A 618 Squadron Mosquito releasing a Highball bomb, during trials on Loch Striven, 1943.

Barnes Wallis's other bouncing bomb

Plans to sink the German battleship Tirpitz in 1943

By John Sweetman

Part II: TARGET TIRPITZ

The latest date for launching an attack on the German dams had been advanced from 26 to 19 May 1943, and a meeting at the MAP on Thursday 13 May heard that not until 15 May would the 20 modified Mosquitoes allocated to the squadron destined to attack Tirpitz with the smaller version of Barnes Wallis's 'bouncing bomb' (codenamed Highball) have left Vickers-Armstrong's works. A further three weeks would by required for the fitting of long-range tanks. So far 220 Highballs had been manufactured at Crayford: 99 been filled with Torpex (40 now at Sumburgh, 59 in store at Glascoid), 104 inert-filled (including 60 at Turnberry and 20 at Manston). The critical factor, however, was that 'no conclusive drop' had yet taken place. [1]

None the less, a decision clearly had to be taken about the dams raid, long expected to occur simultaneously with that on Tirpitz. The Vice-Chiefs were unable to do this in London, not least because the First Sea Lord had forbidden his deputy to discuss the matter in his absence. Thus an urgent signal went to the Chiefs of Staff in Washington on 13 May: 'Further trials, modifications and considerable further training of crews necessary before Highball can be used. Consequently delay likely to prevent Upkeep operation this year if it has to wait for Highball'. The following day, the Chiefs of Staff authorised the independent dams raid, which took place on Sunday 16 May. Meanwhile, Highball and Operation Servant remained in limbo. [2]

The decision to press ahead with No 617 Squadron's attack on the German dams before perfection of Highball was not unreasonable. In truth, both the method of delivery and even the specifications of the smaller 'bouncing bomb' were still in doubt. On 11 August 1942, Patent No 937,959 was filed, which included a sketch later reproduced as Fig 9 in Wallis's paper 'Air Attack On Dams' showing the weapon crawling down the side and under the hull of a warship. The following passage appeared with technical details of Wallis's invention: 'A missile weighing 1,000lbs released from an aircraft travelling at 400mph at 50-100ft above the water surface and a rate of 1,000rpm has been found satisfactory. With calm water surface a missile projected under such conditions would have a maximum range of 2,000yds'. However, the patent was not apparently formally registered until 9 July 1943, and the data may therefore reflect the results of trials and tests after August 1942. [3]

The need for a comparatively-high speed of delivery caused trouble with the velocity at which the weapon would strike the side of the target ship

Meanwhile, there had been several different stages in the evolution of Highball as distinct from Upkeep. The need for a comparatively-high speed of delivery caused trouble with the velocity at which the weapon would strike the side of the target ship. Difficulties with the release gear in the aircraft, from which two Highballs had to be released in succession, and uncertainty about substitute HE used in spinning tests as well as the composition of the inert-filling for practice and trial drops were responsible for delays in finalising the design of Highball. At various times, separate documents - reflecting statements by Wallis – seemed conclusively to prove that the weapon was 35in in diameter and 950lbs in total weight, though figures about the size of the charge varied between 500lbs and 600lbs. On 22 January 1943, for instance, Wallis wrote that Highball would carry 600lbs of Mineol, on 2 February 500lbs (the amount previously mentioned). Several documents identify resin and sawdust as the inert-filling, but on 8 February Napthalene, Kaolin, Barium Sulphate and Aluminium 5/120 were listed, though it is possible that they were merely under consideration. The meeting on 2 February was among those to be told about a 35in diameter weapon, and this was confirmed by Flt Lt Green at the MAP on 26 February. Yet the later addition of two 18in wide external metal plates, 5/32in thick, did marginally increase this measurement. On 4 February, ACAS (TR) had also referred to work on the '35in diameter bomb … This design which at a very early stage consists at present of a cylinder containing the explosive, cased in a spherical shell, the annulus being filled with soft wood to absorb the shock on impact with a target'. However, an unidentified paper in Barnes Wallis's files dated 9 March showed the gross weight of the 'Light Highball' as 1,000lbs, with a 545lbs charge of Torpex and diameter of 35ins. On 17 March the Chief Executive of the MAP, Sir Wilfrid Freeman, noted that the fusing mechanism on Upkeep Lancasters would be on the starboard side and asked Wallis whether he wanted the same arrangement for the Mosquitoes, a reminder that apart from the design of the weapon perfection of fusing and release gears had to be achieved, too. On 5 April 1943, D Arm D informed Wallis that he had decided to fit Highball with 'a fusing control to the D/C pistol' and therefore not to remove the 'safety fork on the ground before take-off'. Four days later Air-Marshal Sir John Slessor, AOC-in-C Coastal Command, pointed out that the weapon had not yet been finalised. [4]

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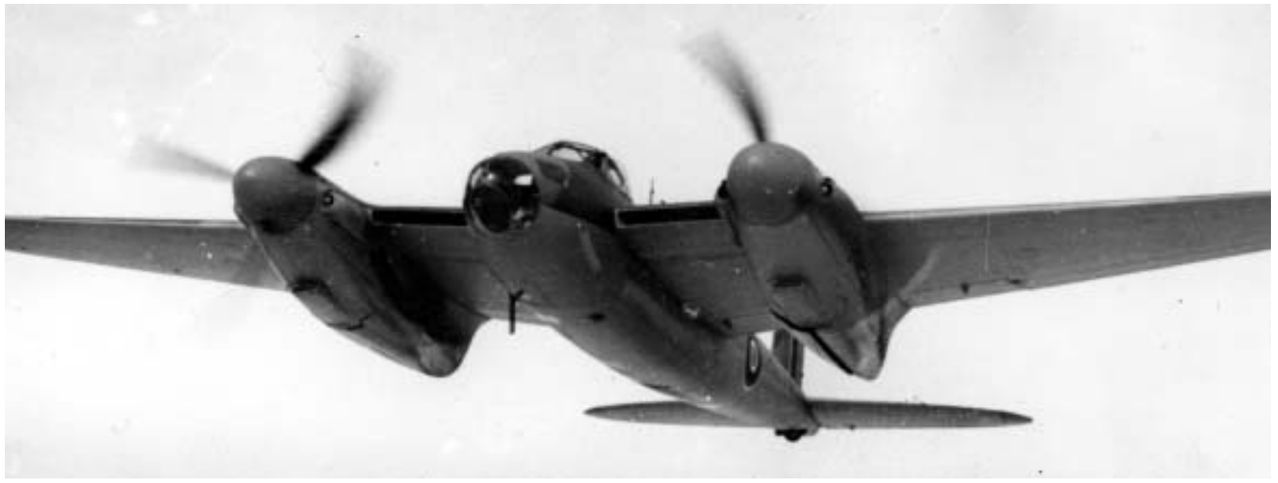
NO 618 SQUADRON

Nevertheless, positive steps were taken to form and train the Mosquito squadron, which would deliver Highball against *Tirpitz*. The meeting on 25 March at the Air Ministry to discuss Highball and Upkeep progress, chaired by Bottomley, agreed formally that Coastal Command would assume responsibility for Highball operations. The following day Coastal and Bomber commands, acknowledging that No 618 Squadron would form at RAF Skitten, agreed that on or about 1 April Bomber Command would supply nine experienced crews and eight Mosquitoes for preliminary training there.



A de Havilland Mosquito B 1V. The first aircraft of this mark modified to carry Highball was taken on charge by No 618 Squadron in April 1943.

Eleven Coastal Command Beaufighter crews were to go to 1655 Mosquito Training Unit at RAF Marham for a one-week conversion course on 29 March. The previous year, the existing north-south runway had been extended and an east-west one added at Skitten, a satellite of RAF Wick in the north-east of Scotland near Loch Watten. Events now moved swiftly. On 28 March, the first Beaufighter crews from 235 Squadron, transferred to 618, arrived at Marham. The CO of the new squadron was Wg Cdr G H Hutchinson from 235 Squadron, his flight commanders Sqn Ldr C F Rose (who carried out most of the Mosquito trials at Reculver) and Sqd Ldr G N Melville-Jackson. No 618 Squadron officially formed at Skitten on 1 April to carry out training exercises in connection with Highball, ' a special mining weapon'. From the outset, Hutchinson stressed the need for strict security. On 3 April, ground crew from 105 and 139 squadrons converged on Skitten and shortly afterwards eight Mosquitoes from the same squadrons duly arrived for training purposes. Low-level flights began almost immediately, and on 5 April the first fatality occurred, when a Mosquito flew into a hillside. The Bomber Command Mosquitoes would, theoretically, be replaced by the designated modified Mosquito IVs (normal cruising speed 240mph at low level), the first arriving on 24 April, the last four on 15 May. The 'mines', at that stage still with wooden casings, were to be kept dry under cover, and 'tactical exercises using photographic methods' were planned against a naval target in Lake Cairnbawn in addition to the low-level flights. A Vickers-Armstrong's superviser, Jim Rogerson, went to Skitten to oversee work necessary on Highball and the 'special' Mosquitoes. As April passed, prolonged low-level exercises involving navigation over water in the area of the Faroes and Shetlands were devised.

The first modified Mosquito (DZ 531/G) arrived from Weybridge on 17 April. Its bomb-bay doors had been removed and installed in the bomb-bay were the cradles and spinning gear for the two Highballs

An early version of a Highball used for spinning trials.

A Highball being loaded into the modified bomb-bay of a Mosquito.

The first modified Mosquito (DZ 531/G) arrived from Weybridge on 17 April. Its bomb-bay doors had been removed and installed in the bomb-bay were the cradles and spinning gear for the two Highballs. When they were carried, one Squadron navigator described them as 'inverted humps' protruding beneath the fuselage. [5]

TIRPITZ ON THE MOVE

Such were the unfavourable conditions for Photographic Reconnaissance Unit (PRU) aircraft that between 24 October 1942 and 9 March 1943 Tirpitz was spotted only nine times in and around Trondheim Fjord. The next flight on 13 March drew a blank. An Ultra interception had warned the Admiralty on 11 March that Tirpitz might be on the move in the near future, and the following day that she was probably making for Narvik. Although not spotted by reconnaissance aircraft, the battleship did indeed leave Trondheim early on the morning of 11 March and complete an uneventful 300mls passage north to Bogen Bucht, near Narvik, two days later. She did not remain there long. On 22 March, in company with the pocket battleship Lutzow, battlecruiser Scharnhorst and eight destroyers she sailed 240mls further north to Kaa Fjord, a branch of Alten Fjord in Finnmark close to the North Cape, where she anchored on 24 March at 0418. From there Vice Admiral Oskar Kummetz intended to use her and his whole battle group to attack the Arctic convoys. Alten Fjord nestled among a series of sounds and fjords leading off the Loppehavet inlet from the Arctic Ocean. Kaa Fjord, approximately 4mls long and 1 3/4mls wide with a spit of land protruding from its southern end effectively dividing it into two, was a cul-de-sac hanging NW-SE of Alten Fjord almost at its extremity. [6]

An operation against her at Narvik seemed the best option, 'but in that event the Highball Mosquitoes must either be carrier-borne to the locality or the crews must abandon their aircraft after the attack over the sea and be picked up'. A rather dubious proposition for the crews involved...

An assessment at this time (possibly by Coastal Command) considered attacks on Tirpitz north of Trondheim concluding that Highball might be 'a profitable type of weapon … if it works as the theorists claim. But it is as yet in the design stage and from past experience we can be certain that many difficulties will arise before it behaves as predicted, if it ever does'. An operation against her at Narvik seemed the best option, 'but in that event the Highball Mosquitoes must either be carrier-borne to the locality or the crews must abandon their aircraft after the attack over the sea and be picked up'. A rather dubious proposition for the crews involved. Kaa Fjord did not apparently come into the reckoning at all. [7]

As Tirpitz exercised and waited for a suitable target, plans for the use of Highball pressed ahead, and in Scotland training of 618 Squadron intensified. HMS Bonaventure, depot ship for the Royal Navy's X-craft (midget submarines) preparing independently to attack Tirpitz, was stationed in Loch Cairnbawn. Lying close to rising ground, where the lake was 1,300yds wide, her position closely resembled that of Tirpitz in Foetten Fjord and plans were made for 618 Squadron to mount dummy attacks against her. On 31 March, Capt E Banks received instructions to anchor his ship on a bearing of 350degs and effectively extend it by placing two drifters ahead and astern to produce a simulated length of 800ft. X-craft training must not be compromised, and if Bonaventure were not available a third drifter should stand in for her. Banks replied on 1 April that his ship was anchored on a heading of 315 degrees and hoped that this was suitable.

Evidently it was, for three days later arrangements were put in hand for F46 cameras to be installed in the 618 Squadron practice Mosquitoes at RAF Skitten, where VHF was fitted to them. On 6 April, HQ Coastal Command ruled that the cameras should be put in the bomb-sight position, but not until 14 April was it confirmed that Vickers-Armstrong's staff would be responsible for that work. During the later part of the month, using the cameras some 125 low-level flights from 60ft at a speed of approximately 360mph were carried out by 618 Squadron pilots against Bonaventure. [8]

SCOTTISH TRIALS

However, Highball had not yet been perfected, and trials to supplement those at Reculver were planned involving practice strikes on Courbet in Loch Striven. On 20 March 1943, as ACAS (Ops) Air Vice-Marshal Bottomley had advised the CAS that, although he believed Highball 'potentially a most promising weapon', not until trials against the target ship 'in about a month' could he make any firm recommendations. The high speed of the Mosquitoes would permit release from longer range than other aircraft, but he had doubts about the manoeuvrability of Mosquitoes in a narrow Norwegian fjord. Bottomley went on to paint a sombre picture. 'Although Highball may have advantages over the torpedo in that it can defeat present type torpedo booms and may have fewer tactical limitations in dive and speed of approach, it has no advantages over the torpedo in countering the normal methods of defence of harbours by flak, smoke and searchlight. Heavy losses must be expected on account of the strong defences on the hills round the ship and the warning of approach which the enemy will be bound to have'. Perhaps
significantly, Bottomley also chaired the Chiefs of Staff ad hoc sub-committee established to examine the feasibility of the weapon. [9]

In preparation for the trials on Loch Striven, static spinning tests took place in the modified Wellington at RAF Turnberry, 19-21 April. In the interests of security, on 29 April the Admiralty insisted that spectators at Loch Striven be minimised and senior officers of all Services wear civilian clothes. For the trials themselves, recorded on cine camera and scheduled for 9/10 May, the aim was to release inert-filled Highballs 1,200yds from Courbet from 50ft at 360mph. Some surviving records optimistically show that the first store, spinning at 700rpm, hit the target ship at 160mph, 12ft above the water line and 179ft from the bows, rebounding 13ft to be caught by nets under the ship. The second drop was made 200yds further back from the marker buoys at 800rpm and 370mph. It bounced three times before hitting the target at 164mph, 3ft

In preparation for the trials on Loch Striven, static spinning tests took place in the modified Wellington at RAF Turnberry

above the water line, 200ft from the bows and rebounded 7ft. However, the official report drawn up by RAF Helensburgh painted a much bleaker picture. On 9 May, two Mosquitoes failed to release Highball, and a store fell from one aircraft as it turned to run in again. The following day, three modified Mosquitoes did hit the target, but the primers of the hydrostatic pistols failed to function and only one 'badly distorted'

Highball was recovered. All three Mosquitoes had trouble with the release gear and one was damaged in dropping the store. So the two detailed drops actually occurred on 10 May after total failure the previous day and were by no means successful. On further investigation it had been discovered that the buoys were only 800yds from Courbet and this undoubtedly affected impact speeds. [10]

...as 617 Squadron gained success with Upkeep, the operation with its 'little brother' (Highball) against Tirpitz was by no means certain, for the weapon remained unproven

A meeting at the MAP on 13 May justifiably declared the results to be 'inconclusive' and the Chiefs of Staff were informed that 'future trials, modifications and considerable further training of crews necessary before Highball can be used'. The following day, another meeting at Weybridge examined in more detail the failure of the Highball drops against Courbet on 9/10 May. Wallis was upbeat. 'Variations in dimensions of stores after filling and incorrectly dimensional jigs for setting up the calibre (sic) arms were mainly responsible for these failures'. As noted on 13 May, necessary modifications to the Mosquitoes were being made and the next series of trials in Scotland should be from 1,600yds at 50-60ft, with an aircraft speed of 360mph and Highball spun at 900-1,000rpm. If successful and the hydrostatic pistol primer were heard to function, the subsequent drop should be at 1,400yds and thereafter reduced each time by 200 yds until the priming system failed. This would give the minimum distance for release, and next stage would be to find the maximum release point, starting at 1,800yds, working upwards by 200yds. Rough water would reduce the effective range by 20%. 'Mr Wallis (then) described the range finder he is providing which can be set by the pilot to suit smooth or rough water conditions'. Nevertheless, as 617 Squadron gained success with Upkeep, the operation with its 'little brother' (Highball) against Tirpitz was by no means certain, for the weapon remained unproven. [11]

On 18 May 1943, two days after the raids on the Moehne and Eder dams, Wallis wrote that the following week-end he must work on 'the little brother'. Similarly on 25 May, he explained to Wg Cdr G P Gibson, who led 617 Squadron to the dams, that he had just returned from Scotland 'after a worrying time with your weapon's small brother'. Five days later, Bottomley revealed that 'minor release gear troubles' had emerged in the Courbet trials, not evident at Reculver. 'Some' did release satisfactorily, but there appeared to be a hold up with others, which meant that there was a delay in release so that the weapon hit the target at too high a velocity and broke up. A problem experienced on 9 May still intermittently occurred as well, 'with weapons falling off the aircraft during flight before the approach run'. Vickers-Armstrong felt that 'use of steel-hearted cable in part of the release gear, which stretched' was to blame, and 3-4 days should see necessary changes completed. Bottomley believed that these were only 'teething troubles' and pointed to the problems associated with Upkeep, which were eventually solved. However, he did recommend postponing any decision about extending the order for Highball Mosquitoes. [12]

SLOW PROGRESS

Progress was not, in reality, fast. On 17 June Wallis admitted to Air Vice-Marshal the Hon RA Cochrane, AOC 5 Group Bomber Command, being 'so continually engaged in difficulties with Upkeep's small brother'

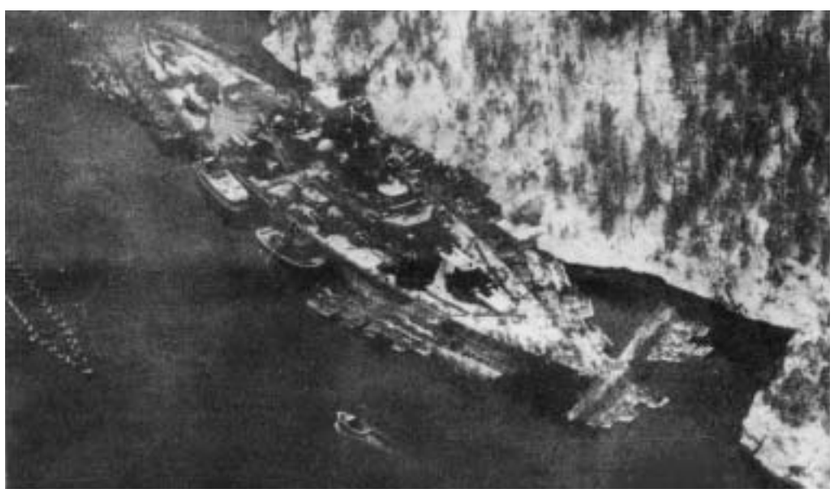
Whatever the other problems with Highball, range of the aircraft had always been a major stumbling block

that personal correspondence had badly lagged. On 2 July, an Admiralty minute noted that 'technical difficulties are still being met in the development of this weapon. Running trials against Courbet have been delayed owing to technical defects in both weapon and aircraft'. Throughout July and August 1943 in groups of 2-6 almost daily from Skitten 618 Squadron Mosquitoes carried out 'navigational exercises'. In truth, though, after more than four months 618 Squadron was still marking time. Way back, on 11 February 1943, the possibility of launching a Highball attack on Tirpitz in April, admittedly 'remote' due to the amount of technical work ahead and 'strenuous training' necessary, had none the less been actively mooted. [13]

Whatever the other problems with Highball, range of the aircraft had always been a major stumbling block. After consultation with Geoffrey de Havilland in April, steps had been taken to fit additional tanks to the Mosquitoes intended for the Tirpitz operation. On 6 April the possibility of flying the operational machines off aircraft carriers had been proposed, and de Havilland's firm estimated that eight of their men would require four days to assemble one modified Mosquito on board ship. Air Staff officers also pointed out that 'to fly the aircraft off would involve a serious risk', especially as one might ditch on take-off. The hydrostatic pistols on the two Highballs would then activate and could well sink the carrier. In any case, the Mosquitoes could not land again on the carrier. Flying on to a base in the northern USSR after bombing might be an option and this tied in with yet another suggestion on 8 April. By not carrying a second Highball, Alten Fjord and Narvik would be in range from Sumburgh, provided the aircraft went on to land at Vaenga, near Murmansk. [14]

'We consider that this operation has a very remote chance of success whilst the ships are berthed in their present position at Alten Fjord'

On 18 April, Coastal Command assessed the overall position. The earliest date for using 20 Highball Mosquitoes would be 26 May. 618 Squadron crews could not be kept 'indefinitely' idle and it was therefore recommended that Operation Servant should not be scheduled later than the end of June. Furthermore, the proposal to fly from Sumburgh to the northern Soviet air-field at Vaenga left no margin for error, evasive action or possible damage. Sumburgh to Alten



Tirpitz with service vessels alongside, affording added protection from possible Highball attacks.

Fjord totalled 860mls in a direct line, and Vaenga was a further 218mls – 1,078mls without deviation or delay. With their additional tanks, the Mosquitoes had a range of only 1,160mls. One calculation did suggest that, by reducing the cruising speed, this could be stretched to 1,257mls, but that tactic had operational penalties. On 12 May Coastal Command responded unenthusiastically to a proposal from No.18 Group to use the Gee navigational aid. At 10,000ft its range in good conditions was 200-250mls, at 15,000ft 300-400mls. Coastal Command therefore doubted the wisdom of fitting it even to one or two aircraft. None the less, an outline plan of attack was drawn up in June on the basis of taking off from Sumburgh, bombing en route and landing at Vaenga. One submarine would be stationed approximately half way between Sumburgh and Alten Fjord about 150mls off the Norwegian coast, a second 150mls north-west of the fjord. The attacking aircraft would fly at sea level parallel to the Norwegian coast, 150mls to seaward over the first submarine to turn sharply towards the target over the second submarine. An alternative would be to fly at 15,000ft 250mls from the coast, then 100mls west of the second submarine turn towards the target and approach it at sea level. Whichever of these routes was chosen, the Mosquitoes would climb to 5,000ft 100mls from Tirpitz. A separate analysis estimated 75-85 single-engined fighters between Alten Fjord and Vaenga, at the German-held bases of Alta, Banak, Kirkenes and Petsamo. [15]

None of these ideas nor plans in reality showed promise, and on 2 July 1943 Bottomley wrote on behalf of himself and ACNS (H): 'We consider that this operation has a very remote chance of success whilst the ships are berthed in their present position at Alten Fjord'. He revealed, too, that the C-in-C Coastal Command 'has described the operation as not being a practical (sic) operation of war'. The following day, the CAS advised Winston Churchill that the chances of Highball hitting Tirpitz in Kaa Fjord were 'negligible'. [16]

PLAN OF ATTACK

Fortunately, 618 Squadron did not know this. Its crews had been stepping up their navigational exercises, often carrying two inert-filled Highballs, and a detailed plan had been discussed with the aid of a model built by RAF Medmenham and transported to Skitten. A narrow spit of land blocked off one-third of the mile-wide entrance to Kaa Fjord, which was then covered by twin anti-submarine booms. Immediately behind this spit lay Lutzow; Tirpitz was about 4,000yds further south on the western side of the fjord under the lee of high ground. At this point, the fjord narrowed to 1,000yds, as another spit east of Tirpitz effectively divided it in two. A number of destroyers and flak vessels further protected the two warships, with additional flak guns on surrounding hills besides the inevitable smoke screen.

The geographical profile and lay-out of German defences posed major difficulties for a Highball operation, which no doubt to some extent shaped the negative conclusions in Bottomley's letter of 2 July. Approximately 1,200yds of clear water was needed after release of the weapon. Low-flying Mosquitoes could approach from the sea eastwards along Alten Fjord, then turn almost 90 degrees to starboard into Kaa Fjord. Hopping over the spit at its entrance would not only take the aircraft right across Lutzow, but

...so long as Tirpitz remained in Kaa Fjord, Highball against her was not a viable proposition. Nevertheless, 618 Squadron continued to train for such an operation

present an end-on attack as Tirpitz was berthed along a north-south axis. A second option would involve passing the entrance at its eastern extremity, thus skirting Lutzow but ensuring that the attack would still be from an acute angle. The preferred option, would be to fly north-south along the eastern tongue of the

target and clearing high ground beyond it. Such an approach would give under 1,000yds of water over which Highball could bounce, and the lessons of high velocity failure at short range against Courbet were fresh. It is, therefore, difficult to disagree with Bottomley that, so long as Tirpitz remained in Kaa Fjord, Highball against her was not a viable proposition. Nevertheless, 618 Squadron continued to train for such an operation, as test pilots, Wallis and a host of other engineers and manufacturers strove to iron out difficulties of release and impact force. [17]

FINAL STAGE

After Upkeep had been proved at the Moehne and Eder dams, full concentration could be given to Highball. In its 5th report on 17 May Bottomley's committee dealt with the trials on 9/10 May against Courbet, concluding that redesign of the hydro-static pistol and release of Highball from a greater range were necessary. The exercise had proved, however, that a pilot could hit a ship 'with considerable accuracy', though at high velocity the hydro-static pistol could not withstand the impact. The committee's 6th report on 29 May noted that more trials were in progress against Courbet, the results of which were not yet to hand. Irrespective of these there was 'still some difficulty in the installation of Highball in the aircraft, the cause of which is unknown'. [18]

Matters had not improved significantly by the 7th report on 13 June: 'The unexpected difficulties which have been met in the technical trials of the weapon have held up tactical and operational trials and delayed the date of readiness of the Squadron for operations'. Even if the present trials in Loch Striven did solve outstanding problems, it would be 'fortunate' if 618 were operational by the end of June and Coastal

The only proposition worth serious consideration was that of mounting the operation from Vaenga

Command now planned the attack on Tirpitz for about 12 July. The Squadron should have all of its Mosquitoes fitted with long-range tanks by 23 June. Bottomley confirmed that the 'unsuitable' release cables, identified by Vickers-Armstrongs in May, had been replaced, but no trials had yet taken place with 'a double drop' of Highball. Moreover, 'a satisfactory sight for ranging at various speeds and at various angles of attack to the ship is essential'. 'First results are very promising' of one designed by Wallis: six should be available by 16 June, and the rest a fortnight later. Investigations were still continuing, though, into the optimum depth for exploding Highball beneath a capital ship. [19]

The 8th report on 27 June proved even less optimistic, and time was rapidly running out. It was now clear that, even with drop tanks, Mosquitoes could neither attack Tirpitz and return to the United Kingdom nor fly on to Vaenga. So any operation against Alten Fjord or Narvik would involved baling out over Sweden. Only Trondheim of Tirpitz's berths was viable from the United Kingdom. It might be possible, though, to fly directly to Vaenga and use that as a base for attacking Alten Fjord. The committee, therefore, recommended that the proposed operation be postponed until about 12 August to permit this to be discussed with the Soviets. 618 Squadron currently had 19 operational aircraft, to which further modifications of the release mechanism were required to these. 'Adequate' HE-filled stores were at Sumburgh, 16 'special sights' with 618 Squadron, whose practices with them had shown errors 'well under 100 yards'. More trials with the target ship had suffered from bad weather and 'technical difficulties': premature release of Highball had been caused by 'whip' in the fuselage during high speed flight, which dictated yet further modifications. The cause of 'inconsistent running' by the store was 'not definitely known', but might be due either to incorrect balancing or deterioration of the cement filling. In his other capacity as ACAS (Ops), also on 27 June Bottomley produced an Air Ministry report, which analysed range

Effectively, the Highball attack on Tirpitz had been abandoned

problems and held that, in view of enemy fighter strength in the area, the final stage to Vaenga would need to be at ground level and maximum cruising speed. The only proposition worth serious consideration was that of mounting the operation from Vaenga. Early in July, the Chiefs of Staff threw a proverbial large spanner in the Highball works. Operation Servant should be postponed until the Royal Navy had launched Operation Source on Tirpitz with its X-craft. If Servant went ahead beforehand and failed, Source would face unacceptable, added danger. [20]

The 9th report of the Chiefs of Staff ad hoc sub-committee on 12 July admitted that the general position 'remains unaltered' since 27 June. Technical difficulties 'have not been completely overcome' and it was impossible to state when 618 Squadron would be operationally ready. Trials since the last report now suggested that inconsistent running had been caused by 'unseasoned or unsuitable wood'. If ash could be obtained, that would be used for the outer skin, if not an outer casing of 'heavier gauge metal and using no wood' would be tried. Even with the highest priority, neither alternative would be available in under a month. New hydrostatic pistols to withstand 2,000G impact were being made: 'This pistol is essential if the thicker metal casing of the store is developed since the stronger case will not have the cushioning qualities of the wooden cased store'. Trials with Courbet had again been frustrated by bad weather, but 'technical trials' had been possible at Reculver. Curiously, in view of the evident lack of progress in solving the several problems identified in its reports and Bottomley's own expressed opinion on 2 July, the sub-committee argued that 'in spite of the many technical difficulties so far experienced we believe the weapon still shows promise'. However, it was 'not recommended for the squadron to remain long off operations'. Here was a circle, which could not be squared. So, early in September 1943, the Chiefs of Staff declared that, although a cadre would be retained to continue with 'development and operational trials', the bulk of 618 Squadron would be 'released for other duties'. Effectively, the Highball attack on Tirpitz had been abandoned. [21]

Although the smaller 'bouncing bomb' eventually did function in 1944, plans to attack Tirpitz with it were not revived. Instead, RAF Bomber Command would destroy her with another Wallis invention, the 12,000lb deep-penetration Tallboy bomb, on 12 November 1944.

Notes:

Sir Barnes Wallis's papers contain a wide range of personal and official correspondence as well as copies of the minutes of meetings connected with his various projects, including Highball. When consulted at his residence in Effingham, the papers were not catalogued. They have since been dispersed mainly to the Science Museum, RAF Museum Hendon and Churchill College Cambridge. Some remain with the family, a few are in the possession of the Barnes Wallis Memorial Trust at the Yorkshire Air Museum, Elvington. Reference to the 'Wallis Papers' is made, therefore, only to identify the source of information and quotations.

1 Wallis Papers
2 PRO Air/1234
3 Wallis Papers
4 2, 4 &8 Feb 1943, PRO AVIA 15/3933; Wallis Papers
5 25 & 26 Mar 1943, PRO Air 14/840; 2 &7 April, Coastal Command summaries, PRO 15/442; Wallis Papers; D. Curtis, A Most Secret Squadron, Skitten Books, 1995, Page 65.
6 PRU, PRO Adm223/50; operational summary, PRO Adm 223/50; Alten Fjord, PRO Adm 199/942.
7 PRO Air8/1243.
8 PRO Air 15/442.
9 PRO Air 8/1243
10 Wallis Papers.
11 14 May meeting, PRO Air 8/1234; Wallis Papers.
12 29 May 1943, Bottomley memo.' PRO Air 8/1234; Wallis Papers.
13 17 June 1943, Wallis Papers; 2 July, PRO Air 8/1243; visits, PRO Air 28/915; 11 Feb 1943, Sir Henry Tizard to the MAP, PRO AVIA 15/3934.
14 PRO Air 15/442.
15 PRO Air 8/1237.
16 PRO Air 8/1243.
17 PRU, PRO Adm 223/87; 618 Sq. training, PRO Air 28/915; Wallis Papers.
18 PRO Air 8/1237.
19 PRO Air 8/1237.
20 PRO Air 8/1237.
21 PRO Air 8/1237