

North Hill in World War II Minehead, Somerset

SCHOOLS RESOURCE PACK for Key Stages 2 & 3



This pack has been created by Sarah Butterworth and Caroline Barnes of Emerald Ant C.I.C. Emerald Ant is dedicated to engaging communities in their local history and heritage through exciting arts projects and interactive education. Community Interest Company 9608594.

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Moorland
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Contents

>> ACTIVITY >>

1. Tank Missions and Top Trumps
2. Designing a Tank Training Ground
3. Camouflage Design
4. Radar Station: A Very Hush Hush Building
5. Radar Detection: Creating an Invisible Plane

>> CURRICULUM AREA >>

- Science / Engineering, Geography, History
- Art & Design, Maths, Geography, History
- Art & Design, Geography
- Language & Literacy, Creative Writing, History
- Art & Design, History, Science

Credits

Cover Painting by Year 5 pupils at Minehead Middle School. Photograph credit Caroline Barnes.

Top Trump cards

>> Crusader

Miller, David – *An Illustrated Guide to World War II Tanks and Fighting Vehicles*, 1981
CRUSADER MARK III - http://commons.wikimedia.org/wiki/File%3ACrusader_tank_III.jpg
http://www.tanks-encyclopedia.com/ww2/gb/Cruiser-MkVI_Crusader.php

>> Stuart M3

Image - <http://commons.wikimedia.org/wiki/File%3AM3-Stuart-Fort-Knox-1.jpg>

>> Sherman

Image - "M4 Sherman tank - Flickr - Joost J. Bakker IJmuiden" by Joost J. Bakker - M4 Sherman tank. Licensed under CC BY 2.0 via Wikimedia Commons - http://commons.wikimedia.org/wiki/File:M4_Sherman_tank_-_Flickr_-_Joost_J._Bakker_IJmuiden.jpg#/media/File:M4_Sherman_tank_-_Flickr_-_Joost_J._Bakker_IJmuiden.jpg

Miller, David – *An Illustrated Guide to World War II Tanks and Fighting Vehicles*, 1981

>> Churchill Infantry Tank

Image: http://upload.wikimedia.org/wikipedia/commons/4/42/Tanks_and_Afvs_of_the_British_Army_1939-45_KID1265.jpg

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Activity 3 Tank camouflage detail and dummy tank images, source: The Tank Museum, Bovington. Painting by Year 5 pupils at Minehead Middle School, photograph credit: Caroline Barnes.

Activity 4 Photograph of Dave Lloyd; source: www.ronblundell.co.uk

Activity 5 Ordnance Survey Map showing North Hill to the West of Minehead. Reproduced by permission of Ordnance Survey on behalf of HMSO. © Crown Copyright. All rights reserved.

CRUSADER III - a heavy cruiser tank



There were 3 different models. This one is the most developed and most successful.

Specification

Country of origin: GB

Dates of service: 1939-43

Production: 5,300

Crew: 3

Armament: the first tank to mount the 6 pounder gun, machine gun

Armour: 7 - 51mm; an increase in frontal armour compared to earlier models

Dimensions: Length 6m x width 2.64m x height 2.23m

Weight: 20,040 kg

Speed: 64 km/h

Range: 160km

Vertical obstacle: 0.68m, trench 2.5m, gradient: 60%

Advantages

- Suspension very good - it could move fast, up to 40 mph.
- Good storage for ammunition.
- Good artillery at the time - 6 pounder gun .
- Could be adapted for bulldozing, mine clearance, deadly as anti-aircraft tanks (AA tanks). Some adapted as observation posts for the Royal Artillery.
- Could be covered with "Sunshade" that disguised the tank as a lorry to German aerial reconnaissance. Dummy tanks were also deployed.
- Crew only 3, not 4-5.
- Could deal with mines during the first hours of the offensive.

Disadvantages

- Commander acted also as gun loader and wireless operator.
- Armour too thin, especially in earlier models.
- Lack of high explosive shell and weak 2 pounder guns in earlier models.
- Earlier models had mechanical problems and sand erosion in the desert.
- Long distance driving caused track break-up in the desert.

Operation

Battle of El Alamein, Egypt 1942, also Tunisia, Sicily and Italy, 1943

STUART 3 - The "Honey" light tank



There were 3 different models. This one was the most developed and most successful.

Specification

Country of origin: United States

Dates of service: 1941-2

Production: 13,859 by 1943

Crew: 4

Armament: 1 x 37mm gun, machine gun, 2 x machine guns in hull, one machine gun on turret roof

Armour: 10-44 mm

Dimensions: Length 4.5m x width 2.2m x height 2.5m

Weight: 12.5 tonnes

Speed: 57 km/h (road), cross country: 32 km/h

Range: 70 miles

Vertical obstacle: 0.6m, trench 1.8m, fording depth: 0.9m, gradient 60%

Advantages

- mobile and reliable for scouting
- most widely used light tank of WW2
- excellent across country
- gun could fire more accurately than previous tank models

Disadvantages

- Gun size limited, little firepower
- Poorly armoured
- High silhouette
- Little scope for development

Operation

Western Desert, 1941-2, used everywhere, especially in Burma, capture of Antwerp, Pacific

THE SHERMAN M4 MEDIUM TANK - Infantry / Cruiser



These tanks are likely to have been used at North Hill.

Specification

Country of origin: United States

Dates of service: 1942-1945 onwards

Production: 49,230

Crew: 5

Armament: 1 x 75mm gun on turret roof, smoke mortar in turret roof, additional guns

Armour: 15-100 mm

Dimensions: Length 6.2m x width 2.6m x height 3.3m

Weight: 31.5 tonnes

Speed: 40-48 km/h

Distance: 100 miles

Vertical obstacle: 0.6m, trench 2.3m, fording depth: 0.9m, gradient 60%

Advantages

- Cheaper to produce than other tanks
- Good fire power
- Good armour – superior to German tanks
- Gunners could aim whilst on the move, but not fire
- Good suspension
- Adaptable - could be amphibious; the 'Sherman Duplex Drive' was fitted with a floatation screen and propelled in the water by propellers at the back.

Disadvantages

- Relatively high compared to other tanks
- Could burst into flames when hit by anti-tank fire

Operation

Korea, Middle East, North Africa

Side 1

Side 2

THE CHURCHILL INFANTRY TANK



Specification

Country of origin: GB

Dates of service: 1940-1950

Production: 5460

Crew: 5

Armament: 2 pounder gun in early models, Churchill VII (later model): 75mm guns + machine guns

Armour: 16-102mm (early models), 25-152 mm (later)

Dimensions: Length 7.4m x width 3.25m x height 2.5m

Weight: 39.5, 50 tonnes in later models

Speed: 25 km/h (road), cross country 12.8 km/h

Range: 90 miles

Vertical obstacle: 0.8m, trench 3m, fording depth: 0.9m, gradient 60%

Advantages

- Low silhouette
- Thick armour, welded
- Later models had good 75mm guns
- Great steering – could make sharp turns
- Use of hydraulics in clutch and steering – driving was much less tiring
- Very adaptable – used for mine clearing, making bridges
- From 1944 the Churchill had a flame-thrower, fuel carried in a trailer behind the tank

Disadvantages

- Early models were built in a year and had a lot of mechanical problems
- Slow and sluggish
- Low firepower – only 2 pounder gun available until 1942

Operation:

Europe, Egypt

Side 1

Side 2

Activity 1: Tank Missions and Top Trumps

>> TANK MISSIONS - CHOOSE THE RIGHT TANK FOR THE JOB >>

>> USE YOUR TOP TANK TRUMP CARDS >>

>> SHARE AND DISCUSS WITH THE CLASS >>



Churchill flame-thrower



Sherman M4



Stuart M3

> Refer to Background Reading Section 2 - TANKS - WORLD WAR 2 <

FOR EACH MISSION CONSIDER:

- What type of tank is needed? Light, Cruiser or Infantry – or a mixture of 2 types?
- What are the dangers?
- What is the risk and what is your protection?
- What weapons do you need?
- How visible are you to the enemy?
- What obstacles do you have to get over?
- How much time do you have to complete your mission?

MISSION 1: Desert Crossing. You are in Egypt, fighting the Germans and Italians. You need to get across wide desert terrain and pass through a bombed-out village. The roads are destroyed. There is a risk you may be seen, or even attacked from the air, and ground. The enemy has laid explosive landmines somewhere on the way. Which tank will you use?

MISSION 2: The French Battlefield. It is 1944, you are fighting German lines in France. Your task is to take your tank before foot-borne infantry across a very bumpy, muddy battlefield, full of deep trenches. Enemy tanks have been spotted 2-3 km away, they have powerful anti-tank guns. You must destroy the enemy as much as possible. Which tank will you use?

MISSION 3: Spy on Nazi Head Quarters. It is 17:00 hours. You have information that the Nazi commanders are to hold an operational meeting in a farmhouse around 30 miles away. This will take place at 19:00 hrs, when it is dark. Your Orders are: 1) to go around the back of your own lines, cross several fields and wooded areas into No Man's Land and enter enemy territory 2) spy on the meeting and bring back information. Which tank will you use?

Activity 2: Designing a Tank Training Ground

>> CHOOSE A TANK FROM THE TRUMP CARDS
AND MAP YOUR IDEAL TANK TRAINING GROUND >>

TRAINING REQUIREMENTS

The recruit must be trained to do the following:

- Manoeuvre the tank across as many different ground surfaces as possible
- Drive over and around small hills and through trenches
- Drive over small obstacles
- Shoot at moving targets
- Drive in a way in which infantry behind would be protected
- Go fast!
- Be well camouflaged / maintain low visibility.

As well as the most obvious things, your ground must contain the following:

- Danger zone where no person will go
- Circuits so that tanks do not bump or fire into one another.

Use the following symbols on your map:

LEGEND	
Training Area Boundary	
MOD Freehold Boundary	
MOD Leasehold Boundary	
Out of Bounds Areas	Permanent
	Firing Over Rights Only
Restricted Areas	Out of Bounds Unless Allocated
	Woods Out of Bounds to Tracked Vehicles
Danger Area Boundary	
Training Area Sub Division Boundary	
Danger Area Sub Division Boundary	
Barrack Area	
Firing Point	
Moving Target	
Bearing Picket	
Danger Area Flag Beacon	
Barrier, Barrier Range Sentry, Tapping in Point	
Range Sentry with Tapping in Point	
Tank Crossing Point Other, Concrete	
Light Tracked Vehicle Crossing Point	
Tank Driver Training Route	
Light Tracked Vehicle Training Route	
Tank Turning Point	
Tank Driver Obstacle (North to South ONLY)	
Maintenance Route (B Vehicles ONLY)	
Public Rights of Way	
Radar Equipment	
Bivouac Area	
Washdown Point	
Helicopter Landing Area: Pad	
Entry Point (As Specified)	

>> Concrete roads >> Boggy terrain >> Sand >> Danger zone
>> Firing Point >> Targets >> Railway for moving targets
>> Lookout Post (for control) >> Underground storage for ammunition
>> Tank Marshalling area – servicing, re-fuelling and parking
>> Nissen huts – for washing, eating and time off

Background Reading

Section 2: Tanks in WW2
Section 3: Tank Training in WW2
Top Trump Tank cards

Things to consider:

1. WW2 firing ranges needed to be between 1828 – 3657m long to fire 17 pounder guns. It could hit a tank about 2000m away, but the firing range needed to be much longer to include the danger area when targets were missed. Adjust your map's scale accordingly.

2. Look at where your tank operated and consider the training needs of drivers and gun operators.

3. What type of tank is it? What jobs would suit it?

4. How many tanks would be on firing or driving training at the same time?

5. What is the size of the tank? How much space will it need to move around?

6. What space is needed to fire at moving targets?

Activity 3: Camouflage Design



Detail of tank camouflage paint



Paintings by Year 5 pupils at Minehead Middle School



Troops carrying a dummy tank made to look like an M3 Stuart

Alongside tank engineering and design a variety of camouflage schemes were used for aircraft and ground vehicles in different theatres of war.

Disruptive camouflage is a form of camouflage that works by breaking up the outlines of an object using a strongly contrasting pattern and was used to disguise the shape of the tanks as well as helping to blend into particular environments.

During the Second World War soldiers were fighting in a wide range of countries, climates and terrains, this resulted in a wide variety of patterns being created - from elaborate sprayed camouflage, to patterns that look like they were smeared on with a broom and rag. Others literally utilised branches and foliage from the landscape around them. Some soldiers left large piles of pre-cut branches at roadsides, to allow retreating units to quickly camouflage their vehicles.

Paint was not always available and soldiers would improvise using material and resources around them: for example in snow conditions alongside paint, chalk, white sheets or even stacked snow was used.

Others created their own recipes to create paint:

- Dark brown paint: crushed wood coals in combination with crushed brick.
- Earth grey: filtered road dust or clay, diluted with water and glue.
- Green: use various plants (leaves, grass) burned with boiling water, then dried and crushed. The best plants for this purpose are nettle, fern, and clover.

1. Using the Top Trump Cards draw the shape of one tank in the centre of your paper, leave room for the background.
2. Repeat this so you have three drawings of blank tanks.
3. Select up to three colours to create a disruptive camouflage design on each tank for the following battle environments:
 - North Africa, desert with high dunes and sandstorms
 - A wooded area in northern Europe during the summer
 - A heavy Russian winter
4. Now paint and draw the environment within which you are trying to camouflage your tank.

Activity 4: Radar Station

A Very Hush-Hush Building

Very few documents survive or have been made publicly accessible that refer to the building of Radar Stations, this was a secretive time and architects, engineers and scientists were protective of developments such as Radar, in case they fell into the enemy hands.

One local man, Dave Lloyd, was tasked with installing the telephone line at the Radar Station.



>> READ THE FOLLOWING EXTRACT FROM DAVE'S MEMOIRS THEN CREATE A SHORT POEM OR STORY FROM THE PERSPECTIVE OF SOMEONE WHO HAD LIVED IN MINEHEAD ALL THEIR LIFE AND HAD SEEN THE RADAR STATION BEING BUILT BUT HAD NO IDEA WHAT HAPPENED INSIDE IT. >>

The area of land where the RADAR station is sited was owned by a farmer. Imagine you were working on that farm and knew the area well, or perhaps you were the wife or girlfriend of a soldier from the town.

Remember people may have been suspicious, curious and would probably have made up fantastical stories about what might be happening up on North Hill.

Memories of Dave Lloyd

"It must have been around July/August of 1941, I remember the weather was great and very hot. I had been assigned the job of setting up the Private Line connection at the training camp on North Hill. I suppose I was extremely lucky, not to have been called up at 18 and to be one of the few civilians to be allowed in to that very hush hush building, which is the only building that is still standing on North Hill - the Radar station. If I recall correctly, the Defence ministry used Burgess and Co. as the builders.

Being in the communication trade I was reserved until 20 before being conscripted, and of course we only had wireless (radio) and telephones, television was just being tried out in London, in fact one of the pioneers was John Loggie Baird, and my father used to tell me that his wife used to chat with him in our shop in Friday Street. Her husband had evacuated her to Minehead with the children and they had a house or accommodation on North Hill.

As I was saying, I was given the job to make up a small Telephone board to take up and fit in this newly built very hush hush building on the hill.

The building that is still standing on North Hill was a rushed concrete single storey building with double doors of solid iron, all internal walls were lined with cork and it had a large hole in the centre of the flat concrete roof. There were no trees around it then, just a little flat grassy patch, all the doors and small windows had heavy steel shutters inside and there were guards on duty at the doors.

This building is just at the edge of the Rhododendron Wood (now mostly cleared) and about 500 yds. down to the Seaward side overlooking the channel and really not far from Geenaleigh Farm below. There were many Nissen type huts in the Rhododendron wood which was very overgrown and kept them well hidden. The concrete foundations are still in evidence

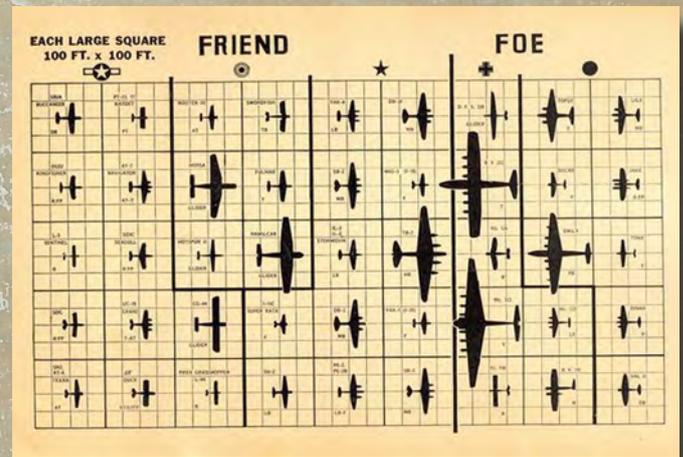
Later, after connecting the phone which was a direct Private Line to Hartland Point and seeing it worked, I had the chance to watch the operator of the Radar Screen which was quite small and green and about 15/18" in diameter. The hole in the roof was feeding an oblong antenna. If I am right it was controlled by the Royal Navy with Navy personnel and was to pick up movements in the Bristol Channel of boats or more likely submarines. It was all very exciting at the time as none of the general public knew about Radar. We had to adhere to the slogans everywhere telling us to "Be like Dad-keep Mum" or "Remember the Walls have Ears."

I believe the building was divided off and all the Power and transformers were separate from the Control room which was dark and totally lined with cork tiles, the wall facing towards Selworthy (West) had the Console and operator watching the round Green Ocilographe screen about 15-18" in diameter, the wall facing channel had many grey cabinets with humming valves etc. On the left was an officer's desk and more gizmos."

**Memories of Dave Lloyd taken from a series of emails between
Dave Lloyd and Ron Blundell, September 2011**

Activity 5: Radar Detection

Creating an Invisible Plane

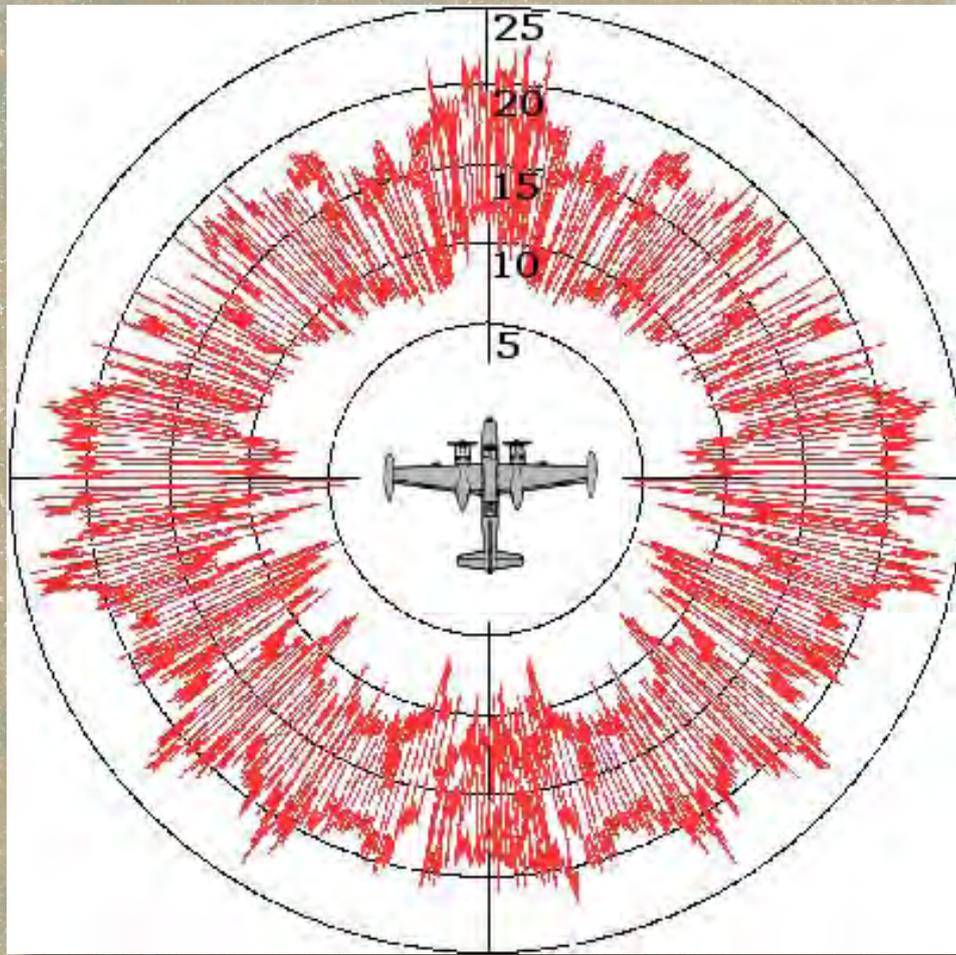


Harry Potter was able to use an invisibility cloak to avoid detection and this might seem to be the stuff of fantasies and science fiction but scientists and engineers are constantly working on stealth technology to make military aircraft, ships, submarines, and missiles less visible (or even invisible) to avoid detection. Stealth technology is not just one technology, but a variety of methods that decrease the distance at which a vehicle can be detected by radar, infrared, sonar, or other means.

Radar is a detection system that tracks the location, speed, and direction of an aircraft by sending out (transmitting) short bursts of radio waves, and then listening for an “echo” as the waves bounce off the aircraft. By measuring how long it takes for an echo to arrive back, and how much of a frequency shift has occurred in the echo (as compared to the transmitted signal), the distance to the aircraft, and its velocity, can be tracked. As each aircraft is a different shape the pattern of the echo or “radar signature” is different, allowing the radar operators to identify which aircraft are flying into and out of the area.

One way an aircraft is made more “stealthy” is by reducing its radar cross-section, or the “radar signature” that it produces. A Radar cross-section is a measure of how detectable an aircraft is by radar and would have been seen on the monitors at North Hill. In the past, radar cross-section used to be directly related to the size of the aircraft. A smaller plane would have a smaller radar cross-section than a larger plane. For example, there was a small, conventional military plane from the 1940's, called the B-26. It had a wingspan of about 22 metres (m) and its radar cross-section, as shown in the diagram overleaf, was about 25 m².

- Using the aircraft templates select two aircraft one friend and one foe, enlarge and cut each one out to fit into the centre of your radar diagram.
- Look carefully at the shape of the aircraft and use a bright pen to draw in the radar waves. The nearer the aircraft is to the centre ring the longer the spike of radar waves will be.
- Now try designing your own aircraft either using a silhouette or folding a paper aeroplane. Contrast the radar diagrams; which do you think would be hardest to identify and why?



This drawing shows an example of a radar cross-section diagram for a military aircraft used during World War II, called the B-26.

There are some ways to reduce the radar cross-section, including:

- Modifying the aircraft shape, so that it contains flat surfaces and sharp edges, instead of the curved, aerodynamically friendly surfaces of conventional aircraft.
- Simplifying the propulsion system so that it contains no moving parts.
- Using composite materials, instead of metals, to construct the airframe.
- Using radar-absorbing materials on the skin of the aircraft, like special paints or gold coatings.



Map showing North Hill to the West of Minehead