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MARINE

Daughter Craft: An integral addition to the offshore wind vessel family

Foreword by Andy Page, Founder & Managing Director of Chartwell Marine

Offshore wind is quickly becoming the cornerstone of the global energy transition. Of all renewable energy technologies, it is arguably the best placed to deliver both the pace and scale of change that is needed to transform the energy system.

According to the Global Offshore Wind Report 2024, total offshore wind capacity is predicted to reach 487GW by the end of 2033 and a whopping 2,000GW by 2050.

Keeping up this pace depends on the ability of the industry to take its learnings from smaller, nearshore projects and scale them up to bigger, more complex projects in testing deep water environments.

It has been widely acknowledged that this goal relies heavily on a supply of specialist, highly capable vessels able to fulfil demanding operational requirements far from shore.

Significant investment has been channelled into the development of large Service Operation Vessels (SOVs) that sit at the heart of all construction and maintenance operations – acting as floating hubs for both logistics and accommodation.

These SOVs have been ably complemented by increasingly capable Crew Transfer Vessels (CTVs), optimised for fast transit to and from port or in partnership with SOV, as well as transfer of technicians and equipment across all critical infrastructure.

However, this ‘proven formula’ for offshore wind vessel support is not without its weaknesses. For some years, the industry has coupled its race to scale in turbine technology and wind farm size with a ‘bigger is better’ approach to vessel procurement – particularly for CTVs.

In turn, this has piled the pressure on an already stretched global shipbuilding industry to deliver larger, more complex vessels – filling up available build slots and leading to long order backlogs that frustrate the efforts of operators and wind farm owners to get new boats on the water.

Offshore wind is only as strong as its supply chain. CTVs and SOVs will always remain the backbone of a support vessel fleet – but to tackle a growing shortfall in capable boats, the market urgently needs to consider new and innovative ways to plug the gap.

At Chartwell Marine, we believe it’s time to ‘scale down to scale up’.

Daughter Craft is a vessel class that has largely been overlooked by the offshore wind market to date – but with space for two Daughter Craft aboard each SOV, there is a huge opportunity to maximise the potential of these smaller boats to deliver major operational and supply chain efficiency gains.

In this report, we'll take a deeper dive into how a new breed of next-generation Daughter Craft is set to become an integral part of offshore wind fleets, and the role they will play in supporting the global expansion of offshore wind.

A brief history

Daughter Craft have been in use for centuries and can be considered as any smaller vessel launched and recovered from a larger vessel, or "Mother Ship", and are often used for operations such as:

- Personnel Transfer Search and Rescue (SAR) operations.
- Anchor and Line Handling operations.
- Research and Exploration operations.

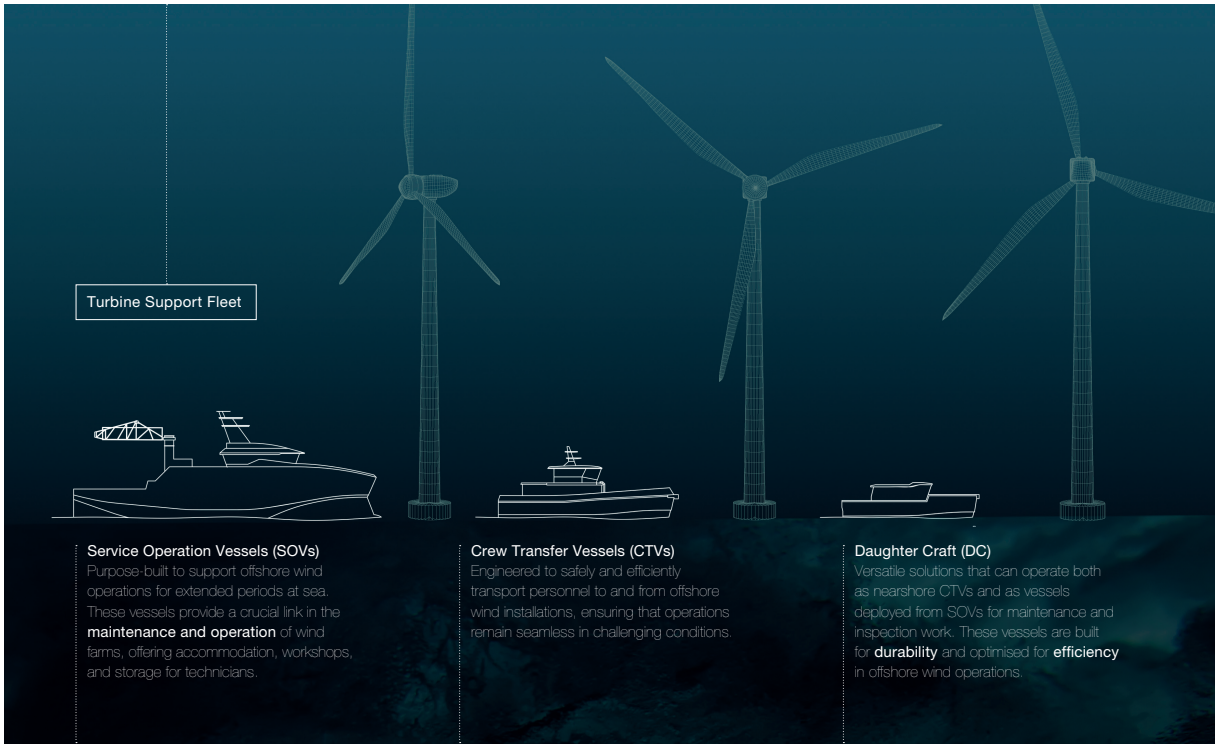
Since the 1950s, they have predominately been used by the oil and gas industry for fast response operations, and are still in use to this day. However, these vessels – commonly known as lightweight Rigid Inflatable Boats (RIBs) – can only operate in limited conditions and provide a very small number of amenities for crew comfort. When conditions allow, these vessels typically perform tasks supporting oil and gas operations, including:

- Emergency rescue and evacuation.
- Transporting personnel and equipment.
- Performing inspections in areas inaccessible to larger ships.

As offshore wind projects have moved further from shore, there has been a rise in the number of SOVs acting as operations and accommodation hubs for crews onsite. Daughter Craft have increasingly been used alongside SOVs to help with onsite operations – enabling these high value assets to stay focused on their primary tasks, especially during construction, and operations and maintenance (O&M) charters.

However, conventional Daughter Craft are not able to perform at a level that is suitable or acceptable for offshore wind operations –particularly considering the technically demanding requirement to 'push on' to access turbines.

Thus, most logistical support activity has continued to be undertaken by more powerful high-performance CTVs, which is becoming less feasible due to the increased cost and difficulties of undertaking O&M activity further away from shore. As a result, there has been a growing need to develop a next generation of Daughter Craft that can provide safe 'push-on' transfers, while maintaining the ability to be launched and recovered to SOVs.



Offshore wind turbine support fleet: SOVs, CTVs, DCs

Small vessels, increased operability

Having worked to commercialise a range of proven CTV and midi-SOV designs, Chartwell Marine identified a significant opportunity to develop a new class of 'next-generation' Daughter Craft for deep water offshore wind deployment.

These enhanced Daughter Craft are designed to bring some of the core strengths of traditional CTVs into a smaller vessel – or 'compact-CTV' - that directly complements the activities of SOVs and CTVs on site.

This new breed of Daughter Craft can play the role of a 'Swiss Army Knife', bringing significant efficiencies to offshore wind vessel operations across the following areas:

1. Transporting crews and equipment quickly, comfortably and safely around offshore wind farms in choppy seas from SOV motherships anchored on-site. This can eliminate round trips taken by a conventional CTV to and from shore, often more than 2-hours, resulting in cost savings and an overall increase effectiveness.
2. Maximising the reach of an on-site SOV. Large SOVs commonly deploy 'walk to work' systems, allowing crews to access a single turbine at a time. By making the most of one or even two Daughter Craft davits aboard a typical SOV, operators can enable technicians to simultaneously service multiple wind turbines, cutting down the traditional three-day O&M operations cycle. This flexibility also allows for off schedule deployment without impacting the scheduled maintenance programme of the high value SOV asset.
3. DCs can serve as a designated safe refuge or emergency rescue option in situations where the SOV is required to operate beyond a 2-hour safe recovery range. This provides an essential backup, ensuring the safety of personnel and equipment during extended operational scenarios where immediate recovery may not be feasible.
4. Acting as a temporary nearshore CTV – taking on less demanding logistical charters for wind farms located closer to shore. In this way, Daughter Craft can continue to deliver value as an operational asset during SOV build phases or other project downtime.

5. DCs can also be used for survey operations by using a gondola structure with transducers below the water and drones, enabling crews to undertake both above and or below-water inspections of wind turbines.

Purus Apache, Daughter Craft

Next-generation capabilities

In 2019 Chartwell started the development of its next-generation Daughter Craft – with support from The Carbon Trust Offshore Wind Accelerator (OWA) program – directly targeting the operational efficiencies identified above and to explore emission reduction technologies.

Chartwell leveraged its extensive CTV experience and deployed the latest design techniques and technologies to create first the Chartwell DC models. Using a 1:10 scale powered model – created by industry experts Seaspeed Marine Consulting – Chartwell was able to test the initial designs in the state-of-art QinetiQ Ocean Basin Tank in Haslar, UK. The tank – typically used for military vessel testing – was able to replicate a range of conditions that DCs would

encounter, ensuring that the vessels could perform at any offshore wind farm, regardless of the location.

After years of extensive hydrodynamic testing – using the latest Computational Fluid Dynamics (CFD) and tank testing techniques – and sea trials, the first Chartwell DC, Grace Darling, was launched for SOV operator North Star in 2022.

Grace Darling was an industry first and had a range of new specifications that made it perfectly suited to support the construction of large-scale offshore wind farms in rough seas:

- Capable of operating at speeds of 20+ knots in seas with waves in excess of 1.5 meters.
- Dynamic Bow fendering that ensures safe transfers in excess of 1.5m Hsig.
- Bi-Fuel hybrid propulsion that allows zero-emission slow-speed operations and loitering.

Chartwell has subsequently refined the design, developing monohull and catamaran solutions, that can be specifically tailored to operator and end-user requirements. The Chartwell DC now has a number of key features that create a safe and comfortable environment for crews offshore:

- Comfortable suspension seating that crews can adapt to their personnel requirements and sea conditions.
- Large windows that create a light environment and increases visibility, reducing sea sickness and motion-induced fatigue.
- Thermal and sound insulation fitted throughout the cabin, creating a climate controlled and low-noise environment.

Decarbonising the maritime industry has become an important objective over the last decade. Chartwell identified that Daughter Craft could play a significant role in helping to create a zero-emission maritime industry by using multiple propulsion systems – including methanol power and hybrid technologies – that can be tailored to each vessel's exact requirements. For example, the Chartwell DC uses a combination of diesel and electric outboards that allows a vessel operator to select the most effective and efficient propulsion system depending on the vessel's operational load case and task. This results in a reduction in fuel burn and C02

emissions – and when compared against a standard 12m diesel and waterjet powered catamaran – the vessel fuel burn can be reduced by as much as 38%. These learnings can be leveraged for wider alternative fuel research and implementation projects, which will help to create a carbon-free maritime industry.

The Chartwell DC has set a new standard in vessel design – providing the industry with a highly capable, efficient and low-emission vessel that can be tailored to the specific needs of offshore wind developers.

Andrew Duncan, Renewables & Innovations Director at North Star

"Working with Chartwell Marine to create the ultimate offshore wind daughter craft has been an absolute pleasure. We share common goals to innovate and push the boundaries of what could and should be achieved with this class of vessel. By improving on the previously accepted norm, and the operational limits by more than 50%, we have been able to increase 'time on turbine' and create significant operational and cost efficiencies for our clients. The fact that the vessel is more comfortable and efficient, and has enabled a local shipyard to return to building vessels in the UK, is a wonderful bonus."

Tee Ed, Daughter Craft

Plugging the gap

As the adoption of next-generation Daughter Craft increases worldwide, they have the potential to play a key role in easing vessel supply chain, R&D and skills challenges impacting the global market. Significant supply chain benefits of Daughter Craft include:

- Cheaper and quicker to build than traditional SOVs and CTVs. On average, Daughter Craft can be built for around 25% of the cost of a typical CTV, and take 6-8 months to build – half the time of a traditional CTV.
- Built by local boatyards and teams using standardised construction kits and off-the-shelf components – helping to satisfy local content requirements that are often key to winning offshore wind auctions in markets such as APAC.
- Train the next generation of boatbuilders, as Daughter Craft use standardised kits that require only a base level of skills and knowledge to build.
- Act as a test bed to develop and test new maritime innovations, such as hybrid propulsion systems and innovative hulls, that can used on a range of vessels and help to spur further innovations and decarbonise the maritime industry.

A growing opportunity

As the industry builds its understanding of the efficiencies and synergies Daughter Craft can create, and the number of newbuild SOVs and CTVs continues to grow, there is a clear opportunity for these vessels to rise to prominence as an integral part of the global vessel mix over the next 10-15 years.

The latest UK government statistics – developed by ORE Catapult – predict that more than 2325 CTVs and 423 SOVs will be needed by 2050 to meet global vessel demand for offshore wind O&M alone.

Due to their enhanced operational capabilities and the fact that they can be built by any shipyard using off-the-shelf components, Daughter Craft could play a critical role in helping to meet future global vessel demand, alongside their CTV cousin.

With each new build SOV potentially able to accommodate two Daughter Craft, we could – theoretically - see 846 of these ‘compact CTVs’ deployed by 2050, helping to meet up to a quarter of the total forecast CTV demand.

As a further indicator of growing global demand, Chartwell’s order book for Daughter Craft has expanded, with **10** vessels now launched and operational, and **6** vessels currently in build for **8** different operations across Europe, APAC and the USA.

Boreas Worker, Daughter Craft

Conclusion

As it stands, there are not enough vessels available to construct the growing pipeline of offshore wind projects around the world. This needs to change, urgently.

Next-generation Daughter Craft alone will not solve the vessel challenge. But, through their innovative design and capabilities and working in conjunction with CTVs and SOVs, they will play a crucial role in ensuring the smooth and cost-effective running and maintenance of offshore wind farms for years to come.

To fast-track the adoption of Daughter Craft throughout the offshore wind industry, the industry needs to invest significantly in shoring up local supply chains and developing teams with the skills and knowledge to build these boats in suitable numbers.

If we can rethink our strategy and recognise the role of Daughter Craft as an integral addition to the offshore wind vessel family, we stand a fighting chance of meeting vessel demand, ramping up the development of offshore wind farms, decarbonising the maritime industry and accelerating the global renewable energy transition.