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PROJECT TORPEDALO
THE FASTEST PEDAL-BOAT CROSSING OF THE ATLANTIC OCEAN

MARK BYASS
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BENTLEY

Autodesk



CREATIVE

ICOM

JohnBurn
www.johnburn.co.uk

globalbeach...

PROJECT SYNOPSIS

- Two engineers from Bentley Motors are going to attempt to cross the Atlantic Ocean in a pedal-powered boat, to raise money for charity.
- This boat will be designed and made by the two engineers, and be completely bespoke. It will be entirely self-sufficient, with onboard electricity generation and water production.
- The Atlantic has only been crossed by pedal-boat once before, in 1994, with a trip duration of 111 days.
- The target duration of the 3000 mile, unassisted Atlantic crossing is only 38 days – as such, the crossing will be an attempt on a World Record.
- Target sponsorship is £250,000, to be split between the Motor Neurone Disease Association and Make-A-Wish Foundation®.
- Bentley Engineering will be supporting the project through resources in the design, materials and manufacturing departments.
- The Bentley Sales & Marketing department will be assisting with pushing the project in to mainstream media channels, raising public awareness and managing project marketing.
- Major partners are now sought to support the project through sponsorship.
- More detail about every aspect of the project is included in the following pages.

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INTRODUCTION

Mark Byass (Design Modeller) and Mike Sayer (Technical Assistant to Engineering Director) are both keen charity fundraisers. Over the past years, both have undertaken physical challenges in order to raise money for a number of charities. While Mark has completed the 26 mile Jungfrau Marathon twice, and run as part of a team from Crewe to the Brooklands racetrack in Surrey, Mike has completed 10 kilometre swims and cycled 350 miles from Crewe to Le Mans, all in aid of charity fundraising.

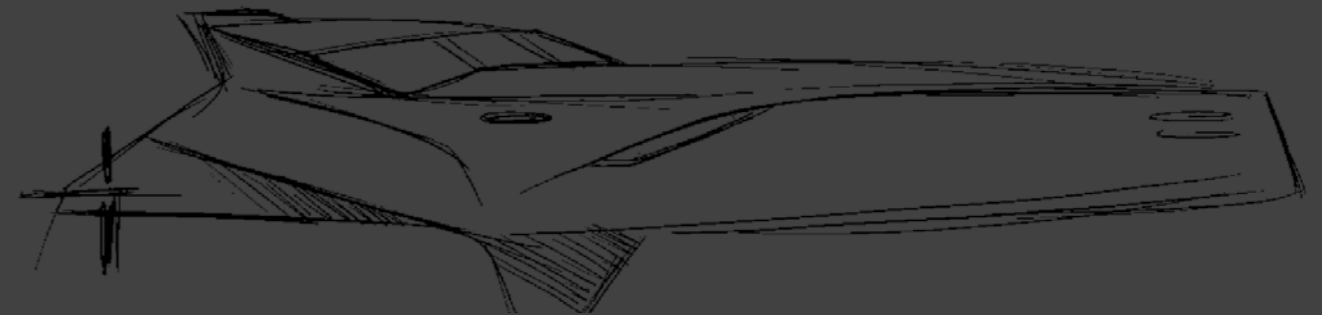
Since completing their most recent and separate charity challenges, Mark and Mike have decided to form a team to allow them to determine and complete a charity fundraising event of much greater depth and difficulty than either of them have attempted before.

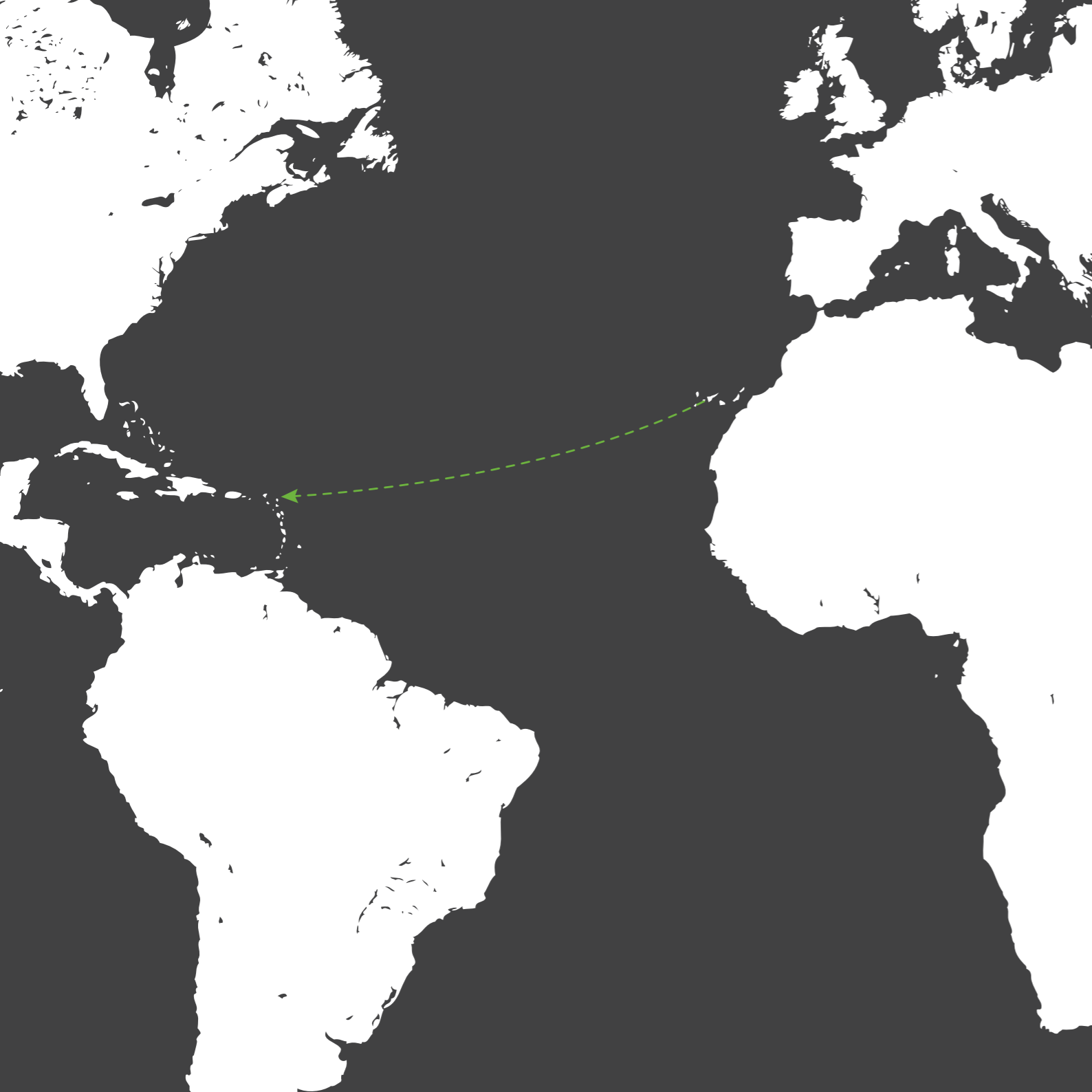
The requirements of the challenge are:

- To be based around extreme sustained physical exertion that will require complete dedication and very high levels of mental and physical strength.
- To be an exciting, new idea that will excite potential sponsors to allow the maximum amount of money to be raised.
- To involve an environmentally friendly, sustainable message.
- To have the potential to set or break at least one world record.
- To attempt something that very few people have tried before.

With these targets in mind, a challenge has been agreed that will test the pair to their personal limits and beyond. The result has been christened Project Torpedalo, and will test the skills of the team not just during the event, but over the predicted 28 month lifespan of the project. Engineering analysis, model making and testing, full design work, manufacturing skills, project management, fundraising, PR and marketing work will all be involved to a level that neither team member has experienced before. Determination and commitment will be required in equal measure to overcome whatever problems are encountered, with the unwavering goal of completing the challenge.

“ONLY BY SETTING OUR SIGHTS ON
DISTANT AND DIFFICULT GOALS DO
WE TRULY SUCCEED.”





THE CHALLENGE

After consideration of a number of possibilities, the following challenge has been agreed:

- The team will design and construct, from scratch, a self-sufficient pedal-powered boat.
- This boat will be constructed with a net cost of £0, using sponsorship from supplier companies and permission to use Bentley design, engineering and manufacturing resources.
- A glass-fibre prototype boat will undergo sea trials towards the end of 2010 and into 2011, with Mark and Mike pedalling the boat several hundred miles on both flat and rough water to prove the design, construction and durability of the design. The final, racing boat will then be constructed in carbon fibre.
- After further training the team will attempt to pedal across the Atlantic Ocean. This attempt will be in December 2011, leaving from La Gomera in the Canary Islands and arriving into English Harbour in Antigua, 2900 miles (2500 nautical miles) later. The team will not be planning on using support of any kind during the crossing, and will be entirely self-sufficient.
- The Atlantic crossing will be in association with Woodvale Challenge, who amongst other events organise a trans-Atlantic race every two years.
- The target duration for the Atlantic crossing will be 38 days, setting a new World Record.
- The fundraising target for the project is £250,000.

This challenge represents a test of physical and mental durability unlike any other. Far fewer people have crossed the Atlantic Ocean under their own power than have climbed Mount Everest. 99% of these people have rowed the Ocean – there has only been one previous pedal-powered east-west crossing of the Atlantic, which took place in 1994 and took 111 days. With this in mind, it is very possible that the team can set a new World Record.

One fact is already certain – Mark and Mike will not stop working or pedalling until arriving in Antigua having successfully pedalled a boat across the Atlantic Ocean.

CHARITIES

Mark and Mike have decided to split the fundraising monies between two charities. These charities are ones that both team members feel strongly about, with such a connection being important when dealing with the intense exertions that lie ahead.



Charity One – Motor Neurone Disease Association

MND is a rapidly progressive, fatal disease. It attacks the nerves that send messages from the brain to the muscles, leaving people unable to walk, talk or feed themselves and eventually unable to breathe. Imagine a healthy and alert mind trapped inside a body that can't move, but can still feel. That's the devastating reality of Motor Neurone Disease (MND). Every day 5 people will die from MND and around 5,000 people in the UK are living with MND at any one time. Half of all people die within 14 months of diagnosis.

The MND Association is the only National Charity that provides care and support for people living with MND. We fund an extensive range of services including a vital equipment loan service, care and support and also a help and advice line so nobody need ever feel alone. They also fund research into this terrible disease to ultimately find a cure so that one day we can have a world free of MND.

The Association was formed in 1979 by a group of volunteers who wanted to co-ordinate support, guidance and advice for people affected by the illness. They now have 1,500 volunteers and 120-plus paid staff, all dedicated to improving the lives of people affected by MND, now and in the future.



Charity Two – Make-A-Wish Foundation

Make-A-Wish Foundation® UK grants wishes to children and young people fighting life-threatening illnesses. Since being established in the UK in 1986, they have granted over 5,600 wishes. There are 20,000 children living in the UK with a life-threatening illness - every one of these children deserves to experience the magic of a Make-A-Wish wish. In 2009, around 1,000 children will turn to the Foundation to have their special wish granted. Make-A-Wish needs to raise £5 million a year to continue granting these magical wishes.

Make-A-Wish is affiliated to Make-A-Wish Foundation® International. It is now the largest wish granting organisation in the world and can be found in more than 30 countries on five continents.

*Motor Neurone Disease Association is a registered charity (294354)
Make-A-Wish is a registered charity in England and Wales (295672) and Scotland (SC037479)*

VEHICLE SPECIFICATION

The design and specification of the boat is clearly central to the success of the project. As two people who have no experience of boat design or construction, the team has sought to recruit a number of technical specialists and experts in various nautical fields to assist with the decision-making process and the eventual design of the boat. This team of experts consists of:

- Mr Phil Morrison – Boat Design and Attributes**
 Phil is a British boat designer and racer distinguished by the success of his many designs in many classes since 1967 as well as his own yacht racing career. His designs embrace dinghies, yachts, rowing boats, and multihulls. He is noted for blending innovation with elegant, well engineered structures and high performance, whilst also delivering controllability and sailability. Phil designed the current generation of ocean-going rowing boats, used by Woodvale Challenge in their trans-ocean races.
- Mr Alex Whatley and Falmouth Marine School - Hydrodynamics**
 As Curriculum Area Manager for Marine Technology at Falmouth Marine School, Alex has a great deal of knowledge both from his own experience and within his body of staff. An expert in hydrodynamics and hull design, as well as the use of carbon fibre in marine applications, Alex is the ideal man to advise on the sub-surface hull design. The project will hopefully develop some mutually beneficial ties with Falmouth Marine School, that will eventually see experience and ideas travel in both directions.
- Mr Jamie Fabrizio, Global Boat Works – Boat Construction**
 Not only is Jamie a boat builder with 19 years of experience to his name, but he also works closely with Phil Morrison and has produced a number of his designs. He has designed and installed trans-ocean rudder systems, and worked with the same water desalination equipment that the project boat will employ.
- Mr Antony Dodworth and Mr Lee Bateup – Materials**
 Antony and Lee lead the advanced materials research group at Bentley Motors. Having pioneered developments in new forms of carbon fibre and other composites (both in terms of materials design and manufacturing processes), they are experts in the use of carbon fibre for strong, lightweight structures. With their help, the boat will be as tough as possible whilst weighing significantly less than the current generation of ocean rowing boats (made from plywood and glass fibre).

With this team of experts established, individual meetings have been held to determine the design specification of the boat. Mark will lead the design of the boat, using it as his Final Year Design Project for the culmination of his part-time BEng degree at Staffordshire University, and the input from this expert team will allow him to take an established rough packaging buck and create a boat design that is stable, low-drag, light, self-righting, strong and durable.

Boat Configuration	Closed-cockpit self-righting monohull with open forward deck area and sleeping compartment to rear
Approximate Dimensions	Bow-to-stern: 8.0 metres Beam: 1.5 metres Height: 1.5 metres (excluding keel and propeller)
Construction	Two-skin carbon fibre hull with foam core and carbon ribs Sprayed copper-metallic coating beneath waterline Carbon fibre superstructure Environmentally-friendly epoxy resin derived from soya oil
Powertrain	Single one-gear pedal crankset Forward leg-operated Hobie Mirage drive Custom twin-blade low speed propeller Switchable dynamo for emergency electricity generation
Electrical System	Power provided by flexible solar panels on cabin roof Onboard water desalination system (via reverse osmosis) with 25 litres/hour installed capacity. 2x Gel batteries GPS navigation system and tracker VHF radio Satellite phone AIS transponder Bilge pump Cabin and exterior lighting Built-in video recording system Onboard music system
Self-righting	Full self-righting capability without external intervention. Ability to self-right when fully loaded, empty or any intermediate state
Target Performance	Comfortable average cruise: 3 knots High speed cruise: 4 knots Maximum self-propelled speed: 7 knots Maximum design boat speed: 15 knots
Duration Capability	Food storage capacity: enough for 90 days Water supply through onboard desalination 150Ah installed battery capacity
Safety Equipment	Self-deploying ocean life raft Emergency tracking, location and homing beacon Separate emergency radio Manual water desalinator Full flares kit Fire suppression equipment



MATERIALS & MANUFACTURING

The boat will rely on modern materials and construction techniques. These will require expensive materials and processes, which will have to be sourced through/from companies willing to sponsor the project.

The main material of construction will be carbon fibre, which will form the hull and major skins of the boat. This will be assembled using an environmentally friendly epoxy resin, and for the hull will likely feature inner and outer carbon skins around an inner core of buoyant foam, bisected longitudinally and laterally by carbon fibre ribs.

Moulds for carbon fibre lay-up, or patterns for making moulds, will be machined into tooling foam. Ideally, this machining will be performed by a sponsoring external company. A sponsor for supplying large amounts of core foam and tooling foam has been secured already. Once moulds have been prepared, carbon fibre lay-up will be by hand. After curing, the individual moulded sections will be joined together to form the boat.

Once the hull and structure of the boat have been built up, fitting out with the electrical system, drivetrain and marine fixings will begin.

The project also contains scope for using a material recently developed by Bentley – Metal Coat Composite (MCC). This involves spraying a plasma of a particular metal into a mould, before laying-up carbon fibre onto the sprayed skin. The resulting laminate is stronger, proportionally lighter, and tougher than standard carbon fibre. In this marine application, the material and process could be particularly useful. The sub-surface hull of the boat could be formed of MCC with a copper exterior, which has excellent anti-fouling properties as copper prevents sea life attaching itself to the boat. This would keep the hull free of protrusions and disturbances that would increase hydrodynamic drag. The possibility of using this material is being investigated with the project team's materials experts.

MARKETING & PUBLIC RELATIONS

The key to the project being a fundraising success lies within the marketing strategy. Fortunately, the project has the PR and promotional power of the Bentley Sales & Marketing team behind it, which will facilitate exposing the project to the press and the public.

There are many methods and outlets that are available to the project to attract the attention of the public, and significant public exposure is vital to be able to raise money and also highlight the major sponsors of the project. Several of these methods have already been discussed with Bentley:

- Press releases to the local and national media once the initial design work is complete.
- A complete project website hosted by Bentley and designed by one of the web agencies that Bentley works with. The site will include micro-blog feeds from Twitter and Facebook, weekly photo updates via Flickr, details of the boat and the project, space dedicated to all project sponsors, details of how to sponsor the project and team profiles and contact details.
- An article in the Bentley customer magazine (global circulation of 53,000).
- Once marketing materials and scale models have been produced, the possibility of dedicating space to the project on automotive show stands will be explored.
- Bentley attendance at sailing and yachting events, such as Cowes week and the Southampton and London boat shows.
- Investigations are being made to ascertain whether a television company is interested in making a documentary about the project.

The success of the marketing campaign will hopefully cause a loop of positive feedback – more exposure makes the project more attractive to sponsors, and if the number of major sponsors increases then more opportunities to highlight and market the project will be available. All of these factors will hopefully result in a great deal of sponsorship, both corporate and private, to ensure that fundraising is as successful as possible.

As a project relying on the support of Bentley, it will reflect several of the current marketing messages of the company. The core messages that the project will involve are:

- Use of lightweight and modern materials and designs
- Sustainability and ecological thinking, through the use of environmentally friendly materials and the self-sufficiency of the boat
- The successes of the Bentley Graduate Development Programme (both team members are Programme graduates)
- Integrated modern technology – live GPS tracking, the latest solar panel developments, etc

More important than the marketing messages, however, are the three unique aspects of this project when compared to any other human-powered ocean boat project:

1 – The boat will be pedalled, not rowed

2 – The boat will be designed and built by the team, not bought off-the-shelf

3 – The project has the marketing support of a major international car manufacturer who will ensure that the project receives mainstream media coverage and feature the boat at public events

SPONSORSHIP

The project is entirely dependant on sponsorship. All equipment and materials, manufacturing and testing services, finance to meet the Woodvale race entry fee and transportation costs must all be covered through sponsorship deals to allow the project to happen. Corporate, private and personal sponsorship must then be sought to allow the target of £250,000 to be raised for charity.

To facilitate the search for sponsors and hopefully make agreements easier, a five tier sponsorship system has been devised. Each tier has a sponsorship value assigned to it, and the benefits and rewards for sponsors increase with each tier. Whether a sponsor contributes to the project through donating equipment, providing capital or providing a service, the value of their contribution determines the tier that they occupy. This structure is intended to provide a framework, but does not have to be completely rigid – every sponsorship deal can be negotiable within the framework. The sponsorship system is shown on the next page.

At this early stage of the project, several important sponsors have already joined the project. The following has been agreed, without cost to the project:

- A supply of all the required carbon fibre for the project from the Bentley materials research division.
- A supply of environmentally friendly epoxy resin, using soya oil as the base hydrocarbon.
- Supplies of all required tooling foam for mould making, and core foam to be sandwiched between the inner and outer carbon skins of the boat.
- The Bentley Training Academy has agreed to pay the £1500 needed to send Mark and Mike on the three training courses required by Woodvale in order to enter the trans-Atlantic race (first aid, ocean navigation, and radio skills).
- World-leading website developers Global Beach have agreed to design and construct the project website.
- The project has the full support of both the Bentley Engineering and Sales & Marketing departments, signed off by the respective Members of the Board. Engineering support includes full use of CAD equipment, model making and machining facilities, and access to materials.
- Autodesk are supplying all our required design software, and have generously donated £10,000.

A range of public fundraising activities will then be required to generate as much charity money to add to that provided by Tier One sponsors as possible. This may include work with local schools and companies, project presence at major public displays and events, approaching Bentley customers, and media work and promotion. These measures should together ensure that the fundraising targets are met, meaning that over the course of the project £250,000 can be generated for charity. This can then be supplemented by a project-ending auction of equipment, potentially including the boat itself.

PROJECT TORPEDALO SPONSORSHIP MATRIX

	PLATINUM £50,000+	GOLD £10,000 - £49,999	SILVER £1000 - £9999	BRONZE £250 - £999	MEMBERS £10 - £249
Logo on monthly project update newsletter	x	x	x	x	x
Access to all released project images and media	x	x	x	x	x
Company ID with weblink on project website	See Note 1	See Note 1	See Note 1	See Note 1	See Note 1
Material for use in company publications (on request - e.g. testimonies)	x	x	x	x	x
Use of project name, logo and supporting materials	x	x	x	x	x
Copies of post-event report and media pack	x	x	x	x	
Invitation to boat launch event	x	x	x	x	
Sponsor logo on boat	Very large	Large	Medium	Small	
200 words about company on project website	x	x	x		
Use of team members and scale model for sponsor event (UK only)	x	x	x		
Mention in press releases from Bentley, if applicable (dependant on theme of release)	x	x	x		
Logo on project exhibition stand for public appearances	x	x	x		
Official tour of Bentley factory for four people	x	x	x		
Logo on printed promotional material about the project	All	All	Posters		
Logo on project clothing	x	x			
Logo on project support vehicles (if used) and boat trailer	x	x			
Company details on exhibition stand for public appearances	x	x			
Brand / market sponsor exclusivity	x	x			
Use of team members and 1:1 exhibition boat for sponsor event (UK only, exc. costs)	x	x			
Official tour of Bentley factory for four people inc lunch and Bentley passenger rides	x	x			
Dedicated separate page on project website	x	x			
Mentions in interviews	x	x			
Mentions during race blog entries	x	x			
Ad hoc appearance requests	x				
Naming rights for boat	x				
Photo opportunity on board boat in water with team	x				
Possibility of identity partnership with Bentley Motors	x				

Note 1 – Company ID on Project Website

Platinum: Highlighted, title logo on opening page. Logo highlighted on all website pages

Gold: Large logo in frame at bottom of all pages. Central logo in sponsorship section

Silver: Logo in frame at bottom of all pages, and in sponsorship section

Bronze: Logo in sponsorship section

Member: Company name in list of supporting companies

