Project Cerulean - A Vast Ocean of Possibility to Explore

In 2018 Swire Shipping and the University of the South Pacific launched a new project to research and design a low-carbon wind powered, commercially-operated freighter to stimulate outer-island Pacific trade. Route analysis by the Micronesian Centre for Sustainable Transport (MCST) demonstrated a marginal but viable business case if the vessel could be built within budget. Collaboration with French ship design firm, VPLP resulted in this design for a 40m ship initially targeting the copra trade between RMI, Kiribati, Tuvalu and Fiji. Spiralling costs in all aspects of ship construction following the Covid pandemic and subsequent global logistic chain crisis has seen shipyards with overflowing order books. With build quotes nearing double initial estimates, the business case is no longer viable, and Swire have made the decision not to proceed further at this time.

While the project has not resulted in a new vessel, the research collaboration has provided a much-improved understanding of the challenges facing inter-island transport connectivity under the current conditions. Most importantly, the project has provided an immense amount of information and detailed analysis on deploying Wind-Assisted Ship Propulsion (WASP) vessels, designed for the specific range of operational conditions in Pacific island countries and capable of responding to the needs of remote island communities. MCST's lead researcher of the Cerulean Project, ***Andrew Irvin[1],*** *discusses the research findings and why the research platform gained is so important for the Pacific's forthcoming transition to low carbon shipping.*

Undertaken as a broad investigation into the suitability of a purpose-built inter-island cargo vessel, Project Cerulean has provided a case study on regional gaps inhibiting the construction/operation of these next generation vessels for outer-island Pacific deployment. The project is of critical importance to our overall research agenda on transitioning to low carbon shipping because it was the first public private partnerships with a commercial shipping line. Unlike bilateral or aid-based projects, the ship being considered had to meet a commercial operating bottom-line for its investors. As demonstrated over the past four years, the famine to feast fluctuation in global ship building costs has made this vessel on this route untenable at this time. This is a critical lesson for Pacific private sector contemplating the technology transition to understand. Decarbonisation is essentially an economic, not a technology question.

Upon evaluating the *Cargo & Route Assessment Reports*, it became obvious that demand for outer-island shipping significantly outstrips existing supply. The sector cannot meet current demand without increased frequency of vessel operations. Decarbonization and cost-effective, decentralized, equitable transport service access would only be possible under a scenario in which newly built vessels were designed and deployed in accordance with the requirements of specific routes.

Considering these route requirements and corresponding decarbonization commitments, Project Cerulean provided insight into legislative processes required to establish an inter-island shipping sector *Green Corridors*. The versatility required for provision of outer-island service was presented to the Central Pacific Shipping Commission (CPSC), with acknowledgement and approval of a route inclusive of the Marshall Islands, Kiribati, Tuvalu, and Fiji.

However, given the per capita trade volumes estimated along this route, a single Cerulean-class vessel would have been highly insufficient to meet demand. These communities are currently limited to small aircraft (if airstrips are available at all) and infrequent government-subsidized shipping.

[1] Andrew is now undertaking his PhD on a 3 year international scholarship to UoM

Since the project's inception, market forces drove the potential for operational profitability beyond even marginal profits in a commercial environment. This was inclusive of consideration of WASP-related savings on fuel expenditures. Our analysis included variable fuel price conditions in a market where fuel prices have hit both record lows and highs in the shipping sector over the project lifespan.

There were three key assumptions that underpinned the research; that is a shipyard in the Pacific Islands would be preferred to construct the vessel; Swire Shipping would be responsible for operation and administration of the vessel; and if demand exceeded supply, scaling and replication of Project Cerulean would be an option worthy of additional research and action.

Through the construction contract bidding and negotiation a variety of challenges arose, ultimately proving detrimental to operational viability. Chief among these was continued increase in construction quotes by the various interested shipbuilders, escalating as more refined design specifications were delivered. Price increases reflected an industry-wide increase not unique to Project Cerulean. The initial quote for a similar vessel design was for US$2.6 million.

The Cerulean design was conducted by renowned naval architects VPLP. During the preliminary design stage, MCST evaluated shipbuilding capacity across Oceania to meet project requirements. A quote from Bluewater Craft in Navua, Fiji was obtained alongside preliminary quotes from Asian shipyards. The initial Fijian quote totalled US$2.98m, however, over the course of full-build design, the scale and complexity of the vessel outstripped the capacity of Bluewater Craft to accommodate the construction, and no other regional shipyards could submit a construction bid, due to capacity or scheduling limitations.

The iterative full-build design process between Swire, MCST, VPLP, and Lloyd's Register, resulted in the Indosail rig design being selected as the most suitable for reducing crewing requirements while meeting performance efficiency targets. However, finding a yard to construct this at a realistic cost became a fundamental challenge. One key industry gap s not properly captured on the global scale is the absence of appropriately skilled and equipped shipbuilding firms able to deliver sailing vessels for commercial, as opposed to luxury/sporting purposes. Consequently, VPLP solicited Marechal to provide delivery of a revised Gaff Ketch rig instead of the preferred Indosail design, reducing the overall efficiency savings from the design. Construction costs climbed during COVID, with shipyard cost projections reaching US$5.37m. The additional rig, costs brought total costs above US$6.41m.

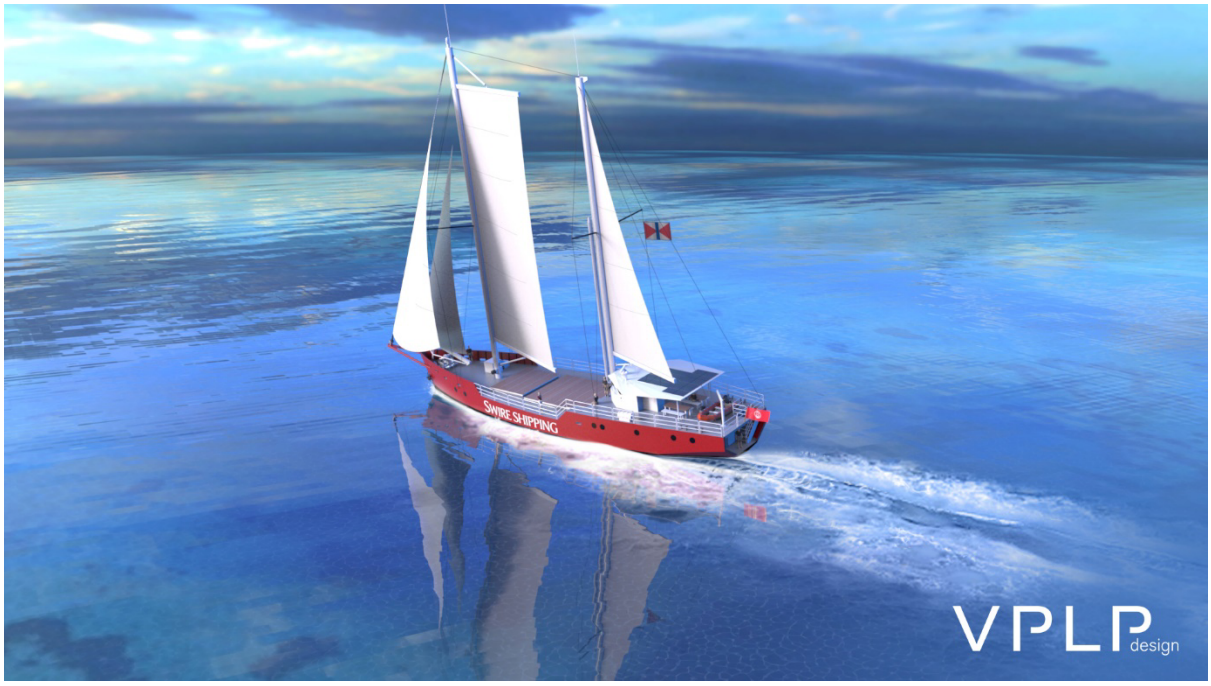
MCST devised additional methodology for quantifying socio-economic benefits for communities along the intended initial trial route, that is, Lautoka, Fiji to Funafuti, Tuvalu, encompassing Rotuma, Nukulaelae, and Niulakita. Projected social and environmental Return on Investment (SEROI) over the estimated 30-year vessel lifespan reached US$21.85m. Less compelling were cumulative cash flow projections, only breaking into profitability in the 29th year of operations on its most promising evaluated route at this elevated build price. Given this, Swire Shipping's Sustainability Fund Board decided not to proceed to a build tender given various increases in capital demands relative to the administrative oversight required by Swire. Following this determination, consolidation of project findings resulted in delivery by MCST of the *Project Cerulean Cumulative Report.*

A key research finding is that moving a localised shipping transition agenda forward requires additional prioritization and capitalization by Pacific states and financial partners ready to support decarbonization of public services under an economic model of avoided loss, not commercial profitability. Building upon this unique and valuable analytical and design work will enable our countries to make more informed shipping decarbonization decisions for their domestic fleets.

Project Cerulean provided a critical look at the challenges facing decarbonization of Pacific maritime operations, advancing international, multi-sectoral discussions concerning shipping services. The Research Collaboration Agreement between Swire and USP was a regional first and has enabled MCST to undertake one of the most detailed and cross-dimensional investigations into the transport requirements of outer islands in decades. It represents a necessary step in better understanding how to address human mobility and transport connectivity issues at a unique, remote, and vast scale.

Unachievable in isolation through singular project interventions, a broad, sector-wide investment in the shipbuilding and seafaring sector is required to restore viability and sustainability to the process of traversing these large ocean states in a just and equitable manner. This research highlights the challenges of organizing a tailored design appropriate to Pacific operating realities and provides greater depth of understanding concerning current maritime transport sector needs in the region. This is particularly relevant for the broader policy and financial development dialogue to decarbonize within the established reduction targets of the Pacific Blue Shipping Partnership co-chairs, RMI and Fiji. For achieving such high ambition commitments, MCST invites partners to build upon the work of Project Cerulean to devise, construct, and deploy a fleet of new generation of vessels to meet the Pacific's needs.

Rendition of the Cerulean vessel with a Gaff Ketch "Fisherman's" rig.



Rendition of the Cerulean vessel with an Indosail rig.