DESIGN A VESSEL – LESSON PLAN:

Curriculum Area:

Design Technology and Science (Materials)

Activity:

For learners to research, design and build a cross Atlantic rowing model using a variety of materials, focussing on sustainability sources and potentials of recycled products.

Learning Objectives:

Learners will:

- Understand that the RN has talented and highly qualified sailors employed in a wide range of roles at sea.
- Understand the challenges and associated requirements when building a cross Atlantic rowing vessel.
- Plan and design a model using appropriate materials (considerations like buoyancy).
- Build a model of the rowing vessel for consideration as next year's design.

Resources:

- Vessel Design/Build PPt
- Planning worksheet

Notes:

Individual organisations to assess the suitability of planning and desired resources.

Introduction/Background:

Submariners have to go away for long periods at sea and this brings its own challenges. Considering that a Submarine can deploy for up to 9 months, potentially surfacing as few as 3 times in that period, there is a huge amount of planning that needs to be carried out to ensure that the vessel is able to sustain itself and its crew for the length of time that it is away.

Submarines combine endurance and flexibility, which allow them unparallel freedom to operate worldwide in support of our ships and nation's interests.
It takes a real team effort to keep a submarine safe and running well. Behind each submarine is a large team of talented submariners who work hard in some of the most challenging conditions imaginable, to make sure that our submarines operate safely. This includes engineers, chefs, medics, sonar operators, communicators, survival equipment maintainers and logistics personnel. Submarine Marine Engineers keep the submarine operational and safe.
In taking on this (up to 6 week) Cross Atlantic Challenge, these 4 Royal Navy Submariners will be facing some similar obstacles to a Submarine when preparing for its deployment. In small groups, spend 10 minutes discussing and identifying what you believe the key considerations that are needed when preparing for this adventure?

Food: Our rowers will be taking in on average 6000Kcals per day for 55 days (the average human eats 2000kcals per day!). In order to store that volume of food in the boat, the weight and volume is cut down

by the main source of nutrition being dehydrated expedition meals. The meals are a high calorie, lightweight alternative to normal food. (Insert picture of food from presentation). In order to store 700+ meals, our rowers will pack their meals throughout the boat in every space imaginable even sleeping with some! To provide some variety and to keep our rowers fuelled throughout the day, they will take 'snack packs'. The daily 'snack packs' will be made up from sweets and high protein snacks eg. Nuts, beef jerky. Each 'snack pack' will be approximately 3000Kcal to ensure our rowers have high sugar foods at hand whilst rowing.

Water: Water onboard is produced by our watermaker. We use solar power to create electricity and produce drinking water from seawater through a process known as reverse osmosis. This process takes seawater and forces it through a series of membranes at high pressure to strip the salt leaving drinkable water! Each rower will drink around 6 litres of water per day. In comparison you should drink around 2 litres per day!

Clothing: Whilst rowing there will be no shelter from the sun for our rowers. We use specialist UV protective long sleeve shirts as well sun hats for protection from heat injuries. It is important that all clothing is quick drying so it can be washed and re used easily.

Medical: With no doctor onboard, all our rowers are trained in marine first aid. Should they get any minor injuries, they have the knowledge to address them. If more serious injuries occur, they will utilise an on call doctor via the satellite phone for assistance.

Communications equipment: Having reliable communication equipment is key to safe crossing. Our rowing team will be in contact with the shore support team for a variety of reasons, these include weather updates, medical advice and to speak to loved ones. This is achieved by using specialist satellite phones that can call from anywhere in the world! They will also take a BGAN device which will allow them to send photos and short videos back to shore. This is great for capturing sea life and the night sky!

Miscellaneous (personal effects): Reducing the weight of the boat is key to a fast, efficient crossing. Our rowers will only pack essential kit and don't have room for many luxuries. However, in order to make the crossing enjoyable and help with our rower's mental health, each rower will take some lightweight private items. This could be a mince pie for Christmas day or letters from loved ones!

Recycling: In the Royal Navy we have a saying 'make and mend', and wherever possible personnel try to repair and re-use equipment to avoid unnecessary waste. The Oardacious team recycle materials following this mantra with the newest boat planned to be made of upto 70% recycled materials. Think about the materials you would want to use, and can you think of materials which could be used that involve recycling/re-using items.

Looking at the Oardacious rowing challenge, what important factors will the team need to consider and how can they be solved in the design of the vessel?

Challenge:

Design a prototype vessel for the Oardacious rowers to cross the Atlantic in. Details to include:

- Materials (reasoning)
- Storage
- Living/Sleeping area

DESIGN & BUILD

Depending on age and ability of learners this can be done using Junk Modelling resources, Lego, Woodwork/fibreglass secondary DT work so tailor design expectations to the appropriate level for when you plan to build the vessels in a future lesson.

Conclusion:

- What was the most difficult part of the planning process?
- How do you think your plan will evolve as you start to build the prototype?

Second session: *The Build*

Curriculum Area:

Design Technology and Science (Materials)

Activity:

For Learners to use their previously created plan to build a rowing vessel model using a variety of materials, focussing on sustainability sources and potentials of recycled products.

Resources:

- **Vessel Design/Build PowerPoint**
- **Planning Sheet**
- Appropriate resources for build (KS2 – Junk Modelling, KS3 – local assessment on used materials)

Notes:

Individual organisations to assess the suitability of planning and desired resources.

Learning Objectives:

Learners will:

- Understand that the RN has talented and highly qualified sailors employed in a wide range of roles at sea.
- Understand the challenges and associated requirements when building a cross Atlantic rowing vessel.
- Build a model of the rowing vessel for consideration as next year's design.

Introduction/Background:

As part of the Atlantic Challenge, 4 Royal Navy personnel will be rowing over 3000 miles from the Canary Islands to Antigua in the Caribbean to raise money and awareness for the challenges faced by Submariners and particularly their families.
Royal Navy submarines and surface vessels are at the forefront of state of the art design and technology. They are the product of years of planning and engineering excellence to ensure that they are able to fulfil the required roles of the UK in the wider world. These roles range preventing terrorism, keeping sea lanes clear for safe travel and humanitarian support to those in need all over the globe.

DESIGN & BUILD

Once built, the vessels of the Royal Navy require personnel with the highest levels of engineering capability and training to maintain and support the roles for which they are nominated.
Likewise, a huge amount of planning and design has gone into the HMS Oardacious boat to enable its team of 4 Royal Navy personnel to safely cross the Atlantic. Engineers require flexibility, proactivity, and a desire to find a solution to problems which may arise, how many of these qualities will you demonstrate in this challenge?

Last session we designed our own prototype boat designs for the crew to use in the coming years. What considerations did you and your team make when planning?

Considerations:

- Buoyancy
- Weight
- Size
- Streamlining
- Space for supplies
- Sleeping areas
- Protection from the elements
- Recycling materials where possible (junk modelling – plastic bottles, spoons etc)

Challenge:

Using your team's design, choose appropriate materials to build the prototype boat for next year's event. Build a model for 4 crewmembers to cross the Atlantic in out of anything from junk modelling to secondary level DT projects

Conclusion:

Did your model meet the criteria you set out to achieve?

Which materials did you choose?
Would you alter your plans if you were to do it again?
What was the most difficult part of the build?

Extension Activities:

List the challenges and possible solutions that you see for the team as they spend 6 weeks at sea exposed to the elements (sunstroke, cold and wet conditions etc.).