**RIGHT:** Operation . Outward underway on Languard Common, Felixstowe note the racks of cylinders arranged on the right hand side. The backdrop is provided by Landguard Fort. A fort at Landguard has protected **Harwich Harbour** since the reign of Henry VIII. The five-sided fort pictured here (and which is today open to the public) dates from 1717-20. (THE NATIONAL ARCHIVE, ADM199-848)

This TALE began on the night of 16/17 September 1940. It was a stormy night and violent gales tore loose a very large number of barrage balloons from across England's east coast. The winds carried the balloons over the North Sea, coming to earth throughout Scandinavia. The wide-spread and devastating effect that these seemingly harmless stray balloons created was reported by the Swedish press on the following day, the 18th.

'A great number of English barrage balloons, which, clearly, were set free by the heavy storm on Tuesday, have drifted in over the south and west coasts of Sweden and over Denmark. The trailing cables of the balloons caused damage in many places to over-head electric circuits and caused interruption of traffic, in Malmö and Gothenburg among other places. The traffic on the West Coast Railway was crippled.



The effects of the balloons hitting power cables were as devastating as a major air raid. Sweden, of course, was not at war with Britain and the incident was an embarrassment to the British Government. But some of the balloons reached German-occupied Denmark where they did so much damage that anti-aircraft guns were brought into action to shoot them down. This, naturally, set people in Britain thinking. As Churchill observed: 'We may make a virtue of our misfortune'!

### LIKELY TO DESCEND IN GERMANY

The Air Ministry was instructed to consider the practicality of using balloons as an offensive weapon. Balloons could clearly do a great deal of damage, they were comparatively cheap to manufacture and no-one would have to risk their life sending them to the enemy. It was calculated that if balloons were released from Great Yarmouth on a westerly wind they were likely to descend in Germany. But the Air Ministry showed little interest in the scheme. expressing concerns that the Germans might retaliate in kind - the lamest of excuses in time of war. Plus, they noted, the prevailing winds across the UK tend to be westerly, which would limit the opportunities for balloon

# OUTWARD BOUND Balloon Warfare on German War Effort

releases from the Continent, and it was passed on to the Boom Defence Department (BDD) of the Royal Navy which had suitable facilities for such an operation on the south and east coasts.

The first BDD balloon base was situated on Landguard Common in Felixstowe. The base was operated predominantly by women -**Operational Boom Defence Wrens** - even though the work was mainly heavy, outdoor, manual labour. Big strong girls were chosen and one person who saw the team at Felixstowe lined up in the field in bell bottom trousers and blue jerseys, described the women as 'Amazons'. The girls were also trained to operate defensive Lewis guns, even though the employment of women on lethal weapons was at that time officially prohibited. The Wrens living quarters were at the Suffolk Convalescent Home on Felixstowe seafront.<sup>3</sup> >>

∆ rare photograph capturing the release of incendiary balloons. as part of Operation Outward, from Languard Common. Felixstowe Interestingly, those carrying out the task seem to a combination of both naval and Royal Air Force staff. (THE NATIONAL ARCHIVE, ADM199-848)

**BELOW:** 

Large numbers of unusual yellow objects drifted over the streets of the east-coast port of Felixstowe in March 1942. Spotted by women in the town, the cry went up that the Nazis had invaded at last. But these were not German paratroopers - they were, in fact, Britain's latest secret weapons! John Grehan investigates the story of Operation Outward.

**BELOW:** The idea behind Operation **Outward** came from the events of the night of 16/17 September 1940. During a series of violent gales large numbers of British barrage balloons were torn loose from across England's east coast. Carried across the North Sea, these balloons caused havoc in Scandinavia and Denmark. (MIRRORPIX)

### OFFENSIVE CAMPAIGN AGAINST GERMANY

Two types of balloons were designed for flights over Germany under the codename Operation *Outward*. One was made of rubber with a diameter of 6.5 feet containing a volume of 148 cubic feet which resulted in a lift of 10.5lbs. The other was 10 feet in diameter and was made of rubberised silk, with a volume of 494 cubic feet and a lift of 35.6lbs. Below the balloons trailed a 300-feet steel cable.

The balloons were surprisingly sophisticated and were built with automatic devices to enable them to remain in the air for the desired length of time. To keep them airborne the balloons carried a six-inch-tall cylindrical can which held water and an aneroid device that responded to air pressure. If the balloon descended then water was released and the balloon rose back to the prescribed height. To prevent the balloon from expanding too much, and rising too high, a length of rope with a ball at the end was suspended internally from the top. The ball sat on the opening of the filling tube and prevented the gas from escaping. But, when the balloon expanded the rope was pulled vertically and the ball

was lifted from the tube opening, thus releasing gas. The balloon would then descend accordingly.<sup>4</sup> The balloons rose at a rate of 850 feet per minute to a height of between 20,000 and 30,000 feet, and when the string became taut and the gas released, the balloons descended at a rate of 200 feet per minute until the ball-valve closed again and the balloons started to ascend.

Though the effects of the early release programmes could not be known, the great enthusiasm for the operation shown by the BDD quickly manifested itself in a variety of explosive devices it designed that could be carried by the balloons. Though the original intention was simply to disrupt Germany's electricpower supply network, the BDD took the wording of the inaugural document at face value and began an 'offensive' campaign against Germany.

The principle behind this idea was that the explosive devices attached to the balloons would be triggered when they landed in Germany or when they were handled by the enemy. Four different devices were used. The first was a simple, small yellow bomb, four inches long and two-and-a-half inches in diameter. It was triggered by a small cartridge which was fired when banged or pulled. The second was a cylindrical metal canister nine inches long with a diameter of eight-and-a-quarter inches. It was fitted with a lid and held seven or eight short-necked half-pint bottles containing a mixture of phosphorus and benzene which ignited immediately the glass was shattered.

The third device was an incendiary sock. This was a bundle of wood-wool soaked in paraffin inside a canvas cover, the whole device measuring twentyseven inches long by ten inches wide and ten inches deep. It was triggered by an electrical igniter which was connected to four fuse cords that were activated by an electrical contact when the device struck the ground. The next variation, the fourth, was a can of incendiary jelly inside a can eleven-anda-half inches by six-and-a-half inches by four inches. At one end of the can was a releasing device mounted on a plate and at the other an impact fuse for igniting the jelly. When the jelly was ignited it erupted over an area of around 20 feet!

#### **DANGEROUS OBJECTS**

Each day at 10.00 hours the Director of Boom Defences, or one of the three Royal Navy Commanders present at the



site, would decide if any balloons were to be released that day. This decision would be based on the following criteria:

1. Suitable wind direction and upper wind speed strong enough to enable the balloons to reach enemy territory one or two hours after dark;

2. Adequate ground wind speed. This had to be ten miles per hour or greater;

3. Absence of heavy cloud formations over enemy territory;

4. Absence of heavy rain or snow and ice.

If conditions were suitable for balloon operations, the officer-in-charge would give the time of the first release, the hours between which the releases would take place, the total number of balloons to be released and the time of the fuse setting for the incendiary devices. This information would then be passed on to both the Admiralty and the Air Ministry.<sup>5</sup>

In July 1942 a second *Outward* base was established at Old Stairs near Ringwould, Kent, despite continued opposition from the RAF which remained extremely worried about these dangerous objects drifting across the skies. Because of this continued pressure, it was decreed two hours notice had to be given before any balloons could be released, and all flights had to be undertaken in daylight hours. The last flight would be one hour before sunset. If the RAF had an operation of its own over the likely target area or if it was felt that the balloons might impede the actions of Fighter Command, the Air Ministry had the authority to order the cancellation of all balloon releases.<sup>6</sup>

Nevertheless, the BDD dispatched anything from 600 to 6,000 balloons every month – a rate it hoped to increase with the opening of a third site, in 1943, at Waxham near Great Yarmouth.

A Number of Unfortunate Accidents Over on the Continent, the Germans thought at first that the attacks on their electricity supply network were the result of sabotage from the ground. Then, eventually, when they found lengths of cable and remains of balloons next to the breaks in the lines, they realised what was happening.

The Germans took the potential cumulative effect of the balloons very seriously (quite correctly as it turned out) and quickly arranged counter-measures. Fighter planes

### OUTWARD BOUND Balloon Warfare on German War Effort

were scrambled during daylight hours to shoot down the balloons and antiaircraft batteries were employed to bring them down whenever they were spotted. Incredible though it may seem, on one occasion a force of 200 German fighters were ordered to intercept a flight of balloons. All sightings of balloons had to be reported to the authorities and electrical supply and generation facilities in the path of the balloons were notified in advance so that they could shut down endangered lines.<sup>7</sup>

Inevitably, not everything went to plan. In April of 1942, claims from the Electricity Commission were made against the Admiralty for War Damage for interruptions to electricity supply in Ipswich 'caused by operations with a device involving the use of small balloons'.8 A Civil Defence pamphlet was also produced to warn police and ambulance crews of the hazards they might encounter from 'British Balloon Devices', particularly the phosphorus bottles and the incendiary canisters.9 Colchester, Harwich and Frinton-on-Sea all suffered from rogue balloons and, on one occasion, the Harwich-Frinton tram service was stopped by them for over twenty-four hours. >>

RIGHT: WAAF barrage balloon operators with one of their charges. Women personnel also operated balloons for Operation Outward. (MIRRORPIX)

**BELOW: The** success of the D-Day landings did not end balloon operations. Here, personnel of No.1 'M' **Balloon Unit** inflate M-type balloons from cylinders by the roadside at Bunsbeek. Belgium, before loading leaflets for despatch over Germany. (IWM CL1963)

Some balloons drifted in the entirely opposite direction, coming to earth in Bristol, Bournemouth and Dorchester. There were also a number of unfortunate accidents to the Wrens. The balloons were inflated with the hydrogen gas inside green canvas tents which were sprayed with water to prevent static electricity building up. However, when the wind was strong the movement of the balloons against the sides of the tents created friction between the canvas and the rubber envelope. Occasionally this caused the hydrogen to ignite resulting in many of the Wrens suffering burns to exposed flesh and hair.

### DESTRUCTION OF THE GERMAN HARVEST

The entirely unpredictable nature of Operation *Outward* resulted in the balloons straying right across Europe. In neutral Switzerland, which adjoins Germany, the effects of the attack were severely felt. Admiralty files, released to the public in the 1970s, disclosed the following:

'Swiss people were warned of the dangers of a new type of foreignmade balloon which has been found in considerable numbers on Swiss territory. The warning, broadcast by radio, said that the balloons are fitted with a metal container holding an inflammable liquid and with a steel cable about 300 feet in length.'

'It may happen', said the announcer, 'that the cable, trailing near the ground, has come in contact with high-tension wires. It is, therefore, dangerous to touch them. The balloons are filled with hydrogen, and it is dangerous to approach them with a burning match or a cigarette.'<sup>10</sup>

Remarkably, some balloons even reached Italy (reported in the Press on 27 September 1943) and, on 18 September 1942, Bulgarian Radio was put off-air by incendiary balloons!11 These balloons also had the unexpected effect of destroying woodland and crops. In occupied Belgium grain and flax was burnt in the fields and, in the Indre Department, one incendiary balloon set fire to a granary, causing the loss of 500,000 Francs-worth of grain. Indeed, the 'Reich Air Defence League' stated in August 1942 that the primary purpose of the balloons was the destruction of the German harvest.12

Operation *Outward* continued until September 1944, when the enterprise was wound-down in case the balloons affected Allied forces operating in Europe. By that time 99,142 balloons had been launched,







of which 45,599 were fitted with just trailing wires - 55,543 carried incendiary devices. It had involved only six Naval and Royal Marine officers, seven W.R.N.S. officers, eighty Marines and 140 Wrens. The entire operation cost a modest £220,000.

#### OPERATION INCREASED IN INTENSITY

During the campaign, no-one in Britain could possibly know precisely how effective the balloons had been. But what was certain was that frontline German forces were diverted from their main defensive tasks to deal with the balloons and valuable ammunition was expended upon them. Whereas in Britain it was largely second-line, non-combatant personnel used in their deployment. So, even discounting the possible disruptive effects of the balloons striking power lines and the like here in the United Kingdom, Outward was considered to have been at least worth the effort.

After the war, the Admiralty was keen to learn how successful *Outward* 



In German-occupied France the balloons cause eighty-four power failures on the main 220 kV system between September 1942 and June 1944 (almost one a week) and in occupied Belgium during a similar period of time there were 194 failures on the high-voltage network, let alone the low-voltage system. At first the Germans kept detailed records of each incident but, as the operation increased in intensity, the number of power failures was so great that they simply gave up documenting them. The incidents became so frequent that gangs of trained men were kept on stand-by to fix damaged cables and conductors.



The subsequent estimate provided by the British Central Electricity Board, using the evidence gathered by the post-war survey, claimed that the losses to the German electricity companies amounted to £1,152,000. This figure does not include the loss of industrial production caused by the resultant power failures - this is merely the cost of damaged plant and equipment. The total cost to German industry must have been colossal.

#### DESTRUCTION OF THE BOHLEN PLANT

The greatest single loss suffered by the Germans was the complete destruction of the power station at Bohlen near Leipzig, which was about the same size as Battersea Power Station. This occurred in July 1942 when a balloon cable short-circuited a 110 kV overhead line running from the plant. The protective circuit-breaker failed to work and the power was fed back to the generators. This led to a mechanical explosion followed by a general fire. 250,000 kV of plant was rendered unserviceable.

As a result of the destruction of the Bohlen plant the circuit-breakers used by the German electrical companies were modified to make them more sensitive. Sadly for the Germans, this made them so sensitive that the circuitbreakers were frequently triggered by sudden surges in demand and even by birds when there were no balloons in the sky! The destruction to the Bohlen plant was calculated as having the equivalent effect upon the German

#### ABOVE: Large numbers of Luftwaffe fighters were regularly sent up to intercept the Operation Outward balloons. (1940 MEDIA LTD)

LEFT: A War Office diagram of an Operation Outward balloon.

**RIGHT:** Visual proof that Operation Outward worked - the devastation at the generating station at Bohlen, Germany. caused by an incendiary balloon, July 1942. (THE NATIONAL ARCHIVE, ADM199-848)

**BELOW:** The third and final launching site for Operation **Outward** was opened, in 1943, on the East Coast at Waxham near Great Yarmouth. The actual open area believed to have been used for the balloon releases is now a camp site. (VIA AUTHOR)

war effort as the loss of a large warship. A loss achieved by the simple deployment of balloons.<sup>13</sup>

Lieutenant Commander Edmead, who conducted the post-war research on behalf of the DBD, discovered that even if the balloon cables did not break the power lines on first contact, they would damage them to such an extent that in adverse conditions - such as following a severe snow storm - the lines would break. "The total number of incidents", Edmead calculated, "must have reached a formidable amount". Incredibly, the Luftwaffe eventually stopped trying to shoot down the balloons because "the incidents were too frequent and often occurred several times in an hour".14

Though rarely-reported, and often dismissed as being of little more than nuisance value, Operation Outward was in fact a startling success. Indeed, the Germans were "greatly relieved" that the scale of the attack was not heavier!<sup>15</sup> From the statistics complied by the Admiralty, it would appear that almost every week (and sometimes every day) German power supplies across the country - and therefore German industrial units - were being disrupted. To cite an example, in one factory alone, more than 1,000 man-hours were lost in just a single incident.<sup>16</sup>

It could well be that this comparatively benign enterprise, which aimed principally at destroying plant and equipment rather than killing people, was, for the resources employed and the negligible injuries incurred, the most successful operation conducted by any nation in the entire Second World War. •



#### FOOTNOTES:

- The extract from the 54th Division's War Diary reads as follows: "The appearance of a number of strange-shaped balloons over Felixstowe (forty was the number) with trailing ropes [sic] to which were attached white metal canisters, caused great curiosity and some trepidation amongst the local population ... in Maidstone Road, Felixstowe, the sight of the balloons caused two women to commence screaming hysterically that the invasion had commenced and Nazi parachutists were coming down. Their uproar was promptly quelled by the local ARP warden", TNA W0 166/6340.
- The National Archive (TNA) ADM 199/848, War Cabinet Chiefs of Staff Committee meeting, C.O.S. (40) 872, 26, October 1940, Use of Balloons as an Offensive Weapon.
- 3. Vera Laughton Mathews, Blue Tapestry, (Hollis & Carter, London 1948), p.226.
- 4. TNA ADM 1/15627.9.
- 5. TNA ADM 199/848 262517, Instructions for Operation "Outward".
- 6. In May 1944, the RAF asked for Operation Outward to cease altogether. After negotiations between the DBD and the RAF the operation was allowed to continue but only under a trickle release system in which only one balloon was released every six minutes, from each station, and the balloons with wires only one every 500 minutes, ADM 199/848, Report of The Director of Boom Defences, 19 December 1945.
  - TNA ADM 1/1683,27.7.44.
- Christopher, J. Balloons at War: Gasbags, Flying Bombs & Cold War Secrets (Tempus, Stroud, 2004), pp. 124-5.
  Civil Defence Training Pamphlet No.2, Objects Dropped from the Air (HMSO 1944).
- 10. TNA ADM 1/15627.

12.

- 11. Daily Digest of World Broadcasts, No.I 153, BBC, 13 September 1942.
  - Sheila M. Bywater, typescript memoir Small Part, Big War, in the Imperial War Museum, Department of Documents, Ref. 05/62/1: ADM 1/15627. 28.8.42.
- 13. TNA ADM 199/848, Report of The Director of Boom Defences, 19 December 1945
- 14. TNA ADM 199/848, Report of The Director of Boom Defences, 18 December 1945.
- 15. Ibid. To give some indication of how Operation Outward has been viewed by some historians, the reader should consult J.P. Foynes, privately-published The Battle of the East Coast (Isleworth, 1994), p.211, in which he states that it was a "mere pin-prick to the enemy".
- 16. TNA ADM 1/16843, Minute of 8 July 1944

