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Offshore hydrographic and oceanographic monitoring using ocean drones

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Introduction

As the global dependence on offshore energy resources expands, the utilization of maritime unmanned systems (MUS) emerges as a promising strategy for protecting and monitoring susceptible offshore platforms. This poster shows the escalating requirement for offshore energy, the vulnerability of these platforms to potential assaults, and the constraints associated with prevailing inspection techniques. By harnessing MUS, both the military and civilian sectors can augment security protocols. Despite technological advancements like big data and artificial intelligence, often referred to as the "new oil," the global economy will continue to rely on energy in the foreseeable future. This energy is primarily derived from two sources: traditional or "legacy" sources like oil and gas, and environmentally friendly or "green" energy sources such as solar and wind. There is a growing trend among nations and energy companies to explore and extract these legacy energy sources from offshore locations, as well as initiate new initiatives for offshore wind energy production. However, irrespective of the energy type being extracted or generated, offshore platforms, particularly oil rigs, oil and gas pipelines, and wind farms, remain highly susceptible to potential attacks. The inadequacy of current inspection methods employed for offshore energy resources, including oil rigs and offshore wind farms, is becoming increasingly evident. Considering the significant advancements made in unmanned maritime vehicles and their versatile capabilities in various missions, it is imperative for the offshore energy industry to contemplate the adoption of these platforms as a means to bolster security measures.

Figure 1 – Offshore wind farms

GREEN ENERGY MONITORING

Offshore platforms - especially oil rigs, oil and gas pipelines and wind farms – need constant monitoring and are incredibly vulnerable to attack. The inadequacy of existing inspection methods for offshore energy resources, including oil rigs and offshore wind farms, is becoming increasingly evident. In light of remarkable advancements in maritime unmanned vehicles over recent years and their versatility in undertaking various missions, it is imperative for the offshore energy industry to contemplate the adoption of these platforms as a means to augment security.

NORD STREAM GAS ATTACK

The widely publicized act of sabotage in September 2022 targeting the Nord Stream gas pipelines, which traverse the Baltic Sea from Russia to Europe, captured significant international attention. While the majority of media coverage centred on identifying the perpetrators responsible for the attack, little emphasis was placed on recognizing the inherent susceptibility of these offshore energy sources to intentional acts of aggression or other forms of potentially destructive harm.

Figure 2 – Nord Stream Gas attack locations

. Considering the substantial advancements witnessed in unmanned maritime vehicles over recent years, showcasing their diverse capabilities in various missions, it is essential for the offshore energy industry to contemplate the adoption of these platforms as a means to fortify security measures..

With the growing global reliance on offshore energy sources, there exists a significant disparity between the increasing dependence on these multibillion-dollar platforms and the corresponding investment in protective measures. Evidently, the existing methods employed for inspecting offshore energy resources, such as oil rigs and offshore wind farms, demonstrate inefficacy.

MARITIME UNMANNED SYSTEMS FOR GREEN ENERGY MONITORING

The offshore wind farm sector has experienced remarkable expansion, and projections indicate a substantial increase in the number of wind farms situated in coastal waters, suggesting exponential growth within this industry. Numerous offshore wind farms are already operational, and many more are in the pipeline for future development. In contrast to the reliance on traditional offshore energy protection systems, the current proliferation and utilization of unmanned surface vehicles (USVs) present an intriguing proposition. These USVs are being employed both in military and civilian contexts and as operators gain access to these assets, novel and inventive approaches are emerging to undertake tasks previously carried out by manned systems. Among the most notable applications is the protection of offshore energy sources.

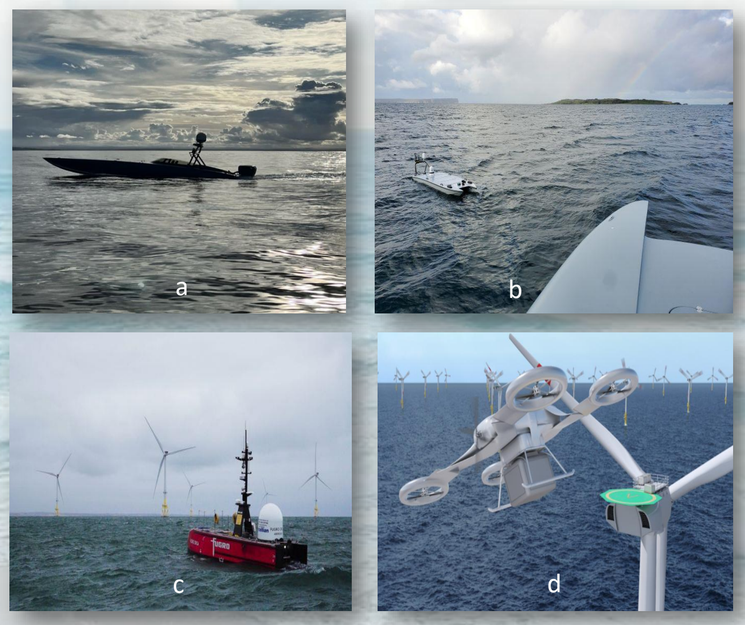

Figure 3 – MUS used for green energy monitoring, a- Martac USV, b- Devil Ray USV, c- FUGRO USV, d- UAV for blade monitoring

The off-the-shelf technology discussed herein presents an immediate opportunity to expedite and enhance the thoroughness of inspections conducted on offshore wind farms, oil and gas platforms, as well as the associated subsea pipelines. Moreover, its implementation has the potential to reduce reliance on human divers. In this regard, three key missions in which stakeholders overseeing oil rigs, pipelines, or offshore wind farms could leverage this unmanned surface vehicle (USV) technology encompass multiple sensors.

REPMUS EXERCISE SERIES

The NATO MGEOMETOC COE in the REPMUS exercise series conducts an analysis of the current state of MUS and their operational availability in military and industry communities of Allied Nations, with a specific focus on their applicability in ENVIRONMENTAL MONITORING operations.

Additionally, the COE investigates ongoing research and development initiatives, as well as exercise opportunities, aimed at collaborating with industry and academia to create concept demonstrators that showcase the potential future environmental monitoring capabilities of different Nations.

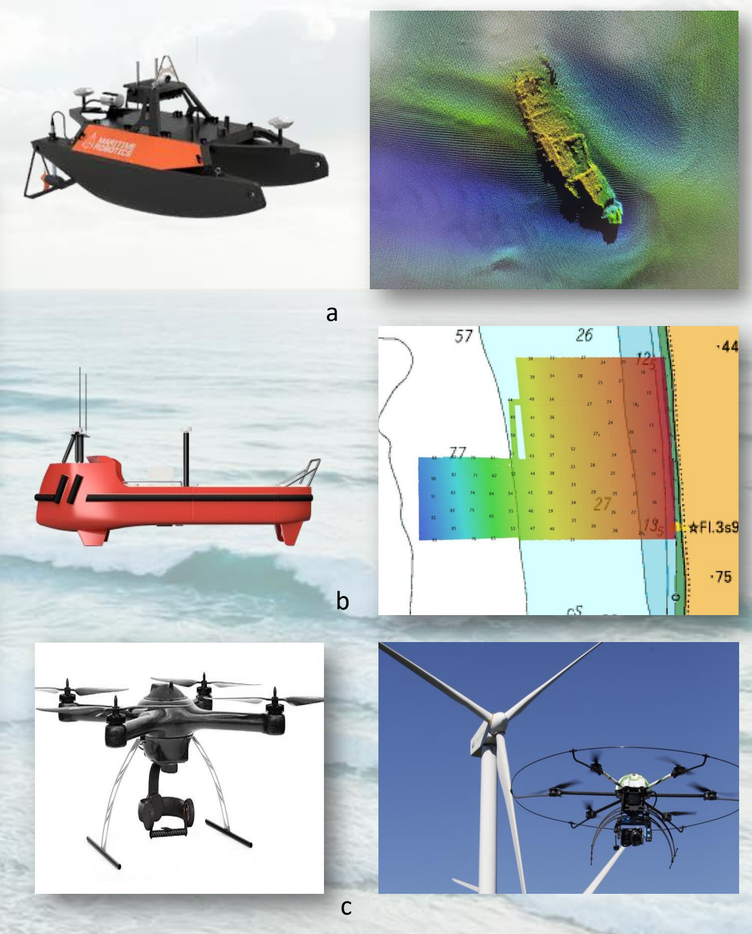

Figure 4 – (a) OTTER USV and an identified wreck
(b) USS Accession USV and a bathymetric surface
(c) UX Spyro UAV for wind blade monitoring

The unmanned technology, which holds promise in aiding the oil and gas and offshore wind farm industries, is already being deployed for inspecting crucial infrastructure, including harbours, ports, inland waterways, dams, levees, canals, bridges, and other infrastructure elements that present challenges for safe and efficient human inspection.

Conclusions

Energy companies have made significant investments in offshore oil and gas rigs and offshore wind farms, and this trend is expected to persist. Therefore, it becomes imperative for these companies to safeguard these investments against potential failures, acts of sabotage, or other hazards. However, the existing methods used to inspect these assets suffer from drawbacks such as sluggishness, high expenses, and inherent dangers. To overcome these challenges and ensure the secure and efficient delivery of energy globally, the utilization of commercially available off-the-shelf (COTS) maritime unmanned systems(MUS) can prove advantageous.

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