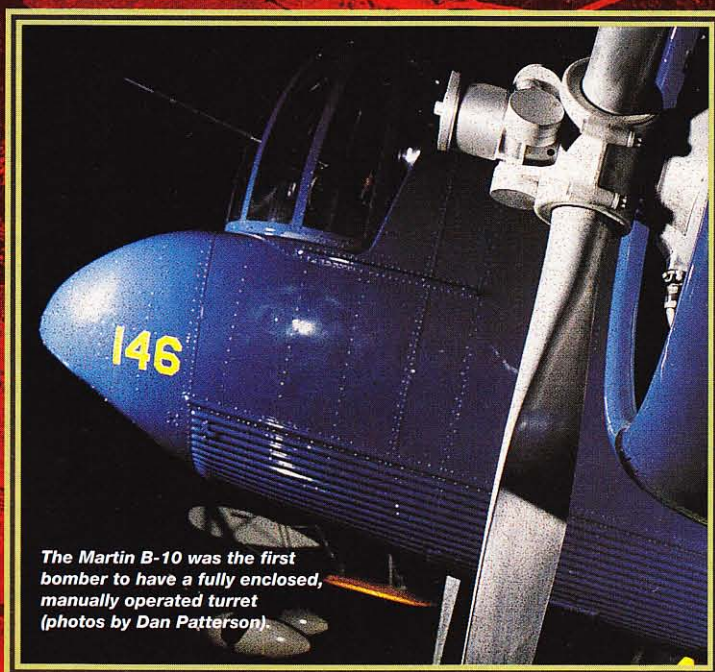


BOMBER DEFENSE

THE MYTH & REALITY



The Martin B-10 was the first bomber to have a fully enclosed, manually operated turret (photos by Dan Patterson).

The introduction of the Martin B-10 in 1932 revolutionized bomber development. It was the most modern in the world and set the pattern for everything that followed. This all-metal monoplane had retractable landing gear, variable-pitch airscrews and the first fully enclosed, manually operated turret. Armed with a single .30-caliber machine gun, this turret measured 36 inches in diameter and was 35 inches high. The turret's welded-steel framework was sheathed in "plastacelle" sections. The open slot for the machine gun proved to be a major drawback: gale-force winds roared into the turret and forced the gunner/bombardier to wear goggles at all times.

BY DONALD NIJBOER



Described as “uncomfortable” and incapable of covering a stipulated field of fire, this turret set the stage for the more advanced powered turrets that followed. The B-10 was not only a quantum leap for bomber aircraft, but it also showed how inadequate existing fighters really were because it was faster and more capable of defensive fire. This helped foster the idea that the bomber did not need a fighter escort and that any large bomber formation could defend itself. This idea held well into 1943 when the Americans were the last to learn a very harsh lesson.

New bombers such as the B-10 and the Boulton Paul Overstrand began a trend that led to the development and, ultimately, the widespread use of the powered turret in WW II. In Britain, companies such as Boulton Paul, Nash & Thompson and Bristol began to design the enclosed, powered turret, and the first powered turret to see RAF service was a Boulton Paul design. In 1935, 101 Squadron was the first to be equipped with twin-engine Overstrands armed with a nose-mounted powered turret. The turret was a great success, but it was not perfect. Its slow rotation and the use of compressed air to move it limited its use. These problems were solved by adapting a system developed by French engineer de Boysson of the *Societe d'Applications des Machines Motrices*; he had built a turret that combined electrics and hydraulics. The self-contained hydraulic generator was powered by an electric motor that was confined to the turret's rotating portion. This was a great breakthrough. This self-contained unit provided the gunner with a comfortable seat and sealed gun apertures that didn't allow the cold slipstream to blast through. In addition, the turret rotated smoothly and with easy-to-control precision. Surprisingly, neither the French government nor the French aircraft industry was interested in the design. The British, however, were more than happy to acquire the license for the turret's development and quickly instructed companies to produce competitive designs. Powered turrets

were from Bristol, Nash & Thompson and Boulton Paul were soon standard equipment on British bombers.

In 1934, Gianni Caproni, the Italian aeronautical engineer, developed and built upper and lower turrets for the Caproni Ca.89. They were at first manually operated, but by 1937, turrets in most Italian bombers were powered.

Surprisingly, Germany's rearmament program did not include powered turrets. Even with major advances in airframe and powerplant development, German bomber armament centered on the hand-held machine gun. It was believed that a bomber's speed and hand-held guns could defeat any fighter attack. In the

United States, turret development was practically nonexistent before 1939. Even the famous Boeing B-17 was not equipped with turrets. The prevailing attitude was that turrets were “too heavy and complicated.”

Royal Air Force

When war broke out in 1939, the Royal Air Force had the only strategic bomber force equipped with the world's most advanced powered turrets. As impressive as that might sound, only five squadrons of Vickers Wellingtons and nine squadrons of Armstrong Whitworth Whitleys—all with Frazer-Nash nose and tail turrets—were available for combat. The rest of Bomber Command was equipped with 15 squadrons of the obsolete Fairey Battle, eight with the Bristol Blenheim and six with the Handley Page Hampden.

When the Bristol Blenheim first appeared in the summer of 1937, it caused much excitement. Its modern,



The Frazer-Nash nose turret of a Vickers Wellington.



Initially, the Bristol Blenheim had a Bristol Type B.1. powered turret that was armed with a single Lewis machine gun. This turret armament was later changed to incorporate two Browning .303-caliber machine guns.

streamlined looks and impressive speed convinced many that the RAF was armed with the world's most advanced bomber. But after wartime equipment and a Bristol top turret had been installed, the Blenheim's performance was mediocre at best. Armed with one wing-mounted .303-caliber machine gun and a Bristol Type B.I. powered turret with a single Lewis gun that required constant magazine changes, the Blenheim was no match for the cannon-armed Luftwaffe fighters. Flying Officer Doug Sample, 415 Squadron, RAF, describes the Bristol turret:

The Bollingbroke [Canadian-manufactured Blenheim] was equipped with a Bristol turret, and I found that its movement was somewhat jerky. I didn't think it was a very good turret compared with the others we trained on during turret manipulation.

In the heavy-bomber category, the RAF was equipped with the Handley Page Hampden, the Armstrong Whitworth Whitley and the Vickers-Armstrong Wellington.

When the Wellington I entered service, it was armed with two Vickers turrets, each equipped with a single Lewis gun, but the turret was not popular. Although very roomy, it had poor sighting and gun control. Subsequent marques were armed with the more advanced and reliable Frazer-Nash FN5 front turret and FN20 four-gun rear turret that had Browning .303-caliber machine guns.

Bomber Command's premier bomber was the Avro Lancaster—a true heavyweight. The Lancaster's original armament included 10, .303-caliber

The Avro Lancaster's Frazer-Nash FN50 mid-upper turret had two .303-caliber machine guns, and its FN20 tail turret had four.

American bomber turrets were equipped with twin Browning .50-caliber machine guns. British gunners preferred the Canadian-built Lancasters because their turrets were armed with the heavy-hitting .50s as opposed to the lightweight .303s of the British-built Lances.

The Blenheim also had a single .303-caliber machine gun mounted in the port wing.

machine guns. They were mounted in four powered Frazer-Nash turrets—two in the FN5 nose turret, two in the FN50 mid-upper, two in the FN64 mid-under and four in the FN20 tail turret. The FN64 mid-under did not see widespread use, and only four squadrons were equipped with this turret.

Sighting was done with a periscopic sight, but there was no solution for the sight's intrinsic flaw: its limited field of view prevented the bombardier from rapidly acquiring a target. As a result, the FN64 was never installed on production aircraft. The Canadian-built Lancaster was equipped with a Martin mid-upper turret armed with two .50-caliber Browning machine guns. The armament on

British bombers was always considered light. Warrant Officer 2nd Class Fred Vincent describes his frustration with the rifle-caliber machine guns:

I fired my guns four times at what I thought were German fighters. I put bullets right through them, but nothing happened. That's the

way it appeared to me. My bullets were ineffective because of the range and because the German night fighters were armed with cannons. They could outgun us every time. It became a game of who saw whom first, and it was certainly demoralizing to have four guns, each shooting 1,100 rounds a minute and still not be effective.

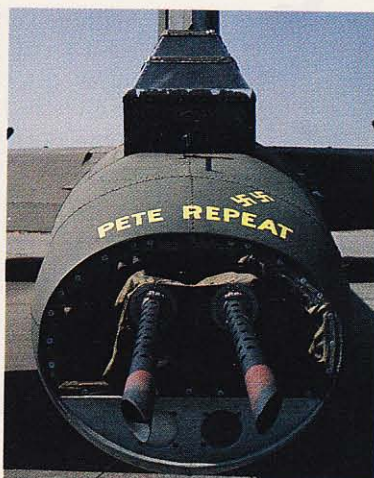
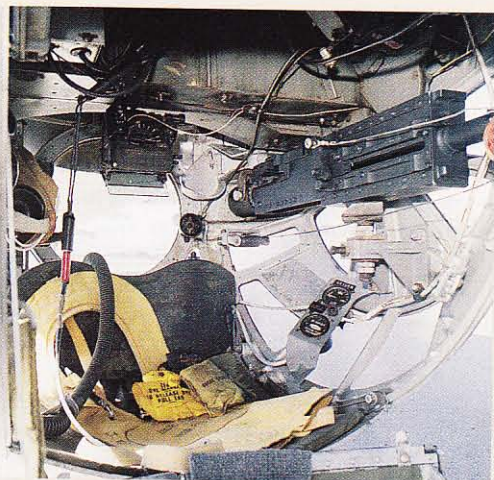
U.S. Army Air Force

By the time the 8th Air Force arrived in England, U.S. aircraft manufacturers had developed a number of excellent turrets for their bombers. Early in the War, the facility at Wright Field had acquired some Boulton Paul and Nash & Thompson turrets for appraisal. After a great deal of study, these turrets were used as the basis of the first U.S. designs. In many ways, the American turrets—being more heavily armed and armored—were better than their British counterparts. As U.S. industry kicked into high gear, General Electric, Consolidated, Martin, Erco, Bendix, Emerson and Sperry produced thousands of turrets.

Although lighter in terms of bomb load, the American equivalent to the mighty Avro Lancaster was the Boeing B-17 Flying Fortress. Early combat experience alongside the RAF showed that B-17C model was less Fortress-like than had been hoped for. The B-17C was armed with two hand-held Browning .50-caliber (12.7mm) guns in the dorsal position, two in the ventral, one .30-caliber (7.7mm) gun in the nose and one .50-caliber in each of the two waist positions. The guns had a tendency to freeze at high altitude, and losses to fighters and accidents steadily grew until gun heaters were at last developed.

After an extensive redesign, the first truly combat-ready B-17 emerged. The B-17E model was equipped with a Sperry top turret, a Bendix remote-control lower turret (soon replaced by the Sperry ball turret), a tail turret, two guns in the waist positions and two guns in the nose. The E model was soon followed by models F and G. The B-17G's arma-





attacks, the B-17G model was equipped with a Bendix remote-control turret that was operated by the bombardier.



B-17 Gun positions

Clockwise from top left: if there ever was any doubt as to why the smallest guy on the crew was the ball-turret gunner, this peek into the turret's cramped space should remove it once and for all.

One of the most important gunners on a bomber was the tail gunner. As well as fending off enemy fighters, he kept an eye on what was going on in the formation.

The B-17 used a Sperry top turret that was armed with two Browning .50-caliber machine guns.

To counter the Luftwaffe's frontal

high, perhaps reflecting the chin turret's inability to fire higher than 26 degrees above horizontal, and the upper turret's inability to depress below +5 degrees; the B-24 shows up particularly poorly against nose attacks that are level or low, perhaps a result of fewer ball turrets being flown.

For many gunners, the experience of fighting off enemy aircraft was terrifying. But it was not always that way. Tail gunner S/Sgt. Earl R. Wilbur describes his close encounter with a German fighter:

On this one memorable mission, we had good support from our "little friends," who engaged the Germans in a dogfight to which I had a ringside seat. We were flying in the formation's tail-end Charlie position when the next thing I noticed was an Me 109 level at about seven to eight o'clock and in a position I couldn't reach with my guns. He lowered his gear and flaps and flew along with us. He sat there while the ball-turret gunner and I instructed the pilot to move the plane so we could get a clear shot, but the German pilot knew the blind spot of the B-17 very well. I watched as he took off his oxygen mask and casually smoked a cigarette. After about two or

three minutes, he pulled up his gear and dropped below like a rock. He apparently had run out of ammunition. That was the

ment reached a high of 13, .50-caliber machine guns, and it was equipped with the new Bendix remote-control turret.

Operated by the bombardier, this turret was added to combat the frontal attacks favored by the Germans. An extensive report ("An Evaluation of Defensive Measures Taken to Protect Heavy Bombers from Loss and Damage," Headquarters 8th Air Force Operational Analysis Section, November 1944) that dealt with the defensive measures taken by U.S. heavy bombers reported on the B-17 chin turret as follows:

The B-17 is apparently particularly vulnerable to nose attacks that are level or



B-29 Gun stations

Left: the B-29's tail-turret area had plenty of space for the gunner. If the tail gunner became incapacitated, the tail guns could be operated by a side blister gunner.



Left: in some B-29 models, a 20mm cannon was included with the two .50-caliber machine guns.

closest I ever was to the face of the enemy.

June 5, 1944, saw the War's first B-29 raid on Bangkok, Thailand. The B-29 represented bomber design's technological leading edge. Fully pressurized, the B-29 also had the most advanced remote-control self-defense turret system in the world. At the heart of the General Electric-designed system was a central fire-control computer. As the gunner aligned his sights, the computer analyzed the information taken from the gunsight (parallax, ballistics, deflection) and sent electrical impulses to the engaged turret. These signals were then amplified and that "energized" the turret drive motors to the required aiming point. Other information, such as outside air temperature, barometric altitude and indicated airspeed, were also keyed into the computer by the navigator operating a handset. As long as the gunner tracked the target smoothly with his sight and adjusted the range, the computers adjusted the vital aiming allowances that were usually associated with manned turrets.

The B-29 was equipped with a tail gunner and four turrets whose gunners operated them from positions just aft of the wing. There, the upper and two side blister gunners controlled the aft-upper, aft-lower and front-lower turrets. In an emergency, the side blister gunners could also operate the tail turret. The navigator/nose gunner controlled the front-top and front-lower turrets. One of the system's unique features was that the gunners could control more than one turret at a time and could double their fire power at the flick of a switch. The intensity of fighter activity over Japan was not like that of the air battles over Germany, and although the gunnery system was very effective, Japanese fighters still managed to shoot down quite a few bombers. A B-29 tail-gunner, Sgt. Andy Doty, describes his encounter with an enemy fighter:

The only other time I encountered a fighter was the time we were jumped coming out of Osaka. It was a twin-engine fighter, and I know darn well he was trying to get us by surprise. To this day, I shudder to think what might have happened had he been able to catch us napping. We were unwinding because once you got a hundred miles off the coast, you began to relax. There was a cloud base down below us, and for some reason, I was still watching when I saw this guy pop up and drop back down. The next thing I

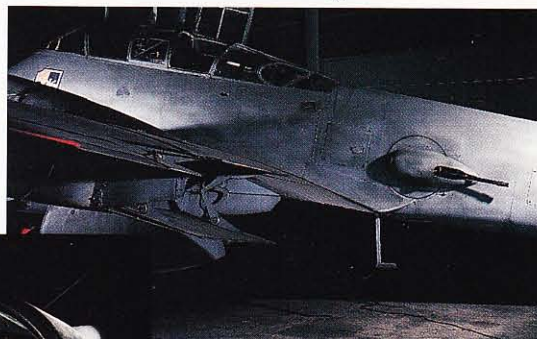
knew was he popped up through the clouds behind us. I alerted everyone. I was able to open fire when he swung across the back of me. He was firing; I was firing, and I can still see my bullets smashing into his engine and wing with parts of the engine and wing flying off. My bullets were hitting his right engine, but I couldn't force myself to swing the guns over to the pilot's compartment. We were told to trust the sight and not the tracers.

So I did, of course. If I had shot at the pilot's compartment, I might have killed some poor guy, and I'm glad now I didn't.



The Mauser MG 81 7.92mm machine gun replaced the Rheinmetall 7.92mm MG 15 machine gun.

The side barbettes of the Me 410 could be raised and lowered 70 degrees to the horizon and were able to swing out 40 degrees from the fuselage.



The barbettes were attached to a transversely mounted drum that was rotated by an electric motor. If a gun was about to fire on the airplane's structure, contact breakers would interrupt the gun's firing.



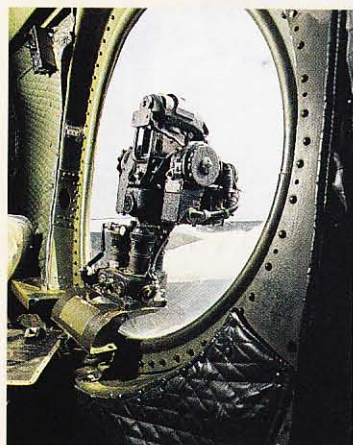
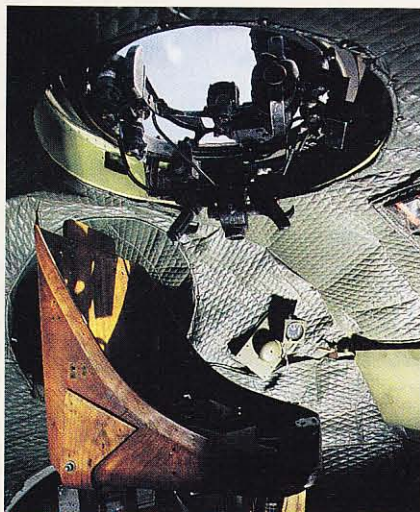
Luftwaffe

In 1939, when Germany invaded Poland, its bomber forces were equipped solely with hand-held machine guns on gimbal mount-

ings. The Rheinmetall 7.92mm MG 15 was the most widely used, but although it had a high rate of fire, it was not belt-fed; instead, it used saddle-type magazines that held 75 rounds, and these proved to be an immense liability. The MG 15's high rate of fire (1,100rpm) required gunners to change magazines often, and when under attack, gunners lost vital shooting time while they did this. One of the first German bombers equipped with a powered turret was the long-range Fw 200 Condor. The Fw 200C-0's defensive armament consisted of one 7.92-mm MG 15 machine gun in a hydraulically operated upper turret just aft of the flight deck, a similar weapon on a flexible mounting in a raised aft dorsal position and a third firing downward through a ventral hatch. Later Condor versions carried the large, hydraulically operated HDL 151 forward turret that housed a heavy-hitting 15mm gun.

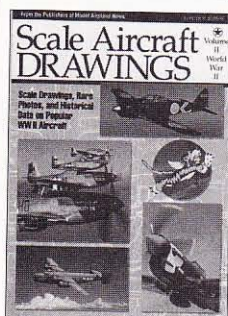
The first fully remote-control gun system to see operational use was fitted to the Messerschmitt Me 210 fighter/bomber. The Me 210 was not a success and was quickly super-

Below: the top blister gunner also operated the upper and lower aft turrets and the lower front turret.



Above: as well as being able to control the tail turret (if necessary), the side blister gunners operated the upper and lower aft turrets and the lower front turret.

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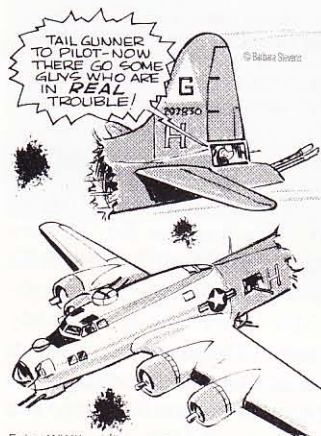


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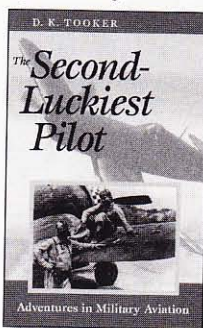
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BOMBER DEFENSE

seded by the improved Me 410. Both versions were equipped with an FDL 131 barquette (small gun blister) on each side of the fuselage and were armed with a single 13mm MG 131 machine gun. The two barquettes provided excellent fields of fire when compared with that of a single-mounted turret. This advanced remote system consisted of a large, transversely mounted drum that was in the fuselage just aft of the wing. This drum was rotated upward and downward by an electric motor. The two side-mounted guns could be moved through 70 degrees above and below the horizon and through 40 degrees of azimuth or out from the fuselage's side. Contact breakers interrupted the firing if the guns pointed at the aircraft structure. Now the rear gunner/observer had two guns that could fire upward, sideways and downward. Even with this advanced remote-control system, the Me 410 was no match for single-engine fighters and was withdrawn from service in 1944.

The turrets that were developed and perfected during WW II were remarkable pieces of machinery, but they were not enough to prevent bomber crews on both sides from suffering heavy losses. After the War, the role of the air gunner quickly disappeared. Jet aircraft made the bombers' defensive armament obsolete, no matter how advanced. Bomber aircraft in the future would use speed and electronic countermeasures to defend themselves. Today, that defense is in the form of stealth technology and, so far, that has proved the most effective. ✦

Donald Nijboer (left) is a freelance writer living in Toronto, where he currently teaches



radio broadcasting at Humber College. His first book, "Cockpit—An Illustrated History of World War Aircraft Interiors" has been translated into German, Japanese and Italian. His next book, "Gunner—An Illustrated History of World War II Turrets and Gun Positions," will be published in Spring 2001 by The Boston Mills Press.

Noted aviation photographer Dan Patterson (right) took all of the photos for the books.