U-BOAT STORY

U-534 EDUCATION PACK

KEY STAGES 2 + 3

DISCOVER THE AMAZING VIEW OF LIFE ON BOARD U-534

TEACHING RESOURCES TO SUPPORT YOUR VISIT TO U-BOAT STORY

The Mersey Partnership Annual Tourism Awards Winner 2011

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INTRODUCTION

The U-boat Story education pack contains everything you need to know about planning a visit to U-boat Story as well as flexible ideas for activities to help your group gain the maximum educational benefit and enjoyment from their visit.

U-boat U-534 offers an inspiring story of living history and can link to many areas of the curriculum enhancing pupils' knowledge, skills and understanding of topics, including life on board an enemy submarine, World War II history and the Battle of the Atlantic, as well as important scientific principles such as buoyancy, the movement of sound underwater and submarine technology.

The U-boat Story education pack contains pre, during and post visit activities that can be adapted for pupils at Key Stages 2 and 3 to support individual and group work. The resources also contain activity sheets and fascinating background information to provide an insight into the story of U-534, life on board a U-boat and the science of submarines.

BOOKING YOUR VISIT TO U-BOAT STORY

ADMISSION PRICE TO U-BOAT STORY IS £4 PER CHILD. JOINT U-BOAT STORY & MERSEY FERRIES RIVER EXPLORER TICKETS ARE AVAILABLE AT £7.50 PER CHILD.

ENTRY IS FREE FOR ONE MEMBER OF TEACHING STAFF PER SIX CHILDREN.

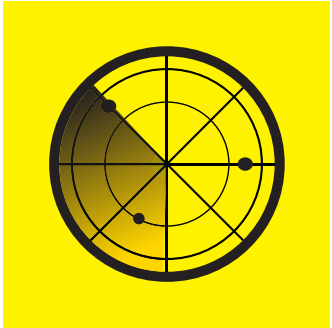
Payment can be made by cash, cheque or cards on the day. Please make cheques payable to 'Mersey Ferries Limited'. A complimentary ticket is available for teachers wishing to undertake a familiarisation visit.

Coach parking is available at Woodside Ferry Terminal but must be booked in advance on 0151 330 1444.

If you require space for your group to eat lunch, please mention it when placing your booking.

The whole experience is expected to take around one hour. The ferry terminal contains toilets for the attraction and a café. At the end of the attraction, a shop sells U-boat related merchandise along with pocket money items. It is possible for "goody packs" to be made up in advance for school groups.

FOR MORE DETAILS ABOUT BOOKINGS PLEASE CONTACT 0151 330 1444.



PREPARING FOR YOUR VISIT TO U-BOAT STORY

Once you have placed a booking you will receive a confirmation letter or email. Please check all details are correct. If you have any queries please call 0151 330 1444.

Please familiarise yourself with the background information featured in this pack (see page 6) and the layout of the attraction (page 4).

Put pupils into smaller groups with an adult as a leader.

Share the map of U-boat Story and Exploring U-boat Story information (see right) with adult leaders to help plan your visit.

ON ARRIVAL AT U-BOAT STORY

The group leader should confirm details with Reception staff before the children enter the building.

Toilets are located inside the ferry terminal.

Pupils should be told where to go in an emergency.

If they get separated from their group, pupils should be told to go to Reception so their group leader can be contacted.

If an emergency alarm is sounded, pupils should remain with their group leaders, meet outside the building and the group leader should report any missing children to a member of staff.

You are then free to explore U-boat Story at your leisure.

EXPLORING U-BOAT STORY

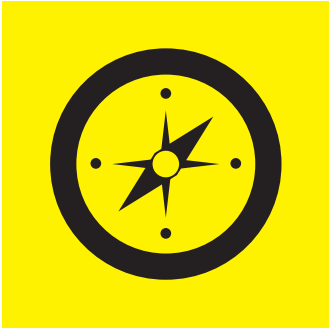
As well as offering the opportunity to view the inside of a submarine, U-boat Story provides a unique experience to explore World War II from a different perspective, life on board an enemy submarine.

The following section provides an overview of the exhibits and interactives at U-boat Story. You may find it useful to use this along with the map of the attraction to plan your visit and to arouse curiosity amongst your pupils about what they will see and do at U-boat Story.

Your group can either explore the U-534 outside first or visit the exhibition. It is suggested for larger groups that the group splits and one group explores the exhibition whilst the other takes in the U-boat.

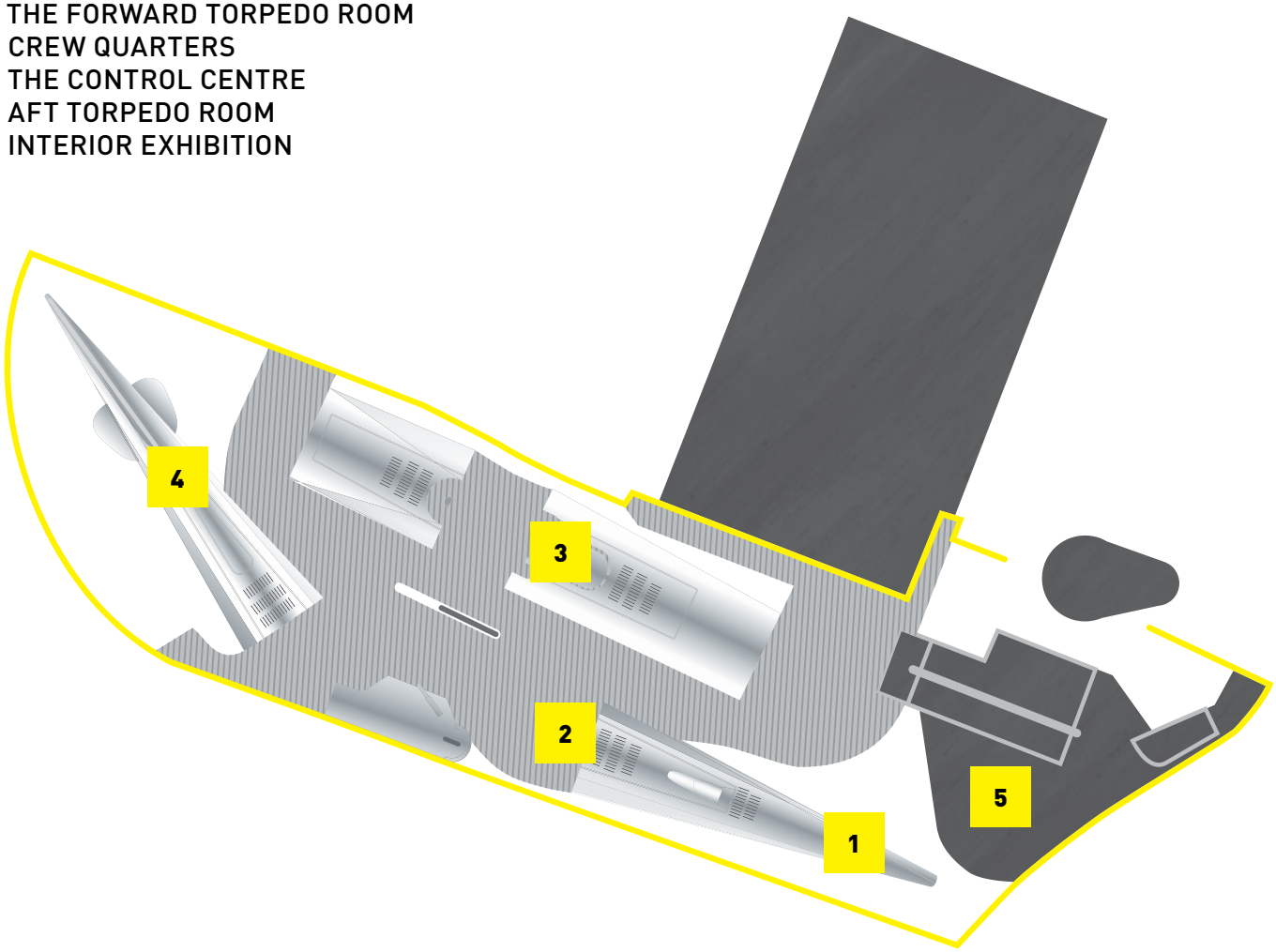
U-534 is cross-sectioned and the use of graphics and clever lighting will highlight the various controls and different elements of the submarine. Those areas not immediately visible will be seen through CCTV, which your group will be able to control the movement of and try to identify various parts of the submarine comparing the images against pictures of the original inside of the vessel.

A viewing platform will enable your group to look down onto U-534. When you explore U-534, encourage your group to try to find the areas listed on pages 5 and 6.



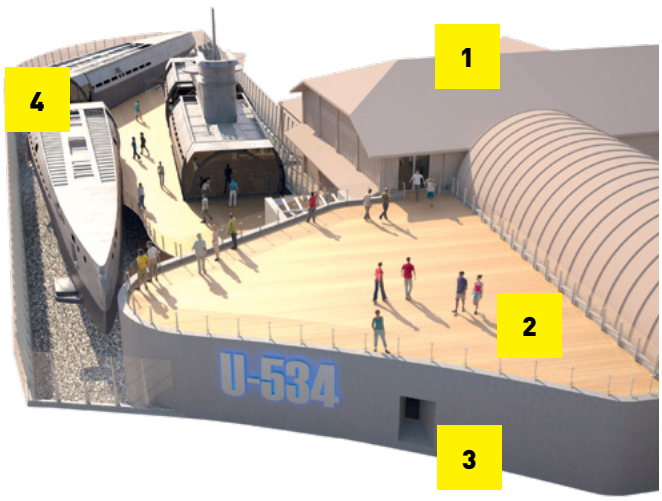
U-BOAT STORY

1. THE FORWARD TORPEDO ROOM
2. CREW QUARTERS
3. THE CONTROL CENTRE
4. AFT TORPEDO ROOM
5. INTERIOR EXHIBITION



THE U-534 SITE

1. WOODSIDE FERRY TERMINAL
2. VIEWING TERRACE
3. INTERIOR EXHIBITION
4. EXTERIOR EXHIBITION



U-534 EXHIBIT

THE FORWARD TORPEDO ROOM

Heads, or toilet. See if you can spot the wooden hand pump used to work it.

Four torpedo tubes, which torpedoes were fired through.

Pressure hatch, used to seal the area off.

Wash station, shared by all the men sleeping in this area.

CREW QUARTERS LEADING TO GALLEY AND RADIO ROOM

Door / cutaway through to the tiny galley area.

Door / cutaway to dry store and refrigerator.

Abluftstrang and Zuluftstrang which were part of the air circulation system of the U-boat.

Water management system which carried fresh, salt and waste water around the boat.

Battery compartment is under this section of the U-boat.

Tauchbunker or ballast tanks, which were filled with water to dive and air to rise.

Flutklappen (flood doors) and Kingston valves, which were under the ballast tanks.

Fuel oil tanks.

THE CONTROL CENTRE

Periscope well is the large column in the centre of the room.

Ballast pump which could also be used to extract water that had got into the boat.

Base of conning tower - the Captain's control room.

Hatch to the Commander's quarters where he rested close to the control room.

Hydroplane controls used to control the dive are on the starboard side.

Trimming station used to move water around the boat to keep it balanced - also known as the Christmas tree.

THE AFT TORPEDO ROOM

Aft heads, or toilet.

Twin torpedo tubes, which torpedoes were fired through. The tubes were also used to store torpedoes ready for use.

Aft hatch which was used to load the torpedoes in the aft torpedo compartment.

Wash station, shared by all the men sleeping in this area.

The conning tower or bridge superstructure, where the Commander, officers and lookouts would be stationed when the U-boat was on the surface. The tower is designed to provide a good all-round view of the horizon so that the enemy could be spotted fast.

Dive planes, or hydroplanes, that controlled the angle of the U-boat as it was diving or heading back to the surface.

INSIDE THE EXHIBIT

The exhibition begins with the role of U-534 and how she was used for training, testing and weather reporting, rather than for actually sinking enemy ships.

The exhibition then goes on to explain life on board the submarine where video and artefacts are used to demonstrate how unpleasant and cramped life on board would have been.

Personal stories of the crew are displayed along with some of the personal effects found on board. There is also information about the sinking of U-534.

The final section of the exhibition shows a film about the discovery of U-534 and her remarkable recovery from the seabed.

PERISCOPE INTERACTIVE

Understand the importance of the periscope in helping U-boat crews spot danger before coming up to the surface. Pupils are challenged to count the number of enemy ships they can spot before the destroyer spots them.

ENIGMA CODE INTERACTIVE

Pupils can learn about the Enigma machine, used by the Germans to code and decode messages during World War II as they translate a message.

DIVE, DIVE, DIVE INTERACTIVE

Explore how a U-boat ascends and descends in water. Stay at the surface for too long and you risk being depth-charged. Increase or decrease the amount of ballast in the tanks to control the submarine's depth.

HYDROPHONES INTERACTIVE

Pupils can explore how sound travels underwater as they are challenged to listen to, and identify, the different sounds that a U-boat hydrophone operator might hear, from shrimps to ships.

KEY FACTS

This section provides information that your group may find useful to help complete activities following their visit to U-boat Story.

WHAT IS A U-BOAT?

U-boat is an abbreviation for Unterseeboot, a German word for undersea boat.

WHAT TYPE OF U-BOAT WAS U-534?

IXC/40 – a large U-boat and one of the oldest in the German Navy. It was less manoeuvrable than the more common Type VII but had a longer range.

WHAT WAS U-534'S CAREER?

Three patrols:
- 23 Dec – 31 May 1943,
- 1 Jun 1943 – 31 Oct 1943,
- 1 Nov 1944 – 5 May 1945.

U-534 was never assigned to combat and never attacked a ship. In 1944, U-534 was attacked by a Halifax, which was badly damaged and a Wellington bomber, which it shot down.

WHO WERE U-534'S CREW?

The crew of U-534 were young - the 26 year old Captain, Kapitänleutnant Herbert Nollau was the oldest man on board.

Manoeuvring a U-boat involved many crew members, specialists and seamen who had to know their own job, and each other's, inside out.

U-boats were navigated by officers called the Obersteuermann. They had to be very good at maths to interpret all the data from their instruments and charts and make vital decisions in an instant. Specialist crew, such as radiomen, torpedomen and machineman were responsible for the operation and maintenance of equipment on board the U-boat.

The men on board who controlled the dive planes were called the planesmen - or Rüdergänger. They had a very important job, because if they got it wrong the boat would go into an uncontrollable dive.

The Obermechanikersmaat supervised the maintenance and loading of the torpedoes. During attack, he made the final adjustments to the torpedo settings following instructions from the conning tower.

The Torpedomechaniker would grease the torpedo that was being loaded into the tubes. The men who handled the torpedoes were known as lords. Handling the torpedoes had to be done with extreme care, not only for the personal safety of the men but if they were damaged it could ruin the mission.

The Oberbootsmann was, among other duties, responsible for the discipline and conduct of the men.

The Cook (smutje) had to prepare meals for the crew from a 5ft x 3ft galley. Preparing and serving meals could be a 24 hour a day job.

Radio operators worked on four hour watches transmitting and receiving radio communications.

The chief engineer (leitender ingenieur) communicated to all compartments via telephone and voice pipe.

Zentralemaat (control roommate) - managed the air supply to the various compartments.

The seamen performed other tasks such as loading torpedoes, standing watch on the bridge, operating deck guns and housekeeping activities. Their workload was divided into several shifts, with the seamen working in three 8 hour shifts - one for sleeping, one for regular duties and one for miscellaneous tasks. Specialist crew, such as the two radiomen had three four hour shifts between 8am and 8pm and two six hour shifts during the night.

KEY FACTS

WHAT SIZE WAS U-534?

253.3 feet long 22.688 feet beam. U-534's displacement was 1257 tons submerged and 1144 tons surfaced. Her draught was 14.27 feet light and 15.41 feet laden.

WHAT ARMAMENT DID U-534 CARRY?

6 x torpedo tubes (4 forward and 2 aft), 22 torpedoes, 105mm gun, 1 x 37mm gun, 2 x 20mm gun.

WHAT PROPULSION DID U-534 HAVE?

2 x 9 cylinder MAN diesel / electric 2 shafts 200hp.

HOW FAST COULD U-534 GO?

SPEED: 7.3 knots maximum submerged, 19 knots maximum surfaced.

RANGE: 13850 nm @ 10 knots surfaced 5100 nm @ 18.3 knots.

DEPTH: normal - 330 feet, maximum - 660 feet.

HOW DID THE CREW KEEP CLEAN?

U-534 had two bathrooms, one of which was used to store food for the first part of the voyage.

There were no showers on board. For the entire time on board, the crew never bathed and instead cleaned themselves by swabbing with alcohol, using dish water or the upper deck shower with salt water and salt water soap, but the sticky residue was hard to rinse off.

To control body odour, a deodorant was used. Crews were issued with bottles of cologne but nothing could hide the all pervading smell.

HOW MANY TOILETS WERE THERE ON BOARD U-534?

There were two toilets and neither could be used when the submarine was more than 80 feet below the surface. Only one toilet was available until the food stored in the second toilet had been eaten. The flush system consisted of a hand pump, where the contents of the waste was hand pumped into the ocean after each use. Using the toilet was prohibited when stalking an enemy as it was feared that the noise of clanking metal or floating debris would alert the enemy to the presence of a U-boat.

WHY WERE WEATHER REPORTS IMPORTANT?

Accurate weather reports were very important for both the Allies and the Germans to inform their operations. Forecasting depended on knowledge of weather conditions in the mid North Atlantic. U-534 provided the only accurate reports from this area along with two other German submarines.

KEY FACTS

HOW LONG DID PATROLS LAST?

Each war patrol could take anywhere between three weeks to six months. It was a very mundane life, except for the excitement when hunting an enemy ship, or when being hunted themselves. Crews passed the time by listening to a record-player built into the boat, or by making board games to keep their minds occupied.

WAS THERE MUCH SPACE ON BOARD U-534?

Conditions were very cramped on the U-boat. Engines and batteries filled one third of the space and 52 members of the crew had to share the remaining space with 214 tons of fuel, 22 torpedoes, the ballast tanks, navigation and signalling equipment, ammunition for the guns, 18 tons of food and drink.

In order to maximise the limited space, the forward torpedo room also formed the crew quarters. With such limited bunks available, the crew often had to hot-bunk where, as soon as one person had crawled out, the next person would crawl in.

Privacy was non-existent unless you were the Captain. The Captain's quarters was placed next to the control room and radio room so he could quickly respond during an emergency.

WHAT DID THE CREW EAT ON BOARD A U-BOAT?

The crew ate fresh foods first, and then relied on canned foods once the fresh foods had been consumed or had spoiled. Food spoilt quickly in the damp environment of a U-boat, fresh loaves of bread would sprout white fungi, which the crews nicknamed "Rabbits" due to the white fuzz. Most food tasted of diesel due to the constant exposure of diesel exhaust that surrounded them.

A TYPICAL U-BOAT FOOD SUPPLY INCLUDED:

- 494 lbs fresh and cooked meats
- 238 lbs sausages
- 4,808 lbs preserved/tinned meats
- 334 lbs preserved fish
- 3,858 lbs potatoes
- 397 lbs dried potatoes
- 3,428 lbs other vegetables
- 1,226lbs bread dough
- 2,058 lbs preserved breads
- 464 lbs rice and noodles
- 595 lbs fresh eggs
- 917 lbs fresh lemons
- 2,365 lbs other fruits
- 551 lbs butter and margarine
- 611 lbs soup ingredients
- 408 lbs marmalade and honey
- 309 lbs fresh and preserved cheese
- 1,728 lbs milk powder
- 441 lbs fruit juice
- 154 lbs coffee
- 205 lbs other drinks
- 441 lbs sugar
- 132 lbs salt
- 108 lbs chocolates

WHAT DID A TYPICAL DAY INVOLVE ON A U-BOAT?

0000	First sea watch, starboard engine room watch on duty
0400	Second sea watch on duty
0545	Breakfast for port engine room watch
0600	Crew woken up. Port engine room watch on duty
0630	Breakfast for the crew
0700	Boat cleaning duties for off duty crewmen
0800	Third sea watch on duty
0845	Off duty watch assigned work
1200	First sea watch and starboard engine room watch on duty, main meal for rest of crew
1300	Off duty watch assigned work
1600	Second sea watch on duty
1715	Small evening meal for crew
1800	Port engine watch on duty
2000	Third sea watch on duty
2100	Lights out for off duty crew
2330	First sea watch and starboard engine room watch awaken and prepare for duty at 0000.

THE STORY OF U-534

U-534 was commissioned into the German Navy in December 1942 and after a period as a training submarine in May 1944, she undertook weather reporting duties south of Greenland.

On completing this patrol in August 1944, U-534 was put into the U-boat pens in Bordeaux, France. However, by this stage of the war, it was obvious that Bordeaux would not remain safe for long. U-534 was quickly fitted with new "schnorkel" equipment.

On leaving Bordeaux, U-534 was attacked by a Wellington bomber which she managed to shoot down using her deck guns. This was to be the only sinking U-534 scored during the war.

U-534 spent the rest of the war in Flensburg and Kiel in Germany until on 3rd May 1945, approaching Allied Forces made it necessary for her to flee her homeland.

U-534 was the last U-boat to leave Germany. She headed northwards but her destination remains a mystery.

On 5th May 1945, the U-boats were given the order to surrender. Nollau ignored orders.

Three Liberators from 86 Squadron were immediately dispatched from Tain, Scotland to intercept the U-boats. On finding them, Liberator G for George targeted the surfaced U-534 with depth charges. The bombardier, Neville Baker, during the second low level attack, ruptured the U-boat's hull allowing seawater to pour in. The explosion cracked but did not smash the hull and U-534 began to sink.

Realising his boat was doomed, Nollau gave the order to abandon her. U-534 sank so slowly that forty-nine out of the 52 crew were able to jump overboard and were later picked up by German ships and taken as POWs. Nollau was amongst the survivors.

In 1986, a Danish diver, Aage Jensen, discovered the wreck of a U-boat at 67 metres lying on the seabed roughly half way between Denmark and Sweden, near the small island of Anholt.

In August 1993, U-534 was recovered from the seabed. Eight surviving U-534 crew members and four men from the Liberator G for George were on hand to witness this spectacular recovery.

Before a thorough investigation of the vessel could be carried out, it was necessary to ensure that the 50-year old ammunition was made safe. Thirteen torpedoes and 450 rounds of anti-aircraft ammunition were safely evacuated and blown up, whilst three T11 Zaukonig torpedoes were taken away and stabilised.

In May 1996, U-534 was moved to the Historic Warships Museum in Birkenhead, UK.

In 2008, Merseytravel acquired U-534, cut it with state of the art diamond wire into sections and moved it to Woodside Ferry Terminal to form U-boat Story.

WORD BANK

BALLAST TANKS

A ballast tank is a compartment between the inner hull and outer hull of a submarine. When the submarine is on the surface, the ballast tanks are filled with air and the submarine's overall density is less than that of the surrounding water. As the submarine dives, the ballast tanks are flooded with water and the air in the ballast tanks is released until its overall density is greater than the surrounding water allowing the submarine to sink.

BOW

The front section of the submarine. The opposite of stern.

BOW PLANES

These are the rudders at the submarine's bow, to help angle the ship as it moves downward. They are then used in co-ordination with the stern planes to control depth.

BUOYANCY

The upward force a fluid puts on an object less dense than itself.

CONNING TOWER

Also known as the Commander's control room, this is the point where the Commander would be located to carry out an attack.

CONTROL ROOM

This was the nerve centre of the U-boat from where the vessel was commanded.

DEPTH CHARGE

A weapon that consists of a drum filled with explosives which is dropped near a target and descends to a depth where it explodes - also called depth bomb.

HULL

The submarine's hull is the largest part of the boat. It is made up of two parts: an inner hull and an outer hull. Almost all of the submarine's activity took place in the inner hull. In particular, this is where crew members worked, ate, and slept. The inner hull contains the engine room and the machinery that makes clean air for the crew to breathe and fresh water for them to drink. This hull is designed to resist pressure when the submarine is underwater.

NEGATIVE BUOYANCY

A boat or submarine has negative buoyancy if it weighs more than water.

PERISCOPE

This gives the Commander and crew a view of the sea and sky when a submarine is positioned just below the surface of the water. The periscope contains prisms, mirrors and lenses that allow a submarine to view the surface sea from a submerged position.

PORT

The left side of the boat from the perspective of a person located at the stern of the boat, looking towards the bow. The opposite of starboard.

WORD BANK

POSITIVE BUOYANCY

A boat or submarine has positive buoyancy if it weighs less than water.

PROPELLER

The "propeller" is turned by the submarine's engine. This enables the submarine to move forward or backward, gliding like a fish through the water.

STARBOARD

The right side of the boat from the perspective of a person at the stern of the boat and looking towards the bow. The opposite of port.

STERN

The rearmost area of the ship. The opposite of bow.

SUBMARINE

A ship that can operate completely underwater. A submarine is able to float because the weight of water that it displaces is equal to the weight of the vessel. This displacement of water creates an upward force called the buoyant force and acts opposite to gravity which would pull the ship down. Unlike a ship, a submarine can control its buoyancy, allowing it to sink and surface at will.

TOPSIDE

Exposed or semi-exposed, non watertight area of the ship. The main deck.

TORPEDO

A self-propelled explosive weapon launched above or below the water surface.

TRIM

The balancing of a submarine's weight and equilibrium underwater.

ACTIVITY IDEAS

The following ideas for pre, during and post visit activities provide opportunities for your pupils to examine different aspects of the U-boat experience. Adaptable activity sheets are provided and the Key Facts (page 7) and Word Bank (page 12) should be used to support pupils in completing their work.

ACTIVITY: INVESTIGATING OBJECTS AT U-BOAT STORY

CURRICULUM LINKS

KEY STAGE 2

History: evidence collection; Britain since 1930; key events in the Second World War; new technologies and warfare.

Science: observation; recording; estimation

Literacy: writing for a specific audience, debating; listening to someone else's point of view

KEY STAGE 3

History: evidence collection; a World Study after 1900; key events in the Second World War; new technologies and warfare.

Science: observation; recording; estimation

Literacy: writing for a specific audience; debating; listening to someone else's point of view

Show pupils the images of U-boat Story featured on the website and distribute the map of the attraction (see page 4). Discuss with pupils where U-boat Story will link to their studies and encourage pupils to come up with a specific question or aspect of the U-boat experience they would like to explore during their visit.

Explain to pupils that they are going to carry out an investigation in the exhibition and will be required to select an object to investigate. If you wish to pre-assign

OBJECTS IN THE U-BOAT STORY EXHIBITION

COOKING

Tins of food

Maggi soup

WELL BEING

Cocktail shaker

Board games

ROLE OF U-534

Aircraft recognition chart

Weather chart

PERSONAL CARE

Ditty box

TRAINING

Radar balloon

Radar detector

Toilet operations instruction

NAVIGATION/COMMUNICATIONS

Radio panel (telefunken)

Daily routine diary

Sextant

MEDICAL

Kidney dish with morphine vials

UNIFORM

Iron crosses with ribbon German helmet

SHOW CASE 1

U-534 model

SHOW CASE 4

Engima and cogs

WEAPONRY

TXI Zaunkonig torpedo

DURING THE VISIT

Once pupils have found the object they wish to investigate, it may be useful to give pupils a time limit (e.g. 10 minutes) in which to complete the object investigation record. This will help focus their attention during the object investigation and ensure they have the opportunity to explore the attraction fully.

If you have access to digital cameras, pupils could be encouraged to take a photograph of their chosen object and use it for follow up work when back in class.

BACK IN CLASS

When back in class, pupils use the evidence collected in the object investigation record to present their object to the rest of the group. Encourage pupils to explain what aspect of the U-boat experience it tells us about and what they found interesting about the object. Where pupils selected the same object, it may be interesting to compare different interpretations of the artefact.

IDEAS TO EXTEND THIS ACTIVITY

Pupils debate the importance of each object to the U-boat experience, developing arguments as to why certain objects could be considered more, or less, important than others.

Pupils present their object in either written or pictorial form as an entry for a U-boat Story guide book.

Pupils could carry out further research into their object, examining areas including:

- How the item was developed?
- What materials was the item made from?
- How the item was used?
- How the item has changed over time?
- Is the item still used in naval operations?

Compare and contrast the item with the modern version. Explore why the changes occurred and what possible benefits and drawbacks there may be to these.

U-BOAT STORY: OBJECT INVESTIGATION RECORD

FIND AN OBJECT IN THE U-BOAT STORY EXHIBITION TO INVESTIGATE.

THE OBJECT I HAVE CHOSEN IS:

DRAW OR SKETCH YOUR OBJECT - WHAT SIZE DO YOU THINK IT IS?

WHAT OTHER QUESTIONS DO YOU HAVE ABOUT THIS OBJECT? TRY TO FIND THE INFORMATION TO ANSWER THEM?

HOW WOULD YOU DESCRIBE THE OBJECT TO SOMEONE WHO HAS NEVER SEEN IT BEFORE?

WHAT IS INTERESTING ABOUT YOUR OBJECT?

WHAT WAS THE OBJECT USED FOR?

WHY DO YOU THINK THIS OBJECT WOULD HAVE BEEN IMPORTANT TO LIFE ON THE U-BOAT?

ACTIVITY: HOW A SUBMARINE WORKS

CURRICULUM LINKS

KEY STAGE 2

Science: Forces and Action - types of forces and how these can help us understand how a submarine works, how things move.

KEY STAGE 3

Science: Explore forces as interactions between objects and how they can affect motion; buoyancy; the effects of pressure; explore contemporary and historical scientific developments; a real life example as a basis for finding out about science.

For this activity, you will need:

- A football
- Large vessel filled with water
- Empty plastic bottles
- Orange or lemon rind

STARTER ACTIVITY:

Introduce the word 'submarine'. Break the word down to show pupils that it literally means "under the sea."

Place a football in a sink of water to demonstrate how it feels when you try to submerge a ball in water. Emphasise to pupils how you can feel the water pushing it up as you try to push it down.

DISCUSSION POINT:

Introduce the law of buoyancy and explain that submarines are built with buoyancy tanks that can be filled with adjustable amounts of air or water. The more air in the tanks, the greater the buoyancy of the submarine. Discuss how the submarine can change weight by taking on water or by emptying the water tanks.

DID YOU KNOW?

If the submarine is at the bottom of the sea and needs to come to the surface, compressed air is released from storage tanks into the buoyancy chambers. This forces out the water that was in there and so the weight of the whole submarine reduces.

As it is still displacing the same weight of water because its volume has not changed, the submarine is now more buoyant and will float to the surface. The background notes contain further explanation on how a submarine works.

MAIN ACTIVITY: MAKE A SUBMARINE

Pupils make and test a model submarine following the instructions below.

Using the rind of a fresh orange or lemon, cut a model submarine.

Display the image of U-534 on the interactive white board to introduce pupils to the distinctive shape of a submarine.

Make a few small holes down each side of the model submarine using a pencil.

Put your submarine into a small plastic bottle and fill this with water. Screw on a plastic cap.

By pressing and releasing the sides of the bottle the submarine can be made to rise or fall.

Pupils record what they think will happen to the model submarine when they press and release the sides of the bottle and record what actually happened.

DISCUSSION POINT:

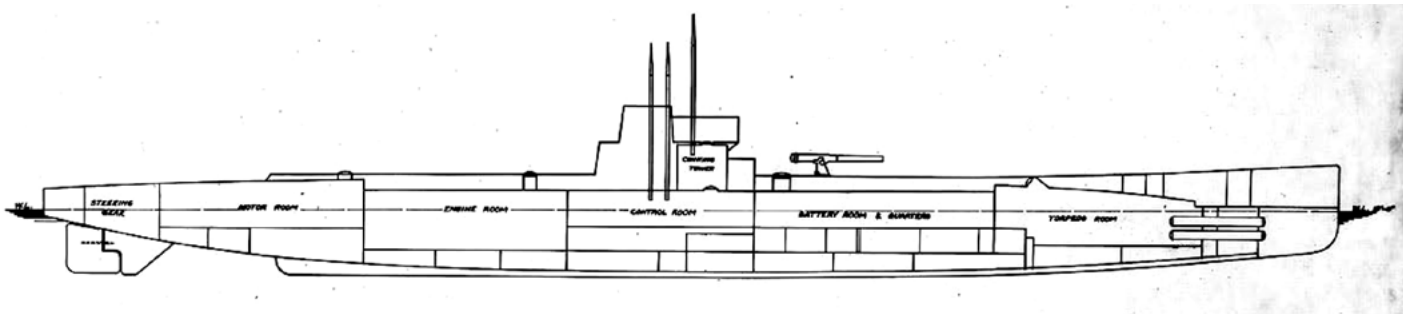
What did the pupils observe?

Why do they think these things happened?

Explain why the buoyancy changes using the terms weight, displacement, pressure, compression. Between the inner hull and outer hull are a submarine's ballast tanks. Explain to the pupils that the ballast tanks cause the submarine to submerge when filled with water and to surface when filled with air.

IDEAS TO EXTEND THIS ACTIVITY

Pupils label the outline image of the submarine with the parts featured in the glossary, exploring how the design of the different parts influenced their purpose.



ACTIVITY: THE ROLE OF U-534

CURRICULUM LINKS

KEY STAGE 2

History: Britain since 1930: key events in the Second World War; new technologies and warfare.

Maths: Using mathematics as a tool for solving problems; deciphering codes.

Literacy: Speaking; listening; group discussion; choose material that is relevant to the topic, writing for different purposes and audiences.

KEY STAGE 3

History: Nature and impact of Second World War; the changing nature of conflict and new technologies.

Geography: Exploring meteorology.

Maths: Using mathematics as a tool for solving problems; deciphering codes.

Design and Technology: Use of materials; design and function of a U-boat.

English: Consider what the reader needs to know and include relevant details, writing for thinking and learning, to inform, explain and describe, focusing on conveying information and ideas clearly.

STARTER ACTIVITY:

Use the background information to introduce the role of U-boats in World War II.

Discuss Churchill's quotation "The only thing that ever really worried me during the war was U-boat peril..."

Explain to pupils that the U-boat they will be exploring at U-boat Story, U-534, had uses other than sinking enemy ships, i.e. training, testing and weather reporting.

DISCUSSION POINT:

Why was weather reporting so important? Use the example of the D-Day landings to illustrate that Allied weather reports could advise General Eisenhower that the bad weather would hold off long enough to allow the D-Day landings to go ahead whereas German weather reports failed to spot this.

DID YOU KNOW?

Accurate weather reporting can give an edge when planning military and naval operations.

When war broke out, Germany had lost touch with the international meteorological community that provided weather reports, so U-boats were needed to get the information and send it back in code that the Allies couldn't understand.

Prevailing winds flow from the north-west, so Central Europe's weather comes from the North Atlantic. By knowing what the weather is like off Greenland, you can make a good guess at what's going to happen around Britain, France and Germany a day or two later.

DISCUSSION POINT:

Why would messages from the U-boats need to be sent using code? What could be the danger of Allies picking up messages? They could use the information to their advantage, direct shipping convoys away from the wolf packs and destroy the U-boats.

DID YOU KNOW?

A code is when you swap a whole word or phrase with a different word, symbol or number.

A cipher is when you change the individual letters in a message, either by jumbling them up, or by swapping them for other letters or symbols. Germany came up with a complicated cipher called Enigma. The machine used adjustable electric circuits and rotating wheels to jumble the letters in a message, and was so complicated that the Germans thought that the ciphers it generated were unbreakable.

MAIN ACTIVITY:

Communicating messages from U-534 using codes and ciphers.

Pupils make their own cipher wheel using the cut out on the following page. Demonstrate how it works by using A and 21 as they key to crack this code.

s	t	o	r	m
18	8	9	3	16

a	p	p	r	o	a	c	h	i	n	g
21	1	1	3	9	21	13	24	7	5	14

As a post visit activity, ask pupils to write down two facts that they learnt at U-boat Story.

The facts should be no more than ten words. Pupils use the cipher wheel to write their facts in code. Pupils should try to crack each other's coded facts.

MORE CODES TO DECIPHER:

u	b	o	a	t	o	n	c	o	u	r	s	e	f	o	r
17	2	9	21	8	9	5	13	9	17	3	18	19	6	9	3

t	h	e	s	o	u	t	h	o	f
8	24	19	18	9	17	8	24	9	6

g	r	e	e	n	l	a	n	d
14	3	19	19	5	22	21	5	26

u	s	e	e	n	i	g	m	a	c	o	d	e	t	o
17	18	19	19	5	7	14	16	21	13	9	26	19	8	9

s	e	n	d	w	e	a	t	h	e	r
18	19	5	26	4	19	21	8	24	19	3

r	e	p	o	r	t	s
3	19	1	9	3	8	18

n	o	t	o	i	l	e	t	u	s	e	w	h	e	n
5	9	8	9	7	22	19	8	17	18	19	4	24	19	5

s	t	a	l	k	i	n	g	a	n	e	n	e	m	y
18	8	21	22	11	7	5	14	21	5	19	5	19	16	15

MORE CODES TO DECIPHER:

p	e	r	i	s	c	o	p	e	s	h	e	l	p	e	d
1	19	3	7	18	13	9	1	19	18	24	19	22	1	19	26

s	p	o	t	d	a	n	g	e	r
18	1	9	8	26	21	5	14	19	3

CIPHER WHEEL ACTIVITY SHEET

To make your cipher wheel you will need to:

Cut out both circles.

Put the smaller wheel (with numbers) inside the larger wheel and fasten using a paper fastener so that the smaller wheel can move freely.

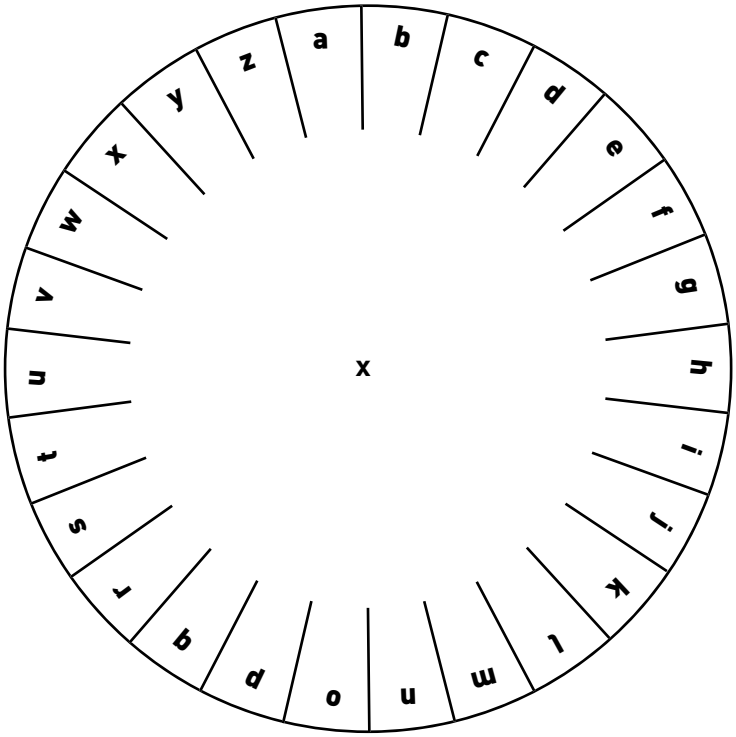
To use your cipher wheel you will need to:

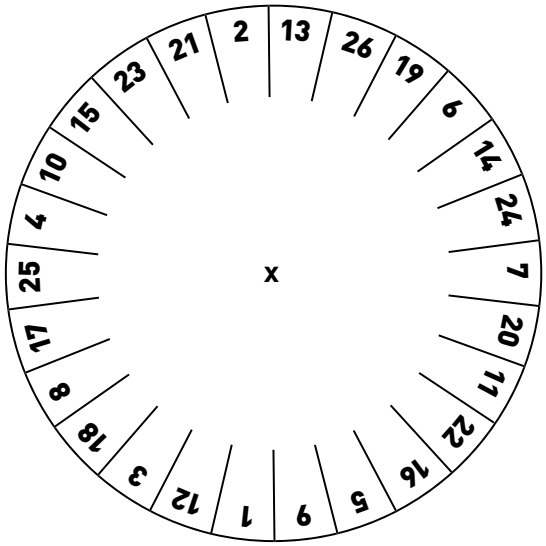
Turn the wheel so that the letter A is in line with the number 21.

By keeping A and 21 lined up the other letters have their own numbers.

Have a go at cracking this coded weather report:

18	8	9	3	16	21	1	1	3	9	21	13	24	7	5	14





ACTIVITY: THE SOUND OF THE DEEP

CURRICULUM LINKS

KEY STAGE 2

Science: Ask questions that can be investigated scientifically and decide how to find answers; materials and their properties - to recognise differences between solids, liquids and gases, in terms of ease of flow and maintenance of shape and volume.

KEY STAGE 3

Science: Sound and hearing: How does sound travel through solids, liquids and gases?

STARTER ACTIVITY:

Explain to pupils that underwater environments are often too dark to see what is around you. Discuss what alternatives could be used to find out this vital information. Hydrophones were used to help U-boats "see" objects underwater.

DISCUSSION POINT:

Sound travels further underwater than in air, but it's very distorted by the time the hydrophone has transformed it from pressure waves to something you can listen to.

DID YOU KNOW?

A hydrophone is like an underwater microphone that picks up sound and converts it into audio signals that can be translated into data that tells the operator where sounds are coming from, how close they are and what they might be...like a school of fish, a torpedo heading your way or a shipwreck.

MAIN ACTIVITY:

Pupils could follow these instructions to make a hydrophone by stretching a thin sheet of rubber over the open end of a funnel connected to a length of rubber tubing and then listen to objects underwater, e.g. battery-operated radio in sealed plastic bag under water or a ticking alarm clock.

1. Add the water to the plastic bag.
2. Seal tightly.
3. Hold the ticking clock against one side.
4. Place one ear against the bag and plug your exposed ear with your finger.
5. Listen to the ticking sounds that reach the ear.
6. Is the sound different when listening to the clock through the water versus listening to the clock without the bag of water?
7. Can sound travel through water?
8. Take turns so everyone has a chance to listen.

IDEAS TO EXTEND THIS ACTIVITY

UNDERWATER GAME

This game can reinforce the difficulties U-boats faced in identifying objects underwater. Split the pupils into groups and assign each group an item that the U-boat may have encountered underwater, e.g. school of fish, whale, dolphin, torpedo, submarine, shipwreck. Pupils must agree on a sound to represent their object and repeat these sounds to the entire class. To play the game, most of the class remains stationary around the perimeter of the designated area. Four or five pupils are then placed in the designated area, blindfolded and given ear phones to wear. Each pupil is assigned one of the specific sounds to locate.

ACTIVITY: LIFE ON BOARD U-534

CURRICULUM LINKS

KEY STAGE 2

History: Britain since 1930: key events in the Second World War; new technologies and warfare.

Literacy: Speaking, listening, group discussion - choose material that is relevant to the topic, writing for different purposes and audiences.

KEY STAGE 3

History: Nature and impact of Second World War; the changing nature of conflict and new technologies.

English: Consider what the reader needs to know and include relevant details; writing for thinking and learning, to inform, explain and describe, focusing on conveying information and ideas clearly.

STARTER ACTIVITY

As a group, discuss conditions on board U-534 that pupils recall from the visit to U-boat Story. Use these words to help: cramped, sweaty, dangerous, smelly, hot, damp, boring, claustrophobic, camaraderie, noisy, hard work.

Encourage pupils to think of questions they would like to ask crew members about conditions on board U-534.

MAIN ACTIVITY

Working in groups, pupils should imagine that they have to interview crew members from U-534. Pupils should prepare questions that cover the following topics: conditions, roles and the purpose of U-534. Pupils use the daily watch routine and background information to role-play the character and answer the questions.

The following questions are provided for pupils that need support:

What tasks did seamen have to perform?

What were living conditions like?

What was hot bunking?

What were the dangers of being on board the U-boat?

How did crew members pass the time when they were off duty?

What did it smell like below deck?

What did crewmen eat?

JOURNAL ENTRY FOR U-534 SEAMAN

Today I arose at 0000 for first sea watch. I was longing for a breath of fresh air and the chance to stretch my legs but the conditions were so stormy that I had to use the safety belt to avoid being washed overboard. I can't believe that even after two months on patrol the seasickness is hard to bear. Being below deck makes it worse - the stench of sweat, diesel, food and damp makes it impossible not to be sick particularly when the U-boat dives. She gets pushed around by currents and waves and you just have to hold on!

When I first volunteered to be a seaman on the U-boat I thought it would be an exciting life but most of the time it is so boring. My duties include loading torpedoes, standing watch on the bridge and housekeeping activities, the same tasks day in day out.

When you're off duty you have to make your own entertainment to take your mind off the boredom, claustrophobia and homesickness. You do build a close relationship with your fellow crew, you have to, living so close to them. Sometimes we play games, cards, sing and play jokes on each other. It can be tough if you don't get on with someone but the Oberbootsmann tries to make sure arguments don't get out of hand. There are 52 of us on board but only 33 bunks so we take it in turn to rest.

The food is boring but we need to keep our strength up - there is lots of heavy equipment on board and the work is very demanding so it is important we eat what is put in front of us. I'd give anything for some freshly baked bread, actually anything fresh that isn't covered in mould and doesn't taste like diesel will do!

You get so hot and sticky down here and I've been in the same clothes since we set off. We're not allowed to undress because we always have to be ready for an emergency whether we're at the surface or submerged. I'm so desperate to get clean but I can't bear how sticky the salt soap makes you so I guess I'll just have to settle for another splash of cologne! I've been trying to get Cook to save some dirty dish water for me to wash with but I stole a tin of ham so he's not doing me any favours!

IDEAS TO EXTEND THIS ACTIVITY

GRUB'S UP!

Using the list of food provided (see page 9) plan a balanced daily menu for the crew.

PACK UP YOUR KIT BAG

Since space on a submarine was so limited, crew members were only allowed a very small amount of kit. This was stored, along with provisions, in wooden or metal lockers.

Pupils should make a list of all the items that a crewman might want to take with him on a 60-day sea patrol.

Remind pupils that space was very limited and ask them to be review their list ruthlessly, discarding any items that might not be absolutely necessary.

Pupils must be able to explain their reasons for discarding some items and keeping others. Compare and discuss lists with classmates.

Ask pupils what they think the most important piece of kit might be for a crewman.

ACTIVITY: THE MYSTERY OF U-534

CURRICULUM LINKS

KEY STAGE 2

History: Britain since 1930: key events in the Second World War; new technologies and warfare.

Literacy: Speaking, listening, group discussion; asking relevant questions to clarify and extend ideas; exploring creative thought.

KEY STAGE 3

History: Nature and impact of Second World War; the changing nature of conflict and new technologies.

English: Asking relevant questions to clarify and extend ideas; exploring creative thought; writing for thinking and learning - to inform, explain and describe, focusing on conveying information and ideas clearly.

STARTER ACTIVITY

Tell the group the story of the final voyage of U-534 (see page 11) and explain that there are many uncertainties about where she was headed, what she was carrying and why Captain Nollau ignored orders to surrender.

MAIN ACTIVITY

Pupils examine the following mysteries surrounding U-534 and use a combination of possible clues, and their imagination, to create a story solving the mysteries of U-534. The story sheet can be used to structure the outcome.

MYSTERY: WHERE WAS U-534 HEADED?

Was she heading to a Norwegian port? German military resistance was crumbling so a good strategy would have been to concentrate the surviving U-Boats in Norwegian ports where they could be a bargaining chip in surrender negotiations.

MYSTERY: DID CAPTAIN NOLLAU HAVE FURTHER SECRET ORDERS?

Was U-534 heading for a destination in Argentina or South America carrying a Nazi leader or precious gold and diamonds to support the Nazis who were beginning to escape?

Nazis were beginning to escape with many heading for South America. They needed gold and jewels to support their escape. One of the radio operators on board was an Argentinian with a German family.

MYSTERY: WHY DIDN'T NOLLAU SURRENDER?

On 5 May 1945, Admiral Dönitz (head of Germany's U-boat service and Hitler's successor for four days) sent all U-boats instructions to surrender by 08:00 hours.

"ALL U-BOATS. ATTENTION ALL U-BOATS, CEASE-FIRE AT ONCE. STOP ALL HOSTILE ACTION AGAINST ALLIED SHIPPING. DÖNITZ"

U-534 was on the seabed when the order to surrender came. All vessels had to return to Kiel or go to Norway, flying a black surrender flag. Most did, but Nollau ignored the order and continued on with another two Type XXI U-boats. Did he not receive orders or did he ignore them?

MYSTERY: WHY DID U-534 SHOOT AT THE LIBERATORS AFTER THE ORDER TO SURRENDER?

Perhaps U-534 didn't get the message from Dönitz. Maybe there was just a misunderstanding.

MYSTERY: WHY DIDN'T U-534 FLY A BLACK FLAG WHEN THE U-BOATS WERE ORDERED TO SURRENDER?

It's possible that Nollau didn't get the message to surrender. Or maybe nothing black could be found to fly, although that's not very likely on board a U-boat with no washing powder.

MYSTERY: WHY WAS A WEATHER REPORTING BOAT CARRYING THREE OF THE LATEST ACOUSTIC TORPEDOES?

The evidence is unclear. U-boats did sometimes carry examples of the latest technology from one place to another - even as far as Japan.

MYSTERY: WHY DID U-534 SPEND MORE THAN FOUR MONTHS BEING REFITTED?

The usual time for a refit was much less than four months, and nobody knows exactly why U-534 spent such a long time out of the water.

MYSTERY: WHY DID U-534 HAVE THREE OF THE LATEST ZAUKÖNIG T11 TORPEDOES ON BOARD?

Only 38 of these Zaukönig torpedoes were ever made, so why were three of them on board the U-534?

MYSTERY: ARE THERE HIDDEN COMPARTMENTS IN THE U-BOAT?

There were some rumours of hidden secrets and compartments on board. Careful inspection of U-534 revealed uniforms, documents, personal belongings, even wine - but no gold or any hint of secret passengers. Even though U-534 has now been cut into four, we don't know for sure whether anything is left hidden.

MYSTERY: WHY DID THE CAPTAIN KILL HIMSELF AFTER THE WAR?

Nobody knows. In fact, we can't even confirm exactly where or when he died. However, many men who had fought in the war did kill themselves - some because of guilt, some because they were traumatised by the fighting.

THE MYSTERY OF U-534 STORY SHEET

EVENTS THAT MIGHT HAVE HAPPENED LEADING UP TO THE LAST VOYAGE OF U-534

WHAT ARE THE KEY CLUES THAT LEAD TO MY INTERPRETATION OF EVENTS?

PLOT (WHAT HAPPENS IN YOUR STORY)

BEGINNING

MIDDLE

END

IDEAS TO EXTEND THIS ACTIVITY

THE SINKING OF U-534

Pupils create a story board of events in the sinking of U-534.

U-BOAT FACTS

Give pupils two minutes to write down up to three facts that they remember about what they learnt during the visit. Compare the results for the group. Pupils conduct further research into these facts.

U-534 QUIZ

USE THIS QUIZ TO REFLECT ON WHAT WAS LEARNT AT U-BOAT STORY.

1. WHAT DOES U-BOAT MEAN?

Unterseeboot, a German word for undersea boat ✔

Unidentifiable boat

Under boat

2. CHOOSE THE CORRECT WORD TO COMPLETE THESE SENTENCES:

BLOCKED WEATHER FOUR
SURFACE ATTACKED EUROPE
FOOD

Most U-boats could only stay underwater for a maximum of _____ hours, so they had to spend a lot of time on the _____ where they could easily be seen and _____.

German U-boats _____ the routes of Allied ships bringing _____ and other supplies from Canada and America to _____.

U-boats provided _____ reports about Britain, France and Germany to the German forces.

3. WHY WERE U-BOATS IDEAL BOATS FOR WEATHER REPORTING? (PICTURE BELOW)

Because they could disappear under the surface to avoid the enemy ✔

Because they could move quickly and cover a large area

4. THIS OBJECT WAS USED FOR NAVIGATION. IT TAKES POSITIONS OF THE SUN AND STARS TO WORK OUT EXACTLY WHERE THE U-BOAT WAS. WHAT IS IT?

Sextant ✔

Thermometer

Binoculars

5. WHAT MADE ZAUKÖNIG T11 TORPEDOES SO BRAINY? (PICTURE BELOW)

They had a 'brain' that could home in on specific sounds, rather then just the loudest or the closest, so they could be targeted much more accurately.

6. WHY WAS IT FORBIDDEN ON BOARD A U-BOAT FOR THE CREW TO UNDRESS?

In case the crew got cold

In case there were any women on board the submarine

So the crew would be ready in an emergency - dressing could cause a delay which may be fatal ✔

7. WHY DID THE LABELS ON TINNED FOOD OFTEN FEATURE NUMBERS RATHER THAN SAY WHAT THE ACTUAL CONTENTS WERE?

Because the food was cheap

To stop the crew stealing food ✔

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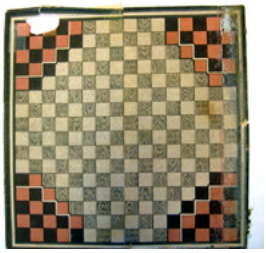
8. THESE OBJECTS WERE FOUND ON BOARD U-534. WHAT DO THEY SUGGEST ABOUT WHAT THE CREW DID IN THEIR LEISURE TIME?



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9. WHY COULD USING THE TOILETS BE TRICKY WHEN THE U-BOAT WAS SUBMERGED?

It was dark and you might not be able to see what you were doing

The lower the submarine went the higher the pressure which could mean being covered with the contents of the pan or being blown out of the compartment! ✔

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10. TYPICALLY, WHITE FLAGS ARE FLOWN AS A SIGN OF SURRENDER. WHY DID U-BOATS USE BLACK FLAGS INSTEAD?

It was difficult to keep white flags clean

It would be easier to identify a black flag from the air against all the white foam in the water ✔

CROSSWORDS

HAVE A GO AT THESE CROSSWORDS TO SEE HOW MUCH YOU REMEMBER FROM YOUR VISIT TO U-BOAT STORY.

ACROSS

3. What the crewmen on board U-534 slept on (5) BUNKS

6. Large weapons used by U-boats (9) TORPEDOES

8. The crewmen on board U-534 played these to pass the time (5/5) BOARD GAMES

10. The part of a U-boat where meals were prepared (6) GALLEY

DOWN

1. Something that you and a U-boat would do to get underwater (4) DIVE

2. Use this to send secret messages (4) CODE

4. Where you can see the U-boat U-534 (5/5) U-BOAT STORY

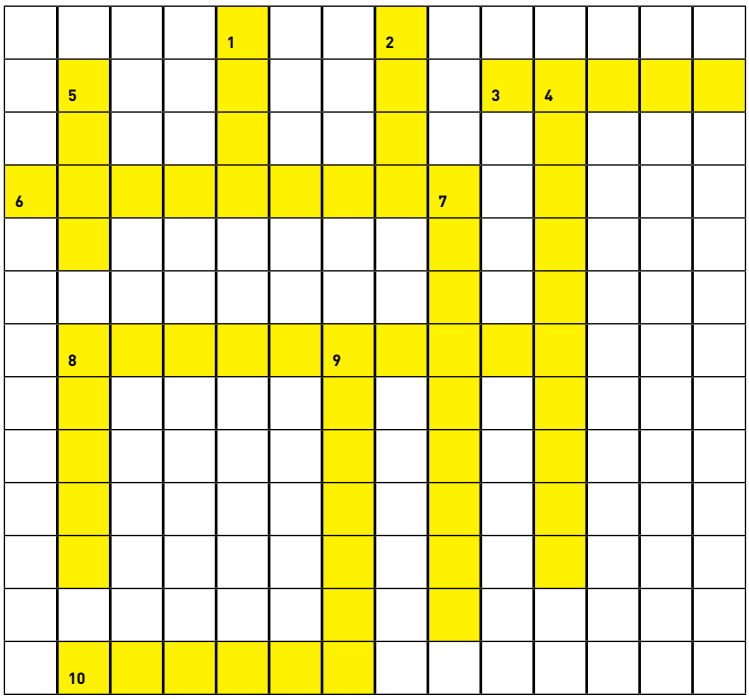
5. The person who prepared the meals on a U-boat (4) COOK

7. An underwater boat (9) SUBMARINE

8. The colour of the flag a U-boat would fly to show they surrender (5) BLACK

9. The country where U-boats were from (7) GERMANY

EASY



CROSSWORDS

HAVE A GO AT THESE CROSSWORDS TO SEE HOW MUCH YOU REMEMBER FROM YOUR VISIT TO U-BOAT STORY.

ACROSS

3. These are used to submerge or raise a submarine (7/5) BALLAST TANKS

5. When a submarine wants to submerge its ballast tanks fill with this (5) WATER

8. The left side of a submarine or boat (4) PORT

9. This was used to help the crew spot danger before coming up to the surface (9) PERISCOPE

DOWN

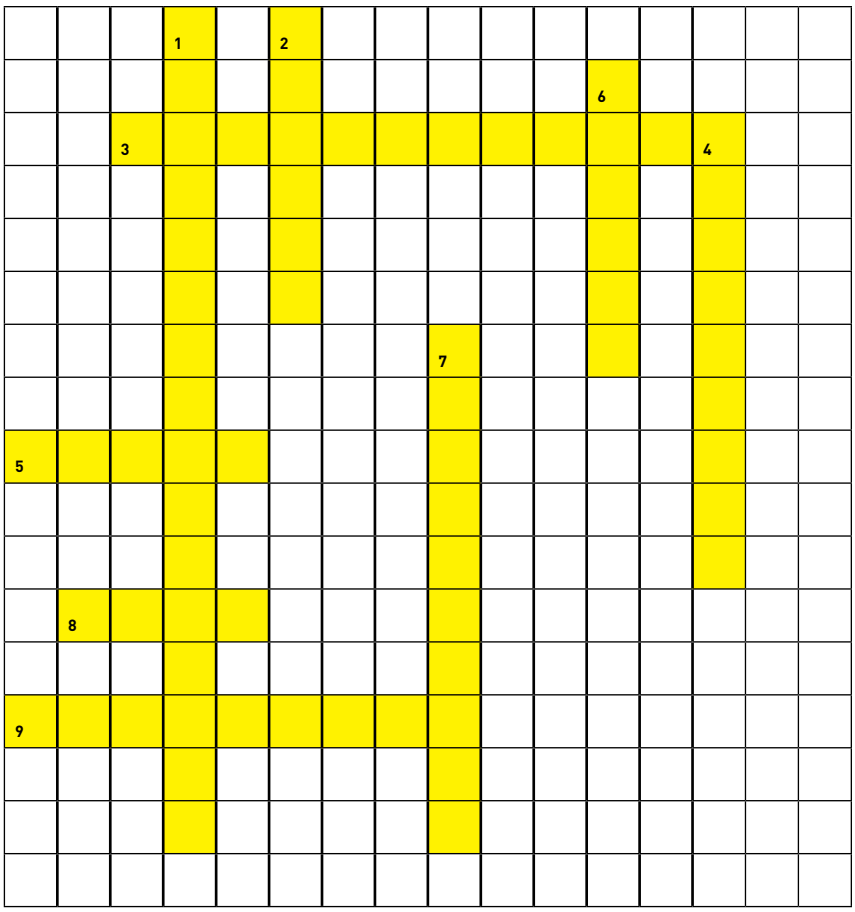
1. The main role of U-534 (7/9) WEATHER REPORTING

2. The name of the captain on U-534 (6) NOLLAU

4. A ship that can operate under the sea (9) SUBMARINE

6. The code used on board U-534 to send messages (6) ENIGMA

7. These move the submarine forward or backward (10) PROPELLERS



ADDITIONAL RESOUCES

HERE ARE SOME LINKS TO WEBSITES THAT PUPILS MAY WISH TO USE FOR ADDITIONAL RESEARCH:

HMS Whimbrel - Battle of the Atlantic Memorial
www.hmswhimbrel.org

Western Approaches Museum, Liverpool
www.liverpoolwarmuseum.co.uk/

Merseyside Maritime Museum
www.liverpoolmuseums.org.uk/maritime/

Imperial War Museum
www.iwm.org.uk

Bletchley Park Museum
www.bletchleypark.org.uk

OTHER PRESERVED WORLD WAR II U-BOATS:

U-505 - Museum of Science & Industry, Chicago
www.msichicago.org/whats-here/exhibits/u-505/

U-995 - German Naval Memorial, Laboe, Kiel

PRESERVED WORLD WAR II BATTLE OF THE ATLANTIC RELATED WARSHIPS:

HMCS Sackville
www.hmcssackville-cnmt.ns.ca/index.html

U-Boat Story
Woodside Ferry Terminal
Birkenhead, Merseyside CH41 6DU

0151 330 1000

www.uboatstory.co.uk

OPENING TIMES

Open Tuesdays to Sundays: 1030 - 1730
(Last admission 1700)

Open Mondays during school holidays

Open bank holidays, except Christmas Day,
Boxing Day and New Year's Day