Good practice guidelines for safe helicopter operations in support of the global offshore wind industry

Section A

G+ Global Offshore Wind
Health & Safety
Organisation

In partnership with energy institute

GOOD PRACTICE GUIDELINES FOR SAFE HELICOPTER OPERATIONS IN SUPPORT OF THE GLOBAL OFFSHORE WIND INDUSTRY

Section A

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This publication has been produced as a result of work carried out within the Technical Team of the EI, funded by the EI's Technical Partners. The EI's Technical Work Programme provides industry with cost-effective, value-adding knowledge on key current and future issues affecting those operating in the energy sector, both in the UK and internationally.

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Ørsted
EDF
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However, it should be noted that the above organisations have not all been directly involved in the development of this publication, nor do they necessarily endorse its content.

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FOREWORD

In these guidelines, G+ recommendations for what an offshore wind company (OWC) needs to do (as distinct from information provided to help OWCs understand the issues and options) are highlighted in **bold**.

To ensure that the guidelines remain up-to-date and relevant, G+ welcomes any feedback. This should be sent to gplus@energyinst.org.

VERBAL FORMS

May indicates an action whose suitability depends on circumstances. It is also used to describe different possible cases that need to be considered – for example in 'technicians may be taken out to the wind farm by one helicopter operator and returned by another'.

Must/shall. G+ does not claim legal authority to mandate requirements, so terms such as 'must' and 'shall' are not used, except when citing legal requirements or standards mandated by law.

Should. Consistent with other G+ Guidelines, this document uses 'should' as the default term for presenting good practices. This allows for flexibility in the means of achieving the safety aims but does not mean that the practice is merely optional. Rather, G+ expects its members to either:

- follow the guidelines, or
- do something else at least equally safe, or
- risk assess, justify and document the acceptance of any exemption.

G+ recommends other OWCs to do the same.

G+ expects its members to refer to these guidelines as mandatory in situations where they have that ability to do so: for example, when placing a contract with a service provider. Alternatives agreed between contracting parties should be justified and documented.

ACKNOWLEDGEMENTS

G+ acknowledges the time, effort, experience and expertise of all who contributed to this document.

G+ member companies formed a Working Group to steer the development of these guidelines, providing oversight as well as contributing to the content. At the time of publication, G+ members and associates are as follows:

Members:

- EDF
- Ocean Winds
- Equinor
- Iberdrola
- RWE
- Ørsted
- Siemens Gamesa Renewable Energy
- SSE Renewables
- Vattenfall

Associate members:

- CIP
- ESB
- GE
- Macquarie
- Maple Power
- Mitsubishi Vestas
- Shell
- Transmission Investment
- Van Oord

A draft of the guidelines was made available to the wider G+ membership and other interested parties for a consultation period in Sep–Oct 2020. EI and G+ gratefully acknowledge the contribution of the following additional organisations in providing comments:

- Aerossurance
- Bristow
- Flight Safety Foundation – BARS Program
- Helicopter Association International
- Helideck Certification Agency
- HM Coastguard (UK)
- HSAC
- M Prior Consulting Ltd
- UK Civil Aviation Authority
- UK Health and Safety Executive
- WIKING Helikopter Service GmbH

The work to develop these guidelines, facilitating the gathering of information, collating, analysing it and presenting it, was managed by the EI and carried out by Orano Projects Ltd and Extensity Consulting Ltd.

Particular thanks are due to companies who, in addition to their role on the WG, contributed specific material. The Strategic Overview (Part A) is based on text developed by Vattenfall. SGRE provided the link into the development of the HeliOffshore Recommended Practices, which form a sister document to these guidelines. Ørsted, SGRE and others provided example materials. RenewableUK provided the ORAG documentation.

Project coordination and final editing and presentation was undertaken by the EI.

Photo credit: thanks to Vattenfall for the cover image

SUMMARY

THE NEED FOR GUIDELINES

Helicopter applications in the offshore wind industry include site surveys, transfer of personnel and cargo to helidecks or hoist platforms, monitoring and inspection, maintenance support, medical evacuation and search and rescue (SAR). Their higher speed and ability to operate in different environmental conditions make them complementary to vessels.

The harmonisation and sharing of experience and good practice that these guidelines aim to promote should lead to health and safety benefits, and also to cost savings from improvements in interoperability and efficiency.

Wind industry users of helicopter services cannot 'contract out' their overall responsibility for the safety of their employees and others who may be affected by their activities, and so need to assure themselves of the safety of any helicopter services they procure. This will require a sound understanding of constraints on helicopter operation, hazards and risk control measures. These guidelines aim to provide or signpost such understanding.

OBJECTIVES

The overall purpose of these guidelines is to support continuous improvement in managing health and safety risks to and from helicopter operations, enabling safe development of the global offshore wind industry. They aim to help the industry integrate helicopter operations safely into projects, taking an approach appropriate and proportionate to the operational context and its risk profile.

AUDIENCE

These guidelines are most relevant to:

- Organisations with a responsibility for the overall safety of the offshore wind energy project that use, or are considering using, helicopters to support the project. These can include the client/customer, developer or lead contractor, owner or operator, or their agents.

They are also relevant to:

- Other supply chain organisations that contract helicopter services, such as maintenance providers.
- Organisations that are not the helicopter contract owner, but nevertheless have their employees transported by helicopter.
- Organisations that do not intend to use helicopters in their normal activities, but who may require helicopter assistance in emergencies or to meet a 'one-off' requirement, and so need to facilitate this through appropriate planning, design and operation.

All of these are referred to as offshore wind companies (OWCs) in these guidelines. The relevance of any particular guideline to a specific OWC will depend on their role and responsibilities on the project.

Attention is drawn to the HeliOffshore Windfarm Recommended Practices (the WinReP)[1]. The WinReP is a 'sister document' to these guidelines. The key differences in audience, purpose and scope are outlined as follows.

Document	Primary audience	Summary purpose and scope
G+ Guidelines (this document)	OWCs using helicopter services	To help OWCs integrate helicopter operations safely into their projects
HeliOffshore WinReP	Helicopter operators providing services to OWCs and OWCs using helicopter services	Identifies recommended practices to enable helicopter operations in support of offshore wind farms in a way that provides a safety benefit

The two documents have been developed over a similar timeframe and G+ has liaised with HeliOffshore throughout to ensure that they are complementary.

SCOPE

The guidelines focus on topics specific to helicopter operations in offshore wind, rather than generic good safety management practices. The guidelines cover all stages in the life cycle of an offshore wind farm

The geographical scope is world-wide. OWCs are reminded that, given the regional and national variations in aviation regulation, they have a responsibility to ensure they are, as a minimum, compliant with the relevant regulatory approach

The guidelines do not cover:
– WTG design standards
– interactions between the wind industry and aviation in general, such as radar interference, or WTGs as physical obstacles, except to the extent that such interactions may affect helicopter operations supporting the wind farm themselves.

CONTENT

Part A of the document is a Strategic Overview. It presents, in a non-technical, narrative form, a summary of experience and learning to date, as a foundation for good practice in the future.

Part B contains the more detailed, formal guidelines, covering (section numbers in brackets):
– health and safety responsibilities of OWCs (3);
– understanding and defining the system and its hazards (4);
– planning and design (5);
– contracting helicopter services (6);
– normal operations (7);
– later life cycle stages, such as repowering and change of ownership (8);
– abnormal conditions and emergencies (9, 10);
– continuous improvement (11).

The Annexes provide additional detail and example materials.

1 HeliOffshore. Wind Farm Recommended Practices (WinReP) (in development)

USING THE GUIDELINES

OWCs can adopt and implement these guidelines in one or more of the following ways:
- incorporation into company standards;
- incorporation into contract specifications, and
- use as prompts in audits and reviews.

In whatever way the guidelines are used, it is important to integrate the approach to helicopter safety into the OWC's overall health and safety management system.

While the overall aim is to promote harmonisation and share good practice, it has not been possible (nor is it necessarily desirable) to develop prescriptive guidelines on all topics. Differences in national regulations and project-specific factors mean that each situation must be considered on its own merits.

Where examples are given, they are not intended as ready-made models or templates that can be copied or filled in without thorough consideration. Rather, they provide structures, tools, prompts and signposts to help OWCs identify and manage risk effectively.

G+ encourages OWC management to delegate competent personnel to consider the guidelines in more detail, and use them as appropriate to develop approaches, systems and tools suitable to the OWC's organisation, its project(s) and their operational context.

As helicopter operations involve complex and specialist topics, a key consideration for management will be ensuring that the organisation has access to competent aviation expertise.

PART A: STRATEGIC OVERVIEW

OBJECTIVES

Historically, the wind and aviation industries and their regulators have used experience gained from oil and gas, marine pilot transfer and search and rescue to develop safety management approaches for the offshore wind context. This Part A of the guidelines aims to provide a non-technical summary of this journey, the learning from experience and good practice for the future.

BACKGROUND

The need for helicopter support, and how to enable it, require consideration in the planning, design and operation stages of offshore wind farms.

When first introduced, helicopter operations were very much an afterthought, requiring wind turbine generator (WTG) manufacturers to add helicopter hoist operations (HHO) platforms to existing designs as a 'bolt-on', sometimes when already positioned offshore. The choice of helicopters was limited, with aircraft manufacturers sceptical of their use in a niche market.

Most new offshore WTGs now have helicopter transfer as part of their core design and aircraft manufacturers are producing helicopter variants optimised for the renewable energy sector.

USING HELICOPTERS – WHY AND HOW?

Helicopters have a broad utility in routine operations and in abnormal events and emergencies. Primarily, they have speed, agility and operate in their own weather window which can be seen as complementary to that of vessels. A severe sea state can stop non-SAR flight; however, as there is a requirement for the helicopter to remain upright following a controlled ditching, there are limits on the ability to use rescue equipment, such as Dacon scoops, safely in heavy seas.

OWCs' needs for aviation may usefully be separated into two distinct categories: logistic support and emergency response. Both should be considered when developing a strategy for the use of aviation and in the planning and design of wind farms. The use of aviation should be factored into all activities, even if only for emergency response.

Over the last decade, helicopters have been used in several different offshore roles, both for routine support and in emergencies, outlined as follows.

Routine support

Logistic requirements will vary throughout the life of the wind farm, from initial surveys, through construction and commissioning to operations, including for inspection and maintenance. During the operational phase, the most frequent use of helicopters is likely to be the transfer of maintenance technicians and their equipment to and from the wind farm. The key routine applications can be grouped as follows:

Air transportation – the movement of personnel and equipment between sites, installations and vessels, with helicopters landing offshore on a certified helideck. These helidecks may be on, for example, offshore support platforms (OSP), offshore substations (OSS) and other structures, or on service operations vessels (SOVs). Such aircraft are not normally fitted with a hoist. They carry first aid kits, but do not have either the specialist medical equipment or paramedic personnel that would be expected on an SAR or air ambulance helicopter.

Helicopter hoist operations (HHO) – the transfer of trained personnel and small equipment using a hoist fitted to the side of the aircraft, operated by trained technical crew members (helicopter hoist operators) in the cabin. Hoists are typically limited to the weight of two fully equipped individuals (around 600 lbs/272 kg) in a single lift. However, in practice, the weight and size of the object that can be handled within the helicopter or on the WTG is often the limiting factor. In addition, the loads must not exceed loading limits on the helicopter or landing platform.

Helicopter external sling load operations (HESLO) (also known as underslung loads) – heavier loads can be carried under helicopters in special containers or approved bags or nets. This has enabled relatively large objects to be delivered, especially where the normal means of lifting loads is unavailable through unserviceability or maintenance. Helicopters used for crew transfer or hoist operations can typically carry underslung loads of over 1 000 kg. For larger or heavier loads, a specialist helicopter may be required.

Surveys, reconnaissance and inspections – light helicopters (and unmanned aerial vehicles (UAVs)) have been used for monitoring, inspection, surveillance, photography and film. Information may be processed on board, transmitted to a surface operator or saved for later analysis. The ability of a helicopter to relocate quickly between structures can enable multiple inspections to be completed during one wind farm visit. Inspections may also be undertaken whilst waiting for other tasking. Survey work (e.g. geomagnetic or bird surveys) may also be carried out using specialist fixed wing aircraft and it will be important to ensure that helicopters and fixed wing aircraft do not conflict.

Emergency response

Medical transfer services (also sometimes referred to as air ambulance, medical evacuation or medevac). Ill or injured personnel have regularly been flown from offshore to onshore medical facilities. If the affected person is mobile and able to wear normal offshore personal protective equipment (PPE), and if the transit is from a recognised transfer site (a structure or vessel equipped with a helideck or hoist area) routine logistics support helicopters can be used.

Should the casualty be immobile or require medical assistance during transit, specialist ***helicopter emergency medical service*** (HEMS) or SAR helicopters are typically used. These crews are trained and equipped to deal with immobile/stretcher casualties and to assist in offshore emergencies.

Search and rescue (SAR) helicopters are able to operate away from designated and approved areas, including rescues from life rafts or the sea surface. Although the airframes used may be similar to those for routine support, their specialist equipment fit and enhanced crew competence enable them to undertake more demanding roles, in worse environmental conditions and in darkness.

Clinical or humanitarian needs – medical severity and urgency, whether the casualty is mobile, what care they may need during the flight etc. – are the overriding criteria in deciding how to carry out a transfer. For example, transit may be allowed without the normal offshore passenger's PPE, where time is critical and life is at risk, or if the casualty is unable to wear it due to injury or incapacitation.

For such cases, the applicable legislation, medical advice, the operator's policies and what is within the scope of the captain's discretion will all need to be taken into account.

It is important to be aware that terms such as medical transfer, air ambulance, medical evacuation/ medevac, HEMS and SAR are not used consistently worldwide. There are variations in the definitions of what each covers, and in the regulatory approvals and certifications that each requires.

Experience shows that taking even a minor case by air may allow normal operations to continue more quickly, such that helicopter transfer may also be justified on operational grounds.

SOME BASICS

The following are answers to some oft-repeated basic questions:

Helicopters use more power to hover than to take-off or land.

The more you wish to carry, the bigger the helicopter required, in terms of rotor size. The bigger the main rotor, the longer the helicopter fuselage to support the tail rotor (which is required to stop the helicopter spinning). The mass of the helicopter will increase accordingly. Helicopter physical dimensions and mass are important considerations when deciding on the structures (such as WTGs and helidecks) from which you wish to operate.

Helicopter operations require constant observance of fuel usage, with sufficient fuel to reach a fuelling point and reserves to cope with bad weather and diversions. Wind farm infrastructure that provides extra refuelling options will minimise transits to and from shore.

For hoisting people under a helicopter, extra safety features are required: principally a safe one engine inoperative capability. This means that, should an engine fail, the other engine will increase its output to provide sufficient power.

Whether hoisting or landing/taking off from a helideck, the helicopter has to be able to fly a single-engine departure, on a safe heading to maintain lateral separation, until adequate height above wind farm structures is reached. As WTGs increase in size, this safe height increases and takes longer to attain.

RISK

OWCs considering the use of helicopters should not underestimate the need for careful safety management and continued vigilance to keep helicopter operations safe in the hostile offshore environment. The offshore oil and gas sector has suffered a number of major accidents, and uncontrolled helicopter accidents are one of the few potential events within the wind industry that can cause multiple casualties in a single event with limited scope for recovery. That said, helicopters offer complementary safety and operational benefits to vessels, as part of an integrated logistics solution. International and national aviation regulations have been developed to control the risk, primarily driven by the experience of the oil and gas industry. However, the development of regulations may lag behind advances in technology and practice, and cannot cover all situations, so compliance alone does not guarantee safety. In addition, therefore, offshore air operators work closely together to develop good practice and produce guidance which they agree to follow.

Helicopter reliability has improved dramatically since they were first used in oil and gas. Major technical malfunctions are, fortunately, now very rare. Weather can limit operations and some weather conditions, such as freezing fog, lightning, icing or very high wind will stop flight.

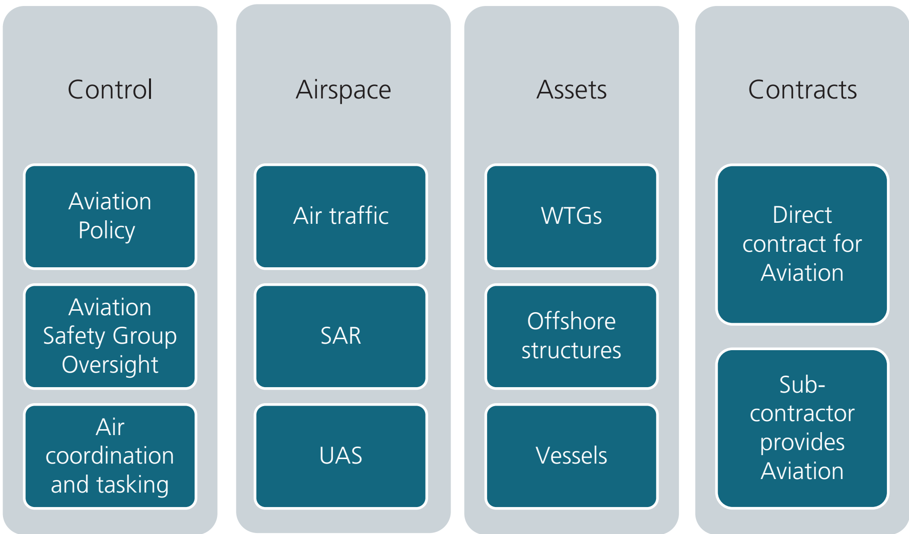
However well-equipped the helicopter, it still has to be flown by a pilot and operated by a crew. Loss of situational awareness arising from poor weather or night flying have been factors in past offshore aircraft accidents. The combined capability and competence of the crew can make the difference between success and failure. Minimum levels of crewing (e.g. single or twin pilot) and of crew experience, training and competence checking are therefore applied to help ensure that capability and competence are appropriate to the demands of the various roles.

PILLARS FOR SAFE OPERATION

Wind farm aviation cannot operate in isolation. It has to work with other airspace users, there are critical interdependencies, and enablers are required from the wind farm. Most of these enablers need to be designed in from the outset of the project.

It may help to look at these interdependencies and enablers as four pillars that must be developed together:

- Pillar 1: the control measures within the OWC's own organisation.
- Pillar 2: the relationship with other airspace users.
- Pilar 3: the provision and configuration of assets that enable aviation
- Pillar 4: the selection and management of air assets and services through contractual methods.



PILLAR 1: CONTROL

Aviation impinges on nearly all aspects of wind farm development and operations, crossing many disciplines but requiring a coordinated approach to ensure safe and cost-effective operations. In reality, OWCs who are not helicopter operators themselves have limited controls available to them to ensure safety. The following have been used and are offered as examples of good practice.

Aviation policy

The risk tolerance of the organisation should be clearly stated within an Aviation Policy. This could be in terms of, for example, overall health and safety aims such as zero harm, or reducing risk to as low as reasonably practicable (ALARP), together with more specific criteria – such as a hierarchy of aviation activities: those that will be routinely carried out, those that can only be carried out under specific conditions and those that are considered too high risk to undertake in any circumstances. Aviation risk tolerance and risk control should be managed consistently across an organisation irrespective of geographical location.

The Aviation Policy should also state how, at a high level, aviation is to be controlled, for example in terms of leadership, governance, risk ownership, clear definitions of accountability and responsibilities, resourcing, training and competence, contractor selection, oversight, monitoring and evaluation and learning from experience.

As helicopters feature in emergency response planning, there should be close alignment between the Aviation Policy and the emergency response philosophy.

Aviation safety group/department – oversight of aviation safety

In order to coordinate and have oversight of all aviation matters, a group or department representing all stakeholders working under an aviation specialist has been effective. This approach facilitates the learning from experience and common approach across all aviation activities which are key aspects of effective risk management.

In addition to the aviation specialist(s), the group / department will typically include (as appropriate to the OWC's role and project lifecycle stage) - engineering, wind farm planning, construction, consenting, logistics, health & safety and operations & maintenance.

OWCs must ensure that their personnel and sub-contractors continue to be protected from harm whilst using or in any way interacting with helicopters. This can only be done by the OWC acting as an intelligent customer, with competent oversight of the helicopter operator and of other aviation services and facilities, such as contracted helidecks, onshore facilities, logistic coordination, handling agents and emergency response.

Oversight includes:

- defining policies, procedures and standards;
- aircraft approval and operator approval, and
- monitoring and evaluation – including reviews, audits, observations and assessments.

Monitoring will typically involve, at a minimum, the recording and evaluation of incident reports, including instances of unserviceability or delays, together with base data such flight times and passenger movements. Ideally, competence to undertake monitoring should be developed within the OWC, although experience and resources can be augmented by employing external consultants. The review of aviation documentation, audits, 'hands-on' observations and assessments are tasks for an aviation specialist, complementing any generic quality or health and safety audits etc.

Air coordination and tasking

At a day-to-day working level, the tasking of helicopters must be coordinated with other activities, such as other aircraft, UAV or vessel operations, operating hours of heliports and handling agents. Restrictions may need to be applied on simultaneous operation (SIMOPS).

PILLAR 2: AIRSPACE

First generation wind farms were positioned close to shore, consisting of relatively small WTGs in shallow water that were spaced relatively close together. Generally, wind farm layout followed a grid-based structure with two lines of orientation, providing situational awareness for marine and helicopter traffic. As WTGs have become larger, their spacing has increased, allowing a little more freedom in wind farm layouts. And, as wind farms extend over greater areas, there will be greater variations in geotechnical conditions across the site potentially leading to a greater desire for less geometrically regular WTG layouts.

As the wind farms grow to dominate their marine environment, marine and air routes, for both routine and emergency situations, need to be considered.

Air traffic

Wind farms can present a physical and air turbulence danger to flight, a radar interference hazard to both air traffic control and military air defence surveillance systems, and an additional constraint on offshore routeing systems. Early dialogue between wind and aviation parties, such that these risks can be designed out wherever possible, is important.

SAR provision

States have a responsibility to provide SAR within their respective SAR regions. However, OWCs need to understand that there are limits on what each state will provide, and hence what additional arrangements they may need to put in place or what requirements they must meet. Key limitations relate to speed of response (for far offshore wind farms the travel time from shore may be several hours by vessel, and over an hour even by helicopter) and availability - SAR helicopters provide a service to the whole SAR region and may be allocated to higher priority tasks.

The delineation of SAR regions is based on technical and operational considerations, not only on boundaries between states. OWCs may therefore need to liaise with more than one national SAR provider, even if the wind farm site and the routes to and from it lie entirely within one state's waters. Wind farm layout, design and individual components have to take SAR into consideration, with some states being more prescriptive than others in their requirements. SAR helicopters require the ability to search within the wind farm, manoeuvre to reach a casualty and hoist them to safety, but wind farm structures and layouts can pose hazards to, or limit, SAR operations.

For WTG efficiency, geotechnical and other reasons, developers would like to be able to position WTGs freely. Some regulators, however, prefer a regular grid layout providing clear lines of orientation, as this helps pilots maintain situational awareness and enhances the probability of detecting vessels or personnel in the water.

Proposed layouts can be assessed, and confidence in them developed, by modelling them in the SAR helicopter flight-simulator database and conducting simulated flight trials.

Unmanned aircraft systems (UAS)

The use of UASs is increasing rapidly and they are likely to take on a greater range of roles over the next few years. UAS operation itself is outside the scope of this document.
It is worth noting here, however, that unmanned passenger flights appear as a vision for the UAS industry, and the rate of progress indicates that such transfers may be possible within the lifetime of new wind farms.

UASs interact with helicopter operations and UAS technical development combined with regulator willingness to permit Beyond Visual Line of Sight (BVLOS) operations will see multiple assets sharing the same airspace. At the strategic level, having wind farm UAS operations overseen by the same aviation safety group or department is a good way to reduce the potential for conflict between operations.

Day-to-day, reducing the possibility of a UAV collision with other aircraft (whether wind farm- related or not), or with wind farm structures, requires detailed air control and timely, accurate coordination. Separation between air assets may be achieved by, for example, process (height banding), procedures (time slots) or automated, technical solutions (geofencing).

PILLAR 3: ASSETS

Helidecks have been in common use in oil and gas and to some extent on offshore support vessels and offshore wind structures. Where practical, a helicopter should always land rather than hoist, because safety is enhanced when the time spent hovering is reduced, and because passenger transfers to a helideck are inherently less hazardous than when hoisting. Helideck provision is the norm in the oil and gas sector. Hoisting requires extra safety measures which limit the selection of aircraft to small utility hoist-fitted aircraft with limited load carrying capacity. Where large numbers of passengers need to be transferred, landing on a helideck is safer, quicker and increases the range of helicopter choice, enabling better optimisation to the role.

However, there is an industry recognition that it is difficult at present to place a helideck on a WTG, resulting in the development of HHO platforms.

The specification of helidecks and hoist platforms is decided nationally and so differs between states. Where wind farms are co-located with other offshore energy installations, helidecks have been known to be shared.

WTGs

Purpose designed HHO platforms have become standard on most new WTGs. Although the specification is decided nationally, such that there is some variation in design, a number of common features are required, as outlined here:

- The platform should be positioned clear of the swept volume of the WTG blades, to maintain separation between the helicopter's rotor and the WTG blades should the latter rotate whilst HHOs occur. Note however that SAR helicopters may hover with rotor blades overlapping the swept blade disc in the horizontal plane as long as the blades are stationary and sufficient vertical separation is achieved.
- Other obstructions should be kept clear of the hover area. For example, the fence surrounding the platform should be sufficiently high to protect those on the deck whilst not itself creating an obstacle hazard.

- The greatest danger to those on the WTG during HHOs is from a blade strike. Accordingly, time within this danger area should be minimised. This has led to the division of the platform into an area for the transfer itself, a safe holding area away from danger and a transfer corridor which should only be used quickly for crossing. Colour schemes designating these areas are nationally mandated.
- The deck assembly should allow helicopter downwash to dissipate through the structure.
- Care is needed in the design of surfaces and other platform fittings such as railings, to avoid introducing a snagging hazard to the hoist hook.
- Helicopter hoist platforms may have secondary roles, such as emergency muster areas, and these uses will also need to be factored into the design.
- Visual reference may be augmented by the addition of WTG blade markers. Extra hover markers on the nacelle may be required for cross-cockpit HHOs.
- HHO lights are required to show when the WTG is stopped and ready to hoist and to warn of any movement away from the HHO position.

Key WTG and helicopter operational factors include the following:

- The nacelle should normally be positioned to give the helicopter pilot the best approach, hover and departure positions, with the blades positioned to minimise the danger to the helicopter and give the pilot a visual hover reference. The exact WTG configuration required will be dependent on the pilot and the hoist position on the aircraft.
- Further movement of the WTG should be prohibited either by remote means (SCADA) or by physical locking where possible.
- HHOs to a dead WTG, which cannot be positioned optimally, or to a WTG turning at a very slow idle, may be permitted subject to the operator's procedures and limits, risk assessment, primary approval from the wind farm / air operations controllers and at the captain's discretion.
- Helicopter downwash may interact with WTG wind monitoring systems and so these should be isolated or overridden to prevent induced nacelle yaw.

Helicopters build up static electrical charge in flight. Landing dissipates the charge through the landing gear, but electric shock can occur if the charge passes from the aircraft to the structure through a person, as is possible during hoisting. A good practice solution is to ensure discharge before anyone on the platform touches the hoist wire or load, using a separate line attached to the hoist hook or load to make contact with the platform first.

The initial certification of HHO platforms will be obtained by the WTG original equipment manufacturer (OEM), usually through a letter of compliance with national requirements, issued by the relevant organisation for the state(s) concerned (e.g. the Helideck Certification Agency, HCA, in the UK). Each individual wind farm will then have to convert this to a specific Certificate for the wind farm in question.

Offshore structures

Offshore structures vary in size from HV transformer modules, which can be positioned on a normal WTG foundation, to large HVDC/HVAC stations which are comparable in size to oil and gas production platforms.

As noted above, safety is enhanced by landing rather than hovering to hoist, and landing also has operational advantages, such as the ability to carry higher payloads. However, helidecks take up considerable space and it may not be possible to locate them on smaller installations. Subject of course to safety justification, HHO platforms, of similar design and dimensions to those on WTGs, or appropriately marked hoist landing points, can be provided on these smaller structures.

Where helidecks or hoist areas are provided on smaller, lower structures, it will be important to ensure that obstacle clearance requirements for a single engine fly away from low height are still met.

Offshore helidecks and hoist platforms may be positioned on both attended and normally unattended installations (NUIs). The size and structure will be the same in either case, but requirements for emergency response (firefighting, mainly) will vary. On an NUI, systems require remote activation prior to a helicopter landing and the first person off the helicopter (which should be the Helicopter Landing Officer (HLO)) to take ownership and run the helideck. The reverse is true on departure, with the installation needing to be returned to uninhabited state.

Providing a helideck within the wind farm is a major enabler and risk mitigator for aviation. The advantages include the following:

- Although helicopter malfunctions are rare, technical warnings are more common, leading to a land as-soon-as-practical caution for further investigation. Having a safe landing location offshore reduces transit times under such cautions.
- A helideck enables the provision of a refuel capability. Offshore fuelling is complex and costly, requiring specialised transportation and storage in fixed or moveable containers. Nevertheless, it enables helicopters to operate within the wind farm without having to return to shore purely to refuel. It also allows HHO aircraft to manage their fuel loads to optimise safety and performance.
- An offshore helideck enables HHO helicopters to offload passengers before starting HHOs
- The ability to land and refuel offshore can be beneficial to SAR mission, whether or not related to the wind farm itself. During emergency responses, the industry has seen rescue helicopters land on offshore structures for over an hour, whilst the helicopter doctor and paramedic are treating and moving the casualty to a transfer location. This enables the helicopter to conserve fuel and eliminates the need to return to shore to refuel replenishment, which could delay casualty transfer to hospital. Such support to national SAR can be seen as a very positive contribution to the wider marine community.

In general, aviation regulators - national aviation authorities (NAAs) - will set out top-level requirements for helidecks, for example that netting should be provided. Details of how to satisfy these requirements (e.g. what the netting can be made of, or how it should be tested) are available in international, national and classification society guidance. Offshore helidecks have their own particular issues, with guano on NUIs requiring particular attention.

Should a helideck be chosen for an offshore platform with support to national SAR in mind, then the size should be able to accommodate the largest SAR/HEMS helicopter likely to be used during the life of the project. The requirement can be specified in terms of the maximum aircraft dimension 'D value' and weight ('t-value').

Vessels

While landing on a fixed platform is preferred to landing on a moving deck, especially in the event of an emergency, there is also a role for vessel helidecks, most obviously in transferring crew to the vessel itself.

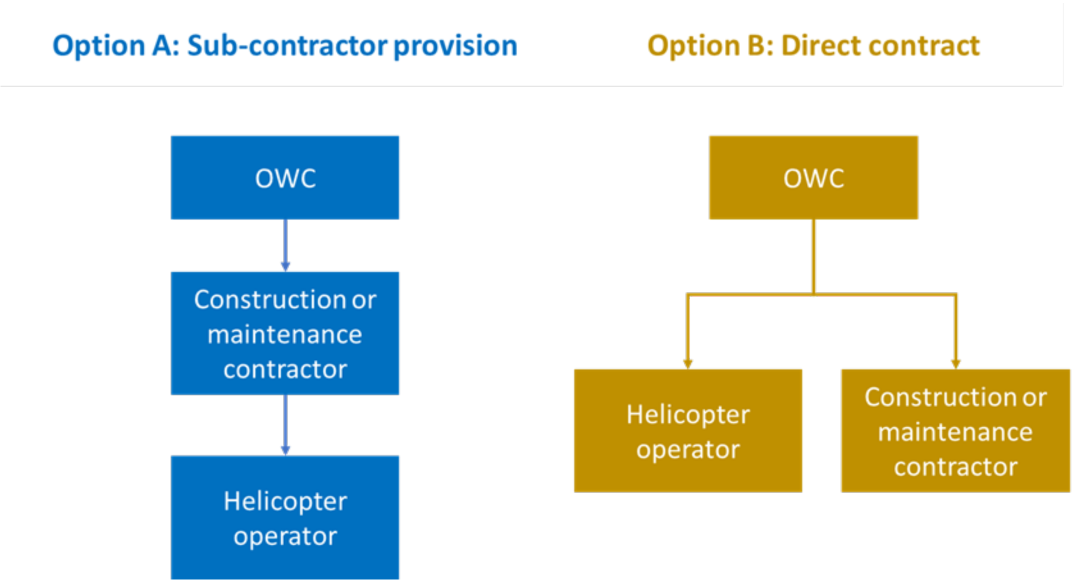
Vessel helidecks and HHO platforms should be designed and operated following similar guidance to that for those on fixed assets. Landing on or hoisting to a vessel introduces extra variables, however. Vessels move as a result of sea state inducing heave, roll, pitch and to some extent yaw. Commercial (as opposed to military) helicopters have relatively restricted vessel movement limits, so sea state will preclude landing on many occasions. The vessel may need to change speed or turn to reduce helideck movements.

A vessel that is under way will produce its own relative wind. Again, the vessel may need to change speed or turn to obtain a more favourable wind for the helicopter, especially if the direction of the helicopter's approach is constrained.

As with fixed installations, landing is preferable to hoisting. However, in both cases the vessel's Master should be fully aware of, and in agreement with, the helicopter pilot's intentions.

PILLAR 4: CONTRACTS

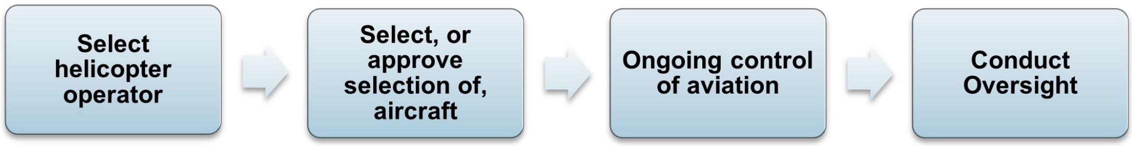
Experience has shown that there are two favoured contractual models for contracting helicopter support during construction and routine operation and maintenance (O&M): sub-contractor provision (Option A) and direct contract (Option B).



Duties and control measures will vary between both options.

In Option A, where the OWC allows the sub-contractor to select and monitor the performance of the helicopter operator, the OWC may elect to participate in sub-contractor audits and only undertake further assessment should concern arise, as shown here:

In Option B, the OWC will have to undertake a full helicopter operator and aircraft selection along the following lines, requiring a knowledgeable in-company aviation team:



On some projects both options have been used, with Option B during construction and Option A during O&M.

In both options, the contract will also need to make clear what infrastructure, services or other support the OWC will make available to the helicopter operator. These could include, for example, providing access to refuelling facilities or maintaining the helideck.

The ongoing control of aviation is often provided by a combined air and marine coordination team, with the air coordination element provided by whichever company contracts the helicopter.

CONCLUSIONS

Experience has shown that the successful use of aviation is derived from early management commitment to implement aviation, a clear understanding of the risks and the measures to control them and a robust aviation policy.

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