The Messerschmitt Bf110 Project

Discovery is just the beginning

Project Report

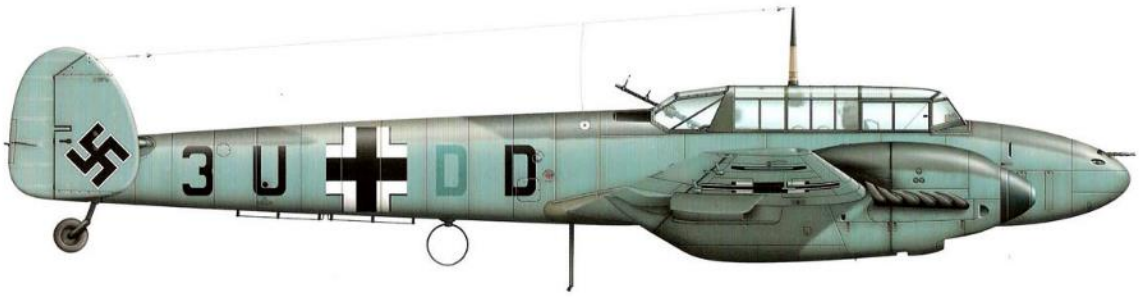
by

Matt Doggett

Sheilah Openshaw

Martin Openshaw

Matt Burleigh



Prepared for the British Sub Aqua Jubilee Trust

September 2021

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TEAM MEMBERS

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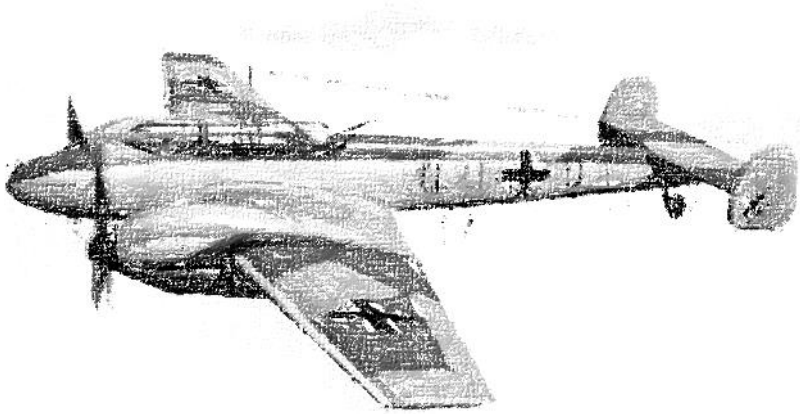

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Introduction

October 1940

For the Luftwaffe crews it had been a relatively quiet week in Germany after a long summer bombing campaign over Britain. For some of them the War was about to take a dramatic turn. Almost a week of wind and rain had forced a lull in any planned bombing missions from both the German and British sides of the Channel. On 6th and 7th October the skies cleared of cloud, filling instead with wave after wave of bombers from both sides, renewing their cross-channel offensives. Throughout the southern counties of England fighter squadrons were scrambled to defend the nation. The pilots had little chance of respite all day long such was the intensity of the bombing. Losses mounted up on both sides.

Fast forward to the 21st century

John Coward is a local Dorset diver with a penchant for the Isle of Purbeck, favouring the Kimmeridge Ledges and their magnificent wildlife and underwater scenery. During various drift dives over the years John has encountered bits of wreckage here and there including the occasional engine block, but always when visibility was less than ideal. Then in early 2019 on a day with visibility of almost 10 m John encountered the wreckage once again.

This time John could see two engines in close proximity and the obvious remains of an aeroplane laid out before him along a section of rocky reef. John quickly turned his camera on to gather some video and photographs before the current ushered him off the site. But what plane was it?

On returning to Kimmeridge John met Martin and Sheilah Openshaw and showed them the footage, asking if they knew what plane it might be. They didn't but by good fortune their godson Matt Burleigh, an aerospace engineer, has an interest in historical aircraft and so they asked him… and there, the project was born. Add in Matt Doggett as project photographer / videographer and Lin Baldock a local marine biologist and the team was ready to investigate and document the wreck site in detail.

Naturally, a meeting in pub was organised to plan the project in more detail.

Just one problem… no-one had a position fix on the wreck.

The Project

This report documents the process of re-locating, identifying and collating the information available to tell the story of the wreckage and crew of a World War II German Messerschmitt Bf110 fighter-bomber that was shot down off the Dorset coast in 1940.

Who were the crew? Where were they flying? When was it shot down? Who shot it down? What state is the plane in today? These were just some off the questions to be answered during the project which proved to be a journey of historical discovery and education for the entire project team.

Meet the team

John Coward is a local Dorset diver with a penchant for the Isle of Purbeck, favouring the Kimmeridge Ledges and their magnificent wildlife and underwater scenery.

John was thrilled to find the wreck of the aeroplane and played a key role in this project in relocating it to get an accurate position fix, thereby allowing the rest of the team to inspect and document the wreck site.

Without John's original footage the wreck might not have been identified so quickly and the story of the find could have gone untold for much longer.

Martin and Sheilah Openshaw are two highly enthusiastic BSAC divers spending their retirement studying the underwater world of the Dorset coast. Being keen Seasearch divers and members of the Nautical Archaeological Society their projects to date have included the Black Bream Project, the Undulate Ray Project and researching the wreck of the Netley Abbey. When John approached them with his original footage of the wreck they jumped at the chance to be involved and set their research skills into action.

Matthew Burleigh is a BSAC diver, a 2nd generation aircraft engineer and self-confessed aircraft nerd. He is also Martin and Sheilah's godson. Matthew invited himself for lunch and as he walked through the door Martin asked him how many WWII twin V12 aircraft there were. Matthew started listing them and at about 15 Martin stopped him and showed him John's video. From that point Matthew was hooked on the project and set about researching airframe designs in more detail to narrow down the aircraft type.

Matt Doggett is a BSAC diver, a marine biologist and an underwater photographer who grew up in Dorset and learned to dive there. He is a Seasearch diver and has played a lead role in the Black Bream Project with Martin, Sheilah and Lin and supported the Undulate Ray Project.

When Sheilah and Martin divulged to Matt that a rather rare and exciting wreck had been found, Matt jumped at the chance to document it with photographs and video and to create a 3-d photogrammetric model of the site.

Lin Baldock is a marine biologist based in Dorset. Lin has an in-depth knowledge of the marine flora and fauna of the Dorset coast and has lent her support to Matt, Martin and Sheilah's previous projects.

Lin played a key role in surveying the marine life both on and around the wreck site whilst doubling up as a video and stills model for Matt on several occasions!

The plan

Located approximately one kilometer due south of Worbarrow Bay in Dorset the wreck site is not the most convenient pace to dive. Being within the MoD Lulworth Firing Range means that any boating and diving activity is restricted largely to weekends and school holidays. Add strong tides, variable and unpredictable visibility into the mix along with team members having various family and work commitments and diving the site was always going to have to be on a somewhat *ad hoc* basis. And of course at the outset of the project we had no confirmed GPS position on the wreck at all!

In the summer of 2019, John Coward set about relocating the wreck. He had an approximate idea of where the wreck was; despite this it still took multiple dives, drifting over the ledges to find the site and finally being able to send up a marker buoy and log its position. Whilst John was relocating the wreck, Matt Burleigh (Matt B) had his head in the books to try and identify the plane from John's original images and video.

Meanwhile, Matt Doggett (Matt D), Lin, Martin and Sheilah hatched a plan to discover the story of the plane, film and photograph it, organise publicity and document the marine life living on the site today.

With the plan ripe for execution, John informed the team in late summer of 2019 that he had relocated the wreck, logged a position and we were good to go. Conditions remained favourable and a weekend in mid-September 2019 saw the first dives take place to further inspect the wreck and confirm its suspected identity as a Messerschmitt Bf110 fighter-bomber.

Following this dive, the weather turned as the autumn gales arrived and no further diving took place that year. But we remained optimistic and planned our activities for 2020… little did we know a global pandemic was brewing and lockdown was looming.

Diving methods and rules

Legal and administrative details

The Protection of Military Remains Act 1986 applies to any aircraft which has crashed whilst in military service. The Act applies whether personnel were killed or not, and it is not necessary to demonstrate the presence or probability of human remains. Under the Act there are two forms of protection:

- All crash sites are automatically 'protected places'.
- They may be designated as a 'controlled site'.

Various activities at 'protected places' and 'controlled sites' are prohibited unless they are carried out under the terms of a licence. It is prohibited to dive, salvage or excavate at a protected site if these activities will or are likely to tamper with, damage, move, remove or unearth any aircraft remains. A licence is required to dive on a controlled site.

The Bf110 wreck is not a controlled site and there is no intention to tamper with, damage, move, remove or unearth any aircraft remains. All diving was on a 'look but don't touch' basis.

The MOD issues and administers licences for activities which are otherwise prohibited. Licences are granted to a named person who must be present during investigations. Licences are generally granted for one year and may be amended or revoked.

MoD guidance also emphasises concern for the discovery of human remains. If human remains are discovered a licence is automatically suspended and the MoD must be informed immediately.

Our investigations on the Bf110 include a very accurate eye-witness account of its crash landing in the sea at the position we have. We know that both the pilot and radio operator / rear gunner (these planes were twin seaters) were rescued by an RAF launch. Therefore there are no human remains in the wreckage.

We also informed 'RAF Air Historical Branch' of the wreck's whereabouts. The Nautical Archaeological Society was also informed and approved of this project which conformed to its guidelines.

Project-specific diving rules

For this project, a set of Bf110-specific diving rules was developed. These were:

- All diving on site will be subject to the "look but do not touch" rule.
- No objects or part of the wreck can be disturbed and nothing must be recovered.
- The site will be shot perpendicular to the tide and away from the immediate location of the wreck, so the divers will swim across the tide and over the adjacent reef to reach the site. The shot will not therefore interfere with the site by being dragged onto it.
- Visibility in the region of the wreck is often good and can reach ~8 m or more. For diver safety, on occasions of low visibility, divers could deploy a thin ground line on a reel attached to the shot to help orientate the divers back to the shot. This will not interfere with or damage the site and can be recovered by the divers after each dive.
- All dives will be conducted in buddy pairs.
- Photography, video and non-intrusive direct measurements are all that is allowed. Any other measurements can be taken from 3D photogrammetric model.

The wreck site lies in ~20m depth between two low-lying reefs in a wider, relatively flat seabed. The wreck itself is relatively small and poses no major hazards to divers as only limited framework and larger engine blocks remain.

Further details of the project's diving rules are provided in Appendix I.

Diving tasks

As explained previously, the project team members each played different roles ranging from wreck inspection / identification, filming, photography and marine life survey. With several of the team members being proficient in more than one aspect of the project there was inevitably cross-pollination across disciplines and consequently better development of methods and ideas. This also ensured that we often questioned one another's approaches to tasks or the conclusions about the identification and orientation of the plane and therefore provided an element of quality control on the overall project.

The diving itself was relatively simple. All dives were no-decompression dives and the small wreck site meant that navigation around the site was straightforward.

The shot line was always dropped well clear of the wreck and the first diver to descend often laid a ground line from the shot to the reef adjacent to the wreck to ensure the subsequent divers found it without issue.

Most dives involved the divers simply inspecting the wreck and marine life, taking images and making notes as required for later discussion and interpretation. The most complex diving task was the photogrammetry which was a relatively new technique to the team. Martin and Matt D attended a workshop in February 2020 run by Martin Davies LRPS of *In Depth Photography*. This furnished us with better knowledge (and confidence!) as to how we should go about photographing the wreck site to create one or more 3-dimensional models.

Site description

The plane wreck lies in approximately 20 m of water around 1 km south of Worbarrow Bay, Dorset (Figure 1). The plane rests on flat, sediment-covered bedrock at the base of a rocky reef rising some 1.5 m above the bedrock. This reef perhaps affords the wreckage some protection from tides and / or swell, although time has obviously taken its toll on the exposed aluminium airframe.

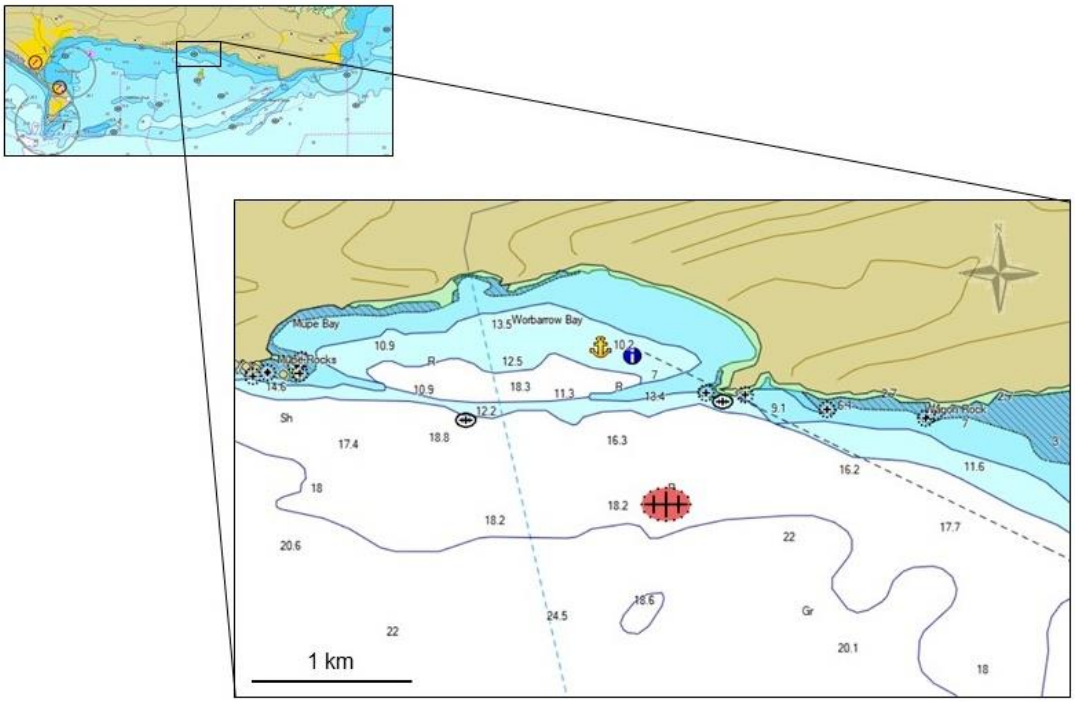


Figure 1: Location of the wreckage (red marker) of the Messerschmitt Bf110 fighter-bomber south of Worbarrow Bay, Dorset.

Wreck detectives

The bulk of the research to identify the wreck was undertaken by Sheilah, Martin and Matt B who spent many hours searching for and scouring documents. A mix of technical drawings, RAF and Luftwaffe records and eye-witness accounts from the Battle of Britain provided the team with an enlightening and fascinating journey into our nation's recent history. This section describes how the project developed and the discoveries made along the way.

Identifying the aircraft type

The first available evidence of the wreck site to the team came from John's initial video footage of the site (Figure 2). Early thoughts were that it might be a de Havilland Mosquito – a multirole combat aircraft which used twin RR Merlin V12 engines. But the chances of a lightweight, wooden plane surviving ~80 years underwater were slim to none. This theory was also discounted on account of the Merlin's engines being upright V engines, with the crank at the bottom; the engines had a dished cover on the crank to hold the oil. In contrast, the cranks on the engines at the wreck site have a dead flat cover meaning it had to be an inverted V engine. One nation in particular used an inverted V engine design: Germany.

Figure 2: Photo of the Daimler-Benz 600 Series V12 engine which helped identify the aircraft type. Photo: John Coward.

Having determined the aircraft was very likely German, Matt next had to check a number of Luftwaffe aircraft that used inverted V12 engines and a number of manufacturers. The Junkers Jumo and Daimler-Benz 600 series (written DB60X where X might be a 1, 3, 9 etc.) were particularly common. Internet searches for photos of these engines suggested the Jumo simply didn't match, but the DB60X looked a good fit. A bit of further searching in the Aircraft and Armament Experimental Establishment (A&AEE) turned up a couple of reports on captured enemy aircraft and engines. The DB60X report included drawings of the gearbox of the engine, a dead ringer for our wreck.

This early research meant we were confident we had a pair of DB60X engines and we knew the wreck site was small. We also knew that the most common small twin-engine German aircraft that used these engines was the Messerschmitt Bf110.

Not wanting to jump to conclusions Matt looked at the wreckage in John's video which showed an obvious structure lifted up off the seabed – the main spar that carries the load into the wings (Figure 3). The structure has a distinctive shape so Matt went searching for drawings and images of it. The only match? The Messerschmitt Bf110! We were pretty sure we knew what it was!

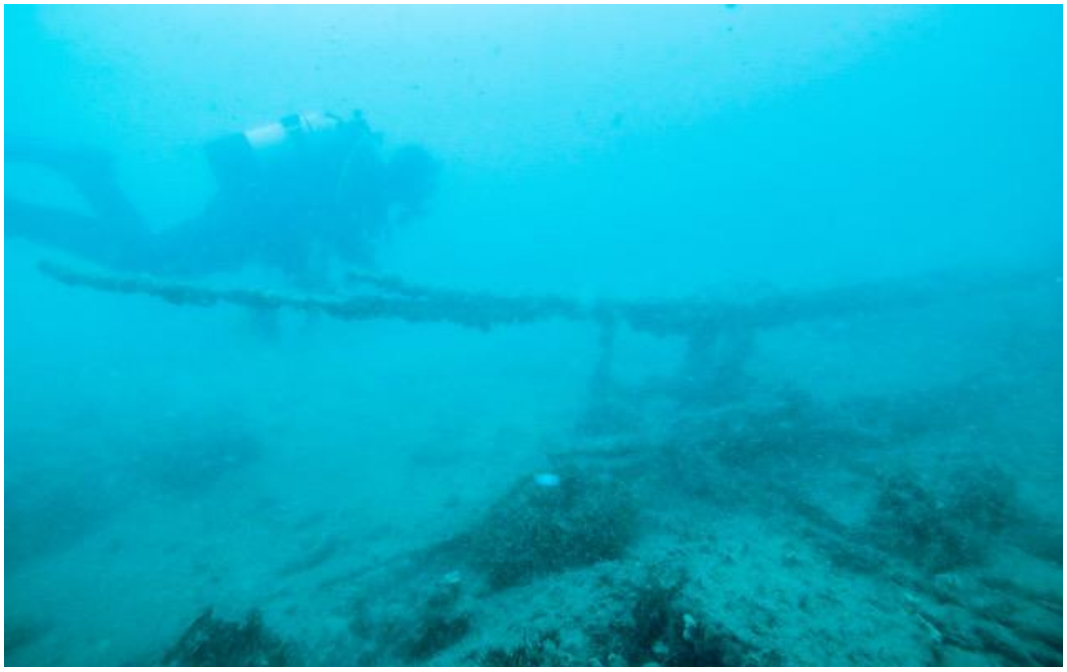


Figure 3: Photo of the main wing spar of the Messerschmitt Bf110. Photo: John Coward.

At this point the team was ready to dive the wreck to make a final confirmation of the model type. Had John managed to relocate it?

When opportunity had allowed, throughout the summer John had been diving back and forth over the area of the reef where he knew the wreck to be. Finally, on 8th September he relocated the wreck sent up an SMB for a position fix. On discussion with John about the wreck's situation adjacent to the reef, Martin adjusted this position to ensure any shot lines would drop on the opposite slope of the reef, removing any risk of damaging the wreck.

On 15th September 2019 the team completed their first dive on the site giving Matt B the opportunity to examine it first-hand and confirm the plane's identity. Having been on the seabed for some 80 years, much of the aircraft remains appear at first sight like rocks but are actually remains of flight controls, radio equipment and various armaments overgrown with fauna and covered in coarse sediment.

A further point of consideration was the plane's orientation. Was it facing into or away from the reef slope? From inspection of technical drawings and comparing the structure, particularly around the nacelles (the frames housing the engines in the wings) Matt B was able to determine the plane was facing away from the reef slope (Figure 4). Additional evidence to support Matt's conclusion came from his inspection of a pile of 'rubble' and realising that it had boxes with knobs and dials on it (Figure 5). Next to that was what looked to be the twisted remains of ammunition chutes, air hoses and radios, more evidence for the nose of the aircraft that housed four 7 mm machine guns (Figure 6).

Regarding the plane's guns, the only other evidence we have seen is a lonely cartridge case that could be identified as a 7 mm Mauser round. Given the orientation of the wreck there may well be a pair of 20 mm cannon sitting just below the surface.

Figure 4: The portside nacelle which would have housed the V12 engine. Photo: Matt Doggett.

Figure 5: Matt Burleigh inspecting the cockpit remains of the Bf110. Photo: Lin Baldock.

Figure 6: Remains of flight controls, radio equipment, air hoses and various armaments overgrown with seabed fauna and covered in coarse sediment deposits (top and bottom). Photos: Matt Doggett.

A brief history of the Messerschmitt Bf110 fighter-bomber

The internet holds a wealth of information about the planes of the Second World War, including the Bf110, often known unofficially as the Me110. We do not attempt to repeat all of that here but rather provide a potted history. More complete and rather excellent summaries are available by both Stephan Wilkinson (How the Me-110 Became a Bomber's Worst Nightmare) and Wikipedia (Messerschmitt Bf110). Whilst Eric Seeger presents an interview with an ex-Bf110 bordfunker (The Messerschmitt Bf 110 From Under the Canopy: Poland, the Battle of Britain and After).

In summary, the Messerschmitt Bf110 entered the Second World War as a twin-seater heavy fighter and / or fighter-bomber (Figure 7). They were designed initially as a fighter-destroyer (Zerstörer) to fight back against heavy bomber squadrons. The planes provided some early gains in campaigns over Poland, Norway and France but soon began to suffer from their lack of manoeuvrability. This weakness was exploited when they acted as escorts to heavy bombers during the Battle of Britain and encountered effective fighter squadrons such as British Spitfires. Losses mounted up. With no other bomber escorts with the range to cross the Channel the Luftwaffe had little choice but to continue using them.

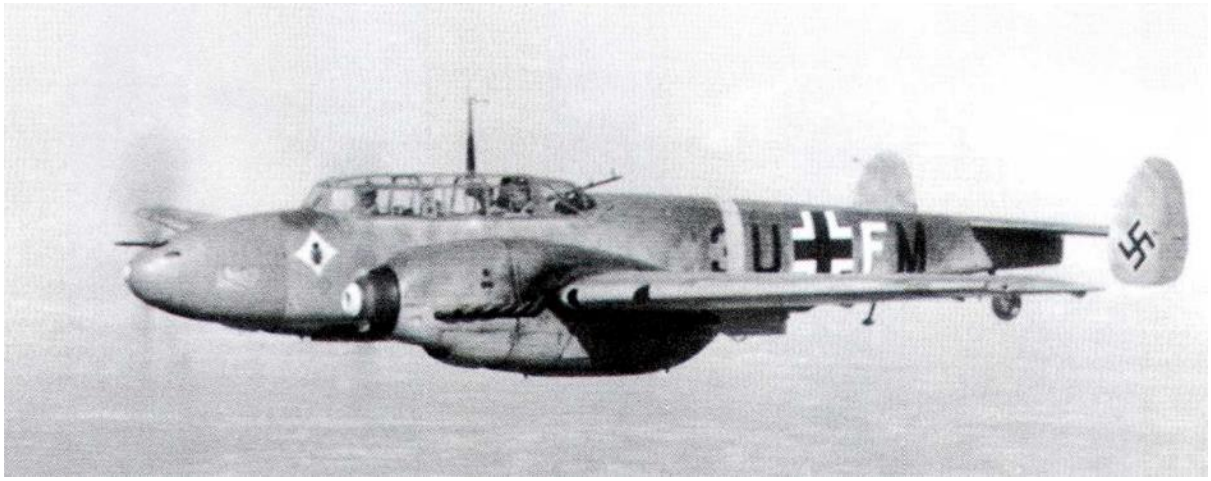


Figure 7: A Messerschmitt Bf110-D flying over the Mediterranean in 1941. Source: www.asisbiz.com.

Stephan Wilkinson's article states that "*during the Battle of Britain, the Me-110's main flaws as a fighter quickly became apparent. In British aviation historian Martin Windrow's words, "It was easily identifiable from long distances; its acceleration and speed were insufficient to allow it the luxury of avoiding combat; it was sluggish in evasive manoeuvres; its turning circle was wide; and with its large wing and tail surfaces, it presented a good target….The destroyer became the destroyed*." "

Stephan Wilkinson goes on to say "*A German Me-110 pilot commented: "The 110 was a safe, easy aeroplane to fly, but it was slow like molasses. And it could not stay in the air more than an hour and a half before we had to get back. What if we encountered Spitfires? In a 110? Get the hell out of there. Get away."* "

Like many aircraft of the Second World War, Bf110s were subjected to several design iterations in the constant search for air supremacy. They later found their niche when converted to formidable three-seater, radar-equipped, night fighters, becoming the Luftwaffe's weapon of choice for this role. Once again, they became an aircraft to be feared.

Events of 7th October 1940

Martin and Sheilah have a personal database of Dorset's underwater records from multiple sources including Gordon Le Pard, an archaeologist formerly at Dorset County Council. Gordon had listed reported aircraft sinkings with references to their sources of information. The database contains entries of 123 aircraft – a good starting point. The wreck itself however was able to yield one further and valuable clue as to its origin. Despite having been underwater for almost 80 years it is still recognisable as an aeroplane, this suggested that the pilot was in control until he 'landed' the plane – otherwise the wreck site would have been a debris field on the seabed.

Martin and Sheilah searched their database for Messerschmitt records and there was indeed mention of a Bf110 ditching into the sea between Arish Mell and Worbarrow Tout – exactly where this wreck was. The database reference (DCC-CD 1-3) was to a document in the Dorset History Centre. During the War, data were being fed to Westminster by the technology of the day; post, telephone and telegram. One of those sources of information were the daily reports of downed aircraft, bombs (including unexploded bombs) and morale by the county chief constables. The reports surviving in Dorset consist of three folders of rather flimsy paper which makes for some fascinating reading.

The entry for 7th October 1940, right at the tail end of the Battle of Britain read, "*At Lulworth between Arish Mell Gap and Worbarrow Tout Machine Me110 crashed at 16:30 hours into the sea. Occupants (two) both prisoners. RAF notified*."

This location described exactly where John had found the plane. We now had a date for the wreck site and a matching aircraft type. Could we find out more? What was happening that day? Who shot the plane down? Who were the crew?

The next port of call was to consult various books, many of which were authored by people who served in the war. Whilst the information within them might not be fully verifiable they pointed Martin and Sheilah in the right directions. Further useful, day-by-day accounts of the Battle of Britain are available online.

Figure 8: A selection of the literature consulted during the quest to discover more about the wreck of the Bf110.

Five main attacks occurred over Britain on 7th October 1940, four toward London and one over Dorset. In Dorset there were many potential targets for the Luftwaffe including Army and RAF bases, fuel depots and ordnance factories. On that day, the rural town of Sherborne was subjected to some 1,600 bombs. This might be explained by its close proximity to the Westland's factory in Yeovil where the Lysander aircraft were produced (a small aircraft capable of taking off from short airstrips and used in clandestine missions behind enemy lines). With precision bombing not necessarily being the order of the day, it is

reasonable to assume that bombers being harassed by hordes of British fighters would simply drop their bombs on any available target and head back across the Channel as quickly as possible. Despite this, the factory was hit and damaged, although an air raid shelter was also hit, killing 100 people.

Indeed the skies over Dorset were chaotic on that day to say the least. In that single bombing raid five RAF planes crashed with one pilot killed and three others hospitalised. Six Luftwaffe aircraft failed to return home with five lives lost, four people injured and two missing in action, possibly lost mid-Channel.

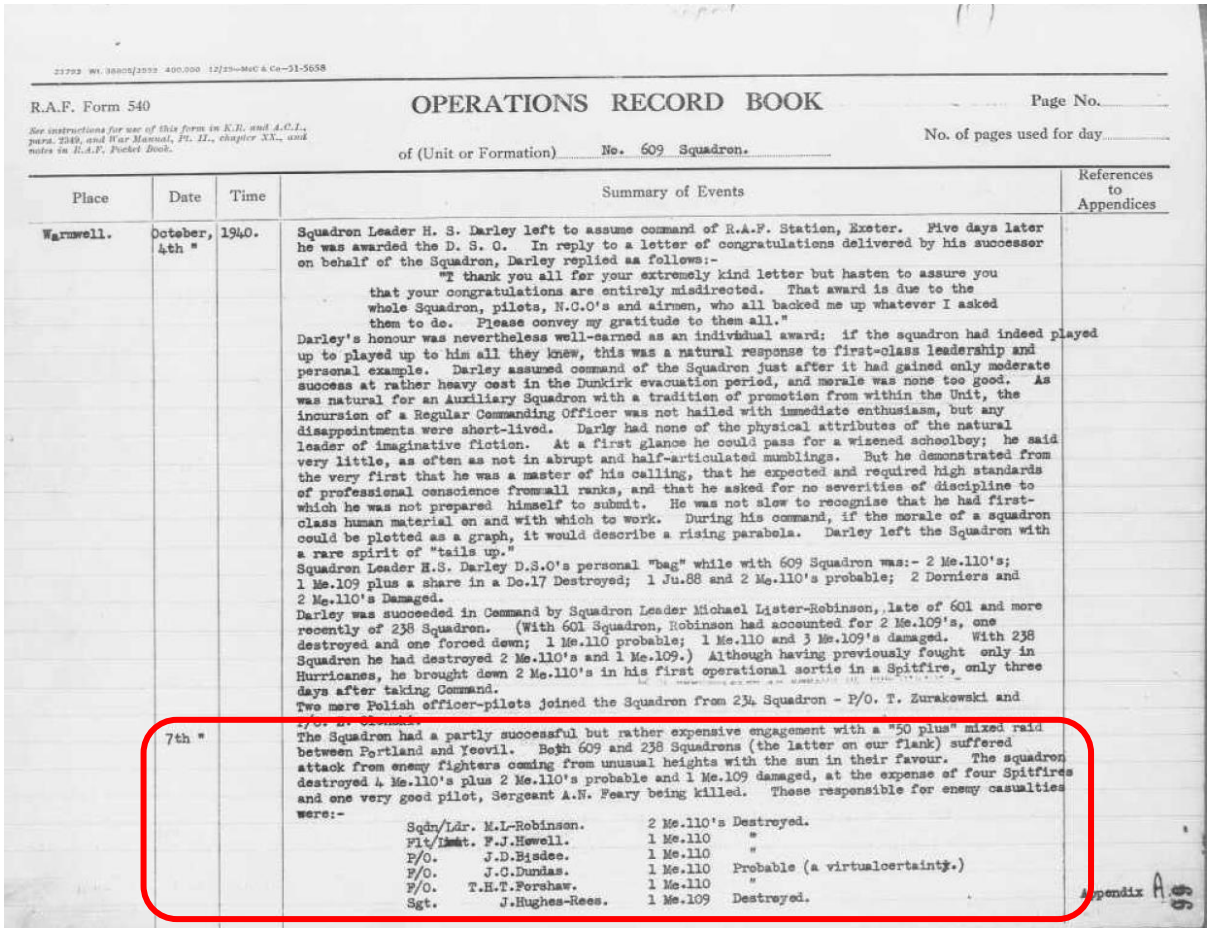
To find out which RAF squadrons were involved in this raid, Sheilah first trawled through the on-line information of all the WWII squadrons, working out which were fighter squadrons, which were bombers and then where they were based in October 1940. Given that Spitfire flight times were limited to about an hour, Sheilah narrowed down the airfields from where the defenders could have realistically launched for a battles over the Dorset coast to four:

- St Eval (four squadrons),
- Boscombe Down (four squadrons),
- Exeter (three squadrons), and
- Warmwell (three squadrons).

From there, Sheilah spent time in the National Archives browsing those 14 squadron Operations Reports of the date. The reports confirmed it was the three squadrons at Warmwell, 609, 238 and 152 squadrons which were operational on the right day in the right area. After a spell of poor flying weather a beautiful sunny day brought a raid of (depending which account you read) 50 to 60 aircraft; Junkers bombers with Messerschmitt 109 and 110s between Portland and the Westland Lysander factory. Both 238 Squadron and 609 Squadron recorded shooting aircraft down for that sortie. With so many planes in the air, and no air traffic control it was a somewhat confused picture. Working out who shot whom was not going to be easy.

The text highlighted in red in Figure 9 reads… "*The squadron had a partly successful but rather expensive engagement with a "50 plus" mixed raid between Portland and Yeovil. Both 609 and 238 Squadrons (the latter on our flank) suffered attack from enemy fighters coming from unusual heights with the sun in their favour. 609 Squadron alone destroyed 4 Me.110's plus 2 Me.110's probable and 1 Me.109 damaged, at the expense of four Spitfires and one very good pilot, Sergeant A.N. Feary being killed*."

At the end of the day of 7th October, the Luftwaffe had lost 21 aircraft and the RAF, 17. Luftflotte 3, one of the Luftwaffe's primary divisions, reported that… "...*enemy fighter defences showed a tenacity unknown so far*."



R.A.F. Form 540

OPERATIONS RECORD BOOK

Page No.

See instructions for use of this form in K.R. and A.C.I., para. 2349, and War Manual, Pt. II., chapter XX., and notes in R.A.F. Pocket Book.

of (Unit or Formation) No. 609 Squadron.

No. of pages used for day

Place	Date	Time	Summary of Events	References to Appendices
Warmwell.	October, 4th "	1940.	Squadron Leader H. S. Darley left to assume command of R.A.F. Station, Exeter. Five days later he was awarded the D. S. O. In reply to a letter of congratulations delivered by his successor on behalf of the Squadron, Darley replied as follows:- "I thank you all for your extremely kind letter but hasten to assure you that your congratulations are entirely misdirected. That award is due to the whole Squadron, pilots, N.C.O's and airmen, who all backed me up whatever I asked them to do. Please convey my gratitude to them all." Darley's honour was nevertheless well-earned as an individual award: if the squadron had indeed played up to played up to him all they knew, this was a natural response to first-class leadership and personal example. Darley assumed command of the Squadron just after it had gained only moderate success at rather heavy cost in the Dunkirk evacuation period, and morale was none too good. As was natural for an Auxiliary Squadron with a tradition of promotion from within the Unit, the incursion of a Regular Commanding Officer was not hailed with immediate enthusiasm, but any disappointments were short-lived. Darly had none of the physical attributes of the natural leader of imaginative fiction. At a first glance he could pass for a wizened schoolboy; he said very little, as often as not in abrupt and half-articulated mumblings. But he demonstrated from the very first that he was a master of his calling, that he expected and required high standards of professional conscience fromall ranks, and that he asked for no severities of discipline to which he was not prepared himself to submit. He was not slow to recognise that he had first-class human material on and with which to work. During his command, if the morale of a squadron could be plotted as a graph, it would describe a rising parabola. Darley left the Squadron with a rare spirit of "tails up." Squadron Leader H.S. Darley D.S.O's personal "bag" while with 609 Squadron was:- 2 Me.110's; 1 Me.109 plus a share in a Do.17 Destroyed; 1 Ju.88 and 2 Me.110's probable; 2 Dorniers and 2 Me.110's Damaged. Darley was succeeded in Command by Squadron Leader Michael Lister-Robinson, late of 601 and more recently of 238 Squadron. (With 601 Squadron, Robinson had accounted for 2 Me.109's, one destroyed and one forced down; 1 Me.110 probable; 1 Me.110 and 3 Me.109's damaged. With 238 Squadron he had destroyed 2 Me.110's and 1 Me.109.) Although having previously fought only in Hurricanes, he brought down 2 Me.110's in his first operational sortie in a Spitfire, only three days after taking Command. Two more Polish officer-pilots joined the Squadron from 234 Squadron - P/O. T. Zurakowski and [illegible]	
	7th "		The Squadron had a partly successful but rather expensive engagement with a "50 plus" mixed raid between Portland and Yeovil. Both 609 and 238 Squadrons (the latter on our flank) suffered attack from enemy fighters coming from unusual heights with the sun in their favour. The squadron destroyed 4 Me.110's plus 2 Me.110's probable and 1 Me.109 damaged, at the expense of four Spitfires and one very good pilot, Sergeant A.N. Feary being killed. These responsible for enemy casualties were:- Sqdn/Ldr. M.L-Robinson. 2 Me.110's Destroyed. Flt/Lieut. F.J.Howell. 1 Me.110 " P/O. J.D.Bisdee. 1 Me.110 " P/O. J.C.Dundas. 1 Me.110 Probable (a virtualcertainty.) P/O. T.H.T.Forshaw. 1 Me.110 " Sgt. J.Hughes-Rees. 1 Me.109 Destroyed.	Appendix A.

Figure 9: Copy of the Operations Record Book for 609 Squadron based at Warmwell on 7th October 1940.

Additional to the Operations Records were those written by the pilots themselves following each mission. This is where social history brings colour to the story. Fighter pilots were heroes idolised by the general public and often invited to parties with the local gentry or to drink with the locals in the pub. Much of their time was spent waiting for the weather to change and the enemy to attack; when that happened from getting the call it took just 90 seconds to get into their aircraft and go. They were in Spitfires. The greatest flying machines of the day. These young men flew for about an hour in an adrenaline-fuelled 'kill-or-be-killed' situation. On landing back at base they were asked to sit down and write a flight report! No doubt a competitive streak existed as well with pilots vying with one another over who made the most 'kills'.

One potential Spitfire pilot from 609 Squadron who might have shot down the Bf110 south of Worbarrow Bay was Flight Lieutenant Frankie Howell DFC (Figure 10). F/Lt Howell claimed one 'kill' on the day and was then shot down himself. He managed to land, wheels-up, in a field south of Shaftesbury but never made it back to Warmwell that day... Howell was detained by the locals in the pub and didn't get back to base until 4am, ever so much the worse for wear!

Howell was eventually discounted from having shot down the plane based on his account of the day's events placing him a considerable distance from Worbarrow Bay at the time the Bf110 was downed and his description of the plane as 'destroyed'.

Figure 10: On 21st October Howell shared a Ju88 with P/O SJ Hill, 609 Squadron's 100th victory. Photo: www.bbm.org.uk.

A breakthrough in the search for more information came when Sheilah was able to book an appointment with the RAF Museum (Hendon) Reading Room. The incredibly helpful staff there supplied a transcript of the diary written by the squadron during the Battle of Britain and a series of books, the '*Luftwaffe Crash Archive*' by Nigel Parker. His references led to two further very important sources.

Firstly, the Imperial war Museum was contacted as they hold microfilm of the Luftwaffe Losses of WWII. They very kindly asked what information was required and supplied copies of the microfilm documents. Being in German these required an element of translation to make sense of them. Nevertheless these documents provided details of planes, pilots, Bordfunkers (meaning wireless operator) and, of course, targets (Figure 11).

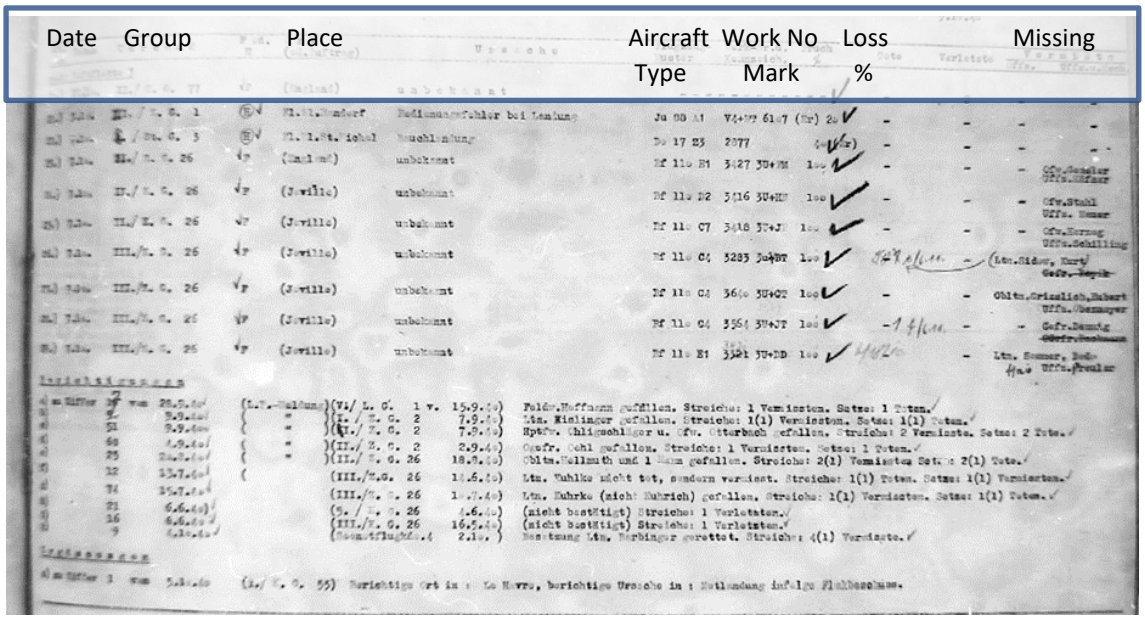


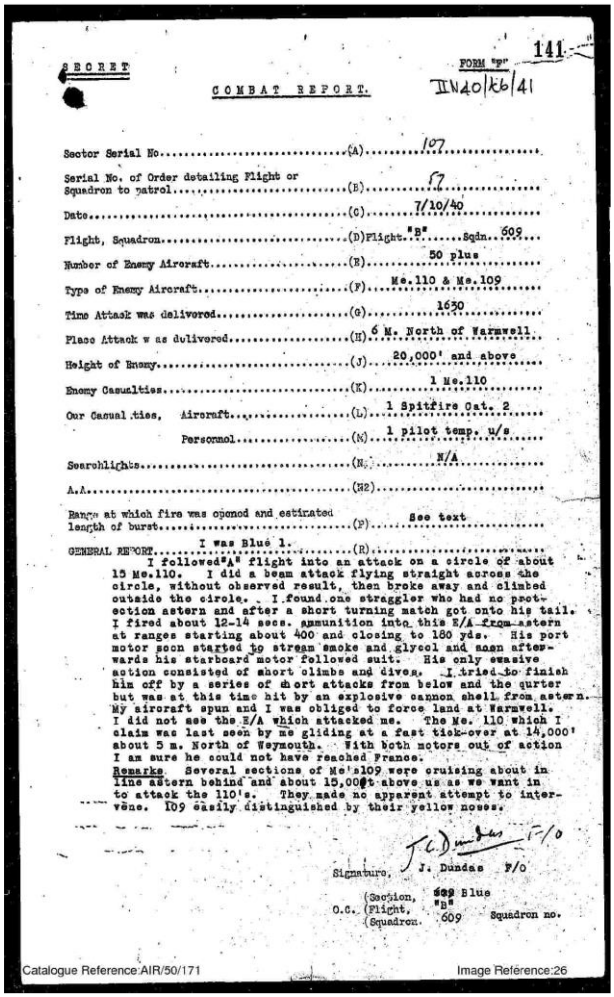
Figure 11: The key microfilm document detailing Luftwaffe losses from 7th October 1940.

Records from 7th October 1940 listed multiple Bf110s that did not return home; several with reference to '*Joville*'. Confusion reigned for a short while whilst Martin and Sheilah searched in vain for French airfields or towns of that name from where the planes may have taken off. Then, remembering how 'J' is pronounced in German, Martin realised this was more likely how the Germans had spelled Yeovil, the target of the day's bombing raid.

So far Martin and Sheilah had details of who claimed to have shot a plane down (squadron Operations Records and pilot's Combat Reports), we had details of where planes had been seen to crash or to land (chief constable reports) and we had details of which planes were missing from the Luftwaffe (Luftwaffe loss records).

It was a very confused story and the only thing to do was to sit down with some clean sheets of paper, examine the source documentation, piece it together and try and work out who shot at whom. Cutting a very long story short we are close but still not 100% sure. Up to three pilots may have shot at the plane which now lies south of Worbarrow Bay, but we cannot say which pilot, if any, administered the Coup de Grace.

Our belief, based on the pilots' accounts of the day is that it was most likely 24-year old Flying Officer John Dundas, DFC and Bar. His Combat Report of his attack on a Bf110 tallies with the report of the county chief constable in terms of both location (attacked north of Warmwell) and time of day (~1630h) (Figure 12). His account states…



SECRET

141

FORM "F"

COMBAT REPORT.

IIN40/kb/41

Sector Serial No.	(A)	107
Serial No. of Order detailing Flight or Squadron to patrol	(B)	17
Date	(C)	7/10/40
Flight, Squadron	(D)	Flight "B" Sqdn. 609
Number of Enemy Aircraft	(E)	50 plus
Type of Enemy Aircraft	(F)	Me.110 & Me.109
Time Attack was delivered	(G)	1630
Place Attack w as dulivered	(H)	6 M. North of Warmwell
Height of Enemy	(J)	20,000' and above
Enemy Casualties	(K)	1 Me.110
Our Casual ties, Aircraft	(L)	1 Spitfire Cat. 2
Personnel	(M)	1 pilot temp. u/s
Searchlights	(N)	N/A
A.A.	(N2)	
Range at which fire was opened and estimated length of burst	(P)	See text

GENERAL REPORT (R)

I was Blue 1.

I followed "A" flight into an attack on a circle of about 15 Me.110. I did a beam attack flying straight across the circle, without observed result, then broke away and climbed outside the circle. I found one straggler who had no protection astern and after a short turning match got onto his tail. I fired about 12-14 secs. ammunition into this E/A from astern at ranges starting about 400 and closing to 180 yds. His port motor soon started to stream smoke and glycol and soon afterwards his starboard motor followed suit. His only evasive action consisted of short climbs and dives. I tried to finish him off by a series of short attacks from below and the qurter but was at this time hit by an explosive cannon shell from astern. My aircraft spun and I was obliged to force land at Warmwell. I did not see the E/A which attacked me. The Me. 110 which I claim was last seen by me gliding at a fast tick-over at 14,000' about 5 m. North of Weymouth. With both motors out of action I am sure he could not have reached France.

Remarks. Several sections of Me's109 were cruising about in line astern behind and about 15,000ft above us as we want in to attack the 110's. They made no apparent attempt to intervene. 109 easily distinguished by their yellow noses.

Signature, J. Dundas F/O

(Section, Flight, Squadron. O.C. Sqn Ldr Blue "B" 609 Squadron no.

Catalogue Reference:AIR/50/171 Image Reference:26

"*I was Blue 1. I followed "A" flight into an attack on a circle of about 15 Me.110. I did a beam attack flying straight across the circle, without observed result, then broke away and climbed outside the circle. I found one straggler who had no protection astern and after a short turning match got onto his tail. I fired about 12-14 secs. ammunition into this enemy aircraft from astern at ranges starting from about 400 and closing to about 180 yds. His port motor soon started to stream smoke and glycol and soon afterwards his starboard motor followed suit. His only evasive action consisted of short climbs and dives. I tried to finish him off by a series of short attacks from below and the qurter [sic] but was at this time hit by an explosive cannon shell from astern. My aircraft spun and I was obliged to force land at Warmwell. I did not see the E/A which attacked me. The Me.110 which I claim was last seen by me gliding at a fast tick-over at 14,000' about 5 m. North of Weymouth. With both motors out of action I am sure he could not have reached France*."

Figure 12: F/O Dundas' combat report of 7th October 1940.

Dundas was the last remaining pre-war auxiliary pilot in 609 Squadron (Figure 13). Following 7th October he was only to live another 52 days. On the 28th November 1940 having already shot down a dozen Luftwaffe planes over the preceding months, Dundas shot down flying ace Major Helmut Wick (*Knights Cross of the Iron Cross with Oak Leaves* – Germany's highest military decoration of the time) who was credited with shooting down 56 RAF planes. But Hick's wingman then shot Dundas down and he crashed into the Channel off the Isle of Wight. A memorial to him was unveiled at Freshwater, IoW in 2000.

Figure 13: Flying Officer John Charles Dundas was credited with 25 strikes (destroyed or damaged) on enemy aircraft between August 1939 and November 1940. Photo: www.bbm.org.uk.

With this information to hand RAF Air Historical Branch was contacted again and informed of the team's findings and avenues of investigation. They confirmed the accuracy of the findings – a huge boost to the project!

The second highly useful reference from Nigel Parker's books was to the interrogation reports of the Luftwaffe Prisoners, held in The National Archives. These documents helped cast additional light on approximately where and when planes were shot down on 7th October 1940 and gave a view of the pilots' thoughts and morale. Two of these reports stood out as being probable candidates for the plane wreck south of Worbarrow Bay; planes 3U+GT (#3640) and 3U+DD (#3415). Which was it?

Several books document this wartime period, attributing people and events to some of the off-shore aircraft sites; these may not be entirely correct or sufficiently detailed. Indeed, even the times and locations given in Combat and Interrogation Reports can be sufficiently vague as to cast doubt over exactly what happened where and when. To determine which plane wreck John had found, only source documentation was used; chief constables report, squadron Operations Records, pilots' Combat Reports and PoW Interrogation Reports. A further vital consideration was that the wreck was largely intact; this indicated the plane had been landed on the sea rather than ditching after the occupants bailed out.

Bf110 3U+GT was piloted by First Lieutenant (Oberleutnant) Hubert Grisslich (27 years old) and crewed by the wireless operator (bordfunker) Sergeant (Únteroffizier) Ludwig Obermeier (23 years old). They reported being shot at by multiple fighters and came down at 1610h. Obermeier, the bordfunker was seriously injured and bailed out immediately after the first attack. The pilot, Grisslich tried to struggle home but came down in the sea after the second engine seized. He was reported to have been swimming in the sea for some considerable time before being picked up. This report is therefore inconsistent with the Chief Constables' report for the Worbarrow aircraft which referenced "*occupants (two) both prisoners*".

Bf110 3U+DD was piloted by Leutnant Botho Sommer (26 years old) with bordfunker Únteroffizier Paul Praüler (22 years old). They too reported having been attacked by multiple fighters. Their plane was the only one that crashed into the sea with both the pilot and bordfunker still on board who were taken prisoners. This is therefore consistent with the Chief Constables' report for the Worbarrow aircraft which referenced "*occupants (two) both prisoners*". It is also consistent with the wreckage being close together and not broken up by a heavier impact from a crash.

Their Interrogation Report revealed they had started their sortie from an airfield 11km north of Cherbourg. Their raid consisted of approximately 48 aircraft of which 20 were bombers. "*On the return journey, flying at 19,000 feet, they were attacked from all sides by fighters, and both engines were hit and disabled. The pilot stated that he could have come down on land, but preferred the water – as a result of his experience he now professed that dry land would have been preferable.*" Lt. Sommer was reported to have had very high morale and had undertaken some 25 war flights with potentially up to nine combat claims on RAF aircraft. In contrast U/O Praüler stated he was glad to be out of the war and had no strong feelings on it either way.

U/O Praüler had been wounded during the attack of 7th October. Details of his injuries were unavailable but were not listed as serious in the original Interrogation Report from 8th October 1940. However, a further report from 25th December 1940 stated he had just been released from hospital and had been further interrogated. He gave details of his Luftwaffe career, from joining in 1937 as a ground-based radio operator, to his training as a flying radio operator and air gunner. Further information he divulged included technical details of an advancement in the DB601N engines which provided higher top speeds for the Bf110s and the plans to convert almost all the aircraft to become night fighters; a move that would find their niche in the Luftwaffe operations over Europe.

What happened next?

The inevitable question is what became of Lt Sommer and U/O Praüler from Messerschmitt Bf110 3U+DD? One source suggests that Botho Sommer at least may have been released during the war and returned to combat flying, but is inconclusive. In the early war years, many German PoWs were shipped to Canada but there are no records to support whether

or not that happened to these two young men. PoW records held by the Red Cross in Geneva are accessibly only to relatives meaning we are unable to gain further access. The German Embassy felt that there was little chance of finding the records in the German Archives since these are also held in Switzerland with the Red Cross. Our efforts to locate and contact any potential descendants have reached an impasse.

The wreck of Bf110 3U+DD today

Throughout the project, images and video have been taken to document the site and are intended for use in presentations, publications and internet and television broadcasts. A selection of these are presented here and in the following section detailing the marine life to be found on the wreck.

What we assume to be the starboard engine lies in a relatively photogenic position and is festooned with colourful sponges, hydroids and bryozoans (Figure 14 and Figure 15). All 12 cylinders are clearly visible as is the flat sump cover which aided the plane's initial identification.

Being of largely aluminium construction, much of the original airframe has corroded away leaving just the structural framework visible and subject to continued scour from sediments moving back and forth over the wreckage in the tide. Despite this, key components remain visible such as the main wing spar (Figure 16), some of the fuel tank support structures and the nacelles which housed the engines (Figure 17). Some components are clearly sited a few metres form the main airframe. It is unclear if this is a result of the initial landing impact and sinking, from tidal and / or wave action over time, or from entanglement in fishing gears previously towed or placed across the site (Figure 18 to Figure 20).

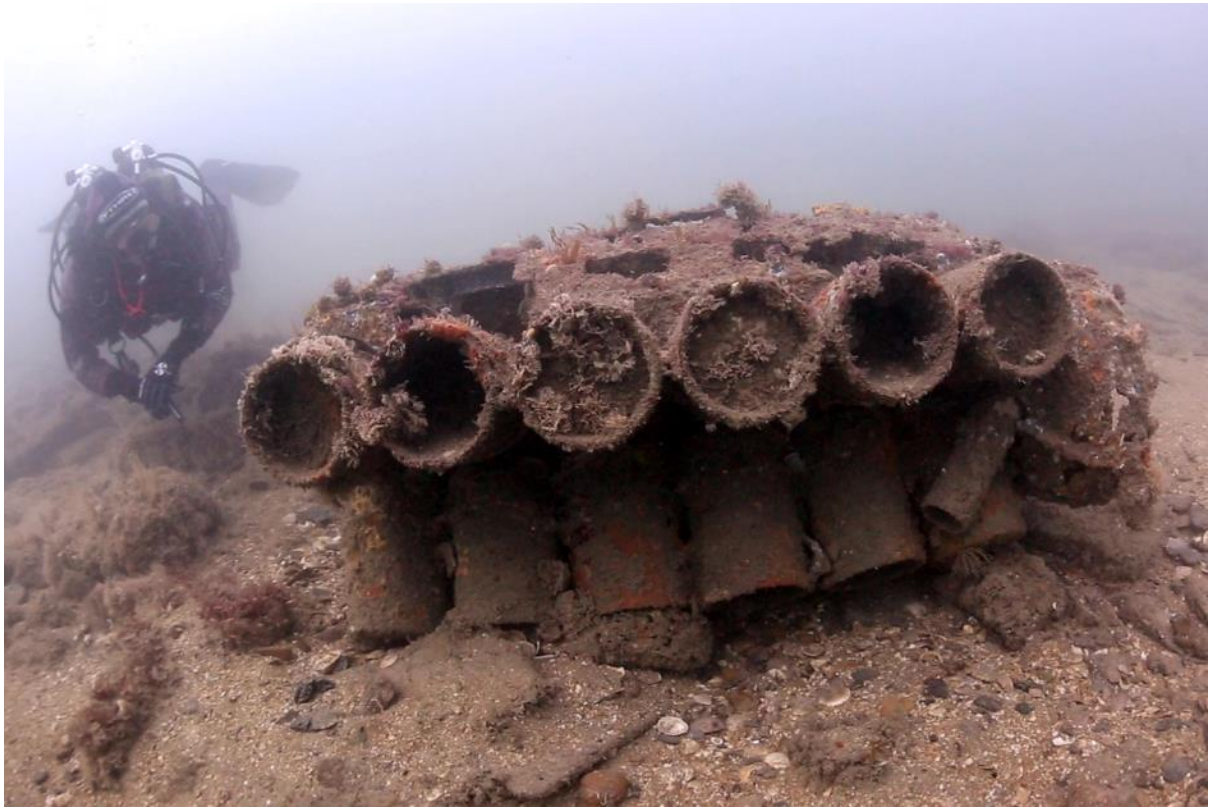


Figure 14: Martin Openshaw inspects the starboard V12 DB600 series engine. Photo: Matt Doggett.

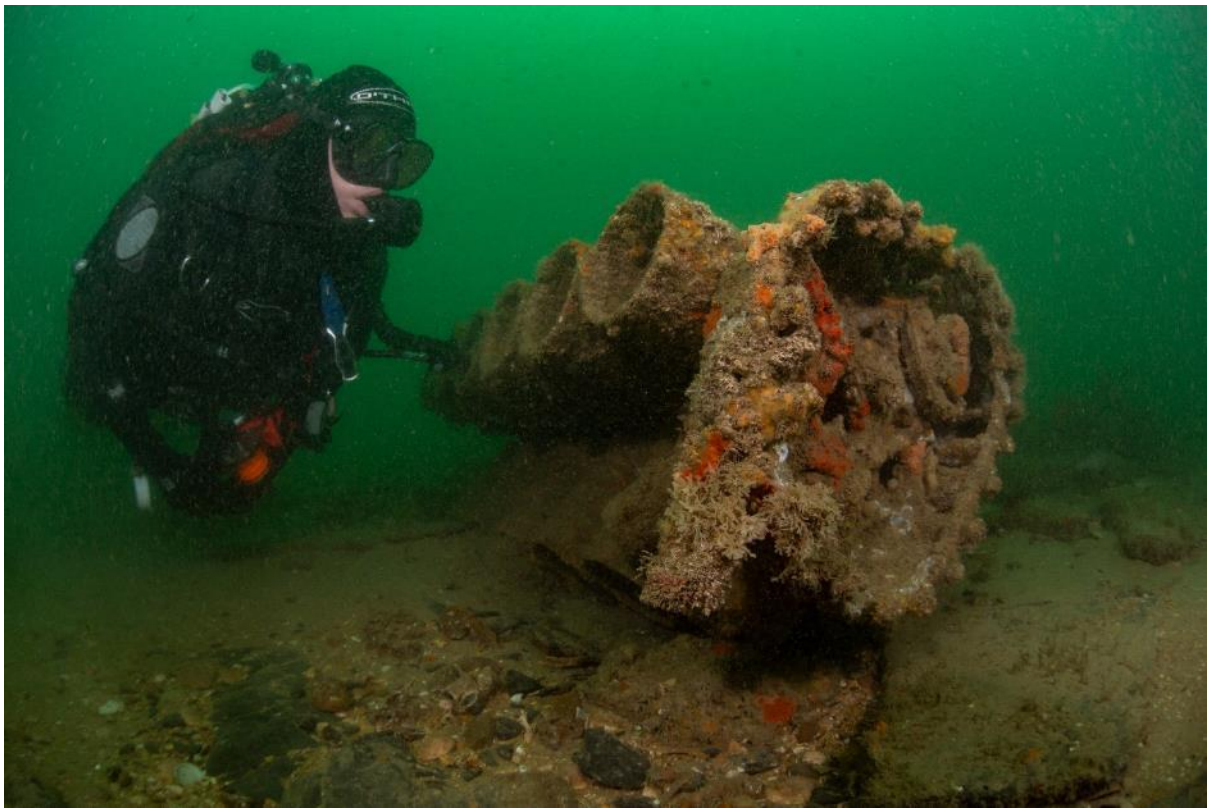


Figure 15: A further view of the starboard V12 DB600 series engine. Photo: Matt Doggett.

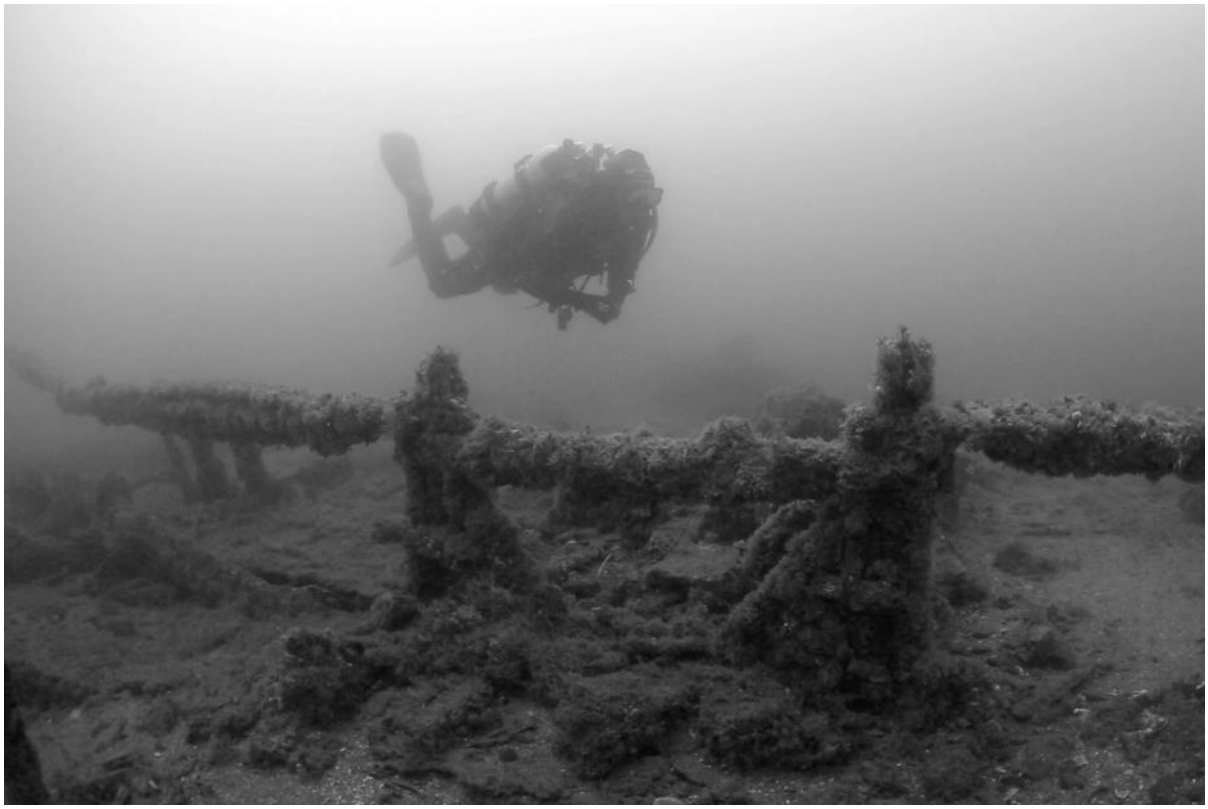


Figure 16: Martin Openshaw swims over the main wing spar. Photo: Matt Doggett.

Figure 17: The lattice framework in the wing structures was where the forward and rear fuel tanks were housed. The nacelles which supported the engines are visible on the right. Photo: Matt Doggett.

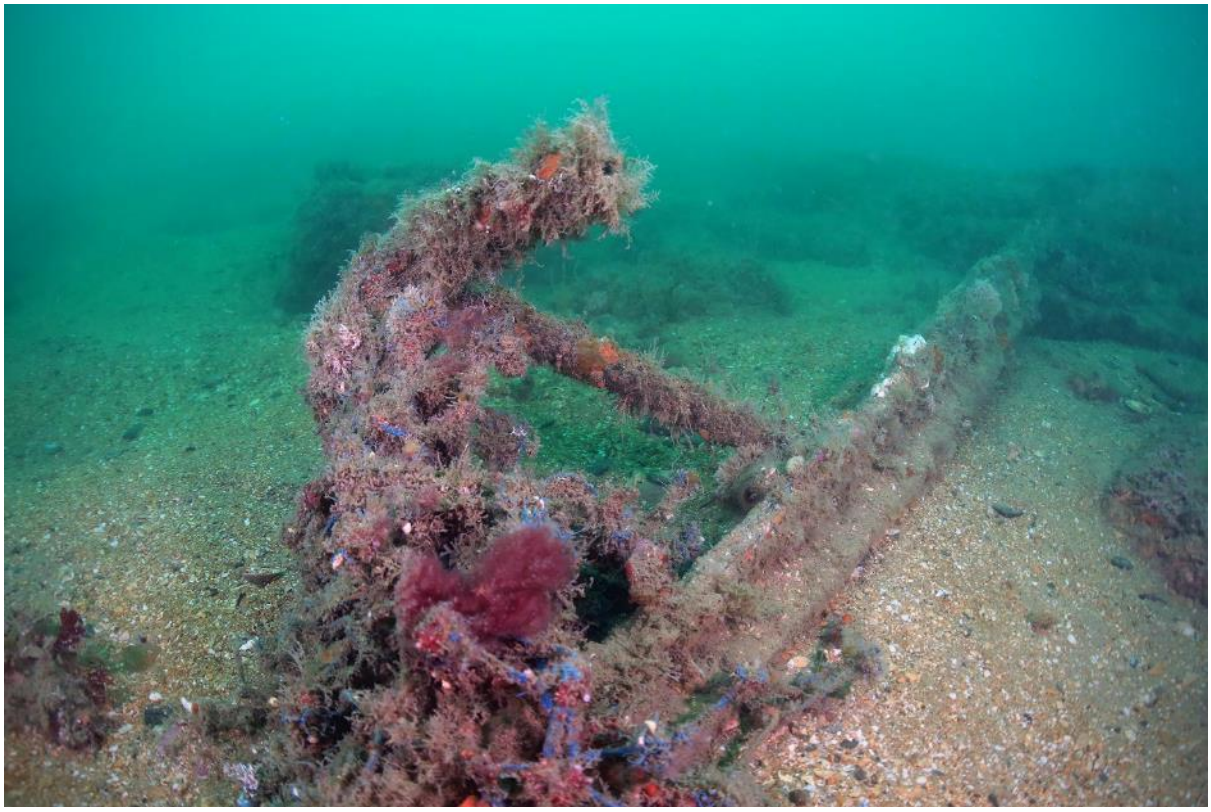


Figure 18: The likely tail spar of the Bf110 entangled with blue fishing net. Photo: Matt Doggett.

Figure 19: The starboard nacelle also entangled with blue fishing net and encrusted with marine life. Photo: Matt Doggett.

Figure 20: An unidentified section of wreckage approx. 1 m west of the starboard engine wrapped in thick monofilament line. Photo: Matt Doggett.

Images such as those shown previously are useful for showing details of the wreck site but make such a small, low-lying structure hard to visualise, particularly with limited visibility. We used the increasingly popular technique of photogrammetry to create 3-dimensional models of the wreck site and each of the engine blocks.

The original 3-d model from 22nd July 2020 was intended only as a test case to see if the technique would be successful; only 10 minutes were spent on the photography at the end of a dive to film the site. In fact the resultant model provided an excellent overview of the wreckage, our main reservation being that it would have been better to include more of the adjacent reef for more situational context (Figure 21). One interesting feature of this model were the bare patches of bedrock scattered throughout the site. These were the nests of black bream that had finished spawning on the site a few weeks prior to the dive and provided a nice link to one of our previous (and on-going) projects supported by the BSA-JT, the Black Bream Project.

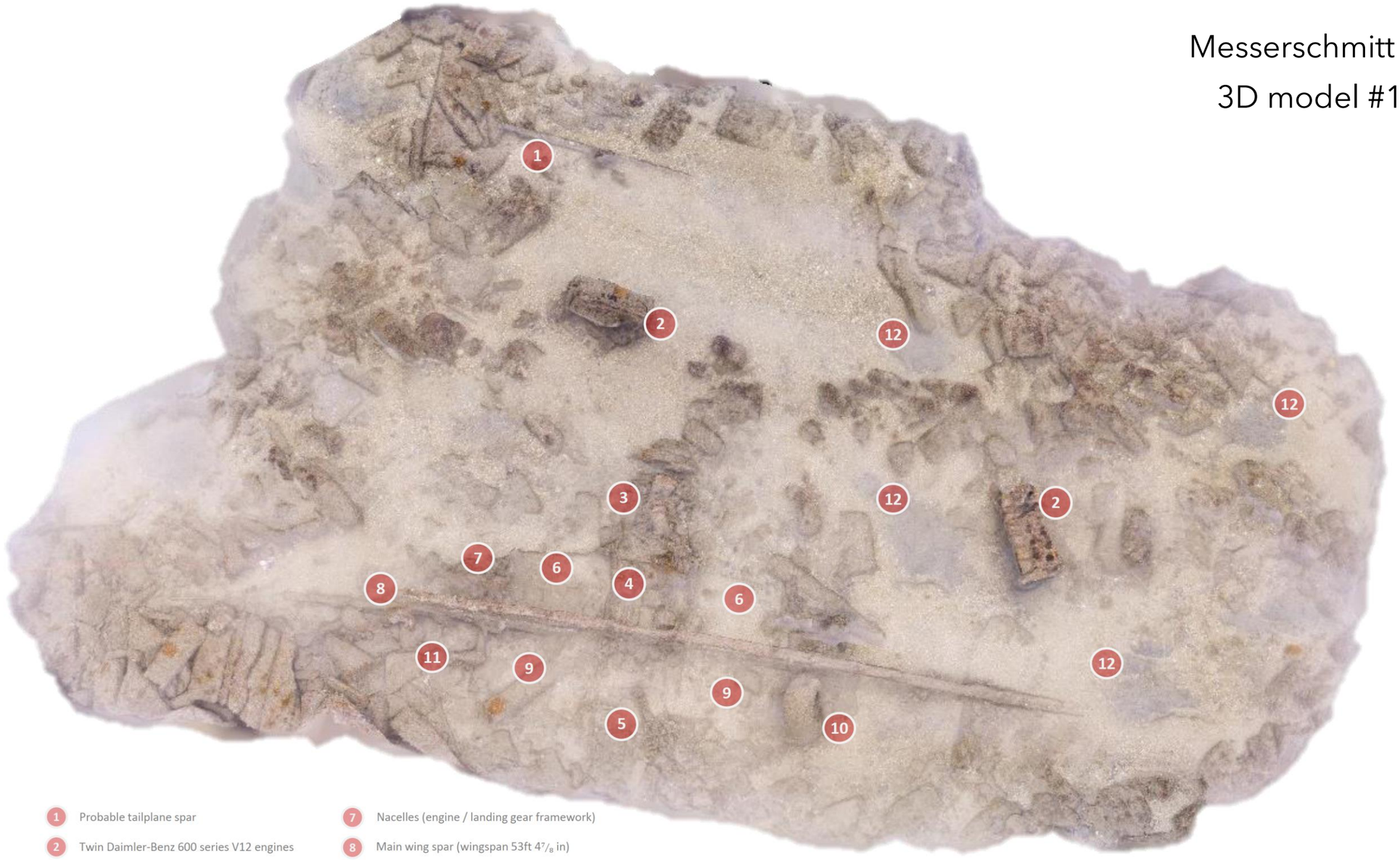
A second attempt to model the site on 18th April 2021 was more successful in capturing the reef behind the plane but was hampered by poor visibility which caused other areas of the model to suffer (Figure 22). Figure 22 shows the wreckage with a Bf110 technical drawing to illustrate the layout of the aircraft on the seabed with greater clarity.

A further attempt to model the wreck site has not been possible this year (2021) but will be made at the next opportunity. The advantage of repeating this exercise periodically is that any deterioration in the wreck site can be documented.

Two further models were produced during additional dives of each of the Daimler-Benz 600 Series inverted v12 engines showing them in full detail (Figure 23 and Figure 24).

All the models produced can be viewed online by clicking the links to Sketchfab on each of the four following figures.

Messerschmitt Bf110 wreck site
3D model #1 – 22nd July 2020



VIEW THE MODEL IN 3D ON SKETCHFAB

Figure 21: Annotated 3-dimensional model of the wreck site. Photo: Matt Doggett.

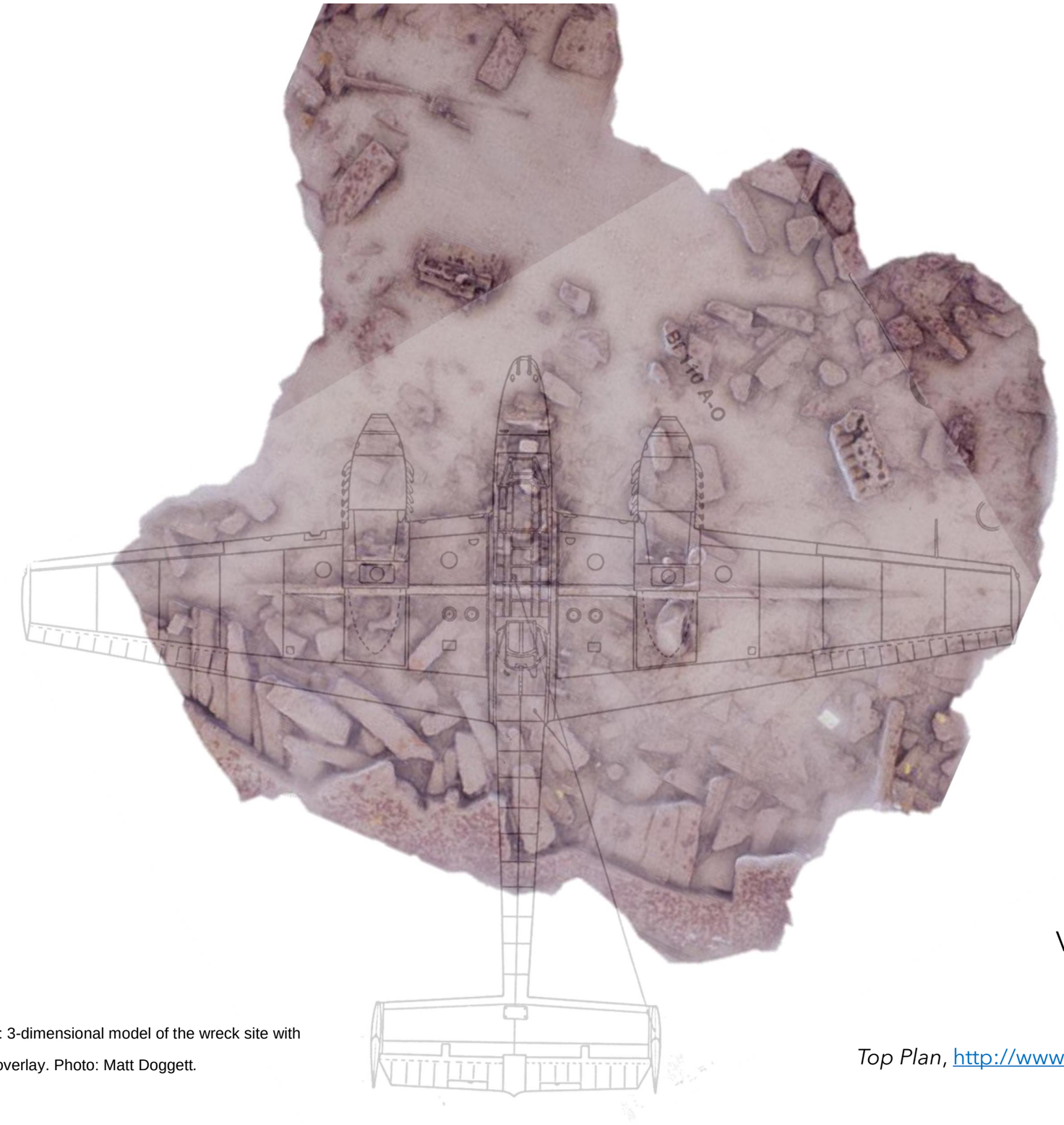


Figure 22: 3-dimensional model of the wreck site with technical overlay. Photo: Matt Doggett.

Messerschmitt Bf110 wreck site
3D model #2 – 18th April 2021

Image overlay of a Messerschmitt Bf110 C-4 (Rickard, J., 2007*)

VIEW THE MODEL IN 3D ON SKETCHFAB

*Rickard, J (24 April 2007), *Messerschmitt Bf 110C-4: Top Plan*, http://www.historyofwar.org/Pictures/pictures_bf110c4_top.html

3D model, starboard Daimler-Benz 600 Series inverted v12 engine – 7th August 2020

VIEW THE MODEL IN 3D ON SKETCHFAB

Figure 23: 3-dimensional model of the starboard engine. The black, red and blue scale bar is 0.5 m long. Photo: Matt Doggett.

3D model, port side Daimler-Benz 600 Series inverted v12 engine – 9th April 2021

VIEW THE MODEL IN 3D ON SKETCHFAB

Figure 24: 3-dimensional model of the port engine. Photo: Matt Doggett.

Marine life

With most of the team members being active Seasearch divers and / or marine biologists, documenting the marine life on and around the wreck site was an obvious and pleasurable task (Figure 25 and Figure 26). Most dives included some documentation of the resident marine life and full records have been sent to Seasearch. A brief overview is provided here.

Figure 25: Lin Baldock makes notes of sponges and bryozoans growing on the starboard engine. Still from video: Matt Doggett.

Figure 26: Sheilah Openshaw taking images of marine life on the port engine. Still from video: Matt Doggett.

Life on the wreck

Being subject to coarse sediments moving across the site with tidal and wave action, much of the fauna growing on the wreck is scour-tolerant and short in stature. The most common sponges encountered included the goosebump sponge (*Dysidea fragilis*), an orange crater sponge (*Hemimycale columella*) and various other orange and yellow encrusting species. Shredded carrot sponge (*Amphilectus fucorum*) and small branching staghorn sponges (*Axinella dissimils*) were also noted (Figure 27 and Figure 28).

Figure 27: The starboard engine block encrusted with colourful sponges, hydroids and bryozoans. Still from video: Matt Doggett.

A dense turf was formed over much of the wreckage and formed of hydroid and bryozoan species. The most abundant of these was the bushy bryozoan (*Chartella papyracea*) with others such as *Crisularia plumosa* and *Amathia citrina* also common (Figure 19 and Figure 28). Small colonies of the potato crisp bryozoan (*Pentapora foliacea*) were found growing on some elements of the cockpit instrumentation and are visible in Figure 6 and the 3d model (Figure 21).

Spiral fan worms (*Bispira volutacornis*) were encountered throughout the wreckage (Figure 28 and Figure 29) as were colonies of filigree worms (*Salmacina* / *Filograna* spp.) and occasional serpulid worms (*Serpula vermicularis*).

The sandalled anemone (*Actinothoe sphyrodeta*) colonised various sections of the wreck but was particularly noticeable on the main wing spar as was the occasional plumose anemone (*Metridium dianthus*) (Figure 30 and Figure 31).

Figure 28: Encrusting life on the port engine pistons including the staghorn sponge *Axinella dissimilis*, goosebump sponge, *Dysidea fragilis*, the bryozon *Chartella papyracea*, short hydroids and fan worms, *Bispira volutacornis*. Photo: Lin Baldock.

Figure 29: Spiral fan worms (Bispira volutacornis) amongst other ‘turf’ species in the cockpit structure. Photo: Sheilah Openshaw.

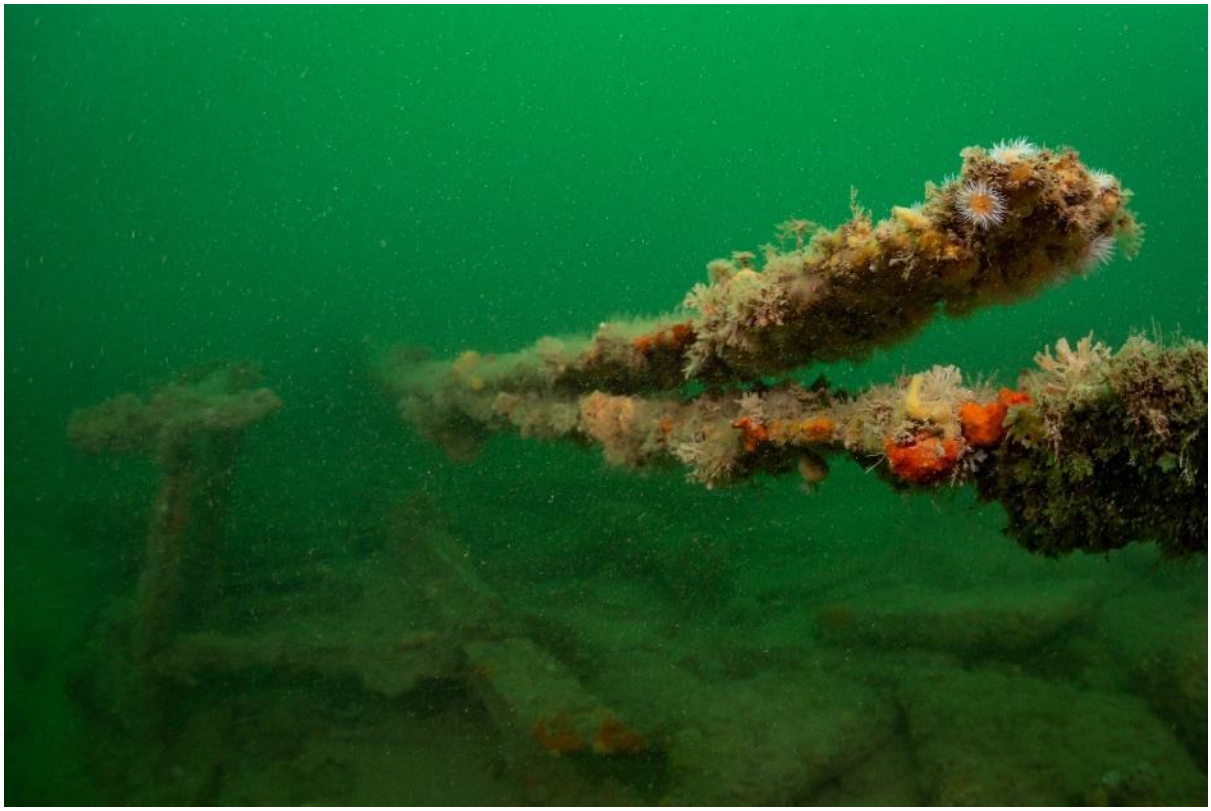


Figure 30: Sandalled anemones (*Actinothoe sphyrodeta*) growing on the main wing spar. Photo: Matt Doggett.

Figure 31: Close-up of sandalled anemones (*Actinothoe sphyrodeta*) growing on the main wing spar. Photo: Sheilah Openshaw.

Larger parts of the wreck structure provide shelter for mobile species such as lobsters (Figure 32) and fish including cuckoo wrasse, ballan wrasse, goldsinny wrasse, bib and tompot blennies (Figure 33).

Figure 32: A lobster takes shelter in its burrow beneath the port wing. Photo: Matt Doggett.

Figure 33: A male cuckoo wrasse peers out from the starboard tyre. Photo: Matt Doggett.

Life around the wreck

Between the wreckage the seabed was mainly low-lying to flat bedrock scattered with cobbles and small boulders and covered in a thin veneer of pebbles, gravel and coarse sediment. On several of the larger, stable rocks were colonies of the pink sea fan (*Eunicella verrucosa*) (Figure 34) including some small colonies less than two years old. Antenna hydroids (*Nemertesia antennina*) also covered the upper surfaces of these small boulders and occasional filamentous and foliose algal species.

Figure 34: Small pink sea fan colonies *(Eunicella verrucosa*) close to the starboard engine visible in the background. Photo: Matt Doggett.

Of particular interest to the team in July 2020 were the black bream (*Spondyliosoma cantharus*) nests observed throughout the wreck site and discussed earlier in relation to Figure 21. Once nesting is complete for black bream, the nests are gradually (or quickly in stormy conditions) covered over with sediments and do not always leave obvious signs of having been present. Without regular diving on the site we might never have known this enigmatic species used the site for such an important stage of its lifecycle. With luck we will be able to document breeding of black bream on the site in future years.

The reef adjacent to the wreck also plays host to mixed sea squirts including the enormous Neptune's heart (*Phallusia mamillata*), further seafans and branching sponges (Figure 35). North of the reef are maerl beds (albeit mostly dead maerl) which in turn are home to gravel sea cucumbers (*Neopentadactyla* mixta) (Figure 36) and Europe's smallest marine fish at just 17 mm long, the Guillet's goby (*Lebetus guilleti*) (Figure 37).

Figure 35: Life on the adjacent reef includes a diverse mix of sponges, hydroids, bryozoans, tunicates and algal species. Photo: Lin Baldock.

Figure 36: Gravel sea cucumbers living among the banks of dead maerl gravel and broken shells. Photo: Matt Doggett.

Figure 37: Europe's smallest marine fish, Guillet's goby can be found amongst maerl waves throughout the Purbeck Coast. Photo: Matt Doggett.

Publicity

With the project program curtailed in 2020 due to the Covid pandemic we prioritised our diving efforts toward recording good quality video footage of the wreck. Having identified the plane and crew during winter 2019/2020 we knew the 80th anniversary of it being shot down would be 7th October 2020. Working with the production company *Off The Fence* we were lucky enough to get the story publicised on the One Show. The story aired on 6th October 2020, bringing our research, footage, 3-d models and the 80-year old story of the Bf110 to the nation's living rooms (Figure 38).

Sheilah has presented the findings to the Nautical Archaeological Society and her local diving club Basingstoke – BSAC 609 (coincidence in the number of the dive club and squadron number is noted) club and Matt D has talks planned in autumn / winter 2021.

Figure 38: Matt D and John Coward on the slipway at Kimmeridge discussing the find for the One Show broadcast.

The future

We plan to continue with periodic diving on the wreck site to monitor its condition. Continued photogrammetry of the site will enable structural changes to be examined and compared over time and will show how the sediments and fauna vary over time in the area.

The framework is in a fragile condition and it may not be much longer before the main wing spar falls away or is damaged from becoming snagged on fishing gear.

Articles are in preparation for diving magazines as well as for various county, historical and aviation titles. Our ultimate goal will be to produce a project webpage and short video as we did for the Black Bream Project and Undulate Ray Project. It is hoped this will be completed in early 2022.

Conclusions

We have achieved the project's objectives to document this wreck and have gathered strong evidence to support the following conclusions.

- On 7th October 1940 a Messerschmitt Bf110 was observed crashing into the sea between Arish Mell Gap and Worbarrow Tout at approximately 1630h.
- The pilot was Leutnant Botho Sommer and the bordfunker Unteroffizier Paul Praüler.
- The plane was Messerschmitt Bf110 E1, serial number 3321 (crossed out and hand-written 3415), registration 3U+DD flying in support of heavy bombers on a mission to bomb the Westland factory at Yeovil.
- The Bf110 was shot at by two, perhaps three Spitfire pilots most likely including Flying Officer John Dundas, DFC and Bar.
- Both Lt. Sommer's engines were disabled and he chose to land the plane on the water. This explains why and how so much of the airframe structure remains intact and is recognisable today.
- Both the crew were rescued and became prisoners of war. Exactly what happened to them in the latter and post-war years is unknown.
- We have documented the wreck site with video, stills and 3-d photogrammetry. The find has been reported to RAF Historical Branch who have confirmed the team's findings as accurate.
- Year after year this amazing part of the Dorset coast reveals to us more secrets of its natural, geological and anthropological history. We will keep on diving!

Figure 39: An archive image of Bf110 3U+DD in France, dated from 1940, potentially with Leutnant Botho Sommer and Únteroffizier Paul Praüler. Source: www.asisbiz.com.

Acknowledgements

We are grateful to the British Sub Aqua Jubilee Trust for provision of funding in support of this project.

Other key individuals and organisations provided valuable help and assistance along the way and to whom we are very grateful include:

- Staff at the Imperial War Museum
- Staff at RAF Air Historical Branch
- Jeff Metcalfe – 609 Squadron Association
- Staff at RAF Museum, Hendon
- Prof. Keith Towell, University of Southampton

Appendices

Appendix I - General diving rules

The following provides a summary of the diving procedures employed during the project.

Diving Gases

All diving will be carried out using either air or nitrox obtained from reputable local suppliers.

Diving Practice and Decompression Procedures

All diving will be within no-decompression limits. Divers will complete ‘safety stops’ at 5 m for three minutes when diving deeper than 10 m.

For this project, a set of Bf110-specific diving rules has been developed. These are:

- All diving on site will be subject to the “look but do not touch” rule.
- No objects or part of the wreck can be disturbed and nothing must be recovered.
- The site will be shot perpendicular to the tide so the divers will swim across the tide and over the adjacent reef to reach the site. The shot will not therefore interfere with the site by potentially being dragged onto it.
- Visibility in the region of the wreck is often good and can reach ~8 m or more. For diver safety, on occasions of low visibility, divers could deploy a thin ground line on a reel attached to the shot to help orientate the divers back to the shot. This will not interfere with or damage the site and can be recovered by the divers after each dive.
- All dives will be conducted in buddy pairs.
- Photography, video and non-intrusive direct measurements are all that is allowed. Any other measurements can be taken from 3D photogrammetric model.

All divers will be logged in and out of the water on a marshalling slate. Following each dive, divers will be asked to confirm they did not undergo any extraordinary events such as rapid ascents.

Diver Equipment

All divers’ equipment (regulators and cylinders) is in service and maintained in good working order. All divers will dive using either twin 7L setups or single tanks with pony cylinders (unless diving is particularly shallow (<10 m) when a single cylinder maybe used - NB not applicable to current project). This ensures that each diver has an independent air supply should they become separated from their buddy. Should separation occur, divers will search for their buddy for one minute and then surface if they have not been re-located. Dive computers rather than tables will be used.

All divers will carry a whistle, delayed surface marker buoy and torch(es) for surface signalling if required.

Diver support

As stated above, divers will dive in buddy pairs on the site. There will always be surface cover in case of emergency. The skipper / coxswain will maintain a constant watch over the dive site throughout each dive.

The vessel is equipped with emergency oxygen therapy kits, flares, GPS, radio and mobile phones for use in case of emergencies.

Expected Depths / Durations

All dives are planned for depths of 20-22 m with each dive lasting approximately one hour. All dives are no-decompression dives.

Expected Environmental Conditions

The project requires calm seas to access the sites. Visibility underwater has to be good for effective site location and acquisition of good quality photographs and video footage. Dives will not take place unless both these criteria are fulfilled. Currents at the site are well understood and we can accurately predict slack tide times with no issue.

Diving Platform

The project will use a RIB to reach most of the sites. We will use the 6 m RIB ‘Starship’ owned privately by Martin and Sheilah Openshaw, from which we have all dived previously.

The vessel is serviced annually and carries a first aid kit, oxygen, flares, GPS and a radio.

The Messerschmitt Bf110 Project – COVID-19 Statement

Although UK diving has now been permitted to resume, the Bf110 Project team will be undertaking the dives responsibly so as to minimise the risks to team members from the SARS-COV-2 coronavirus.

- By meeting and remaining outside for the entirety of the diving activities, the risks of airborne viral transmission are considered low. However divers may choose to wear face coverings should they wish.

- Divers from different households will not share transport to and from the vessel launch site.

- The number of people on the boat at any one time will not exceed four in order to maintain social distancing. This means the project may take more dives to complete than originally anticipated.

- Alcohol hand gel of at least 60% alcohol content (preferably 80%) will be available at all times on the boat and should be used regularly by all on board.

- There will be no sharing of food or drink or utensils by any team members.

- Divers are responsible for handling their own equipment, particularly regulators and should avoid touching other divers' equipment without prior consent. Regulator mouthpieces should come into contact with none other than their owners.

- Masks are to be rinsed and cleaned by none other than the diver-owner and well away from any other divers in the water.

- Should Government guidelines or rules change to restrict either coastal access or socializing with those form other households, the project may need to be postponed, but will continue as soon as possible once restrictions are again eased.

Appendix II – Dive log and project budget

In total the project was awarded £1,500 from the British Sub Aqua Jubilee Trust to pay toward the costs of 15 'diver days' to cover diving costs, air fills and travel for the team members. These were estimated to be carried out over 6-10 project diving days.

The table below shows that to date 25 diver days have been carried out on the project over 13 separate days in total. Further diving on the wreck is anticipated in late 2021 and into 2022.

Date	Divers	Diver days	Task
5 days in August 2019	John and buddy	5	Wreck relocation
08/09/2019	John and buddy	1	Wreck relocation
15/09/2019	Martin, Matt B, Lin, Sheilah	4	Inspect wreck structure, record marine life
16/09/2019	Lin, Matt B	2	Inspect wreck structure, record marine life
12/07/2020	Martin, Matt D, Lin, Sheilah	4	Filming, site inspection, marine life records
22/07/2020	Matt D, Lin, Sheilah	3	Filming, photogrammetry
07/08/2020	Matt D, Martin	2	Filming, photography, photogrammetry
09/04/2021	Matt D, Lin	2	Photography, photogrammetry
18/04/2021	Matt D, Martin	2	Photography, photogrammetry
	Total diver days	**25**	

The table below breaks the project costs to date that the Jubilee Trust contributed toward.

Total project budget: August 2019 – April 2021

Item	Cost per diver per day	No. of days	Cost
Boat costs	£65	25	£1,625.00
Air fills	£15	25	£375.00
Travel (fuel, parking)	£20	25	£500.00
		Total cost	**£2,500.00**

The total cost of the project was estimated at likely >£5k including all boat costs, air fills and travel, plus other items not listed above including data storage, web page design and hosting, training in photogrammetry techniques and purchase of the Agisoft software to create the models. By the time any additional diving has been completed and the project webpage completed the project will not be far off this estimate. The contribution from the BSA-JT has been invaluable in helping the project progress and we will continue to acknowledge its support in all future presentations and publications of the story.