

# Final Summary Report

SGSA Ltd.'s IUK, IMechE, UKI2S supported

104647 FastRig Feasibility Study

11/2018 – 10/2019.



## SUMMARY

### STRAIGHTFORWARD BUSINESS PROPOSITION

Our work produced a compelling and straightforward Business Case for FastRigs – automated, retractable steel and aluminium wingsails. The ship we studied, the *Ultrabulk Tiger*, when fitted with FastRigs can save 20% fuel, every year running the route from Baton Rouge to Liverpool carrying

biomass for Drax. At current market prices the fuel-saving allows payback within 4-5 years (fuel price dependent).

### **STRAIGHTFORWARD MANUFACTURING PROCESS**

Making FastRigs from steel and aluminium optimises the balance between cost/weight/robustness, and means the rigs can be easily repaired and recycled at end of life – retaining material value within our system.

The aluminium wings are made up of four separate sections that lock together to be freestanding. They are mounted on deck with a straightforward steel rig heel.

Preparing the ship for fitting FastRigs is straightforward and can be co-ordinated with vessel being surveyed by Class Society.

### **'NO-BRAINER'**

From academics to financiers we are told “it’s a ‘no-brainer’”.

But like so many climate-focused commercially viable solutions, there is a Catch 22 where nobody (so far) is prepared to finance the critical next ‘innovation’ stage – enabling SGS Demonstrator in the water.

### **BROKEN MARKET – SENIOR DEBT**

Project collaborators have entirely rational reasons for not funding the Demonstrator – it’s not their business to invest in innovation.

After attending a government-initiated ‘London International Shipping Week’ event on green financing for maritime we met with Marine Capital. They confirmed that banks will not allow their senior debt position on secured assets to be subjugated by secondary financing of unproven technology.

*We can't prove it because we can't finance it, and we can't finance it because we can't prove it.*

Catch 22.

### **FIRST OF KIND CHALLENGE**

It is well documented that few in shipping want to be first movers. This quote from a recent interview with BNPParibas articulates the issue well: *“We have some very successful clients that keep telling us ....There is no first-mover advantage...You need the first 20 before the technology reaches the point where it can be used by everyone....So who is going to pay for that, except if you have subsidies?”*

### **LEVEL PLAYING FIELD**

It is clear that there is a role for the entrepreneurial state. For example the UK government’s public-private partnership ‘Energy Technologies Institute’ funded the Finnish company Norsepower to the tune [of £3.5m](#). Recently that project demonstrated fuel savings of 8.2% for the Flettner rotor technology on a Maersk tanker working for Shell.

The shipping industry badly needs to see the demonstration results from a wide number of technologies and drive technology providers to compete, which will deliver better solutions for the industry.

## PROJECT TEAM

**Project leader – Diane Gilpin:** Designed project process, managed outcomes, led dissemination via media and presentations. Driving second stage financing for Demonstrator

**Financial leader – Ian Haugh, FCCA:** Managed all budgeting, finance and interface with IUK; interpreted fuel savings data; developed financial analyses for business case outcomes, building the long-term commercial Business Plan for SGS including IRR, ROI etc;

**Project Manager – Frankie Haugh:** Managed project communications, meeting minutes, updated website, dealt with incoming enquiries

**Humphreys Yacht Design** – quite simply the best naval architects in the world to work with. Determined, committed, intelligent, practical, functional and beautiful designs that are affordable, robust, and workmanlike whilst exuding elegance. HYD have supported the evolution of this initiative for a decade giving generously of their time and expertise.

It is time they were given the freedom to exercise their full creativity.



HYD's attitude over a decade of pioneering 21<sup>st</sup> Century wind ships

**The Wolfson Unit for Maritime Technology and Industrial Aerodynamics (WUMTIA)** – at the University of Southampton, provided detailed and reliable, from decades of work in this space, computational fluid dynamic data (cfd) analysis in eye-wateringly short lead times – a key advantage of working with yacht racing experts is they work fast and accurately, critical in developing designs at the speed we need to in order to decarbonise the global fleet; WUMTIA continue to support SGS in developing fuel savings analysis tools to drive future sales.

**AES** - are a marine design mechanical engineering company, based in New Zealand who specialise in design of sailing yacht masts, spars, rigging, associated rigging load estimation, computer modelling and loadings on deck. AES have been on the winning team in the America's Cup multiple times. This racing mindset ensured that this project benefited from best-in-class engineering support.

**Graeme Winn** – an America's Cup weather-router, Umpire and mathematician applied his considerable talents to evaluating the reams of data generated from the WUMTIA cfd processes on the hull/rig performance, combined with 40 weather data sets to replicate the ship operating at different dates in every season, and applied his proprietary routing algorithm to enable us to predict the total annual savings from the FastRigs for this ship and route.

**Capital Law** – SGS's commercial legal advisers drew up formal collaboration and IP agreements, shaped our IP Strategy, advising on a roadmap for protecting our intellectual assets across the short, medium and long term.

**Abel&Imray** – patent attorneys processed the formal Design Registration for FastRig to protect the work undertaken in this project; they contributed to the development of the longer-term IP Strategy.

## PROJECT COLLABORATORS – who they were, what they did



### SOME OF THE TEAM TACKLING SHIPPING'S GREAT GLOBAL CHALLENGE

**IMechE** – sponsored the project making a significant financial contribution, provided vital engineering support and hosted project meetings.

**TP Group** – provided informal advice on manufacturing approaches, with a view to supporting at next stage.

**UKI2S** – seed investors in Smart Green Shipping Ltd; advisors on funding and fund-raising.

**Drax** – offer a long-term contract of affreightment to Ultrabulk if we can make the business case; provided PR support and lobbied on SGS behalf in Westminster with the aim of securing long term financial support to drive a zero-emission by 2030 project; provided critical data on necessary operational speeds, flow etc for cargo and - best of all – shared knowledge and experience from having already achieved the inspirational transformation from fossil fuels to renewables – Drax moved away from coal to biomass.

**Ultrabulk** – provided critical operational and financial information; gave vital insights into the day-to-day running of shipping business. Before this project had officially started Ultrabulk hosted us on the Ultra Tiger in Liverpool allowing the SGS team to understand all the essential operations on board, to take measurements, to learn about loading and discharge arrangements, to meet the master and crew. This background shaped the Design Brief and helped us to create a robust, workmanlike, best-in-class solution.

**LR** – LR provided briefing on the benefits and application of HAZID workshop for the next phase. LR also provided insight on their third-party independent verification of fuel savings study. LR is the chosen class society therefore they have made contributions from statutory and class requirements perspectives.

**Peter Hinchliffe OBE** – key member of SGS Advisory Board, former Sec Gen International Chamber of Shipping with deep knowledge and understanding of shipping industry has provided invaluable support, refining communications, connecting SGS to market actors and bringing huge credibility to the initiative.

**WTW** – global risk assessors support SGS through the development of potential ‘parametric’ insurance products to give the market confidence to invest in the technology – insuring against the wind not blowing for example; they also ensure the FastRig tech will be insurable at Demonstrator stage and provided valuable introductions to potential investors and financiers.

**Group Partners** – world class strategic advisors to global brands; application of Structured Visual Thinking methods of strategic development; introductions to ‘high net worth’ individuals with a view to securing next stage finance from impact investors. Group Partners are responsible for the visuals in this document.

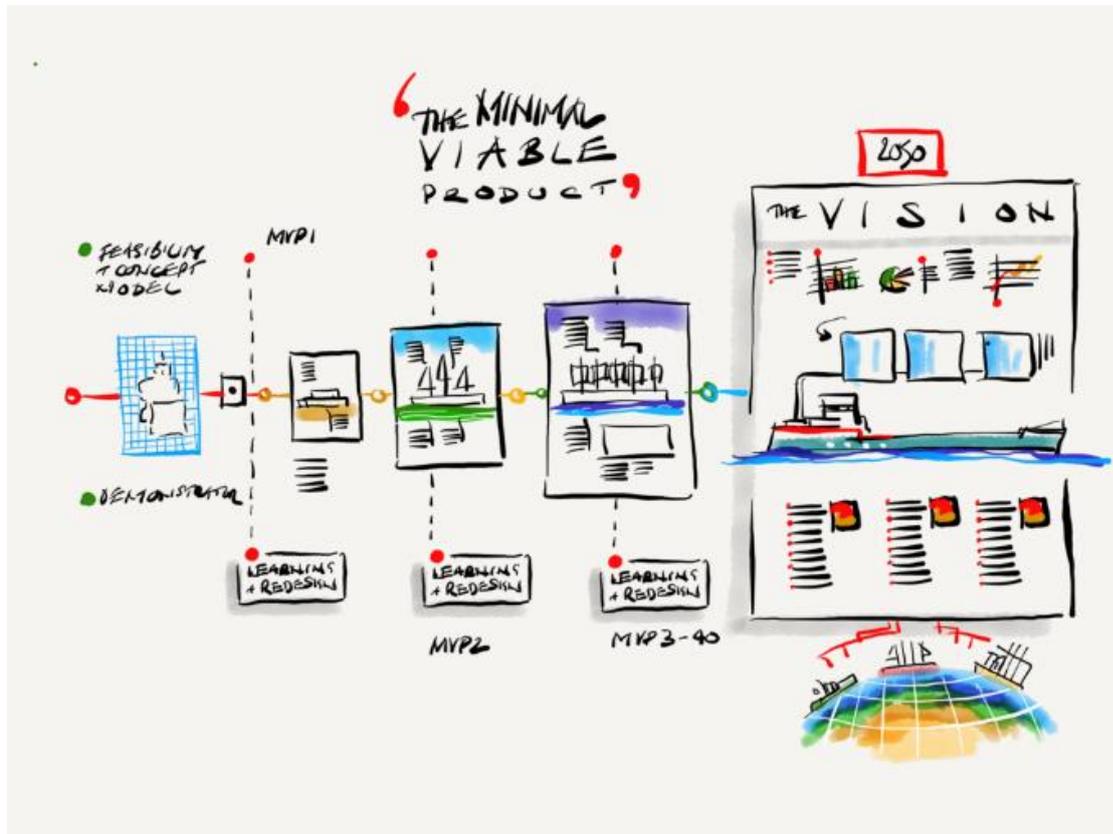
**Ned Molloy** – a consultant to energy and shipping markets focusing on environmental opportunities and challenges. He has advised this project as a collaborator on a wide range of issues from public relations to potential hedging solutions based on the fuel savings from FastRigs.

**BlueGreen Marketing** – a shipping communications agency who supported the project by editing and developing stories ensuring a wide range of shipping and general media took them up.

**International Futures Forum** – work with governments, communities, businesses, foundations and others, supporting people experiencing the combination of aspiration for something better and frustration that little they do seems to get them nearer their goal. IFF help SGS develop capacity for inspiring and transformative innovation.

**EA Gibson** – shipbrokers, provided access to market knowledge and trading insights.

**PROJECT REVIEW – key outcomes by quarter - at the initial kick off meeting** we collectively agreed, that given the limitations of time and budget, we should develop a minimal viable project.



During Q2/3 we progressed FastRigs design. They are to be made from affordable, easily available, recyclable materials – steel and aluminium.

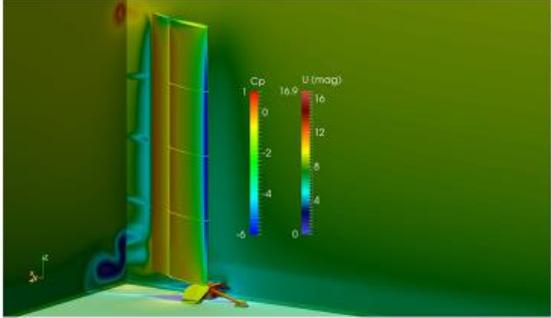
The component parts of the structure comprise:

- A steel rig heel fitting to attach the rig to the deck
- The FastRig lifts and retracts with 2 x hydraulic rams
- The unique aluminium wing section is designed to be a monocoque structure – i.e. it is self-supporting
- It is manufactured via a proprietary extrusion from a die/mould.
- The wing comprises 4 x 10m sections keep both cost and weight down
- This design also makes maintenance straightforward and cost effective as any damaged sections can be replaced quickly and affordably
- The rig is a rotating twin element wing configuration, to enhance efficiency and maximise the power that can be harnessed from a given wind speed and angle.
- The rig has actuators which move the main wing and flap automatically, to deliver the optimum trim setting for the wing for any wind speed and angle.

- The rig is controlled via an intelligent control system

## FASTRIGS: SAFE, EFFECTIVE, ROBUST

- Naval architecture from world leading yacht designers
- Workmanlike, cost-effective and robust construction from steel and aluminium
- Fully automated, retractable, safe
- Designed with input from ship owners, operators, crew, cargo owners, ports, insurers
- Overseen by Lloyds Register
- Institution of Mechanical Engineering support
- Marine engineers and MoD inputs
- Tested by Wolfson Unit, University of Southampton
- Fuel saving validated by America's Cup weather routers



**The final Quarter** focused on finalising the business case and securing funding for the next stage – the Demonstrator.

We formally registered the design.

We agreed our strategic position on securing next stage financing:

Given the climate emergency and the apparent superior potential of our FastRigs solution **we will only seek to secure funding/investment to allow the whole project to progress at the necessary speed and intensity.**

SGS's strategic decision, after consultation with key project advisors, partners and investors - is that this has project has to become tangible now, it has to happen as the first stage in wider a system-change and so we must be ambitious, clear and focused on putting a Demonstrator in the water by 2021. We can't do that piecemeal. We will be courageous and fully focused.