

# **The Unseen Fight: USAAF radio counter-measure operations in Europe, 1943 to 1945**

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## **Abstract**

Germany had a formidable air defence system in World War 2. In November 1943 the RAF established 100 Group to use Radio Counter Measures (RCM) to protect bombers. This was joined in March 1944 by the RCM unit of the Eighth Air Force, the 803<sup>rd</sup> (Prov) BS (H), although RCM equipment had been fitted to USSTAF bombers earlier. In August 1944, the 803<sup>rd</sup> (Prov) BS (H) merged with the 856<sup>th</sup> BS (H) to become the 36<sup>th</sup> BS (H) (RCM). Missions included jamming radars, searching for radar frequencies, and deceptions, and were flown in support of RAF Bomber Command, USSTAF raids and ground armour. In the eleven months from 6 June 1944 to 25 April 1945, the 803<sup>rd</sup>/36<sup>th</sup> BS flew 274 combat missions, comprising some 1,188 effective sorties. Included in this number are 94 missions supporting 100 Group radar screening operations; 121 VHF screening, ten radar screening, and three spoof missions for the Eighth Air Force; five Jackal armour communications jamming missions for Allied ground forces; and 41 search missions.

## **1. INTRODUCTION**

The popular view of the Eighth Air Force in the Second World War is of mass formations of Boeing B-17s and Convair B-24s flying in clear skies, doggedly fighting off Luftwaffe fighters as they press on to visually bomb the target with their Norden bomb sights. Defence of these massive formations was initially handled by the bombers themselves, using formations optimized to allow their gunners to concentrate their firepower against the Luftwaffe onslaught. Later, escort fighters entered the mix and eventually defeated the Luftwaffe day fighter force. But another, unseen defensive measure was at play that helped save bomber aircrew lives and contribute to the final victory of strategic bombing – electronic warfare and its ultimate practitioners in the European Theatre of Operations, the 36<sup>th</sup> Bombardment Squadron (Heavy) (Radio Counter-Measures) and 100 Group, RAF (see section 4 below).

## **2. RAF BOMBER COMMAND**

The United Kingdom declared war on Germany on 3 September 1939 and soon its air force started a bombing effort against Germany that would last almost six years. The Royal Air Force (RAF) Bomber Command strategic bombing campaign against Germany was initially limited by its smaller twin-engine aircraft, such as the Handley Page Hampden and Vickers-Armstrong Wellington, to targets such as shipping and to the dropping of propaganda leaflets. Early on, high losses forced

Bomber Command to operate at night. As bomber attacks grew in strength through an increase in numbers and the fielding of four-engine heavy bombers such as the Short Stirling and, later, the Avro Lancaster and Handley Page Halifax, the effectiveness of these strikes started to make the Germans confront these attacks in a systematic manner.

### 3. THE LUFTWAFFE INTEGRATED AIR DEFENCE OF GERMANY AND OCCUPIED EUROPE

Serious construction of two lines of anti-aircraft artillery (*Flugabwehrkanone* – flak) began in 1938 to protect Germany against bomber attacks from France and Britain. LVZ-West (*Luftverteidigungszone West* – Air Defence Zone-West) was the first attempt to create an integrated air defence system (IADS) incorporating sensors such as searchlights and sound detectors, a common air reporting system, as well as flak guns and fighter bases. At the start of the war, the Luftwaffe flak force was the most lavishly equipped in the world, with 2,628 heavy flak guns (88 mm and 105 mm) compared to about 1,300 heavy anti-aircraft guns in Britain.<sup>(1)</sup>

Germany started experimental radar work as early as 1934. Using a 2.4 m wavelength signal, the radar by the German firm Gema became the basis of the Freya early warning radar (Figure 1). Using a radar beam with 5° accuracy in azimuth, German operators were able to detect targets out to 200 km. Parallel work starting in 1936 by Telefunken resulted in radar that used a 50 cm wavelength signal accurate to 35 m in range and 0.25° in elevation and azimuth to direct searchlights and became the Würzburg. A larger variant, the Würzburg-Riese, was electronically identical to the smaller searchlight and gun laying Würzburg.<sup>(2)</sup>

To challenge the ever-increasing Bomber Command night attacks, the Luftwaffe had to move beyond its initial approach of using a small collection of day fighters that took to the air, blindly hoping to stumble upon a British bomber. Initially the Germans relied upon a system centred on a number of night fighter control stations known as *Flugmeldemess Stellung* which paired a Freya radar with two

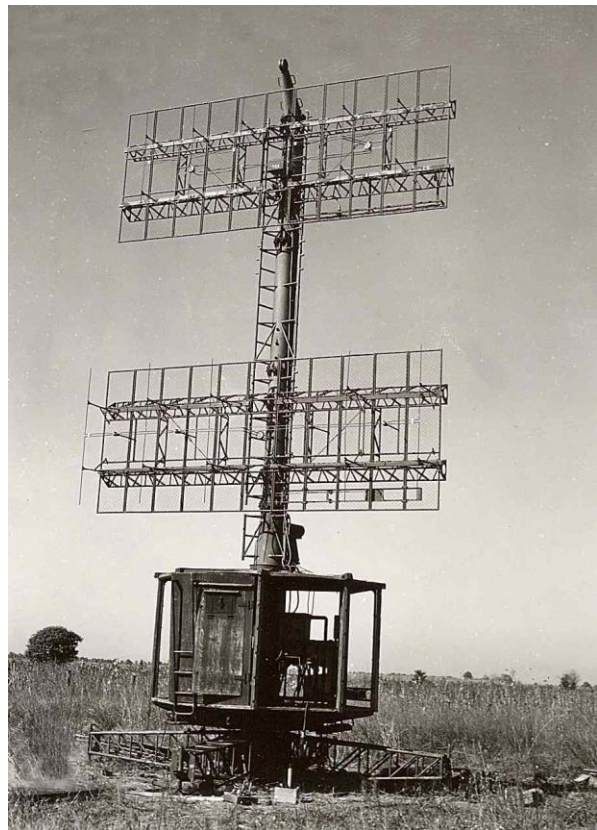


Figure 1. The Freya radar was used for early warning by the Luftwaffe and was the target of the 36<sup>th</sup> BS short-lived radar jamming operations in March 1945. This Freya was associated with a German GCI site in Romania, possibly near Bucharest. (William Cahill Collection)

Würzburg-Riese ground control intercept radars (Figure 2). The system, while highly reliable, suffered from two weaknesses: it could only control one intercept at a time and also had no depth. Once the belt of *Stellung* had been penetrated, further night fighter control was impossible. When this vulnerability was realized by the British, the bomber stream penetration tactic of rushing many bombers through a narrow portion of the *Stellung* belt was introduced in the spring of 1942. As the RAF was switching to the bomber stream, the Luftwaffe was helping its pilots find targets in darkened skies. By the spring of 1942, the FuG 202 *Lichtenstein B/C* air



Figure 2. The end target of 100 Group and the 36<sup>th</sup> BS was the command and control associated with the Luftwaffe. The large Gyges Headquarters in Grove, Denmark provided C2 for Luftwaffe operations in Denmark; the intent of Allied electronic attack was to deny early warning to these facilities in order to delay or mis-direct Luftwaffe fighters. (US National Archives)

intercept radar was in service with Luftwaffe night fighters, replaced in early 1944 by the more effective FuG 220 *Lichtenstein SN-2*. The Luftwaffe, however, doggedly stuck with their *Stellung* control system. They increased its depth with the addition of new equipment, but the underlying system went unchanged though early 1943.

Operation GOMORRAH, the Allied strategic bombing attack of Hamburg in July 1943, witnessed the introduction of ‘window’, paper-backed aluminium foil cut to half of the target radar’s

wavelength, into the electronic fight on a massive scale. The window used by the RAF was optimized for use against the *Würzburg-Riese* radars in the *Stellung* as well as the *Würzburg* anti-aircraft artillery (AAA) gun laying radars – but it also impacted the FuG 202 Lichtenstein as it operated at similar frequencies. The Luftwaffe responded to window by fusing the *Stellung* radar pictures together into a consolidated picture that was forwarded up the chain of command to *Luftflotte Reich*, the organization overseeing all German air defences, which in turn produced a consolidated national air picture (*Reichlage*) that established the route of the bomber stream and attempted to predict the target. Individual bombers were not tracked, but the bomber stream itself – a mass of aircraft and window – was readily visible. Based on *Luftflotte Reich*'s prediction of where the bomber stream would fly over Germany, *Jagd Division Zentral Gefechtsstände* were ordered to scramble their night fighters to intercept the enemy. The Luftwaffe system, highly reliant on the electromagnetic spectrum for both locating aircraft as well as directing airborne fighters to their targets, was susceptible to electronic attack – radio counter-measures or RCM in the vernacular of the era. The RAF had a specialized organization devoted to understanding and attacking the German use of the air waves – 100 Group.

#### 4. 100 GROUP

100 (Special Duties) Group was established on 23 November 1943 to employ RCM equipment to “deceive or jam enemy radio navigation aids, enemy radar systems, and certain wireless signals.” The first operational squadron joined the group two weeks later on 3 December and by the end of the war the group had 24 squadrons, including eight fighter squadrons with the role of interdicting Luftwaffe night fighters. True pioneers of the art of electronic attack, the squadrons within the group jammed radars, radio communications, and navigation aids as well as flying electronic intelligence (ELINT) search missions to look for new radar signals and airborne feint missions to confuse Luftwaffe controllers.<sup>(3)</sup>

The mission of 100 Group – attacking the Luftwaffe IADS – operated at two levels. At the theatre or operational level, the RAF targeted decision makers at the *Luftflotte Reich* or *Jagd Division* level by denying the construction of a coherent air picture with jamming of early warning radars or higher echelon command and control links. Deception operations could also add to the confusion by masking the true target for the evening. At the tactical level, the *Würzburg* gun laying and ground control intercept radars were jammed and communications between a *Stellung* and a night fighter were disrupted with the intent to protect individual bombers from being shot down.

The squadrons within 100 Group operated myriad platforms to perform these missions, with many of the ‘special duty’ jamming squadrons flying former bomber aircraft. The first squadron to operate ‘heavy’ four engine bombers was 214 Squadron. Joining 100 Group on 17 January 1944, it was originally equipped with the Stirling but was slated to re-equip with B-17s. In an effort to rapidly convert the unit, the RAF ‘traded’ fourteen future delivery B-17Gs for Eighth Air Force B-17F aircraft already in the UK which were then fitted out with British electronics.<sup>(4)</sup>

Flight crews and ground personnel from various Eighth Air Force organizations were placed on detached service and sent to RAF Sculthorpe (near Fakenham, Norfolk) to train 214 Squadron in operating and maintaining the Flying Fortress. Personnel started arriving on 17 January 1944 and training continued apace for the next two months. Once the British crews were checked off on their new charges in mid-March the original mission was expanded to encompass a detachment of Americans flying RCM missions with 214 Squadron in support of Bomber Command raids.<sup>(5)</sup>

## 5. ENTER THE YANKS

Eighth Air Force was established as VIII Bomber Command on 19 January 1942. An advanced detachment of VIII Bomber Command was established at RAF Bomber Command Headquarters at RAF Daws Hill (near High Wycombe, Buckinghamshire) on 23 February in preparation for its units to arrive in the United Kingdom from the United States. The first combat group of VIII Bomber Command to arrive in the United Kingdom was the ground echelon of the 97<sup>th</sup> Bombardment Group, which arrived at RAF Polebrook (Oundle, Northamptonshire) on 9 June 1942. VIII Bomber Command started the US Army Air Force's (USAAF) strategic bombing campaign against Germany on 17 August 1942 with a small raid by 12 B-17s against occupied France. The invasion of North Africa and Italy over the next year drew forces away from building a large striking power in the UK, and it was not until the summer of 1943, and the initiation of the Combined Bomber Offensive, that the Eighth Air Force started to have an impact on the German war effort.

As USAAF bombers started to fly deeper and deeper into Germany, the Luftwaffe response increased as did American casualties. On 17 August 1943 VIII Bomber Command launched a two-pronged raid against ball bearing plants at Schweinfurt and the Bf 109 factory at Regensburg. Casualties for this raid were at an unsustainable loss rate of 16%, forcing the USAAF to back off its cherished concept of self-defending bombers, and accelerate efforts in fielding an escort fighter. This only addressed one aspect of the German defences – fighters. Anti-aircraft artillery and the overall coordination of Luftwaffe air defences would be addressed through electronic means.

The perceived success of 100 Group in reducing the losses of Bomber Command had a major influence in driving RCM requirements for Eighth Air Force. American planners, reviewing British operations, noted the need to engage German early warning radars, gun laying radars, and fighter control communications. The RCM program within Eighth Air Force dated from March 1943 and included the introduction of countermeasures on bombers as well as the requirement for an RCM unit. Though a lack of resources caused the RCM unit to be put on the back burner, by the end of 1943 APT-2 Carpet jammers targeting *Würzburg* gun laying radars were operational with the 96<sup>th</sup> and 388<sup>th</sup> Bomb Groups and APT-3 Mandrel jammers built to counter Freya early warning radars were enroute to the UK.<sup>(6)</sup> As additional equipment arrived in the UK, priority was given to fitting out the remaining 96<sup>th</sup> and 388<sup>th</sup> Bomb Group aircraft, both in the 3<sup>rd</sup> Bombardment Division, before fitting out two bomb groups each in 2<sup>nd</sup> and 1<sup>st</sup> Bombardment Divisions, with the plan at the time being to install Carpet in 100% of the bombers and Mandrel in 10%.<sup>(7)</sup> Mandrel and Carpet were 'noise jammers,' the simplest of radio countermeasures equipment. This

equipment would radiate ‘noise’ – non-coherent radio-frequency energy – at the same frequency the target radar was using to measure range and bearing of Allied bombers. This noise jamming would saturate the targeted radar’s receiver so the return pulse of Allied bombers was lost within the many pulses of the jammers – the equivalent of trying to carry on a conversation next to a very noisy piece of construction equipment.

By March 1944, Eighth Air Force was ready to move forward with its plan for an RCM unit. Using the airmen who were training 214 Squadron on B-17 operations as a nucleus, six crews and aircraft from 96<sup>th</sup> Bomb Group were ordered from their home at Station 138, RAF Snetterton Heath (near Thetford, Norfolk), to Sculthorpe on 21 March 1944. These crews, all veterans of 25 bombing missions, had been part of the 96<sup>th</sup> Bomb Group radar countermeasures program and provided a baseline of experience for the new organization. This new unit would report directly to Eighth Air Force, with tactical control going through RAF 100 Group. The unit would fly operations with 214 Squadron, not only assisting in screening Bomber Command operations but also providing USAAF with insight into the British way of RCM operations. The unit’s charter was to investigate and analyse “enemy radio and radar activity of particular interest” to the USAAF and make recommendations on equipment and tactics to counter these threats as well as be able to respond to special missions such as jamming radio-controlled missiles.

Designated the 803<sup>rd</sup> (Provisional) Bomb Squadron (Heavy) on 28 March, the organization would eventually have a strength of twelve aircraft, with the original six from the 96<sup>th</sup> Bomb Group providing a solid start. Five of these aircraft, all B-17Fs, were already equipped with Carpet and Mandrel jammers while the sixth, a B-17G, had jammers as well as search equipment in the form of SCR-587 and Hallicrafters S-27 VHF signals intelligence (SIGINT) receivers used to track Luftwaffe early warning radars and radio traffic. Once at Sculthorpe the aircraft had additional equipment installed and were modified for night flying. Soon the six 96<sup>th</sup> crews, plus three other crews from existing training personnel and new arrivals, were training for night flying and navigation, something not used by VIII Bomber Command but critical for nocturnal Bomber Command operations.<sup>(8)</sup>

On 25 April Lieutenant Colonel Clayton Scott assumed command of the 803<sup>rd</sup> BS and inherited what seemed to be a mess. Two weeks earlier a review of RCM assets in the European Theatre by Eighth Air Force staff had characterized the squadron as inactive and run down with nine aircraft and no equipment as a multi-month fight raged on at headquarters whether the unit was to do experiments and development work or operations. A compromise appears to have been made, and when the squadron transferred to RAF Oulton (near Aylsham, Norfolk) with 214 Squadron on 16 May, direction was given to do experimental work in support of Operation OVERLORD. In the first two weeks of May seven additional B-17Fs were added to the squadron. There was a rush to train personnel on RCM equipment and have aircraft ready for supporting the invasion. As of 30 May only three B-17s were equipped with jammers and a mad scramble entailed to be ready for the big event, with two B-17s having their Mandrel jammers fitted on 5 June. That evening, Captain Robert Stutzman, squadron operations officer, led three other B-17s on the unit’s first operational mission. Between 2235 and 0450 local time the B-17s were orbiting off the Normandy beachhead,

jamming the German early warning radars and screening the approaching Allied invasion force. After the invasion, it was finally decided to have the squadron focus on operations by supporting the RAF. The original crews from the 96<sup>th</sup> Bomb Group rotated back to the US and were replaced by crews who had not completed an operational tour. Extensive training continued within the squadron for night flying and night navigation as well as preparing more aircraft for upcoming operations.<sup>(9)</sup>

## 6. SUPPORT TO RAF BOMBER COMMAND

The second operational mission flown by 803<sup>rd</sup> BS was on the night of 16/17 June 1944. Six B-17s joined sixteen Stirling B.III aircraft of 199 (SD) Squadron to form a Mandrel screen over the North Sea in support of a Bomber Command attack on Sterkrade, Germany. Four similar missions followed by the end of the month, flown in a semi-circle over the North Sea at 15,000-19,000 ft and in concert with ten to fourteen 199 (SD) Sqn Stirlings.<sup>(10)</sup> The APT-3 Mandrel was a noise jammer, operating between 88 and 138 MHz and used to blind German early warning radars such as FuMG 80 *Freya*, FuMo 51 *Mammut* and FuMG 402 *Wassermann*. These radars were positioned along the coast of occupied Europe, passing radar tracking data up-chain where it was consolidated at the *Zentral Gefechtsstand* of the *Jagd Division* before being forwarded to *Luftflotte Reich*. Unjammed, these radars could see as far as East Anglia and observe Bomber Command aircraft as they climbed out of their airfields and formed up for missions to Germany. By denying the Luftwaffe this information, 100 Group confused *Jagd Division* controllers and reduced the amount of time they had to ascertain the direction of the bomber stream and position their fighter assets.

Operations continued in July but at a higher pace. Fourteen missions were flown, averaging five B-17s working with two to three times that number of 199 (SD) Squadron Stirlings. The Mandrel screen not only supported the main effort, it could also be used to support feints where additional 100 Group aircraft would form into a column dropping chaff (window) to create a false bomber stream. The Mandrels would cease transmitting for one minute to allow the Germans to catch a glimpse of the false target, then recommence jamming. Eventually the chaff droppers would penetrate through the screen and continue towards Europe before turning back to the UK. The intent of the entire exercise was to have the Luftwaffe controllers launch night fighters early and to the wrong location in an effort to aid the primary attacking force. Creeping screens, slowly moving towards the coast of occupied Europe, were also used. This tactic allowed the Mandrel-equipped aircraft to initially stay closer to the UK to screen bombers launching on operations and then adjust closer their orbits closer to occupied Europe once the bomber stream was active and crossing the English Channel.

## 7. SEARCH MISSIONS

The sole B-17G transferred from the 96<sup>th</sup> Bomb Group in March had its search equipment removed on 15 June 1944 and transferred to one of the squadron's B-17F aircraft. The 803<sup>rd</sup> BS commenced

four- to six-hour ELINT missions on 6 July with this B-17F, flying five in July and four in August to include one flown on 1 August with two aircraft.<sup>(11)</sup> Tasking for these search missions came from the Anglo-American Laboratory of Division 15, Office of Scientific Research and Development (ABL-15), a joint US-British organization established in fall 1943 at Telecommunications Research Establishment, Malvern, to work with Eighth Air Force to develop engineering solutions for RCM activities.<sup>(12)</sup> Besides the search missions, the squadron also started to play an active role in RCM training.

In May, the Eighth Air Force started to field the 'Carpet-Blinker' system composed of one to three tuneable Carpet jammers and the Blinker search receiver optimized against the *Würzburg* gun aiming radar. The Carpet-Blinker system allowed USAAF bomber crews to track active *Würzburg* signals and tune their Carpet jammers accordingly, a tactical improvement as the majority of Carpet jammers flew with pre-set frequencies. An 803<sup>rd</sup> BS B-24 was fitted with the Carpet-Blinker system and in July the unit started running training classes with flights on this aircraft for personnel from the 2<sup>nd</sup> Bombardment Division. This 'training' B-24 was one of many that started to arrive as the 803<sup>rd</sup> BS transitioned from the B-17 to the B-24.

Starting on 22 June, B-24H and J models arrived at the squadron to replace the existing B-17Fs. Five Liberators arrived in June, followed by five in July and two in August (Figure 3). Starting



Figure 3. 1st Lt. George G. Sandberg and 36th BS Crew No. 304 pose in front of their aircraft, *Lady in the Dark* B-24J-1-FO s/n 42-50665, squadron letter K. *Lady in the Dark* was one of the five original B-24s assigned to the squadron in late June 1944 and survived the war. (Air Force Historical Research Agency)



1 July, RCM equipment was removed from B-17s and installed in the newly-arrived B-24s. With the squadron focusing on Mandrel jamming of early warning radars, Carpet jammers were removed from the B-17s and shipped to Eighth Air Force for use by bomb groups.<sup>(13)</sup> The squadron's first B-24 mission was flown on 12 July, with the last B-17 mission on 28 July. The B-17s were transferred out of the squadron starting on 22 June and by 2 September the last Fortress was off the unit's books.<sup>(14)</sup>

## 8. NEW NAME BUT MISSION UNCHANGED

On 14 August 1944, the 803<sup>rd</sup> (Prov) BS (H) merged with the 856<sup>th</sup> BS (H) to become the 36<sup>th</sup> BS (H) (RCM) and moved to Station 113, RAF Cheddington (near Aylesbury, Buckinghamshire). The new organization was also placed under the 1<sup>st</sup> Bombardment Division at the same time for administrative purposes and reported directly to Eighth Air Force for operations and training, apparently to the disagreement of some of the United States Strategic Air Forces in Europe (USSTAF) staff who would have preferred owning the unit directly.<sup>(15)</sup> Sixteen missions were flown in August, each consisting of four to six B-24s flying Mandrel screening operations. Operations increased in September with the 36<sup>th</sup> BS supporting eighteen missions of six to seven aircraft each. Jamming time varied from two to four hours, with the four-hour missions covering two jamming periods of one to one-and-a-half hours with down time in between. Coordination of Mandrel screens with feints involving chaff-dropping aircraft continued as did creeping screens. As the screens move eastwards towards the continent the B-24s started to get close to the threat, with two missions drawing intermittent anti-aircraft fire and one aircraft being fired on by an unknown airborne assailant.<sup>(16)</sup>

As operations continued, the 36<sup>th</sup> BS worked to set itself up as a 'normal' squadron after operating for months as a detachment or provisional unit. Training programs were created for new crews as well as those that had transferred in from the 856<sup>th</sup> BS. Maintenance facilities were also established and additional maintenance personnel assigned to enable the operational tempo to continue. With its role finally defined, the squadron set out to field proper aircraft for the mission. Work was carried out to enclose a portion of the rear bomb bay on ten of the B-24s, fitting them with oxygen connections and plug outlets for heated flying suits for an RCM operator. Additional flooring was installed in the rear fuselage for equipment, and antennas were installed in the wings and under the fuselage. Most of the installation was just "Group A" hardware – the mounting racks, antennas and wiring harnesses permanently installed in an aircraft making it capable of carrying the "Group B" equipment. Included in the Group A installation at this time were APT-1 Dina jammers, built to target early warning radars, as well as Mandrel III jammers and a regular IFF set modified for use as an RCM system (Figures 4, 5 and 6).

A new 'ferret' search aircraft was also constructed starting in September, with a B-24J undergoing a conversion with an enclosure in the entire rear section of bomb bay for installation of search equipment along with oxygen and heated suit fittings for two operators and additional oxygen bottles.

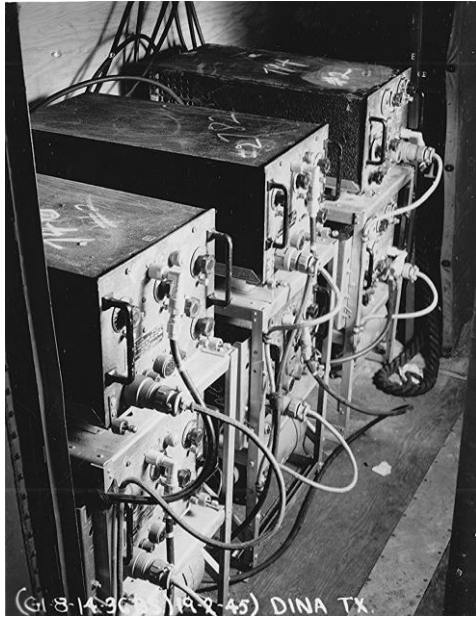


Figure 4. Dina transmitters were located in racks in the rear of the bomb bay of modified 36th BS aircraft. This photo depicts three racks, each two transmitters and a power supply. Power was a limiting factor in the number of transmitters that 36th BS aircraft could carry. (Air Force Historical Research Agency)



Figure 5. Most of the jamming antennas were fitted to the underside of the wings of 36<sup>th</sup> BS aircraft, though Jackal antennas were carried under the fuselage just forward of the tail turret and Carpet antennas under the fuselage aft of the nose wheel. This photo depicts the Dina antennas under the outer wing. (Air Force Historical Research Agency)

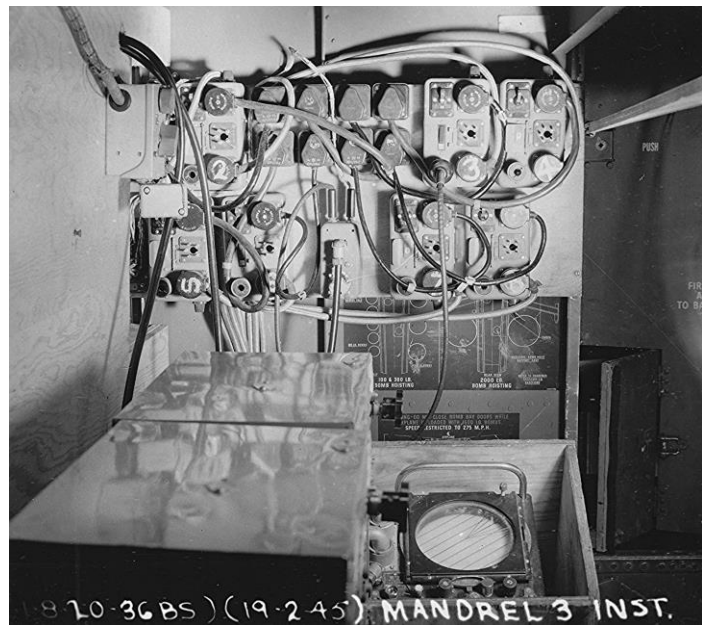


Figure 6. The Mandrel III control panel was mounted on the forward bulkhead of a B-24 bomb bay and used standard IFF control boxes modified for the task. In January 1945, all Mandrel III installations were removed from the unit's B-24s as the squadron started to concentrate on using the Dina for the VHF screening missions. (Air Force Historical Research Agency)

The aircraft was probably fitted out with SCR-587 and S-27 VHF SIGINT receivers (see Section 5), the APR-1 search receiver for radar and radio signals, and equipment to measure pulse repetition frequency (Figures 7 and 8). Confusingly, after all this work the receiver equipment was removed in December and transferred to another B-24J after similar surgery was performed on its bomb bay. No search missions were flown in September, but they resumed in October. While no Carpet-Blinker training flights were flown in August, fourteen were flown in September.<sup>(17)</sup>

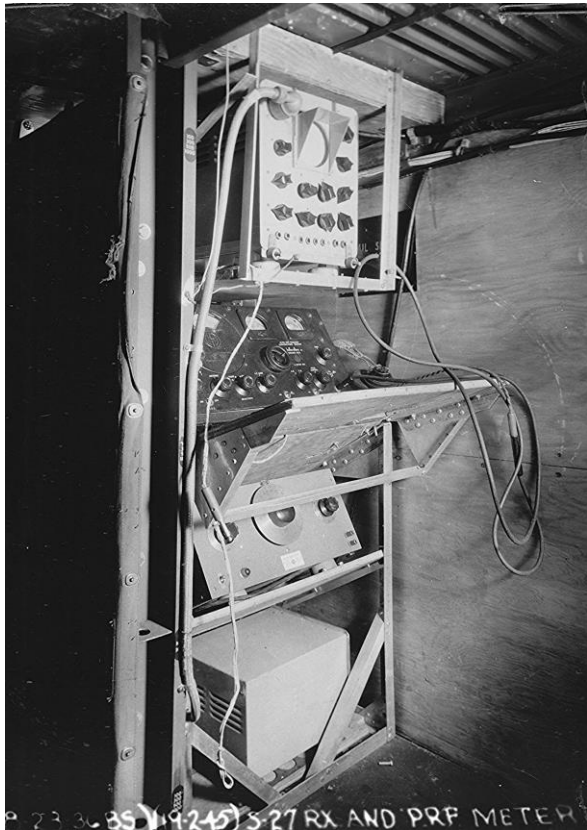


Figure 7. The converted bomb bay of one of the 36<sup>th</sup> BS ferret-configured aircraft, possibly B-24J-1-FO s/n 42-50622. At top is a British Type 32 Monitor for determining PRF and pulse analysis with a S-27 Hallicrafter receiver below. (Air Force Historical Research Agency)

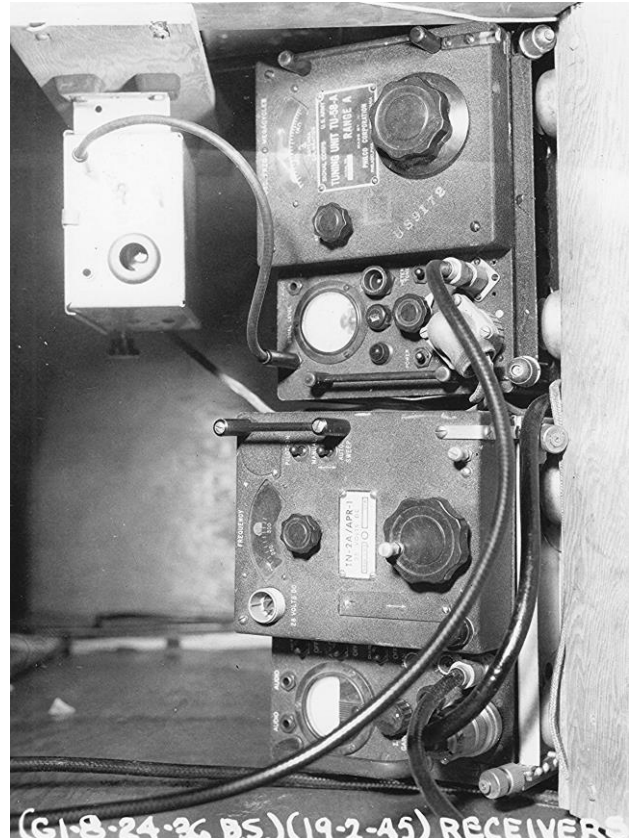


Figure 8. A different view of a 36<sup>th</sup> BS ferret-configured aircraft, possibly B-24J-1-FO s/n 42-50622, showing APR-1 and SCR-587 controllers and displays. The 36<sup>th</sup> BS used its ferret aircraft to monitor the effectiveness of the VHF screen and look for new German signals. (Air Force Historical Research Agency)

Squadron operations continued into the fall, with the 36<sup>th</sup> BS fielding ten aircraft dedicated to support 100 Group operations, eight equipped with six Mandrel jammers and two with three Dina jammers.<sup>(18)</sup> This pool of ten aircraft was used to fly 13 Bomber Command support missions, each requiring six to eight B-24s. As Allied ground forces moved north and east out of Normandy, they started to overrun Luftwaffe coastal early warning radar posts. Consequently, the screening missions started to be flown over the European continent instead of the North Sea. Training of 2<sup>nd</sup> Bombardment Division personnel in Carpet 'spot' jamming of Würzburg gun aiming radars

continued, the course featuring ground and flight training, with two spot jamming trainers which flew 'live' missions over Europe as well as missions over the UK against a captured *Würzburg* radar installed at Station 113.<sup>(19)</sup>

The 36<sup>th</sup> BS flew 13 search sorties in October 1944, five were flown as missions with two aircraft. There are no records for search missions flown in November, with the next search mission not being logged until the last week in December which was not ELINT but in support of communications jamming. The lack of interest in ELINT missions may be attributed to other assets being capable of performing this mission. During this time period, one bomb group in the 1<sup>st</sup> Bombardment Division (457<sup>th</sup> Bomb Group) and the 3<sup>rd</sup> Bombardment Division (94<sup>th</sup> Bomb Group) fielded enough aircraft fitted with APR-4 search equipment for frequencies of over 217 MHz to enable a search aircraft to fly on every group mission. In addition, two aircraft assigned to the 94<sup>th</sup> Bomb Group were fitted with the APA-17 airborne direction finder to allow direction finding of signals.<sup>(20)</sup> This increased search capacity for analysts at USSTAF headquarters probably helped lessen the demand for 36<sup>th</sup> BS search missions as the squadron was starting to change focus again – this time to support Eighth Air Force operations.

## 9. AMERICAN STRATEGIC BOMBING

Eighth Air Force's strategic bombing campaign relied upon the Clausewitz's principal of 'mass'. To have enough defensive firepower to ward off Luftwaffe fighters, and offensive firepower to destroy German factories, the American bombers needed to assemble into very large and intricate battle formations. A cumbersome dance took place over East Anglia as squadrons assembled into their formations, then joined together in their group formations. By late 1944 Eighth Air Force had refined this process as well as they could, but it still took time and lots of VHF radio chatter, even with the use of navigation beacons. Once assembled, the formation headed east into the German air defences. During this assembly, though, the Germans were tipped off by their radio intercept sites located along the coast and were prepared for the incoming Americans.

The Eighth Air Force confronted an inherently different German IADS than that faced by the Royal Air Force's Bomber Command. The daytime operating environment of the bombers of the VIII Bomber Command allowed their adversaries – either fighter aircraft or AAA – to visually acquire their targets when weather was good. Luftwaffe day fighters were scrambled by their Fighter Division *Zentral Gefechtsstände* and given directions to the incoming mass of USAAF bombers. Once in the vicinity of the bombers, it was relatively easy for the fighters to visually acquire the large American bomber formations and start their attacks.

On clear days, Luftwaffe AAA batteries used *Kommandogeräte* optical trackers to direct their fire – but clear days were a rarity over central Europe for many months of the year. Once the H2X navigation radar started to proliferate with the Eighth Air Force in mid-1944 the USAAF was more comfortable bombing through the overcast, making the *Würzburg* radar the critical link for the Germans to engage the American bomber – and the cause of increased training by 36<sup>th</sup> BS on

Carpet-Blinker. Carpet jammers and chaff were used by individual bomber formations to counter *Würzburg*, while escort fighters could suppress the Luftwaffe day fighter force. But if the Eighth Air Force wanted tactical surprise about the timing and location of their attacks, something had to be done about masking the assembly of their bombers.

In November 1944, the 36<sup>th</sup> BS was tasked to provide VHF radio screening of Eighth Air Force assembly operations. A test conducted on 18 November was used to determine the range of Mandrel and Dina jamming against VHF radio communications. Missions started the morning of 25 November and were flown every day for the rest of the month. Each mission used five or six B-24s performing three hours of VHF screening during a five- to six-hour mission over the North Sea (Figure 9). Taking a page from 100 Group's playbook, when no Eighth Air Force missions were scheduled for 28 November the VHF screen was still flown, with three additional squadron B-24s flying behind the screen with extra radio operators reading off a script to simulate the assembly of bomb groups.<sup>(21)</sup>

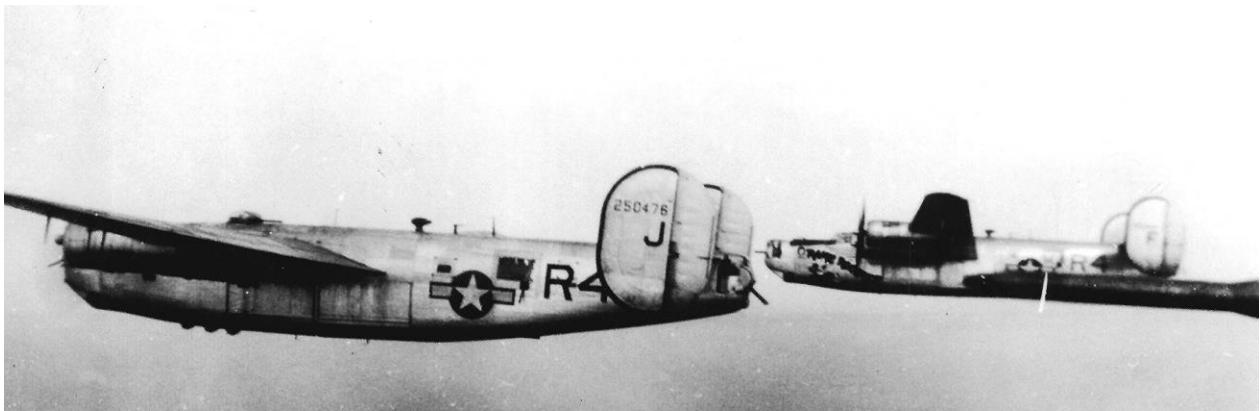


Figure 9. Two 36<sup>th</sup> BS B-24 aircraft in flight, B-24J-40-CF #42-50476 R4-J at left and B-24J-1-FO #42-50671, R4-F *Ramp Rooster* at right. R4-J appears to be carrying three Orvils antennas visible under the port wing; this aircraft was fitted with this equipment in February 1945. (Stephen Hutton)

The 36<sup>th</sup> BS continued to support the RAF in November. Twelve Mandrel screening missions were flown with an average of seven aircraft but starting the night of 25/26 November the numbers dropped back to three B-24s supporting the RAF to ensure an adequate level of effort for USAAF operations. Most 100 Group missions were flown over the continent which started to carry more risk, as witnessed by the squadron suffering its first loss on 10 November. Lieutenant Joseph Hornsby and his crew were flying a B-24J over occupied Europe when the aircraft was hit by anti-aircraft fire. With one engine knocked out and another failing, Hornsby elected to not cross the North Sea but have the crew bail out over Allied lines; unfortunately three of the crew still ended up dying. Five days later a B-24H piloted by Lt Norman Landberg crashed on takeoff killing two of the crew. The squadron was still in good shape aircraft-wise though as two B-24s were gained in October and an additional two in November.<sup>(22)</sup>



Figure 10. 36<sup>th</sup> BS B-24J-5-FO Liberator #42-51546 R4-L *Gravy Train* with a healthy mission log painted on her nose waits in the English gloom between sorties. What appears to be a Carpet antenna is just aft of the nose wheel. (Stephen Hutton)

## 10. ALL IN FOR RCM

December 1944 witnessed the culmination of six months of hard work as Eighth Air Force fielded an impressive RCM capability in supporting its bomber attacks against Germany. Some 1,730 B-17 and B-24 bombers of 34 bomb groups spread across all three air divisions were fitted out with the “Group A” equipment for carrying two Carpet jammers, and within a matter of weeks another three bomb groups would be so configured. Sixty-nine bombers spread across twelve bomb groups were also carrying “Group A” for tuneable Carpet spot jammers. Twenty-two aircraft in the 94<sup>th</sup> and 457<sup>th</sup> Bomb Groups were fitted with “Group A” for APR-4 SIGINT search receivers and flew 18 search missions in the last two weeks of the month, while one APA-17 direction finder equipped B-17 in the 94<sup>th</sup> Bomb Group flew seven direction finding missions.<sup>(23)</sup> If this were not enough, de Havilland Mosquito Mk.XVIs of the 653<sup>rd</sup> Bomb Squadron, 25<sup>th</sup> Bomb Group started to fly “Graypea” chaff escort missions on 4 December, screening the lead bomber formations by dropping chaff starting at the Initial Point (IP) and continuing through the target area. Layered onto this effort was support from the 36<sup>th</sup> BS.

The 36<sup>th</sup> BS flew four types of missions in December: two existing missions - VHF screening for the Eighth Air Force and Mandrel early warning radar screening, at a very reduced rate, for 100 Group; and two new missions - screening missions flown in front of the bomber force to the IP and Jackal communications jamming (see Section 11 below). The VHF screening missions for the Eighth Air Force continued at a brisk pace for the month of December. Twenty-three missions were flown with an average of eight B-24s fitted with Mandrel and Dina jammers, providing three-and-a-half hours of jamming in an orbit 60 miles off the coast of East Anglia paralleling the Dutch coast over the North Sea. As the bomber formations started to move towards the continent, the screening orbit moved eastwards as well and continued jamming until it was overland (Figure 11).



Figure 11. Most 36th BS operations were over the North Sea; “split screen” operations with a northern and southern grouping are depicted in this December 1944 briefing map. (Air Force Historical Research Agency)

The screening operation appears to have confused the German controllers with respect to size, routing and target of the bomber strike force. Two ‘spoof’ missions were also flown on days that the Eighth Air Force bombers were not active. Similar to the ‘spoof’ missions flown in November, three B-24s would fly an orbit in the assembly areas and have crew members reading a script to simulate VHF communications of groups assembling into battle formations.<sup>(24)</sup>

With so much effort supporting USAAF bomber operations, support to the RAF took a back seat. Only three Mandrel screening operations were flown with 100 Group in the month of December, each mission only comprising one or two B-24s. This was essentially the end of support to 100 Group, as the last two missions – each with only one aircraft – were flown the nights of 1-2 January and 2-3 January 1945. This reduction reflected not only the growing size of 100 Group, which was increasingly able to handle all of Bomber Command’s needs, but also the increased demands being placed on the 36<sup>th</sup> BS. Two new types of missions were added to the squadron playbook in December. The first entailed a variant of the escort screen done both by 100 Group and USAAF’s 25<sup>th</sup> Bomb Group. The 36<sup>th</sup> BS flew three escort screening missions in December, with six of the squadron’s B-24s 40 miles in front of the lead bombers screening VHF transmissions. Flying with a fighter escort, when the RCM aircraft reached a point just west of the German border they turned around, dropped in altitude, and flew back westbound beneath the bomber formation. The experiment must have only produced mixed results as it was not repeated after 18 December 1944.<sup>(25)</sup> The last new mission was something that had been in the works for over six months – jamming German Army communications in support of Allied ground forces.

## 11. ENTER THE JACKAL

The ART-3 Jackal was a high-power VHF barrage jammer built to target German Army tank radios (Figure 12). The original request for this capability dated back to just after OVERLORD, when USSTAF made a commitment to Allied Expeditionary Air Force on 16 June 1944 to provide jamming against German armour. Though four aircraft were fitted with Jackal jammers by 20 June, there were no operations until December. Eighth Air Force, bristling at being required to support what it viewed as tactical operations, had requested in summer 1944 that the mission be transferred to Ninth Air Force soonest, but apparently no headway had been made on this request by the end of the year.<sup>(26)</sup> In the wake of the German Ardennes counteroffensive in December 1944, the 36<sup>th</sup> BS was called upon to fly Jackal missions in the region of Bastogne, Belgium. The first mission was flown on 28 December and involved three Jackal-equipped B-24s orbiting west of Bastogne at 15,000-20,000 ft with an additional B-24 equipped with a S-27 search receiver and German linguist orbiting 10-20 nm away. A similar mission was flown on 31 December, this time east of Bastogne and with only two jammer aircraft and one search aircraft. Three additional Jackal missions were flown between 2 and 7 January 1945 with similar compositions of jammer and search aircraft, with fighter cover being provided to the orbiting B-24s for protection from marauding Luftwaffe fighters. These five Jackal missions were all that were flown by the squadron for the duration of the war, though the 36<sup>th</sup> BS remained ready to execute additional missions. The British Jostle jammer was experimented with on two aircraft and found superior to the Jackal and



plans were ready to procure more if the need arose (Figure 13). The aircraft with “Group A” for Jackal/Jostle were also given Carpet I jammers for self-protection, given their mission would bring them close to front lines and an AAA threat.<sup>(27)</sup>

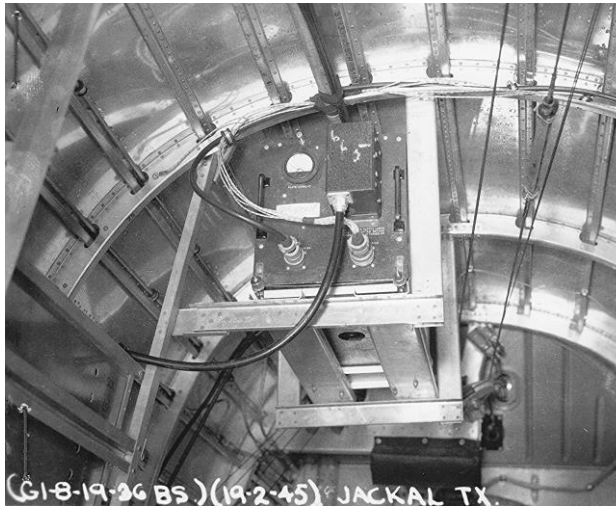


Figure 12. Though only used operationally on five missions, Jackal jammers provided key support to the US Army during the German Ardennes counteroffensive in December 1944. Jackal targeted VHF radio communications used by German armour and utilized a transmitter mounted in rear waist of a B-24 to provide 1 KW of jamming power. (Air Force Historical Research Agency)



Figure 13. The British Jostle jammer was experimented with on two aircraft and found superior to the Jackal and plans were ready to procure more if the need arose. The 600 pound Jostle transmitter is shown mounted in the ball turret position of a squadron B-24 aircraft. To remove the transmitter, the B-24 had to be positioned over a pit dug on the edge of the hard-stand which the Jostle could be lowered into. (Air Force Historical Research Agency)

The squadron received an additional five B-24J and one B-24H aircraft that month, finishing December with 17 assigned aircraft with 22 full and three partial crews. These numbers account for the unfortunate loss of a B-24J over the Irish Sea on 22 December as the aircraft ran out of fuel trying to divert to RAF Valley. Of the crew, only pilot 1st Lt Boehm and co-pilot Lt Burch survived (Figure 14). Tuneable Carpet training continued with 200 men on Temporary Duty Assignment from the 3<sup>rd</sup> Air Division, though squadron records do not indicate flights even though two aircraft fitted with the Carpet-Blinker system were still assigned to the squadron. Finally, living up to its task of performing research, the 36<sup>th</sup> BS had one aircraft fitted with the British ‘Moonshine’ jammer, similar in function to the Dina, and one aircraft equipped with the ‘Orvils’ VHF screening jammer, a SCR-522 radio modified to produce modulated noise.<sup>(28)</sup>



Figure 14. 36<sup>th</sup> BS Crew No. 307 was led by pilot 1st Lt. Harold T. Boehm and assigned *Beast of Bourbon*, B-24H-25-CF s/n 42-50385, with squadron letter H. On 22 December 1944 Boehm and crew, flying B-24J-1-DT s/n 42-51232, crashed into the Irish Sea as the aircraft ran out of fuel trying to divert to RAF Valley. Of the crew, only pilot Lt Boehm and co-pilot Lt Burch survived.

Two months later, on 19 February 1945, Lt Louis McCarthy and his crew hit high ground in instrument conditions when climbing out on takeoff with '50385 for an operational mission, killing three onboard and destroying *Beast of Bourbon*. (Air Force Historical Research Agency)

With the exception of the RAF screening and Jackal missions flown in early January, operations for the first two months of 1945 were relatively boring from a variety standpoint and confined to VHF screening missions for Eighth Air Force. Twenty-two missions were flown in January with four to eight jammers while 24 were flown the following month with six to eight B-24s. Squadron aircraft assigned to the VHF screening role were flying with a combination of Mandrel and Dina jammers. In January, all Mandrel III installations were removed from the B-24s as the squadron started to concentrate on using the Dina for the VHF screening missions (Figure 15). Dina's made up the RCM fit on 12 of the squadron's B-24s with two aircraft each being fitted out with ten of these jammers.<sup>(29)</sup>

The squadron also modified other aircraft, starting with installing 12 Carpet III tuneable jammers in four aircraft for spot jamming. The 'Orvils' VHF screening jammer experiments were showing promise and 60 sets that arrived in January were promptly installed in four of the aircraft (Figure 16). Additional Carpet "Group A" kits arrived and were installed in the B-24s, giving the squadron

flexibility in mounting "Group B" equipment for various missions. Many of the bombers had their ball turrets removed and Long Range Navigation (LORAN) and radio altimeters installed while five further aircraft were modified with a room installed in the rear bomb bay compartment.<sup>(30)</sup>

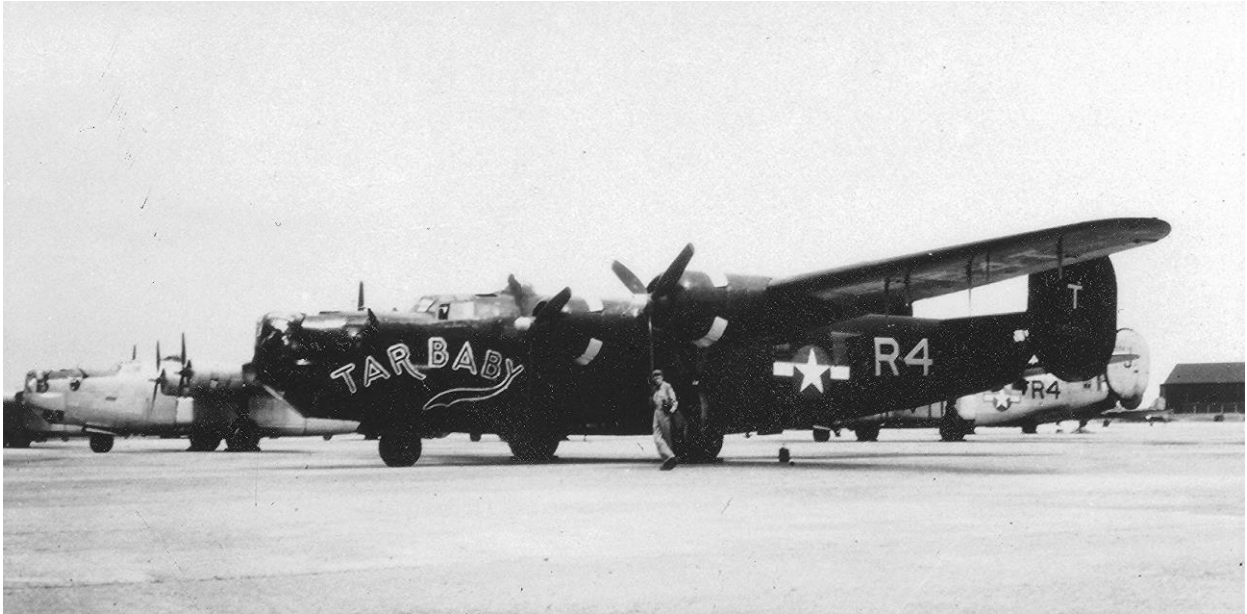


Figure 15. In the foreground is all black B-24J-5-DT Liberator #42-51311 *TAR BABY*, one of two all black B-24s assigned to the squadron in early January 1945. In March 1945, the aircraft was fitted with twenty-two Dina jammers, their antennas visible under the outer wing. B-24J-40-CF #42-50476 coded "R4-J" at right. (Stephen Hutton)

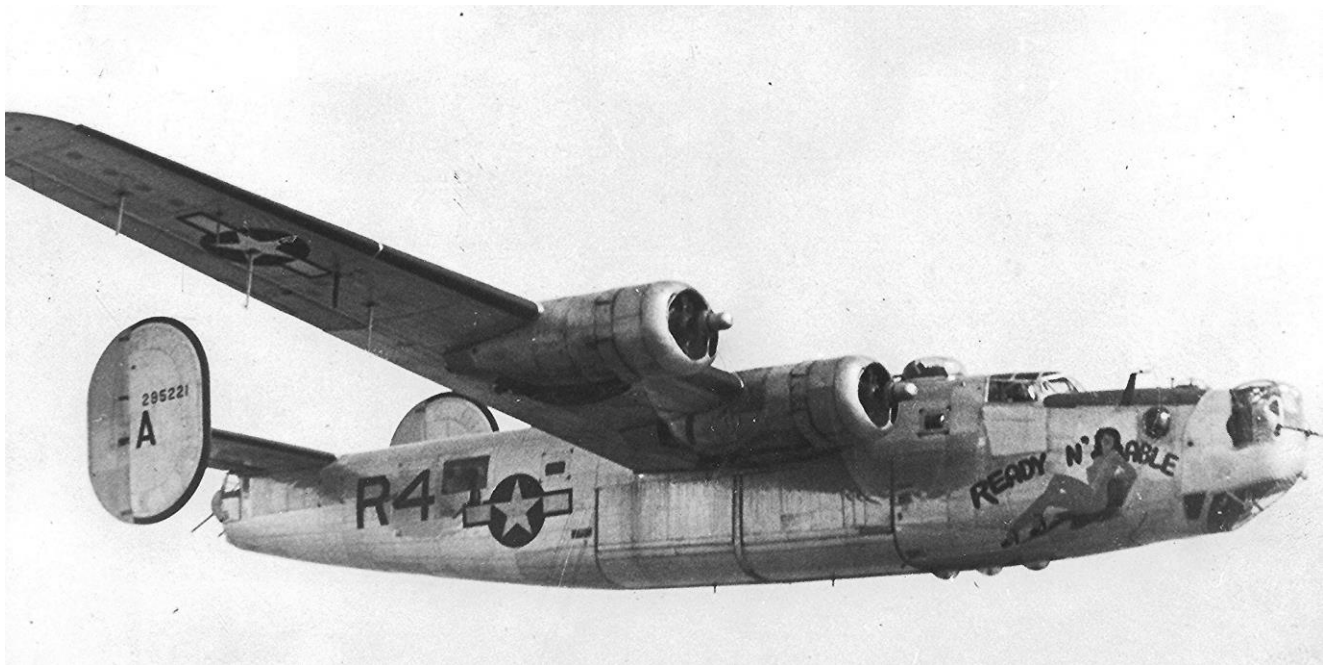


Figure 16. B-24H-25-FO #42-95221 *READY N' ABLE* in flight. Antennas are visible under the starboard wing, fitted to the aircraft in December 1944 for Orvils, Mandrel and Dina jammers. (Stephen Hutton)

The 36<sup>th</sup> BS graduated its last RCM training class for 210 men of 1<sup>st</sup> Air Division and shut down its training section. Enough experience had been built within Eighth Air Force's air divisions for this activity to continue at the group level. All told, the squadron had trained about 600 men since August 1944 while operating under the direct supervision of the RCM Section, Headquarters Eighth Air Force. Finally, five crew completed their combat tours in January 1945 and left the squadron. This pace would pick up in the coming months and even though replacement crews were arriving, squadron strength started to slip.<sup>(31)</sup> This was unfortunate, as Eighth Air Force had big plans for the squadron.

## 12. SPRINT TO THE END

By mid-January 1945, consideration was again given to a group-sized organization dedicated to the RCM mission. The idea dated back to March 1943 and had been deferred due to equipment shortages, but as the Germans appeared to have a new life with the Ardennes counteroffensive and 'wonder weapons', it seemed like a good time to review the old plan for relevance. The group was envisioned as a USAAF-version of 100 Group, with many functions: overseeing ferret aircraft for USSTAF Director of Intelligence investigation work on Luftwaffe radio and radar traffic; airborne jamming of early warning radars, ground communications, and Luftwaffe radio links; radio intercept; 'spoof' raids; and 'wild weasel' types of operations with fighters and bombers homing in on enemy signals to destroy the offending equipment with bombs or gunfire. Jamming of Würzburg radars would be left to the individual bomb groups flying operational missions. The group would include at least three bomber and one fighter squadrons and would report directly to USSTAF.<sup>(32)</sup> While the group never came to pass, it provides insight into the USSTAF staff officers in London and how they envisioned fighting in the electronic realm. The 36<sup>th</sup> BS did, though, receive additional guidance from Eighth Air Force on how to proceed in the coming months.

In February 1945, Eighth Air Force directed 1<sup>st</sup> Air Division to organize the 36<sup>th</sup> BS to be able to carry out four distinct functions: 1) Prevent German interception of VHF radio traffic during assembly; 2) Jam early warning radars to screen assembly; 3) Jam enemy tank communications; 4) Investigate German radar frequencies. According to Eighth Air Force, the squadron would require 19 B-24s and three Lockheed P-38 Lightnings to accomplish these mission areas. Eighteen B-24s would be configured as jamming aircraft, 14 equipped with ten Dina jammers and four carrying with twelve SCR-522 'Orvils' jammers (Figure 18). The squadron already had 20 B-24s on hand, so it was only a matter of procuring an adequate number of "Group B" jammers – still a problem in early 1945. For the investigation function, Eighth Air Force recommended a dedicated ferret B-24 and the P-38s. Even though the 36<sup>th</sup> BS had configured various B-24s to operate in the ferret role in the past, the 1<sup>st</sup> Strategic Air Depot at Station 375, RAF Honington (Suffolk, near Thetford), was fitting out a B-24 specifically for the ferret mission which was assigned to the 36<sup>th</sup> BS in late February. The P-38s were already built and serving with 100 Group and had an interesting background.<sup>(33)</sup>



Figure 17. Close up of the Orvils VHF jamming antennas fitted to the starboard wing of 36<sup>th</sup> BS B-24H-25-FO Liberator #42-95221 nicknamed *Margie* (originally *READY N' ABLE*). Orvils was a VHF screening jammer that used an SCR-522 radio modified to produce modulated noise; in February “Margie” was fitted with six of these jammers. (Stephen Hutton)

In August 1944 Eighth Air Force had provided four P-38s to 100 Group to aid in searching for signals associated with the V-2 ballistic missile which was due to become operational. The aircraft were P-38Js with the pathfinder ‘Droop Snoot’ modification with SIGINT receivers added for an RCM observer to operate in the cramped nose section (Figure 18). The Lightnings were assigned to 192 Squadron at RAF Station Foulsham (near Fakenham, Norfolk) and flew daytime missions with USAAF crews on detached service from 7<sup>th</sup> Photographic Reconnaissance Group (PRG). One P-38 was lost on 26 October 1944 and the remaining three were transferred to the 36<sup>th</sup> BS in mid-March 1945.<sup>(34)</sup> The renewed interest in SIGINT at this late stage in the war was based on intelligence’s latest assessment of the Luftwaffe. Three new threats were seen as on the horizon: more effective AAA controlled by centimetre wavelength radar; proximity fuses for AAA; and a day fighter force composed principally of jet fighters with “extensive and detailed control by radio and radar.”<sup>(35)</sup>



Figure 18. Lt Holt, one of the radar observers assigned to the three P-38Js operated by the 36th BS, is seen posing next to one of his mounts. The P-38J “Droop Snoot” modification was used for formation bombing by other fighter aircraft; the electronic modification used by 100 Group and later the 36th BS removed the Norden bombsight and added a receiver, whose antenna is seen here mounted on the flat bomb aiming panel. (Air Force Historical Research Agency)

As the 36<sup>th</sup> BS prepared to institute its new direction, at the end of February it moved to Station 102, RAF Alconbury (near Huntingdon) and was placed under the 482<sup>nd</sup> Bombardment Group (P) for local administrative support. Two losses were also experienced by the squadron at this time, with Lt McCarthy and his crew crashing on takeoff, resulting in the death of three crew members, and the disappearance of Lt McKibben and his crew on a mission over the North Sea.<sup>(36)</sup>

### 13. MARCH MADNESS

In March 1944, the 36<sup>th</sup> BS flew the VHF screening mission for 27 days, including a day of extended coverage on 24 March to support bombing done to assist Operation VARSITY, the airborne crossing of the Rhine River. All March missions were flown over the North Sea using between two and six B-24s, the majority equipped with Orvils jammers (Figure 19). March also saw the emergence of a new 36<sup>th</sup> BS mission, radar screening sorties flown for the Eighth Air Force. Similar to earlier missions flown with 100 Group, the concept had been directed by Eighth Air Force and may have been based not only on proven 100 Group success, but also intelligence coming from British analysts at Bletchley Park who noted Germans complaining that the VHF screening operation was also jamming some of the German early warning radars. The first radar

screening mission was flown on 16 March and nine more were flown that month. The objective of the mission was to screen the assembly operations from prying German eyes using seven to nine Dina jammer-equipped B-24s. The radar screening missions were first flown 20 miles off the coast of East Anglia, paralleling the UK coast, but later moved to 50 miles from the Dutch coast.<sup>(37)</sup>



Figure 19. The Orvils started to replace the Dina as the primary VHF jammer with the 36<sup>th</sup> BS in February 1945. Orvils control boxes were mounted on either side of the bomb-bay door of squadron aircraft with transmitters on a wooden floor as depicted in the foreground. The modified VHF SCR-522 radios used a Gaston gas tube, seen at the upper left-hand corner of the picture, as a noise source with a stage of amplification to modulate all twelve transmitters. (Air Force Historical Research Agency)

The target of the Dina jammers was the remnants of the Luftwaffe early warning system still active in the western Netherlands. Though Allied ground forces had advanced up the coast of France and Belgium, Holland was still occupied by German forces in contact with the remainder of the German air defences through existing cable networks or the use of powerful, long range HF radios. One way to confirm what was operational was through the use of ferret aircraft. On 7 March B-24 ferret s/n 44-10507, fresh out of depot modification work, flew its first search mission. Thirteen additional missions would be flown during the month, both monitoring the effectiveness of the

VHF screen and looking for German early warning radars, while flying an orbit between the VHF screen and occupied Europe. The aircraft's direction-finding antenna enabled the crew to plot and forward to USSTAF staff for analysis active German radars while the aircraft's receivers enabled RCM observers to note German radar parameters. Based on data received from the ferret, the squadron adjusted its Dina jammers to better cover the German radars still in operation.<sup>(38)</sup>

The ferret's data, when combined with information received from 94<sup>th</sup> and 459<sup>th</sup> Bomb Group APR-4-equipped bombers, gave USSTAF analysts a good idea of what the Germans were doing towards the end of the war.<sup>(39)</sup> Another system also fed into this pool of knowledge – the P-38 ferrets assigned to the 36<sup>th</sup> BS. The three P-38s arrived at Alconbury sometime in mid-March and flew their first search mission on 17 March with a single P-38. Four more solo missions and one with two aircraft were flown in March. The P-38s, their pilots, and maintenance personnel were on detached service from the 7<sup>th</sup> PRG. Three RCM officers were assigned the rather uncomfortable role of flying in the aircraft and operating the receiver, made undoubtedly exciting by the fact that P-38s were reserved for missions “within enemy territory.” Captain Howard Kasch, a liaison officer for the Director of Intelligence, HQ USSTAF, coordinated the tasking of the SIGINT Lightnings. Original guidance called out three specific tasks for the aircraft: 1) searching for new radars in the 30-70 MHz range as well as monitoring the existing Freya radar range of 70-220 MHz; 2) general search of the 600-15,000 MHz spectrum; 3) search for buoys with transmitters for use by Heinkel He 111 aircraft launching V-1s over the North Sea.<sup>(40)</sup> Missions in March were directed at German radars in Holland and along front lines, with patrols along the coast from Dunkirk to Denmark and along the length of the Ruhr Valley. This tasking not only aligned with providing feedback to the 36<sup>th</sup> BS radar jammers, references to searches for 2 cm radars also interleaves nicely with the intelligence assessment of this possible threat.<sup>(41)</sup>

Besides the three ‘Droop Snoot’ P-38 SIGINT aircraft and the B-24J ferret, three additional B-24M aircraft were assigned to the squadron in March. This gain was slightly offset by the loss of a B-24J which was written off after crashing on takeoff on 20 March, though Lt Sweeney's crew suffered no casualties. Engineers within the 36<sup>th</sup> BS continued to tinker with RCM equipment, modifying two B-24s with a “special British alternator” for additional power to enable each aircraft to operate 22 Dina jammers.<sup>(42)</sup>

April 1945 was the last month the 36<sup>th</sup> BS flew operational missions. VHF screening missions were flown for 18 days, all missions flown over the North Sea and averaging four Dina-equipped B-24s. The VHF screening mission on 25 April was the 36<sup>th</sup> BS's last operational mission of the war. Surprisingly, radar screening missions stopped on 30 March and were not continued. Allied ground forces had overrun a few additional German radar posts, but the jamming itself did not appear to have been effective. Studies conducted by SIGINT units in Europe note that “the enemy has been able to ‘look through and around’ the screen sufficiently to secure desired information,” negating the primary purpose of the radar screening mission. This was unanticipated, as the squadron engineering section was gearing up to have dedicated radar jamming aircraft each configured with 32 Dina jammers. Six aircraft had already been configured and seven partially configured before the program was halted.



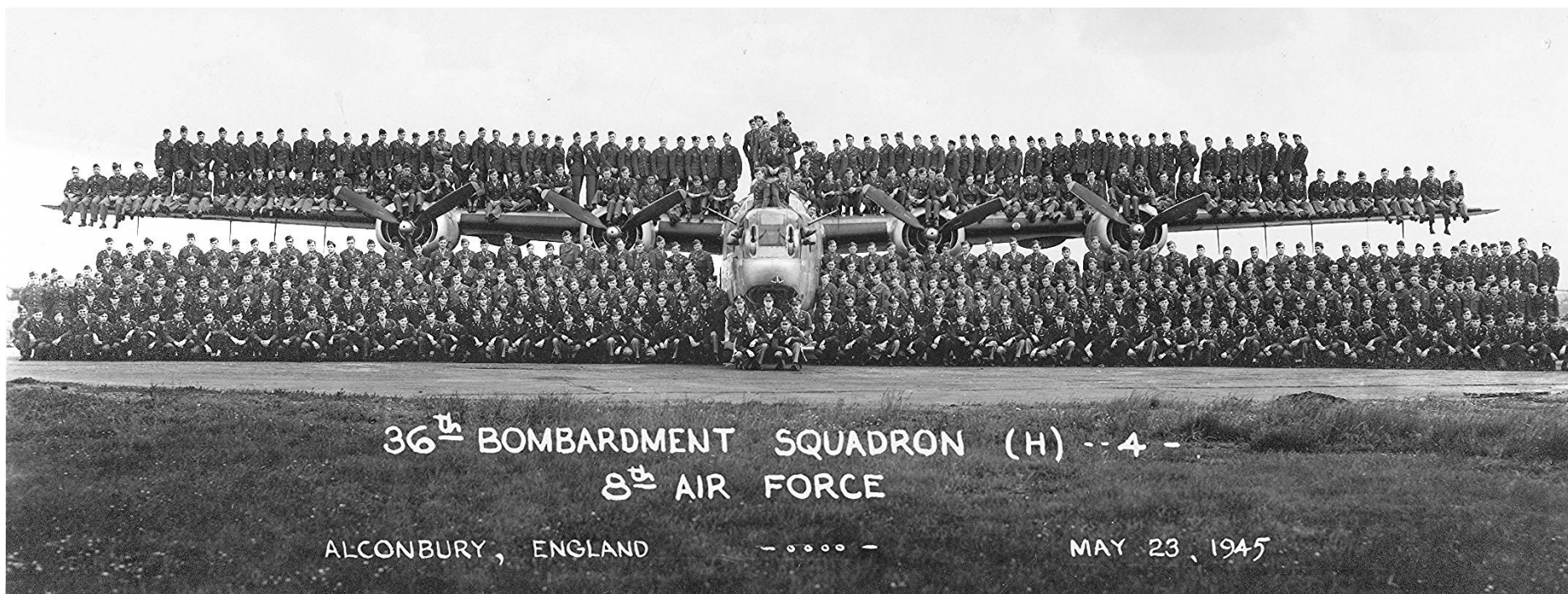


Figure 20. Lt. Col. Robert F. Hambaugh, 36<sup>th</sup> BS commander and a native of Birmingham, Alabama, poses in front of B-24J-2-FO s/n 42-50622, *BAMA BOUND*/'*LOVELY LIBBA*'. This Liberator has had its nose turret replaced by glazing reminiscent of modifications seen on 801<sup>st</sup> BG (P) Carpetbagger B-24s and apparently was the only aircraft in the squadron so modified. In December 1944 this aircraft was modified into one of the squadron 'ferret' search aircraft, though around the time this photo was taken in April 1945 the search equipment had been removed. (Air Force Historical Research Agency)

Search missions also slowed down, with the USSTAF liaison officer returning to London on 1 April. The three ELINT missions flown in April - one B-24 over the North Sea, one P-38 over Baltic seaports and one P-38 over the Munich region - were all conceived and directed by the squadron with the P-38 mission on 13 April the last search mission flown by the unit.<sup>(43)</sup>

#### 14. THE END FOR NOW

Hostilities against Germany ceased on 7 May. Since the squadron had already stood down from flight operations almost two weeks prior, there was little to do other than wait for orders dictating



the future of the squadron and its personnel. To keep personnel occupied, the 36<sup>th</sup> BS flew 27 “observation flights” for ground personnel over the Ruhr and Rhineland in May to let all the hard-working maintenance personnel see the effects of strategic bombing on the German industrial heartland. Forty-four additional “observation flights” were flown in June before flight operations stood down. The 36<sup>th</sup> BS was maintained in the UK as an administrative unit for “high point” personnel enroute to being sent back to the States for discharge.<sup>(44)</sup> No thought was given to rotating the unit back for conversion to B-29s and shipment to the Pacific, as the Twentieth Air Force had a robust RCM capability already in place.

In the 11 months from 6 June 1944 to 25 April 1945, the 803<sup>rd</sup>/36<sup>th</sup> BS flew 274 combat missions, comprising some 1,188 effective sorties. Included in this number are 94 missions supporting 100 Group radar screening operations; 121 VHF screening, ten radar screening, and three spoof missions for the Eighth Air Force; five Jackal armour communications jamming missions for Allied ground forces; and 41 search missions. The RCM squadrons flew with 100 Group for seven months, working side by side with their RAF counterparts to absorb their lessons learned and help shape RCM operations within the Eighth Air Force. Using this knowledge, the squadron supported Eighth Air Force strategic bombing operations, tested and modified RCM equipment, and passed on knowledge of RCM operations through training of Eighth Air Force personnel. In little more than one year of existence, the 803<sup>rd</sup>/36<sup>th</sup> BS tested out equipment and tactics that could be applied in future operations and helped shape future USAF activities in the electromagnetic spectrum.

## 15. DID IT WORK?

Between 25 June and 7 July 1945 the RAF conducted Operation ‘Post Mortem’, an analysis of 100 Group RCM operations against the relatively intact Luftwaffe IADS in Denmark. Some of the findings of this fascinating after action report provide insight into the impact Allied RCM had on Luftwaffe air defence operations. Though Germany continued to upgrade its radars throughout the war, window was found to still be an effective means of denying radar tracking data. The Mandrel radar jammer was effective against *Freya* radars but had reduced effectiveness against later early warning radars such as *Wassermann*. When viewed as a whole, 100 Group’s RCM tactics were found to have contributed to a decline in Bomber Command losses.

What about American capabilities for supporting Eighth Air Force? Since the Americans did not run a similar exercise, one is left to examine evidence and make a judgement call. ‘Post Mortem’ proved the Mandrel to be of limited effectiveness, but this was not the primary tool of the 36<sup>th</sup> BS. One interesting fact from this exercise, though, was the Luftwaffe use of their passive ‘Y Service’ that tracked Bomber Command aircraft through their Gee and H2S navigation transmissions as well as radio calls – even when early warning radars were being jammed.<sup>(45)</sup> Though no archival evidence has been found to support the effectiveness of 36 BS VHF screening operations, it is likely they were able to saturate and degrade the Luftwaffe ‘Y Service’ sites along the coast of occupied Europe. If so, the squadron was able to fulfil its original objective of denying the Luftwaffe early warning on the size and intention of USAAF strategic bomber raids.

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