrated by the events that befell Flight Sergeant Arthur Louis Aaron, a Stirling Pilot with 218 Squadron, during an attack on Turin on the night of 12 August 1943:

"When approaching to attack, the bomber [EF452] received devastating bursts of fire from an enemy fighter. Three engines were hit, the windscreen shattered, the front and rear turrets put out of action and the elevator control damaged, causing the aircraft to become unstable and difficult to control. The Navigator was killed and other members of the crew were wounded. A bullet struck Flight Sergeant Aaron in the face, breaking his jaw and tearing away part of his face. He was also wounded in the lung and his right arm was rendered useless. As he fell forward over the control column, the aircraft dived several thousand feet.

"Control was regained by the Flight Engineer at 3,000 feet. Unable to speak, Flight Sergeant Aaron urged the Bomb Aimer, by signs, to take over the controls. Course was then set southwards in an endeavour to fly the crippled bomber, with one engine out of action, to Sicily or North Africa.





LEFT: The view out of the pilot's window on *Just Jane*. (HMP)

RIGHT: Some of the instruments to the left of the pilot's seat, the most prominent of which is the P4 compass. The brown instrument top right is the undercarriage position indicator. (HMP)

BELOW LEFT: To the right of the pilot's seat are the undercarriage selector lever and safety bolt, painted red, and beyond them the aileron, rudder and elevator trim wheels. The undercarriage control safety bolt prevents unintentional operation of the landing gear. Note the proximity of the Air Bomber's position. (HMP)

BELOW RIGHT: The pilot's seat with the armour plate up. (HMP)



was intense. He lapsed into semi-consciousness. The Flight Engineer, with some help from the Bomb Aimer, kept the Lancaster in the air despite heavy anti-aircraft fire over the Dutch coast.

"The North Sea crossing was accomplished. An airfield was sighted. The captain revived, resumed control and made ready to land. Ground mist partially obscured the runway lights. The captain was also much bothered by blood from his head wound getting into his eyes. But he made a safe landing although one leg of the damaged undercarriage collapsed when the load came on."³

Whilst the gallantry and determination shown by the men in these two accounts is beyond dispute, these events also illustrate how much a bomber crew's survival and success depended on teamwork – at the centre of which was the Pilot. ■

NOTES:

1. Jarrod Cotter and Paul Blackah, *Avro Lancaster Owner's Workshop Manual* (Haynes Publishing, Sparkford, 2008), p.64.
2. Fourth Supplement to *The London Gazette*, No.36235, 2 November 1943. Flight Sergeant Aaron VC, DFM, is buried in Bone War Cemetery, Annaba, Algeria.
3. Third Supplement to *The London Gazette*, No.36285, 14 December 1943.

"Flight Sergeant Aaron was assisted to the rear of the aircraft and treated with morphia. After resting for some time he rallied and, mindful of his responsibility as captain of the aircraft, insisted on returning to the pilot's cockpit, where he was lifted into his seat and had his feet placed on the rudder bar. Twice he made determined attempts to take control and hold the aircraft to its course but his weakness was evident and with difficulty he was persuaded to desist. Though in great pain and suffering from exhaustion, he continued to help by writing directions with his left hand.

"Five hours after leaving the target the petrol began to run low, but soon afterwards the flare path at Bone airfield [in Algeria] was sighted. Flight Sergeant Aaron summoned his failing strength to direct the Bomb Aimer in the hazardous task of landing the damaged aircraft in the darkness with undercarriage retracted. Four attempts were made under his direction; at the fifth attempt Flight Sergeant Aaron was so near to collapsing that he had to be restrained by the crew and the landing was completed by the Bomb Aimer."²

Nine hours after the Stirling had touched down, 21-year-old Flight Sergeant Aaron DFM died of his injuries. Unsurprisingly, he was awarded a posthumous Victoria Cross.

Another Bomber Command pilot to be awarded the Victoria Cross was Flight Lieutenant William Reid – one of ten Lancaster aircrew who were to be awarded this decoration during the war. On the night of 3 November 1943, Flight Lieutenant Reid was the Pilot of a 61 Squadron Lancaster, LM360, detailed to attack Düsseldorf.

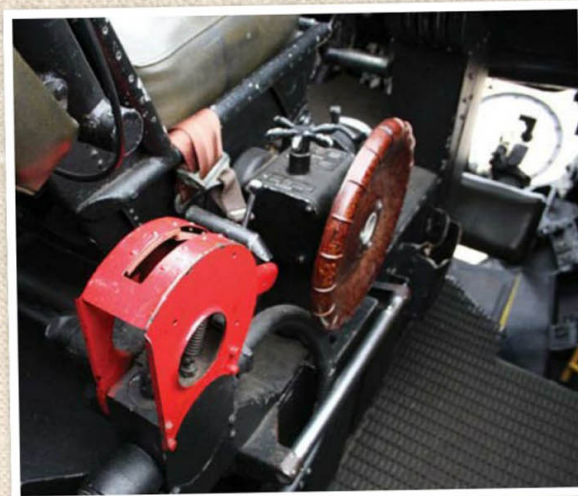
Shortly after the Lancaster crossed the Dutch coast, Reid's windscreen was shattered by fire from a Messerschmitt Bf 110. Owing to a failure in the heating circuit, the Rear Gunner's hands were too cold for him to open fire immediately or to operate his microphone and give warning of the threat; but after a brief delay he managed to return the night fighter's fire and it was driven off.

"During the fight with the Messerschmitt, Flight Lieutenant Reid was wounded in the head, shoulders and hands. The elevator trimming tabs of the aircraft were damaged and it became difficult to control. The rear turret, too, was badly damaged and the communications system and compasses were put out of action. Flight Lieutenant Reid ascertained that his crew were unscathed, and saying nothing about his own injuries, he continued his mission.

"Soon afterwards, the Lancaster was attacked by a Focke Wulf 190. This time, the enemy's fire raked the bomber from stem to stern. The Rear Gunner replied with his only serviceable gun, but the state of his turret made accurate aiming impossible. The Navigator was killed and the Wireless Operator fatally injured. The mid-upper turret was hit and the oxygen system put out of action. Flight Lieutenant Reid was again wounded and the Flight Engineer, though hit in the forearm, supplied him with oxygen from a portable supply.

"Flight Lieutenant Reid refused to be turned from his objective and Düsseldorf was reached some 50 minutes later. He had memorised his course to the target and had continued in such a normal manner that the Bomb Aimer, who was cut off by the failure of the communications system, knew nothing of his captain's injuries or of the casualties to his comrades. Photographs show that, when the bombs were released, the aircraft was right over the centre of the target.

"Steering by the pole star and the moon, Flight Lieutenant Reid then set course for home. He was growing weak from loss of blood. The emergency oxygen supply had given out. With the windscreen shattered, the cold





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THE FLIGHT ENGINEER

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It was made clear to the cadets at the Air-Crew Receiving Centres (ACRC) that the Flight Engineer was, as might be expected, "the member of the crew most concerned with the care and maintenance of the aircraft as a whole".

Needless to say, it was one of the aircrew categories where an individual's "special aptitude" was important. Indeed, the cadets were asked that "if you already have any trade qualifications, so much the better, but do not be discouraged from volunteering because you have no actual experience. If you feel sufficiently interested to want to volunteer you already have the most important qualification."

Flight Sergeant Ed Childs DFM recalled how his mechanical mind helped shape his wartime career: "My father was a builder and as a child in Mill Hill, North London, I used to go to his workshop and make model aircraft from pieces of scrap wood I found." In February 1941, at the age of 18, he volunteered for service in the RAF and was posted to a Maintenance Unit at RAF Lossiemouth. Here he was put to work repairing a variety of aircraft, from Tiger Moths to Spitfires.

"My chance to fly came in late 1942," he continued, "when there was a notice put up seeking volunteers to train as Flight Engineers. I put my name forward, because I thought it might be exciting and because I felt there was a war going on and someone needed to do it."

At the ACRC, Childs would have learnt about the role of a Flight Engineer on an RAF bomber. "When he is not flying," states one Air Ministry briefing, "the Flight Engineer in a squadron is the link between the captain of the aircraft and the ground servicing party. He takes a

close interest in their work; each day he carries out for himself an inspection of a different part of the aircraft, and when the aircraft is being prepared to fly, supervises such work as refuelling, filling oil and coolant tanks and applying de-icing paste to the wings.

"Just before the flight, the flight engineer does an engineering check of the aircraft, both outside and in; then he helps the Pilot to start up and records the gauge readings during the ground test.

"During take-off he operates some of the engine controls, watches to see that engine running limitations are not exceeded and in some cases raises the undercarriage and retracts the flaps on

ABOVE: The Flight Engineer's position in *Just Jane* showing the jump seat that would have been used. (HMP)

BELOW LEFT and RIGHT: The panel on which a Flight Engineer would monitor the various systems on board NX611. The red-painted instruments (see below) are the fuel tank selectors; above them the fuel tank switches – note the guards that are fitted to the switches for the No.3 tanks, these intended to be the last to be selected. The row of dials that include the three that are painted yellow are the oil temperature gauges, whilst below them are the coolant temperature gauges and the row of fuel tank gauges. Above the row of yellow dials are the engine oil pressure gauges. (HMP)



instructions from the Pilot."

Flight Sergeant Ed Childs remembers part of this work: "I would start the engines, and during take-off I would control the throttles once the Pilot needed to put hands on the control column. I had to get the wheels up and trim the flaps."

Once airborne, the Flight Engineer became responsible to his captain for the engines. "He [also] operates such

A FLIGHT ENGINEER IN ACTION

A Flight Engineer in the crew of a 106 Squadron Avro Lancaster, ME669, Sergeant Norman Cyril Jackson, was awarded the Victoria Cross for his actions during a raid on Schweinfurt on 26 April 1944. A supplement to *The London Gazette* of 26 October 1945, No.37324, includes this description of the events that night:

"Bombs were dropped successfully and the aircraft was climbing out of the target area. Suddenly it was attacked by a fighter at about 20,000 feet. The captain took evading action at once, but the enemy secured many hits. A fire started near a petrol tank on the upper surface of the starboard wing, between the fuselage and the inner engine.

"Sergeant Jackson was thrown to the floor during the engagement. Wounds which he received from shell splinters in the right leg and shoulder were probably sustained at that time. Recovering himself, he remarked that he could deal with the fire on the wing and obtained his captain's permission to try to put out the flames.

"Pushing a hand fire-extinguisher into the top of his life-saving jacket and clipping on his parachute pack, Sergeant Jackson jettisoned the escape hatch above the Pilot's head. He then started to climb out of the cockpit and back along the top of the fuselage to the starboard wing. Before he could leave the fuselage his parachute pack opened and the whole canopy and rigging lines spilled into the cockpit.

"Undeterred, Sergeant Jackson continued. The Pilot, Bomb Aimer and Navigator gathered the parachute together and held on to the rigging lines, paying them out as the airman crawled aft. Eventually he slipped and, falling from the fuselage to the starboard wing, grasped an air intake on the leading edge of the wing. He succeeded in clinging on but lost the extinguisher, which was blown away.

"By this time, the fire had spread rapidly and Sergeant Jackson was involved. His face, hands and clothing were severely burnt. Unable to retain his hold he was swept through the flames and over the trailing edge of the wing, dragging his parachute behind. When last seen it was only partly inflated and was burning in a number of places.

Realising that the fire could not be controlled, the captain gave the order to abandon aircraft. Four of the remaining members of the crew landed safely. The captain and Rear Gunner have not been accounted for.

"Sergeant Jackson was unable to control his descent and landed heavily. He sustained a broken ankle, his right eye was closed through burns and his hands were useless. These injuries, together with the wounds received earlier, reduced him to a pitiable state. At daybreak he crawled to the nearest village, where he was taken prisoner. He bore the intense pain and discomfort of the journey to Dulag Luft with magnificent fortitude. After ten months in hospital he made a good recovery, though his hands require further treatment and are only of limited use.

"This airman's attempt to extinguish the fire and save the aircraft and crew from falling into enemy hands was an act of outstanding gallantry. To venture outside, when travelling at 200 miles an hour, at a great height and in intense cold, was an almost incredible feat. Had he succeeded in subduing the flames, there was little or no prospect of his regaining the cockpit. The spilling of his parachute and the risk of grave damage to its canopy reduced his chances of survival to a minimum. By his ready willingness to face these dangers he set an example of self-sacrifice which will ever be remembered."

THE FLIGHT ENGINEER

controls as the air-intake shutters, cooling grills and fuel cocks, and advises the Pilot how to handle the engines to fly the greatest distance for the amount of fuel carried. In his log he records engine conditions and fuel-tank contents, keeping a tally of air miles per gallon. The Flight Engineer also carries a tool kit and a collection of spares so that, if small engineering repairs to the airframe or to engine controls become necessary during flight, he may do them."

An example of how a Flight Engineer's intervention can be so important to a crew's survival is illustrated by the events that befell the crew of Warrant Officer Ron Clark in Lancaster III EE139, *Phantom of the Ruhr*. During a raid to the city of Mannheim on the night of 23/24 September 1943, the bomber was hit by German anti-aircraft fire in the target area. Losing height, they then received the attentions of a German night fighter.

Sergeant Lishman Easby, the Wireless Operator, recalls what happened next: "The aircraft was now vibrating violently and the starboard tail unit was shaking as though it was going to fall away any minute. No one expected we could remain airborne for long and I already had my parachute pack on in readiness to jump.

"Shortly after leaving the target the engineer went aft to examine the damage. He reported the starboard aileron control severed and that the trimmer tab was still connected and causing the vibration. The engineer then severed the aileron trimmer control and the vibration ceased."² Because of the work undertaken by his Flight Engineer, Sergeant Harold "Ben" Bennett, Clark was able to nurse EE139 back to the UK. Running repairs were not the only



emergency roles that some captains expected their Flight Engineers to undertake. "It was almost a Co-Pilot's job," notes Childs, "but there was only one control column. I was sufficiently trained that I could fly the aircraft, but if anything happened to the Pilot it was nigh on impossible to get him out of the seat in all his flying gear. I never heard of one case where anyone got an injured Pilot out of his seat and took over the controls." Childs was also tasked with helping drop the strips of "Window" to confuse German radar.

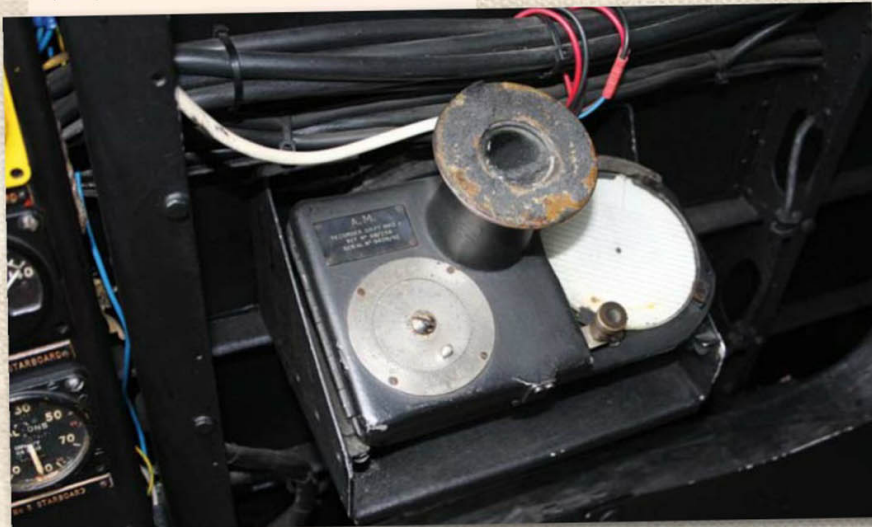
Back at base, the Flight Engineer's last task was to hand his log to the Flight Engineer Leader so that any snags or faults

on his aircraft may be reported to the maintenance staff and put right. This done, his involvement in that particular mission had ended. ■

ABOVE RIGHT: Flying Officer J.B. Burnside, a 619 Squadron Flight Engineer based at RAF Coningsby, checks the settings on the control panel from his seat on board his Avro Lancaster B Mk.III, 14 February 1944. (ww2images)

BELOW: To the immediate right of the Flight Engineer's panel is this piece of equipment – a Recorder, Drift Mk.II. This was a mechanical calculation machine for determining the drift of an aircraft when operating in crosswind conditions. This device has an eyepiece and a prismatic periscope for viewing a distant feature being tracked. (HMP)

RIGHT: Looking forward towards the cockpit of *Just Jane* with the Flight Engineer's position visible in the centre of the picture. (HMP)



NOTES:

1. Interview in *The Telegraph*, 24 October 2008.
2. Quoted in "Close Call For The Phantom", *Aviation Classics*, Volume 1.

THE NAVIGATOR

(Image © B5 Marketing, Tel: 0781 444 8687.)

As the war progressed, the role of the Navigator became an increasingly varied one, his tasks differing from aircraft to aircraft and operation to operation. For this reason, as the cadets arrived at the Air-Crew Receiving Centres they were welcomed by a more general briefing on this aircrew category than they might have expected. Such were the disparities, they were told, "that it isn't easy to give you a clear picture".

"Broadly speaking, [the Navigator's] job is at all times to know the aircraft's position and give the Pilot courses to steer to make good the tracks he plans," continued the advice. "He uses three methods of finding position: map reading; radio-beacon bearings obtained by D/F loop and bearings and fixes – by W/T; and astro observations of the sun, moon or stars.

"Linking these aids with frequent calculations of wind-velocity comprises the business of navigation, which enables him to calculate his speed of travel over the map and the times at which important landmarks, the target, and finally base will be reached."

In an Air Ministry pamphlet published in 1944, it was pointed out that there were four different sub-categories of Navigators, each being specifically trained for the particular job he was expected to undertake.

The first was termed as the "Straight Navigator". These members of aircrew were "destined for heavy

bombers and for Transport Command. Their work in Bomber Command is carried out in close co-operation with the Air Bomber and Wireless Operator (Air)."

The next sub-category was that of Navigator (B). Fully qualified in the roles of Navigator, Air Bomber and emergency Air Gunner, they "fly in Bomber Command medium and light day bombers and in Coastal Command flying boats, general reconnaissance, and torpedo bomber aircraft".

A Navigator (W) was fully qualified both as Navigators and Wireless Operators. The intention was that Navigators in this

category would serve in "Beaufighters of Coastal Command and Mosquitoes of the photographic reconnaissance units."

Lastly there was the Navigator (Radio). These men "are fully qualified Straight Navigators who have been selected for an interest in scientific and technical subjects, which makes them particularly suitable for a special Radio-Operators' course. After

BELOW: Flying Officer P. Ingleby, the Navigator of an Avro Lancaster B Mk.III of 619 Squadron, based at Coningsby in Lincolnshire, pictured working at his chart table in the aircraft. (ww2images)





this course they are posted for special duties in Beaufighter or Mosquito night-fighter and intruder squadrons.”

As a result of these variations, a Navigator in a Beaufighter had to do all the navigation by himself – and often other tasks besides – whilst in a Lancaster he had the Air Bomber and the Wireless Operator to assist him. If conditions were cramped for a Navigator in a big bomber, they were far less accommodating in a Beaufighter, as Flight Sergeant Denis Innell Humphrey discovered during his training prior to being posted to Lancasters and 218 Squadron:

“One sat at the navigation table which was probably fourteen inches by twenty-two, and that was on a flapped up hinge. When it was lifted up you fixed it with a hook on the side of the aeroplane and that held it up whilst you turned your seat round. But when you had turned your seat round you were faced with the radio – the transmitter and receiver. That had to be pulled out on a swivel and clicked into position. When you had got that in position you could start sending messages.”¹

In a Lancaster, the Navigator sat at a chart table facing to the port (left) of the aircraft and directly behind the Pilot and Flight Engineer. His instrument panel, mounted on the side of the fuselage above the chart table, included repeaters of instruments such as the altimeter, airspeed indicator and compass and other details required for navigation. In the early years of the war such instruments as a sextant or astrolabe were also carried on an aircraft. A curtain, separating his position from the rest of the cockpit, was provided so that he could use light to work – a lamp being part of the equipment at his position.

By the winter of 1943/1944, a Bomber Command navigator had two vital pieces

ABOVE LEFT: A general view of the Navigator's position in a Lancaster clearly showing the map reading table. (Courtesy of Mark Khan)

ABOVE: A close up some of the Navigator's instruments. The chart board lamp can easily be seen. The two dials on the panel directly in front of the Navigator, seen here by the lamp, are the air speed indicator (left) and altimeter (right).

ABOVE RIGHT: A close up of the Navigator's Air Position Indicator – a very early mechanical type of GPS equipment.

BELOW: A close-up of the Ground Position Indicator. An ingenious device, it used various mechanical inputs from the aircraft to show the 'plane's approximate position by projecting it as a light image on a map on the Navigator's table.

of equipment to assist him and his crew – Gee and the H2S radar system.

Gee was the code-name given to the radio-pulse navigation system that was first used operationally on the night of

with an accuracy of two miles, which, however, could be bettered by a first class operator”. Such was the importance of Gee, that a non-working Gee set would ground an aircraft. The Gee indicator unit was usually positioned on the left-hand side of the Navigator's chart table in a Lancaster.

Used for the first time on 30 January 1943, H2S was the world's first airborne, ground scanning radar system. It is described by the historian Max Hastings as “one of the decisive technological breakthroughs of the war”.² Self-contained within an aircraft, H2S required no reference to ground stations.

One wartime Navigator, Group Captain Eric Crooper, described how the system worked: “A rotating scanner fitted beneath the aircraft transmitted a beam of radar energy at centimetric wavelengths (very short waves); this energy, meeting the land or sea surface below, was reflected back to a receiver in the aircraft ... There would be few reflections from a

smooth surface (the sea), varying reflections from a rough surface (the land), and intense reflections from a large collection of buildings (towns and cities). Thus a shadowy map of the terrain below, showing coastlines and towns, was built up on the screen.”³

In a Lancaster, the H2S indicator unit was commonly located on a frame to the right hand side of the Navigator's chart table. The H2S radar transmitter and scanner assemblies were mounted in the fuselage floor to the rear of the crew positions. ■



8/9 March 1942 when a force of about 200 aircraft attacked Essen. Using this equipment, a Navigator could fix the position of his aircraft by reference to three transmitting stations in Britain. An article in *Flight* in 1945 stated that through the use of Gee an aircraft could be guided “to its target in Germany

NOTES:

1. “Navigating War: Memories of a Lancaster Navigator”, quoted on WW2 People's War website: www.bbc.co.uk/history/ww2peopleswar
2. Max Hastings, *Bomber Command* (Pan, London, 1981), p.211.
3. Group Captain Eric Crooper, *Back Bearings: A Navigator's Tale 1942 to 1974* (Pen & Sword, Barnsley, 2010), p.30.



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THE AIR BOMBER

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THE AIR BOMBER



At the beginning of the war it was the Observer in a bomber's crew who was expected to do the Air Bomber's duties – as well as those of Navigator. However, as aircraft development continued and bomber crews were reorganized, a separate bomb aiming position was created, allowing the Navigator to concentrate more on his main duties, tasks that were vital to the success of any mission – the role of the Observer was officially split into the two new functions in spring of 1942.

By 1944, the Air Bomber, more

ABOVE: The Air Bomber's position in the nose of *Just Jane*. In the centre is the bomb sight; to the immediate right of this is the bomb allocation and distribution panel used to fuze each of the sixteen bomb stations separately and determine which order the bombs dropped from the bomb bay. In the left foreground is the bombsight computer. (HMP)

RIGHT: The Mk.XIV bombsight fitted to *Just Jane*. The Mk.XIV required only ten seconds of straight flight before the drop, and could account for shallow climbs and dives. (HMP)

BELOW LEFT: The T-1A bombsight computer, a US-built version of the Mk.XIVA bombsight computer, fitted to *Just Jane*. (HMP)

BELOW RIGHT: Located to the Air Bomber's right, just below the bomb allocation and distribution panel, these switches were used to select the Lancaster's camera and flash before bombing. When the bomb release button was pressed, the photo-flash bomb was also released from the aircraft's flare chute, this being set to ignite at a predefined altitude. The camera mechanism was activated eight seconds before the flash was due to explode. (HMP)

commonly referred to as the Bomb Aimer, had "such varied duties that his is one of the most interesting jobs in a squadron". As his name implies, his main responsibility was the actual bombing of the target; the Navigator brought the aircraft to the target area, at which point the Air Bomber took over to direct the pilot over the target, identify the aiming point and bomb it.

The Air Bomber also had "other work to do during the rest of the trip; throughout the whole flight he acts as the eyes of the Navigator, map reading whenever possible and taking astro-sights, noting the weather and sometimes operating special wireless equipment. He is an essential member of the navigation team and all his reports are entered in the Navigator's log or on the plotting chart ...

"He may have to help the pilot by taking spells at flying the aircraft straight and level on a course, if no Flight Engineer is carried on that particular type. Thus the Air Bomber needs special knowledge and skill in many subjects: the characteristics of bombs and ammunition, the theory and practice of bomb-sighting and aiming,

and of air gunnery, the principles of DR navigation rules of thumb for taking astro-sights, map reading, aircraft recognition, pyrotechnics, reconnaissance, signals and photography. His training is a long one, but it is full of varied interests."

Once airborne – the Air Bomber sometimes positioned himself at the crew's rest bed for safety during take-off or landing (used for injured or sick air crew, this was located on the port side between the Lancaster's forward and aft main wing spars) – the Air Bomber filled the time undertaking his secondary duties. Three miles from the target, however, he would take over from the Navigator in order to direct the Pilot towards the aiming position, normally marked by target indicator flares. In late production Lancasters the Air Bomber could even steer the aircraft himself, having controls linked to the rudder and ailerons via the automatic pilot mechanism.

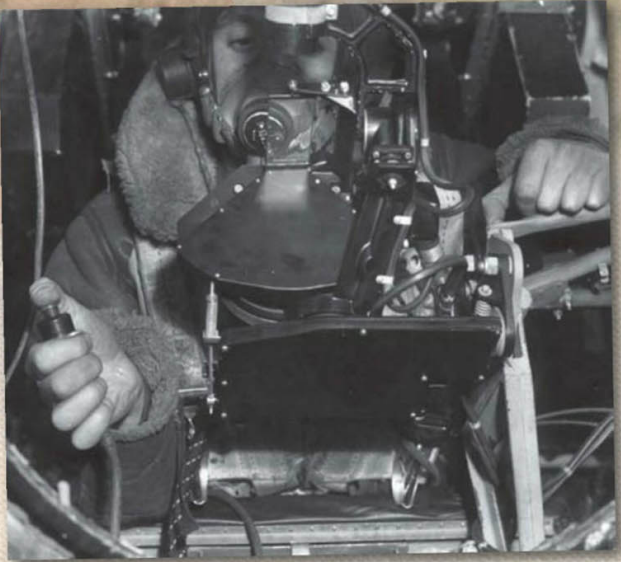
Lying prone, his chest propped on an adjustable support, during the hazardous thirty seconds run-in to the target the Bomb Aimer would give a running commentary to the rest of the crew as he had a clear view forwards and downwards



through his optically flat aiming panel. Beneath him was the forward escape hatch, which would also be used by the Flight Engineer and the Pilot.

Considering that the bombs were often released at altitudes between 18,000 and 28,000 feet, from an aircraft moving at anything up to 380 mph, obtaining a high level of accuracy was a considerable





ABOVE LEFT: The Air Bomber of a 619 Squadron Avro Lancaster B Mk.III, Flight Lieutenant P. Walmsley was photographed operating a Mk.XIV Stabilised Vector Bombsight on 14 February 1944. The main design feature of the Mk.XIV was that it gave the Air Bomber more time to work on the problem of bringing the aircraft to the proper location to drop the bombs. As the calculations of this location were being carried out automatically, he could concentrate solely on the sight throughout the bomb run. (ww2images)

ABOVE RIGHT: Looking up from the Air Bomber's position into the nose turret on *Just Jane*. To man the Frazer Nash FN-5A nose turret, the Air Bomber simply had to stand up and squeeze himself into position behind the twin .303-inch machine-guns. (HMP)

BELOW LEFT: Located on the left hand side of the turret, this is the locking switch that prevents any unwanted movement. (HMP)

BELOW RIGHT: The right hand of the two machine-guns in the nose turret. The nose turret was the least used of the defensive armament on a Lancaster. One exception is provided by Flight Lieutenant William Abercromby DFC who noted the following as his 50 Squadron aircraft, Lancaster R5733, was returning from a mission to Stuttgart in November 1942: "All the three gunners shot up a goods train E. of Paris ... but as the train was going in the opposite direction it is not confirmed whether the train was stopped or not. A motor car was also shot up in this area, resulting in a slight explosion from the car." (HMP)

computational task. These variables were further complicated by the wind over the target, known as drift, and the make-up of the bomb-load itself, different bombs having different aerodynamics. To assist the Air Bomber in this task, the accuracy of bomb-sights improved during the course of the war, culminating in the SABS bombsight of 1944, an incredibly accurate semi-computerised device.

Wing Commander John Bell MBE, DFC, recalled the Lancaster's bombsight: "The [bombsight] used an analogue 'computer' to calculate the trajectory of the bombs from data input by the Bomb Aimer, such as course, altitude, indicated airspeed, wind speed/direction and type of bomb. The bombs could also be fuzed and dropped in specific order using another control panel.

"Basically you had a sighting head with a graticule that displayed

a cross rather like a crucifix, which you kept superimposed on the target until the release point. You would have previously selected the sequence of bomb release on the adjacent control panel, as you'd generally have a mixture of HE and incendiary"¹

The War Correspondent Major Anthony Cotterell accompanied a Lancaster crew on a mission to Frankfurt. He would later publish an account of what he witnessed, and in this he described the work of the crew's Air Bomber – who just happened to be John Bell.

"The Pilot and Navigator were keeping up a running dialogue on how the time was going for the approach to the target. Apparently we were a minute or two early, so we had to lose that amount of time. It was pretty impressive, if the word isn't too banal, to hear the young men talking about losing a minute or two while passing through this firework display.

"I hadn't much idea of what was going on. I didn't know whether we were running up to the target or still cruising round, and I didn't want to disturb the crew in any way ... But presently, I realised that we were running up. 'Get weaving, Skipper, the night's too long,' said someone. 'I can't see that river', said Knights [Flight Lieutenant Bob Knights – the pilot]."²

At this point, the Air Bomber, John Bell, called over the intercom that the aircraft's bomb doors were open.

"Approaching the target the Bomb Aimer reports every indication of a position to the Navigator," continued Cotterell. "When the Navigator judges the aircraft to be over the target area the Bomb Aimer guides the aircraft through the flak until he sees the target in the bomb-sight ...

"By staring around the engineer's

shoulder I could see the Bomb Aimer preparing to press the button which would release another 4,000lbs on to the town.

"The incendiaries were dropped first and then the 4,000lb cookie. Just beforehand there was an appreciable tenseness of the crew. The Pilot, of course, had to keep the aircraft flying as level as possible for the bombing run. He turned and half rose from his seat as if he was willing the aircraft to a supreme effort. I tried to write down the dialogue between Pilot and Bomb Aimer, but it was too fast for my hobbling shorthand ...

"I did not feel any appreciable lightness of the aircraft when 'bombs away' was announced. All I knew was that the dialogue of 'Steady', 'Hold her steady', 'O.K. Bob [Knights]', 'O.K. Bomb Aimer', and the sing-song intonation of members just before the dropping, subsided.

"When the bombs drop the Navigator logs the time, heading of the aircraft, speed and height. These particulars enable Intelligence to plot where the bomb has fallen. Knights asked the Bomb Aimer if he thought they had obtained a satisfactory picture; the Bomb Aimer thought he had. They were all professionally satisfied with the delivery of the bomb."

With the most important part of his work done, all that now remained was for the Air Bomber to help get his aircraft and colleagues safely back to base, taking up position in the nose turret or assisting in navigation. ■

NOTES:

1. "Blockhouse Buster", *FlyPast*, October 2010, p.50.
2. "Frankfurt Revisited", *War*, No.62, Army Bureau of Current Affairs, 22 January 1944.



THE WIRELESS OPERATOR

(Image © BS Marketing, Tel: 0781 444 8687.)

Located in the cramped fuselage space above the Lancaster's bomb bay is the Wireless Operator's position, the communication hub of the aircraft.

"The Wireless Operator is the communication specialist of the air crew," ran the words of the briefing given to the aircrew cadets upon their arrival at the Air-Crew Receiving Centres. "His chief job is to keep his aircraft constantly in touch with the ground by sending and receiving all information, reports and orders vital to the success of the sortie and the safety of the aircraft.

"In addition, he usually has various radio aids to operate so that the other members of the crew may get information necessary for their work; one for supplying the navigator with bearings and fixes, and another for enabling a pilot to descend through cloud to an airfield are two examples. So, far from sitting quietly at a set occasionally sending or receiving a message, the wireless operator is a busy man.

"Nor are his duties confined to the wireless side. He is a member of a fighting crew as well as a communication specialist, so he will learn to use guns and to shoot. In some aircraft he takes

watches in a turret as well as at his sets, in others he only mans a gun position in emergency. The gunnery training he gets varies for the aircraft in which he is going to fly on operations. But whatever type of squadron the Wireless Operator goes to, he has much to learn and the training for his responsible work cannot take less than a year."

Warrant Officer Douglas Radcliffe MBE completed a full operational tour as a Wireless Operator, flying in

Wellingtons with 425 Squadron. "As a Wireless Operator my job was to receive messages," he recalled. "The only time you transmitted was if it was an SOS. Your main job was as the liaison officer in the aircraft. Every fifteen minutes there would be a coded transmission from base which might be information to help the Navigator, or you might be told that an airfield had been put out of action and you had to land somewhere else. You could also tune in to beacons which



RIGHT: The Wireless Operator's position in *Just Jane*. Note the top of the front wing spar in the foreground. (HMP)



Twenty-four-year-old Flight Sergeant George Thompson was the Wireless Operator in a 9 Squadron Lancaster, PD377, that was part of a force detailed to undertake a daylight attack on the Dortmund-Ems Canal on 1 January 1945. For his actions that day Thompson was subsequently awarded a posthumous Victoria Cross. The announcement of his award gave this description:

"The bombs had just been released when a heavy shell hit the aircraft in front of the mid-upper turret. Fire broke out and dense smoke filled the fuselage. The nose of the aircraft was then hit and an inrush of air, clearing the smoke, revealed a scene of utter devastation. Most of the Perspex screen of the nose compartment had been shot away, gaping holes had been torn in the canopy above the Pilot's head, the inter-communication wiring was severed, and there was a large hole in the floor of the aircraft. Bedding and other equipment were badly damaged or alight; one engine was on fire.

"Flight Sergeant Thompson saw that the gunner was unconscious in the blazing mid-upper turret. Without hesitation he went down the fuselage into the fire and the exploding ammunition. He pulled the gunner from his turret and, edging his way round the hole in the floor, carried him away from the flames. With his bare hands, he extinguished the gunner's burning clothing. He himself sustained

transmitted signals to help locate your position, and I would also keep checking the Rear Gunner to make sure he was alright.

"They always said you could tell a Wireless Operator by looking at his boots – the heating duct for the cockpit came out by my left foot, and it would partly melt the rubber sole of your boot. It meant I was always roasting, while the Rear Gunner would be freezing."



serious burns on his face, hands and legs.

"Flight Sergeant Thompson then noticed that the rear gun turret was also on fire. Despite his own severe injuries he moved painfully to the rear of the fuselage where he found the Rear Gunner with his clothing alight, overcome by flames and fumes. A second time Flight Sergeant Thompson braved the flames.

ABOVE LEFT: The Transmitter Type T1154 (top) and Receiver Type R1155 (bottom) were originally designed to provide long-range, high-frequency radio communications and navigation facilities for British bomber aircraft in the Second World War. The equipment was also installed in RAF Air-Sea Rescue launches, used in ground stations and in some ground radio vehicles. (HMP)

ABOVE RIGHT: The view out of the Wireless Operator's window in *Just Jane*. (HMP)

BELOW: Flying Officer R.W. Stewart, a Wireless Operator on board an Avro Lancaster B Mk.I of 57 Squadron based at Scampton, Lincolnshire, speaking to the pilot from his position in front of the Marconi TR 1154/55 transmitter/receiver set. (ww2images)





With great difficulty he extricated the helpless gunner and carried him clear. Again, he used his bare hands, already burnt, to beat out flames on a comrade's clothing.

"Flight Sergeant Thompson, by now almost exhausted, felt that his duty was not yet done. He must report the fate of the crew to the captain. He made the perilous journey back through the burning fuselage, clinging to the sides with his burnt hands to get across the hole in the floor. The flow of cold air caused him intense pain and frost-bite developed. So pitiful was his condition that his captain failed to recognise him. Still, his only concern was for the two gunners he had

ABOVE: The Wireless Operator's Type F Morse key – often referred to as the "bathtub key" because of its distinctive shape. The base of the actual transmitting button is shrouded in a leather diaphragm and together with the totally enclosed Bakelite case prevented the key from igniting mixtures of fuel vapour and oxygen. The case was also designed to be weatherproof for use in open-cockpit 'planes and in rescue launches. (HMP)

BELOW LEFT: For reception of communications signals, the Lancaster's receiver could be operated with either fixed or trailing aerials. A fixed aerial was normally used for the HF ranges, whilst the trailing aerial for airborne installations on the MF ranges. The trailing antenna mount on *Just Jane*, seen here, is located just below the leading wing edge on the port side of the Lancaster. (HMP)

BELOW RIGHT: The view looking down the fuselage of *Just Jane* towards the cockpit. In the foreground is the front wing spar, fitted to which are the emergency air blow-down bottles for the aircraft's flaps and undercarriage. The Wireless Operator's position is just beyond. (HMP)



ABOVE and (1): Located to the left of the Wireless Operator is the Type A1134 crew intercommunication amplifier. (HMP)

(2): Part of the controls for the Transmitter Type T1154 and Receiver Type R1155 sets. (HMP)

(3): Just behind the Wireless Operator's seat, situated high on the port side of the fuselage, is the Lancaster's hydraulic tank, filter and automatic cut-out valve. (HMP)

(4): The electrical distribution panel is situated on the starboard side of the Lancaster, forward of the rear wing spar and to the right of the Wireless Operator. (HMP)

left in the rear of the aircraft. He was given such attention as was possible until a crash-landing was made some forty minutes later.

"When the aircraft was hit, Flight Sergeant Thompson might have devoted his efforts to quelling the fire and so have contributed to his own safety. He preferred to go through the fire to succour his comrades. He knew that he would then be in no position to hear or heed any order which might be given to abandon the aircraft. He hazarded his own life in order to save the lives of others. Young in years and experience, his actions were those of a veteran.

"Three weeks later Flight Sergeant Thompson died of his injuries. One of the gunners unfortunately also died, but the other owes his life to the superb gallantry of Flight Sergeant Thompson, whose signal courage and self-sacrifice will ever be an inspiration to the Service."² ■

NOTE:

1. Quoted in the *Daily Telegraph*, 24 October 2008.
2. Supplement to *The London Gazette* of Tuesday, 20 February 1945.



1



2



3



4

BAW 400TX

2

BAW 400TX

3

1A

BAW

3.5mm

2A

BAW

3.5mm

3A

BAW

3.5mm

4A

BAW

3.5mm

THE AIR GUNNERS

(Image © B5 Marketing. Tel: 0781 444 8687. See inside back cover for more information)

During operations, the Air Gunners' positions in a Bomber Command aircraft were the coldest, loneliest, places in the 'plane.

Whereas other crewmembers enjoyed a degree of comfort through the proximity of their colleagues in the forward section of the aircraft, the Mid-Upper Gunner spent the flight suspended in an uncomfortable canvas sling seat, his lower body in the draughty fuselage and his head and shoulders in the Plexiglas dome.

The Rear Gunner was even more isolated from his fellow crewmembers and any heating system. Squeezed into the cramped confines of their turret, and subject to the most violent movements of the aircraft, the Rear Gunner had so little leg space that some men had to place their flying boots into the turret before climbing in.

"An efficient Air Gunner must have four main attributes", cadets were informed at the Air-Crew Receiving Centres. "First, a gift for rapid and accurate brain-hand-eye co-ordination; for in a matter of seconds he must be able to recognize an enemy

aircraft, estimate its range by knowing its span and comparing it with the size of his ring-sight, judge the position of the enemy in relation to his own aircraft, apply the simple rules of aiming, manoeuvre the turret to bring the guns to bear, and fire to hit the enemy.

"Second, he must be really fit, and have marked determination and fighting spirit. Third, he must be able to keep calm and talk clearly to the captain when his aircraft is in action. Fourth, he requires some mechanical aptitude for reasoning out, under difficult conditions, the causes of gun and turret faults and for rectifying them quickly.

"The task of the bomber aircraft in which he is most likely to serve is to hit its target with bombs. During flight, the Air Gunner is the eyes and the sting of the aircraft. His watchfulness must give the Pilot warning of approaching enemy aircraft, he tells the Pilot what tactics to adopt to evade action; and if combat does develop, his skill in destroying or driving off the enemy determines the outcome of the sortie."

In many ways, the primary role of the Air Gunner was not to shoot down enemy aircraft. The eyes of an alert, professional Air Gunner were the salvation of many a bomber crew, and the chilling cry of "Corkscrew starboard, GO!" as the gunner opened fire on a German night fighter bearing down on them caused an instinctive and immediate violent reaction in any Bomber Command Pilot.

Pilot Officer Andrew Charles Mynarski was the Mid-Upper Gunner of a Lancaster detailed to bomb a target at Cambrai in France on the night of 12 June 1944. During the flight, his aircraft was attacked from below and astern by an enemy fighter.

"As an immediate result of the attack, both port engines failed. Fire broke out between the mid-upper turret and the rear turret, as well as in the port wing. The flames soon became fierce and the captain ordered the crew to abandon the aircraft.

"Pilot Officer Mynarski left his turret and went towards the escape hatch. He



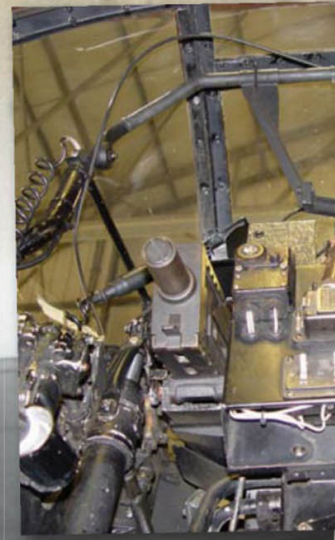
then saw that the Rear Gunner [Pilot Officer Pat Brophy] was still in his turret and apparently unable to leave it. The turret was in fact immovable, since the hydraulic gear had been put out of action when the port engines failed, and the manual gear had been broken by the gunner in his attempt to escape.

"Without hesitation, Pilot Officer Mynarski made his way through the flames in an endeavour to reach the rear turret and release the gunner. Whilst so

RIGHT: The Nash & Thompson FN-50 mid-upper turret on the Battle of Britain Memorial Flight's Avro Lancaster, PA474. We have used this example for the reason that *Just Jane* is not currently fitted with a mid-upper turret – though one is present at East Kirkby and undergoing restoration. As built, NX611 should have been equipped with a Martin 250CE turret, though a number of "interim" Mk.VIIs were fitted with Fraser Nash turrets due to a lack of Martin examples. One of the "taboo arms" can be seen to the left of the turret. Running on a track fitted to the fairing around the turret, these were a safety mechanism that protected the tail unit from damage during firing. (Courtesy of Mark Khan)



THE AIR GUNNERS



ABOVE: A Mid-Upper Gunner sits in his turret on a 630 Squadron Lancaster, LM287 LE-O, at East Kirkby in August 1944. (ww2images)

BELOW LEFT: Looking down in to the foot well of the rear turret, a view that shows how little space there was for a fully-clothed operational Rear Gunner. (HMP)

BELOW RIGHT: A close-up of the control handles and triggers in *Just Jane's* FN-82 turret. (HMP)

doing, his parachute and his clothing, up to the waist, were set on fire. All his efforts to move the turret and free the gunner were in vain. Eventually the Rear Gunner clearly indicated to him that there was nothing more he could do and that he should try to save his own life.

"Pilot Officer Mynarski reluctantly went back through the flames to the escape hatch. There, as a last gesture to the trapped gunner, he turned towards him, stood to attention in his flaming clothing and saluted, before he jumped out of the aircraft. Pilot Officer Mynarski's descent was seen by French people on the ground. Both his parachute and clothing were on fire. He was found eventually by the French, but was so severely burnt that he died from his injuries."

The Rear Gunner had a miraculous escape when the aircraft crashed. He subsequently testified that, had Pilot Officer Mynarski not attempted to save

his comrade's life, he could have left the aircraft in safety and would, doubtless, have escaped death.

"Pilot Officer Mynarski must have been fully aware that in trying to free the Rear Gunner he was almost certain to lose his own life. Despite this, with outstanding courage and complete disregard for his own safety, he went to the rescue."¹

A similar tale of remarkable courage and bravery is that surrounding Flight Sergeant Norman Francis Williams CGM, DFM & Bar – an Australian Rear Gunner who became the RAAF's most highly decorated NCO of the Second World War. Despite the fact that Williams had once told a reporter that life on an RAF bomber station was "one long holiday", and that he did nothing "but sit around all day with my feet up", his actions during one raid on Düsseldorf in June 1943 tell a different story.

Having completed a tour, during which he was awarded two Distinguished Flying Medals, Williams had volunteered for service with the Pathfinders, being posted to 35 Squadron. The announcement of his award of the Conspicuous Gallantry Medal (Flying) in a supplement to *The London Gazette* of 6 July 1943, provides the following account:

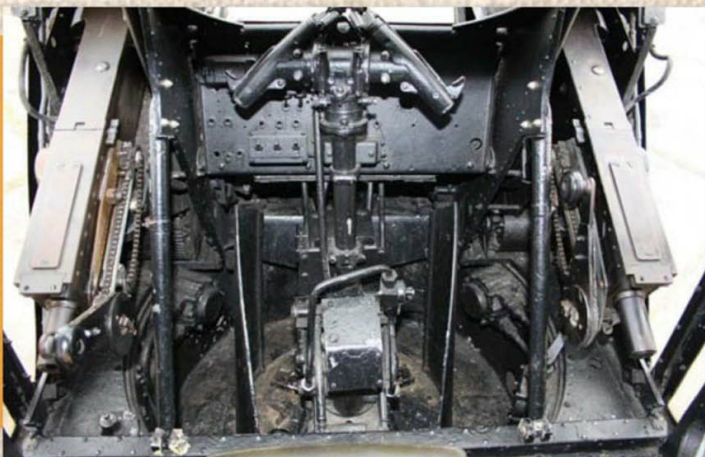
"One night in June, 1943, this airman was the Rear Gunner of an aircraft detailed to attack Dusseldorf.

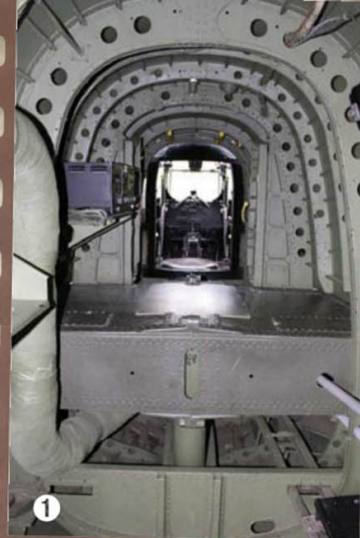
During the operation, the bomber was intercepted by 2 enemy fighters. In the first encounter, Flight Sergeant Williams' turret was rendered unserviceable, while he sustained several bullet wounds in the legs and body. Nevertheless, when the second fighter attacked Flight Sergeant Williams skilfully gave his captain directions which enabled the fighter to be evaded. Flight Sergeant Williams then delivered an accurate burst of fire which caused the enemy aircraft to explode in the air.

"The first fighter resumed the attack but, although in considerable pain, with both legs partially paralysed, Flight Sergeant Williams, with a well-placed burst of fire from close range, shot the enemy aircraft down. Making light of his injuries he remained in his damaged turret until a landing was effected, when his turret had to be cut away before he could be extricated."

Williams later said that he had been informed that had he not survived he would have been awarded the Victoria Cross. The rest of his crew also presented Williams with his turret door, which, once removed from the aircraft, was found to contain thirty-seven bullet holes.

Another example of how the Air Gunners were such a vital member of a bomber's crew is provided by the announcement of the award of the





Distinguished Flying Medal to Sergeant James Mills McKay Williams RCAF. A Rear Gunner, Williams served on Handley Page Halifaxes with 77 Squadron.

"One night in May, 1943, Sergeant Williams ... took part in an attack on Dusseldorf. During the bombing run over the target the bomber was twice attacked by a Junkers 88. Violent evasive action was taken and the aircraft went out of control, but control was regained and course set for base after height of some 5,000 feet had been lost.

"Later Sergeant Williams sighted 2 Messerschmitt 109s flying a parallel course with the bomber, one on the port side and the other on the starboard side, and he gave avoiding directions to his captain. As the bomber was turned Sergeant Williams sighted a third enemy fighter climbing to attack. He brought his guns to bear on the attacker and with a short and well directed burst of fire caused the enemy aircraft to break away emitting smoke and flames. The remaining enemy aircraft did not then attack."

Despite such graphic accounts as these, many Air Gunners completed their service without firing a round in anger; the only sounds he heard for hours on end, aside from the constant deafening roar of the engines, might be the hiss of the oxygen and the occasional crackling, distorted voices of other crewmembers in his earphones. However, even without pulling the triggers to tackle the enemy, the pressure and stress created by maintaining that all-important vigil for hour after hour – so vital to the safe return of him and his crew – was always there. ■

ABOVE LEFT: The interior of PA474's mid-upper turret. The Nash & Thompson FN-50 was fitted with two .303-inch Browning machine-guns, each supplied with 1,000 rounds of ammunition. To gain access to his position, the Mid-Upper Gunner used a step that was stowed on the interior of the fuselage when not in use. (Courtesy of Mark Khan)

ABOVE: The folding internal compartment doors that shut off the Rear Gunner's position from the rest of the Lancaster. In the case of *Just Jane*, the top part of the doors, which would have fully sealed the opening, are missing. (HMP)

(1): Looking down the fuselage of *Just Jane* towards the rear turret. Note the elevator and rudder control rods in the bottom right foreground. The Elsan chemical lavatory would have been situated in front of the rear wing spar seen here. (HMP)

(2): The Nash & Thompson FN-82 turret fitted on *Just Jane*. The Rear Gunner would have stowed his parachute in a rack fixed to the fuselage just out of view to the left. Equipped with a pair of 0.5-inch Browning machine-guns, the FN-82 turrets were fitted to late-model Lancasters. (HMP)

(3): One of the two sliding doors of the FN-82 turret, with a fire-axe in situ, that prevented the gunner from falling out when the turret was being rotated. (HMP)

(4): The interior of the FN-82 turret. The gun sight is supported in front of the gunner's face by the sight radius arm, sometimes referred to as the sight support arm. (HMP)

BELOW LEFT: The left-hand 0.5-inch Browning machine-gun. (HMP)

BELOW: An exterior view of *Just Jane's* rear turret. (HMP)

NOTE:

1. Second Supplement to *The London Gazette*, No.37754, 8 October 1946.

