Options for Dissuading Magnificent Frigate Birds from Resting and Nesting on Offshore Platforms

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Abstract

Magnificent frigate birds nesting and resting on unmanned offshore platforms pose significant operational challenges. This project aims to develop harmless and ethically acceptable deterrent solutions to mitigate the risks these protected species pose to offshore operations while ensuring their well-being. A comprehensive literature review was conducted to identify and evaluate existing non-harmful bird deterrent methods suitable for the offshore environment and magnificent frigate bird behavior. The most promising techniques were evaluated based on effectiveness, feasibility, safety, and environmental sustainability criteria. The study found that laser and audio deterrent systems show the most potential for adaptation to offshore platforms. Future work will focus on integrating these methods with platform CCTV systems for real-time tracking and response.

1. Introduction

Magnificent frigate birds nesting and resting on offshore platforms pose significant operational challenges for Woodside Energy. These large seabirds, with wingspans ranging from 217 to 244 cm and weights between 1 and 1.9 kg (Diamond & Schreiber, 2002), increase the risk of bird strikes on aircraft, prevent helicopters from landing safely, and force pilots to take evasive manoeuvres during flight operations. Such disruptions compromise human safety, lead to considerable losses in operational productivity, and escalate costs for platform operators. Certain offshore platforms have seen frigate bird-related incidents, with 11 recorded in 2021, 13 in 2022, and 9 in 2023 across the entire industry (A. Watt, personal communication, March 19, 2024). Conventional deterrent methods, such as ultrasonic deterrents, have proven ineffective as the birds quickly adapt to these techniques.

The project aims to address these challenges by developing harmless and ethically acceptable deterrent solutions that ensure the well-being of these protected species while mitigating the risks they pose to offshore operations. This aligns with Woodside Energy's commitment to environmental sustainability and regulatory compliance.

2. Process

The project is following a staged process to identify, evaluate, adapt, and consolidate the most promising deterrent solution(s):

1. Conduct a comprehensive literature review of existing non-harmful bird deterrence methods and their suitability for the offshore environment and magnificent frigate bird behavior.
2. Evaluate and select the most promising technique(s) based on effectiveness, feasibility, safety, and environmental sustainability criteria.
3. Adapt the selected technique(s) for integration with platform CCTV systems for real-time tracking and response, if applicable.
4. Develop the final tailored deterrent solution(s) and an implementation plan for deployment on client platforms.

3. Results and Discussion

3.1 Bird Behavior Analysis

Figure 1 Typical example of bird roosting, clustered to the edges of helidecks that overlook the ocean.

Based on CCTV videos, it has been determined that the majority of magnificent frigate birds observed on the platforms are female. The identification is supported by the distinct white marking on their chests. According to Diamond & Schreiber (2002), male frigatebirds have a red sac, while females have a white one. Males are observed on the helidecks, but initial qualitative analysis appears to indicate that less than 1 in 10 of the birds on the helidecks is male.

Notably, as shown in Figure 1, these frigate birds are predominantly found perching on the edges of the helideck, specifically on the side overlooking the seawater. No nesting behavior has been observed to date (A. Watt, personal communication, March 19, 2024).

3.2 Deterrent Method Analysis

3.2.1 Laser

Laser Deterrent Systems have shown high effectiveness in deterring birds, particularly green beam-emitting lasers with a wavelength of 532nm (Genc Oztoprak & Solentas, 2023). These systems offer advantages such as low power requirements, long-range capabilities, and precise control. Genc Oztoprak and Solentas (2023) report the effectiveness of continuous, automatic,

green beam-emitting lasers at military and civilian airports in France. And similar systems have been employed in some offshore oil and gas sites (W. Schifferle, personal communication, June 27, 2024). This suggests their potential applicability to a wider range of offshore platforms.

3.2.2 Drone

Drone Deterrent Systems have demonstrated effectiveness for immediate bird dispersal, although their impact on long-term site fidelity remains uncertain. The shape of the drone and its approach tactics significantly influence its effectiveness. Pfeiffer et al. (2021) found that vultures responded differently to fixed-wing and multirotor platforms, with targeted approaches perceived as riskier. However, offshore environments pose additional challenges for drone operations due to higher wind speeds and different wind characteristics, as noted by Türk and Emeis (2010). This necessitates further research to adapt drone technology for effective use in offshore conditions.

3.2.3 Alternative Platform

Alternative Platforms offer a potential solution by intercepting birds before they reach operating platforms. These structures could be designed to be more attractive to birds by incorporating fish-attracting features and providing 360-degree water exposure. Meyer-Gutbrod et al. (2020) highlighted that offshore platforms serve as critical nursery habitats for juvenile rockfishes, supporting diverse fish assemblages. By leveraging this understanding, alternative platforms could be optimized to attract both fish and birds. However, this method likely entails higher costs compared to other deterrence methods and requires careful consideration of design, construction, and maintenance expenses.

3.2.4 Audio

Audio deterrents, including predator sounds and ultrasonic devices, have shown limited effectiveness for magnificent frigate birds. This is primarily due to the species' lack of natural predators and the limited range of frequencies audible to birds. Beason (2004) noted that birds cannot hear ultrasound and are less sensitive to the range of frequencies they can hear compared to humans. The effectiveness of audio deterrents could potentially be improved by integrating them with other control techniques, but this approach may face ethical concerns if it involves causing harm or distress to the birds.

3.2.5 Gas Cannon

Gas Cannons produce loud, explosive noises to startle birds and prompt them to take flight. Hutchinson (2001) found that gas cannons successfully decreased bird movements and altered flight patterns at Sydney Airport. However, Bishop et al. (2003) noted that their efficacy can diminish over time as birds become habituated to the noise. To maintain effectiveness, it's recommended to periodically relocate the cannons or integrate their use with other deterrent methods. While initially effective, the long-term applicability of gas cannons in an offshore environment may be limited due to habituation and potential operational challenges.

3.2.6 Water Sprays

Water Sprays could be particularly effective for magnificent frigate birds due to their non-waterproof feathers. Diamond & Schreiber (2002) highlighted that these birds rarely land on

water or swim, making them potentially vulnerable to water-based deterrents. Automated water spray systems triggered by motion sensors could create an uncomfortable environment for roosting without causing harm to the birds. This method offers a humane and non-lethal approach to bird deterrence, aligning well with environmental and ethical considerations. However, its effectiveness in various weather conditions and its impact on platform operations would need to be carefully evaluated.

3.2.7 Unmanned Ground Vehicles (UGVs)

Unmanned Ground Vehicles (UGVs) present a novel approach to bird deterrence on offshore platforms. While there is limited academic literature specifically addressing their use for bird control, commercial products have emerged in this space. These robots can serve as mobile platforms for various deterrent systems such as lasers, audio devices, or water sprays. Their ability to operate autonomously on the confined space of a helideck offers advantages over aerial drones in challenging offshore conditions. However, the effectiveness of UGVs in deterring magnificent frigate birds would need to be empirically tested, as their impact may vary depending on the specific deterrent systems they carry and the birds' responses to ground-based movement.

3.2.8 Lighting System

Lighting Systems aim to make platforms less attractive for bird hunting by obscuring fish visibility or creating visual disturbances on the water surface. This system can direct lights towards the sea surface, creating a sparkling effect that makes it difficult for birds to spot fish. However, this method has limitations, as the reflective effect is only observable from specific angles. Additionally, such a lighting system would require significant power to maintain the necessary brightness and could contribute to light pollution. There is no existing literature specifically addressing the use of visual obscuring techniques for bird deterrence, particularly in offshore environments.

3.2.9 Ultraviolet (UV) Lighting

UV Lighting Systems exploit avian UV sensitivity to deter birds from offshore platforms. Bennett and Cuthill (1994) proposed that birds use UV wavelengths for prey detection, while Håstad et al. (2005) found that many fish species display UV markings visible to avian predators. These systems aim to manipulate underwater visibility or create visual disturbances at the sea surface, potentially disrupting frigatebirds' ability to detect and capture prey. By scattering UV light underwater or directing it at the sea surface, this non-invasive method could reduce the platforms' attractiveness as feeding sites.

3.3 Evaluation of Current Bird Deterrent Methods

To assess the bird deterrent methods outlined, a review is conducted by using the structured evaluation method encompassing effectiveness, Health, Safety, and Environmental (HSE) compliance and ethical acceptability, operational feasibility, scalability, adaptability, and cost considerations. The result of evaluation is recorded in the Table 1. According to Seamans and Gosser (2016), no single technique can resolve all bird conflicts effectively. The best results are typically achieved through an integrated approach that combines multiple techniques, each enhancing the other.

Rank	Method	Effectiveness	HSE	Operational Feasibility	Scalability & Adaptability	Estimated Capex cost per unit
1	Laser	High (used in military airports)	Moderate (minimal ecological impact; could cause eye injury)	High (easy to integrate and maintain)	High (adaptable to different settings)	A$31,050 (include installation and training)
2	Audio	High	High (minimal physical impact)	High (easy to deploy and update)	Moderate (effectiveness may diminish without updates)	~A$9,000
3	Water Sprays	High (no direct research)	High (minimal ecological impact)	High (easy to integrate and maintain)	High (adaptable to different settings)	A$139.9
4	Unmanned Ground Vehicles (Robots)	High (with laser system, audio system, or water spray/jet)	Moderate (potential wildlife stress)	High (requires initial setup and programming)	High (adaptable to various settings)	N/A
5	Gas Cannon	High (tested in an airport)	Low (noise pollution, ignition risk)	High (easy to use)	Low (effectiveness decreases without relocation)	A$690
6	Drone	High	Moderate (potential wildlife stress)	Low (requires skilled operation)	Moderate (less effective in adverse weather)	$12,999
7	UV lighting	Unknown (no direct research)	High	Moderate	High (adaptable to various settings)	A$109
8	Lighting System	Unknown (no direct research)	Moderate (potential for light pollution)	Moderate	High (adaptable to various settings)	A$1,049
9	Alternative Platform	Unknown (no direct research, may attract more birds)	Very High (enhances the environment)	Low (significant engineering required)	High (customizable to environment)	N/A

Table 1 Rank of current deterrent methods.

4. Conclusions and Future Work

The comprehensive literature review and evaluation process have identified laser and audio deterrent systems as the most promising options for addressing the challenges posed by magnificent frigate birds on offshore platforms. These methods demonstrate high effectiveness, favorable HSE compliance, and operational feasibility, making them prime candidates for further investigation and adaptation to the specific offshore context and bird behavior observed.

Future work could involve integrating these methods with platform CCTV systems for real-time tracking and response, as well as long-term monitoring of the solution's effectiveness. This would include assessing changes in bird behavior over time, exploring the potential for combining multiple deterrent techniques to enhance performance, and investigating techniques with unknown effectiveness.

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