Version 2.0

HO-WF-RP-v2.0

Wind Farm Recommended Practice (WinReP)

Recommended Practice for Wind Farm Operations

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HeliOffshore

Safety Through Collaboration

Safety Through Collaboration

Collaboration empowers safety and is at the very heart of HeliOffshore. This Wind Farm Recommended Practice is a great example of how our industry – from designers and maintainers, to pilots and passengers – works together and learns from each other to ensure no lives are lost in offshore flight.

I would like to thank the HeliOffshore Wind Farm Working Group, industry stakeholders and every HeliOffshore member who came together to deliver this guidance. Thank you for your commitment and contribution. Together, we will implement and sustain ever-higher levels of performance so those we are responsible for travel home safely every day.

Tim Rolfe
CEO, HeliOffshore

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Modifications and additions to this document from the previous version have been marked with a solid blue bar next to the new text.

During the peer review process of version 2.0, HeliOffshore has consulted with it’s industry partners, G+ and IOGP.

Disclaimer

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The guidance given in this recommended practice document represents a collective position adopted by the WinReP Working Group. Participation in the group or being named as an author does not imply that an individual or their organization support any particular point.

This document is not intended to replace any contractual negotiations, agreements or requirements between helicopter operators and their customers.

About HeliOffshore

HeliOffshore's mission is to inspire a shared safety conversation and collaborative action, informed by data intelligence and supported by resources, so no lives are lost through offshore aviation.

This document compiles recommended practices drawn from the extensive experience and expertise of regulators, manufacturers and operators. It is designed to inform and improve frontline safety performance.

Delivering HeliOffshore's Wind Farm Recommended Practices (WinReP)

In 2018 with the increasing use of helicopters to support offshore wind farms, it was identified that the global sharing of recommended practice was a safety priority. The wind farm working group was established, comprising representatives from helicopter operators experienced in the field, aircraft manufacturers, energy companies and wind turbine manufacturers. The group, working closely with other industry bodies, identified and prioritised a list of topics to addressed.

This document is not a replacement for regulatory or other guidance material but provides clarification and enhancement that is specific to operations in support of offshore wind farms.

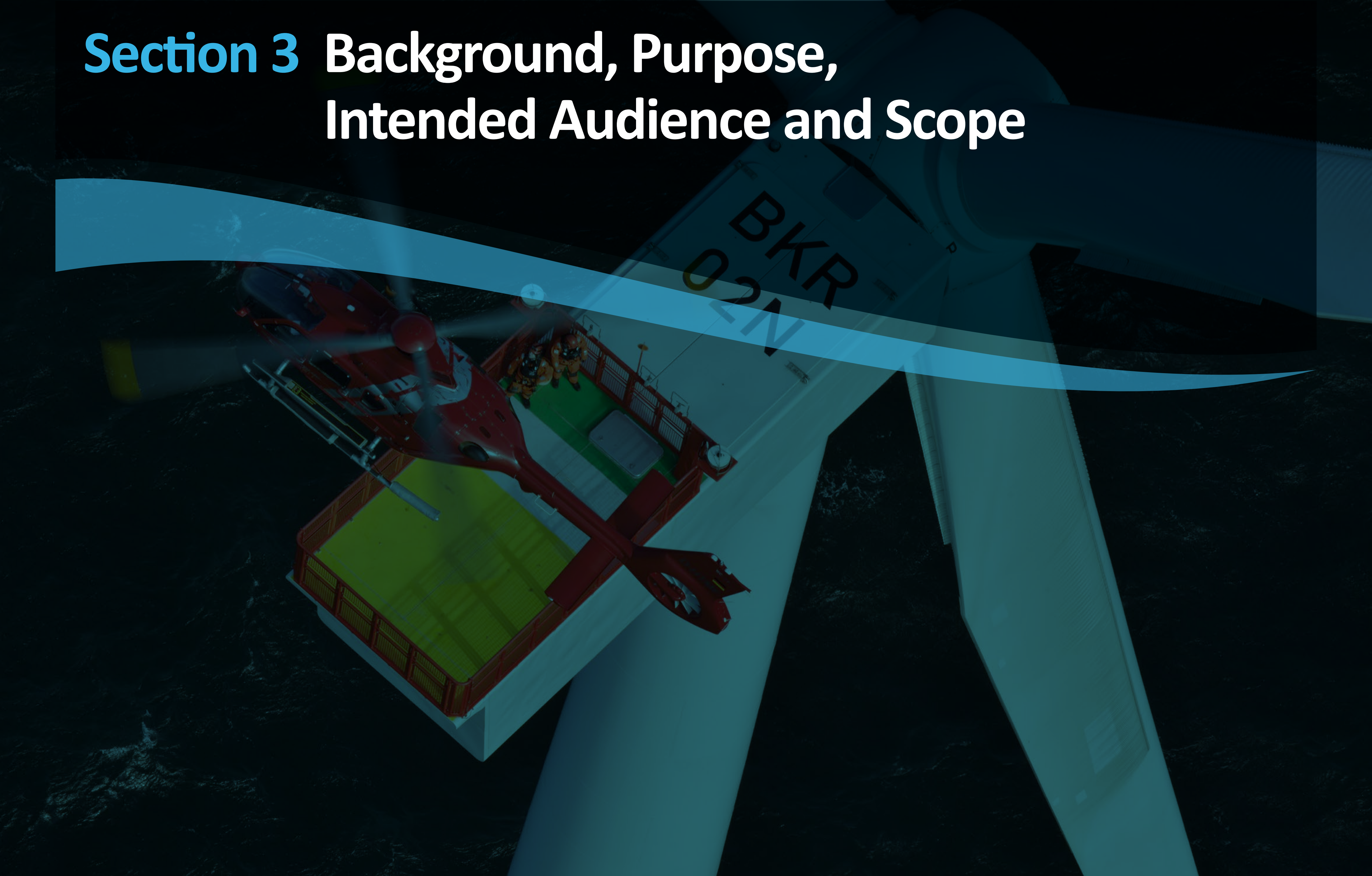
Our work will continue as these recommended practices are expanded to provide guidance on more topics and to reflect developments and learning as this sector of the industry expands.

Thank you, to the dedicated professionals who as members of the working group donated their time and expertise to create the WinReP.

V2.0 builds upon the previous content by adding valuable material that covers Cargo Helicopter Hoist Operations to and from Vessels, Hoist Mission Simulator Training as well as updates to the FDM section. A new chapter has been added to introduce the challenges and associated considerations relating to Helicopter Oil and Gas Transport Flights in Proximity of Windfarms.

Lee Harris
Founder and Chair, Wind Farm Working Group

Section 3 Background, Purpose, Intended Audience and Scope



Section 3
Background, Purpose, Intended Audience and Scope

3.1 Background

Helicopters are capable of operating in extreme offshore environments, operations are, however, still subject to inherent hazards. Helicopter usage in support of offshore wind farms involves a diverse range of tasks including surveys, inspections, cleaning, monitoring, maintenance support, search and rescue, medical support, and the transfer and heli-hoisting of personnel and cargo to and from helidecks.

While aviation is a highly regulated industry, regulation alone does not relieve the user of helicopter services from their responsibility for the safety of their employees. OWCs, employers and customers for aviation services need to ensure that appropriate safety requirements are defined in contracts, suitable safety interfaces between organisations are defined, safety performance data is shared, and safety is subject to routine review[1].

HeliOffshore's Safety Performance Model (Figure 1) provides the language, framework and priorities for the industry's collaboration for safety. The model identifies the areas to focus on in order to achieve the greatest safety benefit. There is considerable benefit in collaboration on safety information sharing. An open dialogue will allow emergent trends to be spotted earlier and allow collective learning and faster, wider implementation of improvements[2].

3.1.1 Purpose

This document identifies recommended practices to enable helicopter operations in support of offshore wind farms in a way that provides a safety benefit.

3.2 Intended Audience

While this document provides guidance to all parties, it is most relevant to:

- Helicopter Operators involved in, or intending to support offshore wind farms.
- OWC's – developers and operating companies (either building, maintaining or operating).

The term offshore wind companies or OWC is used throughout this document and it refers to organisations that:

a) Hold primary responsibility for the overall safety of the offshore wind farm.
b) Contract helicopter services in the support of offshore wind farms.
c) Do not directly contract helicopter services but require their employees to travel by helicopter in connection to their work in offshore wind farms.
d) Specify helicopter transport in their Emergency Response Plan or to provide medical assistance in an offshore wind farm.
e) Do not intend to use helicopters in their normal activities but may require them on an ad-hoc basis or to meet a singular requirement.
f) Helicopter operators involved in support of offshore wind farms who should use this document for their own guidance.

3.3 Scope

This guidance is a compilation of recognised best practices from aircraft operators, industry groups, regulatory agencies, educational organisations and individual experts in this field. It is not intended to replace official or regulatory guidance material, but is a supplementary document to enhance and clarify recommended practices for those developing or supporting wind farm operations.

This guidance should be read in conjunction with HeliOffshore Recommended Practices (relating to HFDM, HUMS and Flight Path Management), IOGP 690/590 and other offshore aviation guidance).

HeliOffshore encourages reference to these recommended practices in contracts for helicopter services in support of offshore wind farms.

This document does not detail the internal processes or structure an OWC will require to effectively engage with helicopter operators, conduct oversight by their aviation departments (see section 10) and integrate helicopters into projects; this guidance can be found in the G+ Good practice guidelines for safe helicopter operations in support of the global offshore wind industry (G+ GPG HeliOps).

The geographical scope of this document covers global helicopters operations, whilst leaning heavily on EASA and European experience.

In regions where there has been considerable experience gained through operating helicopters in an offshore environment, such as the North Sea, regulations and practices are more mature than those in regions where offshore operations are relatively new. This document provides guidance on good practice that builds upon the experience gained by conducting helicopter operations offshore.

Figure 1 – HeliOffshore Safety Performance Model

Accident Events	Accident Prevention Goals					
System Failure	Early Diagnosis of Potential Failures	Enhanced Reliability	Airworthiness Management	Effective Maintenance/ Tool Control	Error Tolerant Designs	Supply Chain
Aircraft Upset	Flightpath Management	Effective Use of Automation	Enhanced Situational Awareness			
Surface/ Obstacle Contact	Enhance Spaces/ Reduce Obstacles	Detect/Avoid Obstacles	Night/IFR Flight Management	RADALT Procedures/Use		
Heliport/ Helideck	Vessel Pitch, Roll Heave Limits	Heliport and Helideck Management	Multiple Helicopter Operations	Heliport/ Helideck Design		
Weather	Effective Flight Planning	Regular Reports/ Forecasts	Adverse Weather Policy/Use	Aircraft Capability		
Collision in Air	Altitude Management	Air Traffic Control Oversight	Bird Strike Prevention	Airborne Collision Avoidance System	High Intensity Strobe Lights	
Ground Collision/ Handling	Weight, Balance and Loading	Passenger Briefing	Flight Handling	Dangerous Goods	Security and Check-In Control	
Fuel Exhaustion/ Contamination	(Hot) Refuelling Procedures	Fuel Checks	Flight Planning	Offshore Alternates	Fuel Reserves	Fuel Testing/ Inspection

Accident Survival Goals
Impact Survival
Flotation
Underwater Escape
Sea Survival
Land/General Survival
Alerting
SAR/Emergency Response
Post-Accident

Enablers							
Safety Leadership/Culture	Effective Safety Management System	Safety Intelligence	Competency	Multi-crew Operations	Personnel Readiness	Modern/Proven Technology	Standards and Oversight

HeliOffshore Safety Through Collaboration
FLIGHT SAFETY FOUNDATION
BARS BASIC AVIATION RISK STANDARD
International Association of Oil & Gas Producers

Section 4 The Aviation Regulation System

Section 4
The Aviation Regulation System

4.1 Regulation and Regulators

Air operators are regulated by their National Aviation Authority (NAA), which may be part of a regional Agency such as the European Union Aviation Safety Agency and the Federal Aviation Agency[3] (EASA, FAA). There is a system of Standards and Recommended Practices (SARPS), published by the International Civil Aviation Organisation (ICAO) that establishes a framework for national regulations. This complex multi-layered arrangement could lead to contradiction in regulations, and agencies work closely together to avoid this. Furthermore, the ICAO SARPS were intended to harmonise international flight and enable aircraft from one nation to safely operate in another's airspace. However, detailed regulations do differ in style, format, sophistication, and effectiveness between different countries.

There is variation between national regulations for aviation activities conducted primarily within national boundaries, including the type of aviation activities most relevant to wind farm support. If a nation has minimal experience with complex, specialist tasks, including offshore operation and hoisting, national regulations may not contain sufficient detail. Further, the effectiveness of aviation regulators varies globally.

Most aviation regulatory systems allow greater levels of risk for smaller aircraft and non-passenger operations. This can translate into less active oversight, less restrictive regulations and less reliance on organisational controls.

For example, unlike In EASA member states, not all nations require Safety Management Systems (SMS) to be in place for smaller operators[4]. This lower level of aviation regulation may not be compatible with the expectations of legislation related to the safety of employees, and OWCs' / customers' own policies for safety.

Regulations are only the minimum legally permissible standards and often cannot, or do not, cover every subcategory or type of operation. This is where Safety Management Systems play an important role. Risk assessments should be developed, sufficiently detailed, and take intended and actual type of operations into account. The risks and mitigating measures that have been identified should complement the legal requirements when defining the operator's standards.

For example, existing hoisting regulations, applicable to ship pilot transfer or mountain operations, may not specifically address the unique risks associated with hoisting individuals to offshore wind turbines. Hence, OWCs, customers and employers need to assure themselves that those using aviation and those operating aircraft are robustly managing risk (see section 10).

OWCs and aviation customers also need to recognise that air operators will have a legal responsibility to assure themselves of some aspects that are the responsibility of the OWC and their other contractors. For example, when the OWC provides facilities, products or services to the air operator[5].

4.2 Aircraft Certification

Civil aircraft and their engines are type certified by the regulator. Acceptance can vary from a simple acceptance, to an in-depth validation of the state of design compliance, or even the imposition of additional national requirements. Aircraft are certified against the standards in force at the time the manufacturer applies for certification.
Airworthiness Directives (ADs) are issued by aviation regulators to address unsafe conditions that develop with aircraft in service. ADs may allow operation for a limited time until an inspection or a modification is done, or impose repetitive inspections. Most nations have a process for the issue of operational directives or equivalent to address emergent operational issues. Operational regulations can vary significantly between nations.

The certification of aircraft and equipment is further discussed in Section 12 – Aircraft Specification.

4.3 Airspace

Nations classify their airspace, imposing different levels of control, with most restrictions typically in place near major airports, through to uncontrolled airspace were users have to see and avoid other traffic independently. The separation of helicopters from other airspace users, including unmanned operations, is a critical consideration and will influence the crew composition. See Section 18 – Flight Crew Complement.

Different categories of airspace can require specific equipment to be fitted to the aircraft and may mean that the helicopter can operate in different weather conditions. Many wind farms will be sited in uncontrolled airspace, while the helicopter may be based at an airport in controlled airspace. Basing helicopters at airports will mean a transition between two or more types of airspace. It can also mean a significantly expanded operational window due to the airport navigation aids and less limitations thus facilitating flights in worse weather than would be possible in uncontrolled airspace. Nations issue a range of airspace restrictions, for example defining danger areas and other prohibited airspace. Some of these may be temporary and announced with short notice.

Establishment of specific airspace zones, for example, a Helicopter Traffic Zones (HTZ), for the wind farm should be considered. Especially in busy airspace, establishing designated helicopter routes will provide a more structured helicopter flow and better deconfliction. Mandatory Transponder Zones can also reduce the risk of poorly controlled general aviation aircraft entering busy low level airspace without electronic conspicuity. Such measures need to be implemented by the national regulator and/or the local Air Navigation Service Provider (ANSP). It may also be possible for the ANSP to institute an information service to cover the wind farm area. ANSP are often funded by airspace usage charges. The needs of other existing airspace users, such as the military and oil and gas helicopter operations need to be considered, as well as the effect the wind farm may itself have on ATC and military radar coverage.

4.4 Operator Regulatory Approvals

Prior to commencing operations, the air operator will need to hold the appropriate regulatory approvals, permits and licenses. That may be from their own NAA and potentially also from the NAA of the state of operation. In some cases, there is a separate economic regulator who licenses air operators to carry passengers. Additionally, countries may have some local requirements that are applicable for foreign operators. Therefore, operators have to verify if local requirements are applicable to them and how they impact the SOPs and risk assessments, then make necessary amendments.

4.4.1 Air Operators Certificate

An air operator's certificate (AOC) is the approval granted by a NAA to an aircraft operator to allow use of aircraft for commercial purposes. This requires the operator to have personnel, assets and system in place to ensure the safety of its employees and the general public. The certificate will list the aircraft types and registrations to be used, for what purpose and in what area-specific airports or geographic region.

4.4.2 Aircraft Maintenance

While the AOC deals with the commercial operation of aircraft, the maintenance of aircraft requires separate approval. More complex maintenance activities require different approvals than the simpler day to day inspections. The organisation conducting the maintenance of the aircraft may be the same as the AOC holder, or this activity can be subcontracted to a third party. A maintenance provider may be limited in the types of aircraft or the types of maintenance that it is approved to conduct. The maintenance activities can only be conducted at approved facilities, and it is to be expected that these facilities will require inspection by the NAA before receiving approval.

4.4.3 Certificate of Airworthiness

Individual aircraft will need a Certificate of Airworthiness, which may either be time-limited, or subject to an Airworthiness Review Certificate process (for example, in the EU), dependent on national regulations. The certification of the aircraft and its modifications will be verified as part of these processes. Other documentation, such as noise certificates and radio licenses are also normally required.

4.4.4 Specific Approvals

Certain documents relating to the operation may also have to be submitted to a NAA for acceptance. Specific missions, such as Helicopter External Sling Load Operations (HESLO), Search And Rescue (SAR), Helicopter Emergency Medical Services (HEMS) or Helicopter Hoist Operations (HHO) may need additional approval as may operating offshore or over areas that are designated hostile environments. In some cases, an air operator who wishes to base aircraft overseas may need to establish a local subsidiary, gain a local AOC (or equivalent), register the aircraft to be used on the local register and employ crews with either local licenses or with their overseas licenses locally validated.

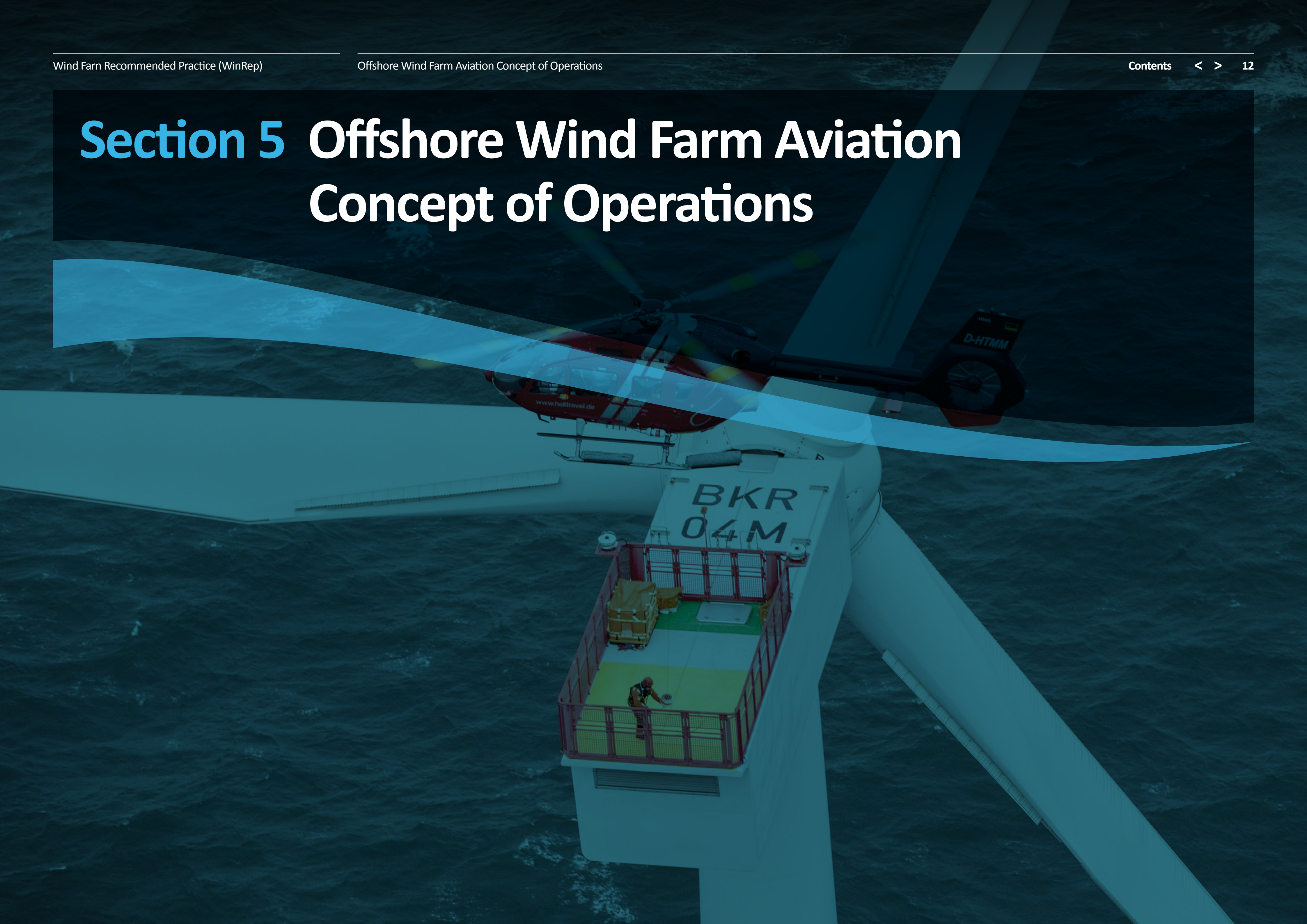
The operator will often also need licenses or permissions to conduct an air service within that nation, even if they are a domestic company. When establishing a new operation, the air operator will need a plan to gain the necessary approvals and permissions in a timely manner. Many agencies do not recognise licenses, approvals or certificates issued by other NAAs or regional agencies.

Some, but not all, aspects of operations are also regulatory requirements for air operators under the more proactive aviation regulators. Within the EU, there are specific requirements for helicopter operators such as holding an Air Operators Certificate (AOC), Helicopter Offshore Operations (HOFO) and Helicopter Hoist Operations (HHO). However, some nations have minimal requirements for the type of operators that support wind farms; operations in support of offshore wind farms are a specialist aviation activity which may not be fully reflected by regulation in less mature regions.

4.4.5 Specific Operational Restrictions

The operator ensures that operations are conducted in accordance with any restriction on the routes or the areas of operation specified by the competent authority or the appropriate authority responsible for the airspace. These restrictions may be communicated through the AIP, NOTAMS, Operational Safety Directives or any other form as applied in the country of operations.

Section 5 Offshore Wind Farm Aviation Concept of Operations



Section 5
Offshore Wind Farm Aviation Concept of Operations

5.1 Contractual Scenarios

Aircraft may be contracted by various parties in support of offshore wind farm development and operation.

For example, during the construction phase, sub-contractors may wish to undertake crew change of construction vessels by helicopter. During the operations and maintenance (O&M) phase, helicopters may be used for access, parts delivery or emergency purposes. Irrespective of who contracts the aircraft, the wind farm developer or their O&M contractor, the site OWC has a responsibility to assure themselves that appropriate measures are in place to manage the risks associated with aviation activity and an employer has a duty of care to their employees (see section 10).

For occasional flight requirements, ad hoc contracts are common. Although short notice tasks by 'best endeavour' are dependent on the operators' other contracts, the contracting company, employer or OWC retain their responsibilities. Larger volume contracts may involve dedicated aircraft on contract or contracted availability of a specific aircraft type from a pool of aircraft. This gives greater service quality and maximum scheduling flexibility for the customer but maximises the effect of aircraft unserviceability and can be expensive if utilisation is low. Economics and resilience can be improved if several customers have similar requirements in the same area, and use contracts to share excess capacity. More formal pools of aircraft are possible too. In this scenario, there is more resilience at lower cost, albeit with some compromise on scheduling and extra liaison between the parties. In the case of emergency service provision, pooling HEMS or SAR assets in a local area is a highly economical way to add capability.

This is difficult to achieve when multiple air operators are used, especially for the more specialist tasks such as hoisting; sharing aircraft is easiest when there are common procedures and PPE in use, and common operating standards are adopted.

5.2 Aircraft Basing

Whereas fixed-wing aircraft primarily operate from an airfield, helicopters can operate from airfields or heliports. The latter can include both dedicated helicopter-only onshore sites and helidecks mounted on vessels or installations. The criteria for heliports, covering their layout, approach guidance, lighting, fire-fighting, and equipment, is not internationally aligned, beyond some broad guidance in ICAO Annex 14 Volume II. Further guidance, more specific to offshore wind farm operations, can be found in Section 15 – Heliports.

There is a misconception that helicopters can land almost anywhere. Although classified as a Vertical Takeoff and Landing (VTOL) aircraft for Commercial Air Transport purposes, helicopters require space clear of obstacles for approach and departure, as well as space to make a safe forced landing in the event of critical power loss. Helicopters can operate from basic, unprepared locations (for example, a field), but for Commercial Air Transport purposes these need to be pre-surveyed, need suitable emergency response resources available and normally need a ground party to secure the site from the public or errant animals. There will be various limitations without meteorological data. Such ad hoc sites can normally only be used for a limited number of flights before greater infrastructure is expected and environmental approval is required.

Onshore heliports can be dedicated to one wind farm or open to support multiple organisations. The former gives more control and can be optimised but is more expensive. The latter allows greater growth, spreads costs and offers greater aircraft redundancy. It is often preferable to invest in an existing aviation site; the environmental and planning implications of a new airfield or heliport can be significant and, unless there are tangible community benefits such as co-location of emergency service aircraft or creating new transport links, there can be local opposition to potential aircraft noise.

Therefore, the three main options for basing aircraft are:

a) A dedicated onshore facility: usually appropriate when the wind farm is in a relatively remote location and there is no alternative. There may be economic advantages to the facility being furnished by the customer if they envisage long term wind farm operation. However, this can create complex contractual dependencies and unclear accountabilities and should be avoided (see section 15).
b) A shared onshore facility: the air operator provides their own facility and overheads are shared between multiple customers, reducing cost. Commercially the operator is clearly accountable for facility operations. This is usual for ad hoc and pooled services, but still advantageous for dedicated aircraft contracts where the air operator has additional local business.
c) An offshore facility: it is possible to base

a helicopter for short periods (several days or weeks) offshore on a suitably equipped vessel, such as a Service Operations Vessel (SOV) or offshore installation. This reduces transit times and provides an on-site shuttle service and/or emergency support. Adverse weather, particularly high winds can prohibit start-up or shut-down in conditions a helicopter could land and remain rotors running (wind speed limitations for running a helicopter may be higher than those for shutting down or starting the helicopter). A hangar will be necessary and limited maintenance must be possible. The aircraft will need to return to a suitable shore base regularly. Occasional offshore unserviceability will be a logistical challenge.

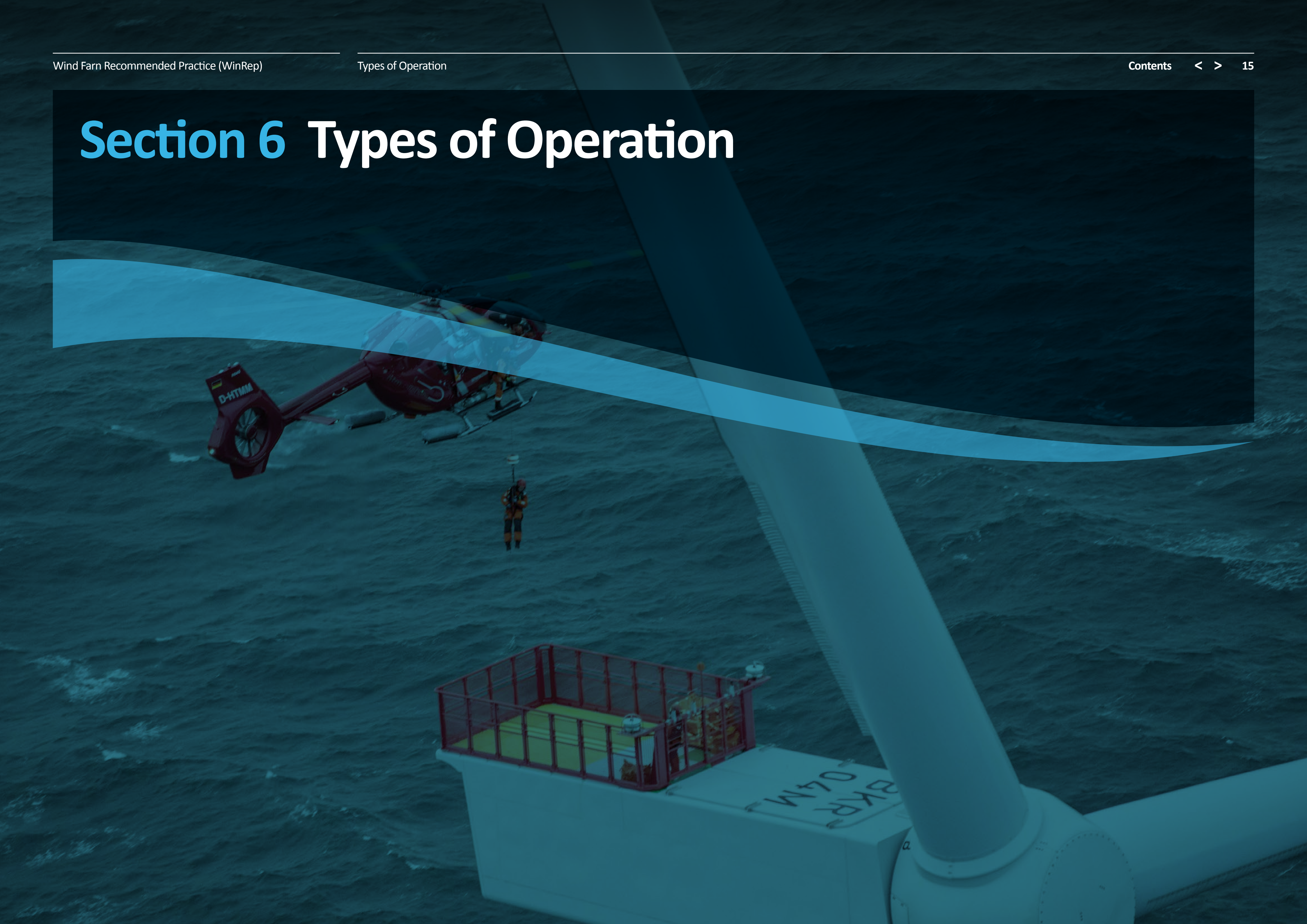
The requirements of an onshore heliport are detailed in Section 15.

The addition of a helideck to an installation or vessel adds costs but can provide considerable extra flexibility. In comparison to vessels transfer or hoisting, it can provide simpler, faster access and greater accessibility, including at night. It can allow a helicopter to shut down in field when necessary and await completion of maintenance or weather to improve. It can shorten the reaction time for deploying personnel at remote wind farms or allow refuelling if a refuelling facility is added to extend the helicopter's payload/range capability. A helideck may also allow emergency assets to loiter whilst casualties are being prepared and can also provide an emergency landing area for wind farm and emergency air assets . The addition of a helideck to an installation or vessel adds cost but can provide considerable extra flexibility and safety. They could also be used to store larger spares to assist O&M teams and minimise additional flights from shore.

However, the location of the helideck, relative to the wind farm, determines the access by helicopter. If the helideck is located within the wind farm, an approach and departure corridor aligned with the main wind direction should be planned in coordination with the appropriate local authorities, NAA, and appropriate minimum WTG spacings applied to allow access by helicopter by night.

Helidecks positioned at the edge of the wind farm are advantageous because they can be approached with fewer restrictions during night and marginal weather conditions, and increase the operational window of the helicopter.

Section 6 Types of Operation



Section 6
Types of Operation

6.1 Advantages of Helicopters

The advantage of helicopters over vessels is the speed at which they react and operate in addition to their ability to safely operate in a wider weather window. This reduces the downtime of turbines but also maximises the effective worktime of technicians. They improve safety by enabling facilities to quickly down man in an emergency and rapidly tend to casualties. If appropriately equipped, they can also provide a rapidly deployable SAR or medical capability. It can take considerably less time to travel the same distance by helicopter, compared with the sailing time of surface vessels; the carbon footprint of helicopters can also be considerably less than surface vessels.

Helicopter Hoist Operations (HHO) are used to transfer personnel and equipment directly to or from the hoist area of a WTG nacelle or to other suitable vessels or structures. HHO allows operations in higher sea states than possible by boat transfer. The speed, delivery directly to nacelle, passenger comfort and ability to transfer heavy payloads and/or people makes the helicopter a cost-saving asset when correctly integrated into wind farm operations.

6.2 Helicopter Hoist Operations (HHO)

WTG HHO is conducted at the minimum height above the hoisting area to reduce exposure time and ensure that, if an engine were to fail, the aircraft is capable of remaining in a stable hover using One Engine Inoperative (OEI) engine rating for long enough to complete the hoist cycle[6] and initiate a safe transition to forward flight. See Section 13 – Performance.

Similar techniques are used for vessels and other structures. Although hoisting from vessels is possible, it is a specialised task preferably done while the vessel is underway, necessitating specific crew training and joint risk assessment. Where practicable, the helicopter should always land rather than hoist, because safety is enhanced when the time spent hovering is reduced[7]. In addition to a passenger safety briefing[8], and survival training required by all passengers (as per section 6.3), HHO passengers need appropriate practical HHO training. In Europe, such operations are conducted under CAT AOC and require an additional specialised approval. In other nations, only more basic organisational approvals may be possible, necessitating greater customer attention.

If routine hoisting or the transfer of larger parties of personnel is envisaged, it is preferable to fit larger vessels and structures with helidecks. HHO may be conducted from heliports onshore, or potentially after picking up passengers from a Service Operation Vessels (SOV) or in-field installation that provides their ‘base’ during the day or accommodates them overnight. While offshore wind farm helicopter hoisting operations initially started with small twin-engine helicopters, they have expanded to include medium helicopters and potentially super medium helicopters as payload/range requirements increase.

6.3 Helicopter Transport Flights

These operations are closest to conventional oil and gas ‘crew change flights’, operating to vessels or installations with helidecks. Passengers need offshore helicopter survival training and also require a passenger safety briefing before each flight. Baggage (which accompanies a passenger) or cargo (consigned to the destination) may also be carried within the helicopter. Such operations are the equivalent of CAT flights in most nations and need the operator to hold an AOC. The only exception is some countries do permit an organisation to operate their own aircraft and carry their own personnel and cargo without an AOC, but this accepts a different level of regulatory oversight and needs extensive in-house expertise by the contracting party.

6.4 Helicopter External Sling Load Operations (HESLO)

It is also possible to use helicopters, without passengers, to carry underslung loads known as Helicopter External Sling Load Operations (HESLO) to move heavy or large equipment. The aircraft needs to be capable of being fitted with a cargo hook. Specific ground personnel are needed to rig the loads appropriately for HESLO. Lighter, more aerodynamic loads can be hazardously unstable unless correctly rigged. This activity requires specific crew training and competence and typically needs a specific HESLO approval in most nations.

6.5 Emergency Service Flights

“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 operations are covered by each term, in the regulatory approvals and certifications required and in relation to operational limitations and the situations in which they can be waived.” (G+ GRP).

Helicopters may potentially be used to support in a range of possible emergency scenarios. It is important they do not intervene or conflict with emergency procedures and arrangements organized at State level. Care is needed to ensure likely scenarios are understood and that an appropriate capability is put in place, with appropriate response times and availability. Night and all-weather operations are more demanding and need greater capability to be implemented safely.

The nature of medical emergency as formally confirmed by a medical professional determines the type of flight required to transport a casualty. The simplest are air ambulance (or medical evacuation / medevac) flights to recover a casualty from a helideck equipped vessel or installation or deliver a paramedic to the scene of an incident. These are generally considered as conventional CAT flights in most countries provided they do not necessitate operation from un-surveyed or ad hoc sites. Most nations do not require a specific operating approval to carry casualties in this way although there will be a need for appropriate procedures and airworthiness approval for certain medical equipment fitted to the helicopter. Medical equipment and accompanying medical personnel should be onboard for the severity of casualty to be transported. Procedures are needed if the casualty is unable to wear normal PPE. See Section 17 – Abnormal Conditions.

The recovery of casualties by hoist from hoisting areas WTGs, vessels or other structures may be considered simply a combination of air ambulance and HHO operations in some nations. In others, they may be treated as a subset of Search and Rescue (SAR) operations.

A SAR service provides a higher capability than an air ambulance / HHO operation. For example, a SAR service can search for casualties in the water and hoist casualties from the water or life rafts. However, this requires even greater training and equipment to maintain proficiency. The regulatory oversight of offshore SAR operations varies around the world. In some nations, there is a national approval available. In others, a negotiation with the regulator is required.

It is important not to confuse a helicopter simply fitted for HHO with a SAR helicopter. They both have a hoist, but SAR needs additional specialist equipment, training and mission systems, operates under different rules and is potentially exposed to different levels of risk.

Helicopter Emergency Medical Service (HEMS) flights are typically permitted to carry casualties, medical staff and medical equipment. They are permitted to operate to un-surveyed landing sites and operate under specific NAA approvals.

Typically HEMS, CAT and SAR operations are conducted separately but under some regulators the distinction between these operations can be less defined.

6.6 Aerial Survey

The first use of aviation within a wind farm project may be mammal or bird surveys conducted by aerial inspection. For these tasks, fixed-wing aircraft fitted with high definition cameras may be more cost effective than helicopters. Aerial survey is required early in the process of gaining consent and continues periodically during the life of the wind farm. In Europe, such operations are conducted under a Part-SPO (Specialised Operations) approval. This is less demanding than a Commercial Air Transport (CAT) Air Operator Certificate (AOC) and the pilots and sensor operators are classified as crew. However, in the EU, part-SPO is far more demanding than in some other nations. Some nations allow these services to be conducted without any organisational approval and therefore necessitate greater customer attention.

Suitable procedures should be in place for deconfliction with other air traffic, especially military and offshore helicopter traffic. Appropriate consideration should be given to the electronic (transponder) and visual (lights and colour scheme) conspicuity of the aircraft.

Unmanned Air Systems (UAS) may become a practical alternative for these aerial survey tasks in coming years.

6.7 Unmanned Air Systems

Unmanned Air Systems (UAS), commonly termed ‘drones’, are widely used by many OWC’s. For example, small multirotor vehicles are increasingly used for inspecting industrial hardware within line of sight of the operator, avoiding the need for a person to work at height. Beyond Visual Line of Sight (BVLOS) UAS are rarer but could theoretically conduct long-endurance survey missions economically. The military has used variants of this technology for many years. However, civil experience with UAS remains limited as there are regulatory and technological barriers to overcome to operate safely in uncontrolled and unsegregated airspace. Developing roles relevant to offshore wind farms include delivering parts to a WTG nacelle or contributing to SAR. It is critical to ensure that UAS are deconflicted from any manned aircraft operations[9] and are not parked where they can be affected by aircraft downwash or prop wash.

As the primary focus of this document is helicopter operations, UAS will not be addressed further other than to recommend that OWC’s assign the same Aviation Department responsibility to oversee (see section 10) all aviation activities to reduce the potential of conflict between manned and unmanned operations (Further guidance on the use of UAS can be found in the Renewables & Unmanned Aircraft Systems – Guidelines for Operations (RUGO) published by RenewableUK).

6.8 Other Charters

As wind farms are built off the coast in remote locations, with limited transport options, it may be necessary to charter fixed-wing aircraft to operate a service to move personnel and cargo from a more well-connected location during construction or O&M phases.

Section 7 Contracting

Section 7
Contracting

To maximise the benefit of using helicopters, customers for aviation services need to establish clear operational requirements, contract with competent air operators[10] and implement effective, proportionate oversight of air operations[11].

There is limited availability of helicopters that are suitably equipped to perform offshore operations and more specifically offshore hoisting operations. Flight and maintenance crews require specific training for each helicopter type; often this training can only be performed at a limited number of global locations with very long lead times.

Customers will benefit from acknowledging aircraft as high-value assets, dependent on highly qualified personnel. It is recommended customers tender contracts that are suitably long term. This is so they are mutually advantageous from a business risk perspective, economic and facilitate implementation of a high quality, safe and sustainable aviation solution. Premature termination for convenience, without adequate notice or compensation, is poor practice and undermines a sustainable wind farm aviation sector. As in other industries, it would be a safety concern.

Section 8 Project Timelines

Section 8
Project Timelines

Every project differs, so it is impossible to give definitive timelines. This section outlines typical project phases and timelines for information purposes.

Helicopter capability can be implemented in weeks if the project uses an existing operating base, if a suitably equipped helicopter is available and the supplier has already been approved by the customer. Negotiations then focus on completing risk assessments, signing the contract, interface procedures and liaison.

Alternatively, it can take 18 months or longer to put a contract in place if the project is situated in an area without existing offshore helicopter infrastructure, using a new, unproven helicopter type or air operator.

An example workflow is shown in figure 2.

Figure 2

Tender (6 weeks to 6 months)

a) Provide bidders with a suitable time to respond
b) Answer clarification questions in a controlled and transparent way
c) Assess bids after deadline has passed
d) Possible audits of bidders
e) Update business case (if required)
f) Present recommendations
g) Seek approval for contract award / final negotiations
h) Award contract

Focused Planning and Prepration Phase (4 weeks to 6 months)

a) Management of change
b) Risk assessment
c) Gaining any new or changed approvals
d) Delivery of new equipment
e) Training
f) Interface documents drafted / align practical details
g) Site visits etc
h) Readiness reviews / audits

In-Service

a) Scheduling
b) Delivery
c) Routine liaison
d) Monitor key performance indicators
e) Regular reviews
f) Investigate accidents and incidents
g) Audits
h) Continuous improvement

Section 9 Duties and Responsibilities of the Aircraft Operator

Section 9
Duties and Responsibilities of the Aircraft Operator

In general, the operator is responsible for the safe operation of aircraft in accordance with applicable regulations, provisions and documentation.

The operator establishes and maintains an effective management system to ensure operational control over any flight operated under the terms of its certificate[12].

It is the Operators responsibility to:

a) Ensure aircraft are equipped, and crews are qualified, as required for the location and type of operation
b) Ensure personnel assigned to, or directly involved in, operations are properly instructed, have demonstrated their abilities and competences[13], and are aware of their responsibilities[14]
c) Establish procedures (OM, SOP, etc.) and instructions for the safe operation of aircraft, including normal, abnormal and emergency procedures, checklists and flight planning procedures[15]
d) Fulfil boundary conditions (for example, safety, including reporting, compliance management system, dangerous goods programme[16], and security programme[17].)

Specific operator requirements with regards to offshore / helicopter hoist operations include:

a) Obtain licencing as air carrier according to regulations
b) Obtain an air operator certificate (AOC) in accordance with regulations
c) Obtain approvals for helicopter hoist operations (HHO) and offshore helicopter operations as applicable
d) The operator also takes into consideration:
   Establishment of further flight and ground operations related procedures
   1. A/C tracking
   2. FDM
   3. Passenger briefing (alleviation, training programme, video)
   4. Use of offshore locations (directory helidecks)
   5. Offshore alternate[18], coastal aerodrome approvals
   6. WX-minima
   7. Additional considerations for selection, composition and training of crews such as experience levels, type ratings.
   8. Consideration of A/C requirements[19]
   9. Performance requirements (OEI)
   10. Equipment requirements for overwater operations (PCDS, Life jackets, suits, EBS, rafts)
   11. Aircraft maintenance facilities
   12. Spare parts provision
   13. VHM system
   14. ERP

Beyond regulatory requirements, the operator ensures compliance with customer requirements.

Section 10 Oversight by OWCs and Users of Aviation

Section 10
Oversight by OWCs and Users of Aviation

OWCs and users of aviation will establish an Aviation Policy, supported by appropriate procedures, to articulate their approach to aviation management and their aviation safety commitments, see G+ HeliGuidelines for further information.

Air operators are subject to aviation regulation but this does not absolve customers, employers of passengers and OWCs from their overall responsibilities. When the user of aviation is not the site OWC, they also need to be able to demonstrate to the OWC that aviation risks are being managed appropriately.

Aviation regulations and their application vary internationally and are rarely enough to fully manage all risks in complex aviation tasks, such as offshore wind farm operations. Capable and competent organisations exceed the minimum of their national regulators; OWCs and users of aviation should look for and acknowledge such initiatives and commitments.

In contrast, OWCs and users of aviation should be cautious of organisations overly reliant on regulatory compliance to justify their competence and examine if they truly understand the risks faced and whether they are actively committed to managing them to As Low As Reasonable Practicable (ALARP).

OWC's control and risk mitigation measures will be based on an Aviation Policy, supported by procedures, contractual and quality control systems. OWC aviation safety control measures should be implemented throughout the procurement and delivery process. Contractor pre-selection, based on safety management and performance should occur before contract award and contracts should allow for aviation specialist audit and quality assessments. Day to day operations should be monitored and controlled by OWC representatives and regular safety and quality audits should be conducted by aviation specialists. This responsibility to manage aviation risk through oversight cannot be outsourced, OWC aviation departments responsible for oversight may be supplemented by external competence or conducting activities jointly with other OWC's.

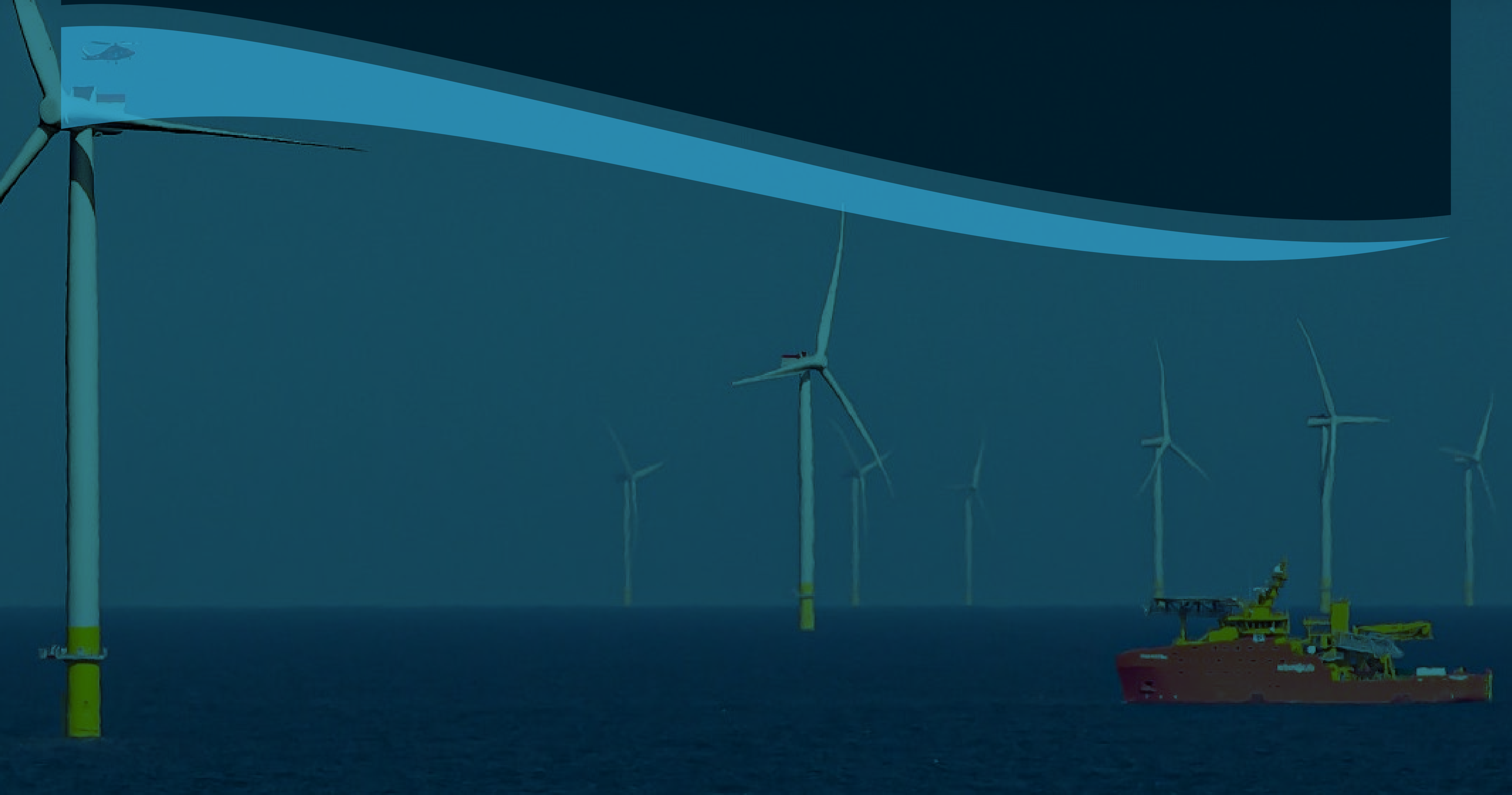
Oversight includes pre-contract award due diligence, review of risk assessments, joint risk assessments, review of manuals, management of change documentation and projects plans, readiness and in-service audits[20] and regular progress meetings and reviews. Oversight should be proportionate and integral with contractor management but will typically include a review of flight planning, crew training[21], Integrated Management System[22, 23] (IMS) from an aviation perspective, Helicopter Flight Data Monitoring (HFDM), aircraft maintenance and ground handling as well as observing an operational flight.

To do this, OWCs, aviation customers and employers of passengers will need practical aviation expertise available to be an intelligent customer. Offshore operations to wind farms and in particular hoisting operations to wind turbines is a specialist area of aviation. It is critical aviation specialists' expertise is relevant to the type of air operations proposed. In order to perform as an effective aviation specialist, extensive experience in the aviation industry is required. Suitable experience varies but, typically, a background as a Nominated Post Holder, Licensed Maintenance Technician or Aircraft Commander with an authority issued Air Transport Pilot License Helicopter ATPL(H), in a commercial offshore helicopter operation would be expected. Experience of operations serving offshore wind farms and / or hoisting would be beneficial.

Figure 3 – Details Aviation Specialist and Auditor Prerequisites[24].

General	Aviation industry experience	*Eight years and must have worked in the aviation sector (flight operations or maintenance)*
		Worked in offshore aviation sector at least 12 months in the last five years
	Experience in the offshore helicopter aviation environment	*Essential*
	Auditor training	*Aviation Lead Auditor or other auditor training course(s) conducted over a minimum of two days.* ***Online training is not accepted***
	Total audit experience	*Ten (10) aviation-related audits (may be conducted under supervision)*
	Aviation audit experience for Lead Aviation Auditor	*Experience as a qualified aviation Lead Auditor which includes having conducted a minimum of two audits as Lead Auditor (under supervision)* ***in at least a two-person audit team.***
Flight Ops discipline	License requirement	*Hold, or have held for a period of eight years, a commercial pilot license, or higher, issued by a National Regulatory Authority, and/or*
	Flight hours	*Commensurate with experience but not less than 2,500 hours*
	Management / supervisory experience	*Flight operations management experience desirable (NPH, CP, BM, BC)*
	Operations experience	*Flight Instructor Rating, and/or*
		Training and/or Check Airman Rating, and/or
		Flight safety officer, quality or safety auditor, and/or
		Flight operations inspector for a National Aviation Authority, and/or
		Flight Simulator Instructor, Type Rating Instructor.
	Aviation experience	*Eight years' experience in commercial aviation as a flight crew member*
		Must have worked in the offshore aviation sector for at least 12 months in the last five years
Engineering and Maintenance discipline	Engineering qualification	*Hold or have held an Aircraft Maintenance Engineer license issued or approved by a National Aviation Authority, and/or*
		Hold or have held a Flight Engineer license, and/or
		Aeronautical engineering degree
	Aviation experience	*Eight years' experience in aviation maintenance functions in support of aircraft related maintenance, or aircraft related quality functions, and*
		Must have worked in the offshore aviation sector for at least 12 months within the last five years
	Management / supervisory experience	*Supervisory experience desirable*
	Quality experience	*Two years' experience performing quality assurance audits or quality system evaluations of aviation engineering and maintenance activity, or*
		Two years as an airworthiness inspector for a National Regulatory Authority

Section 11 Multiple Air Operators and Multiple Customers



Section 11
Multiple Air Operators and Multiple Customers

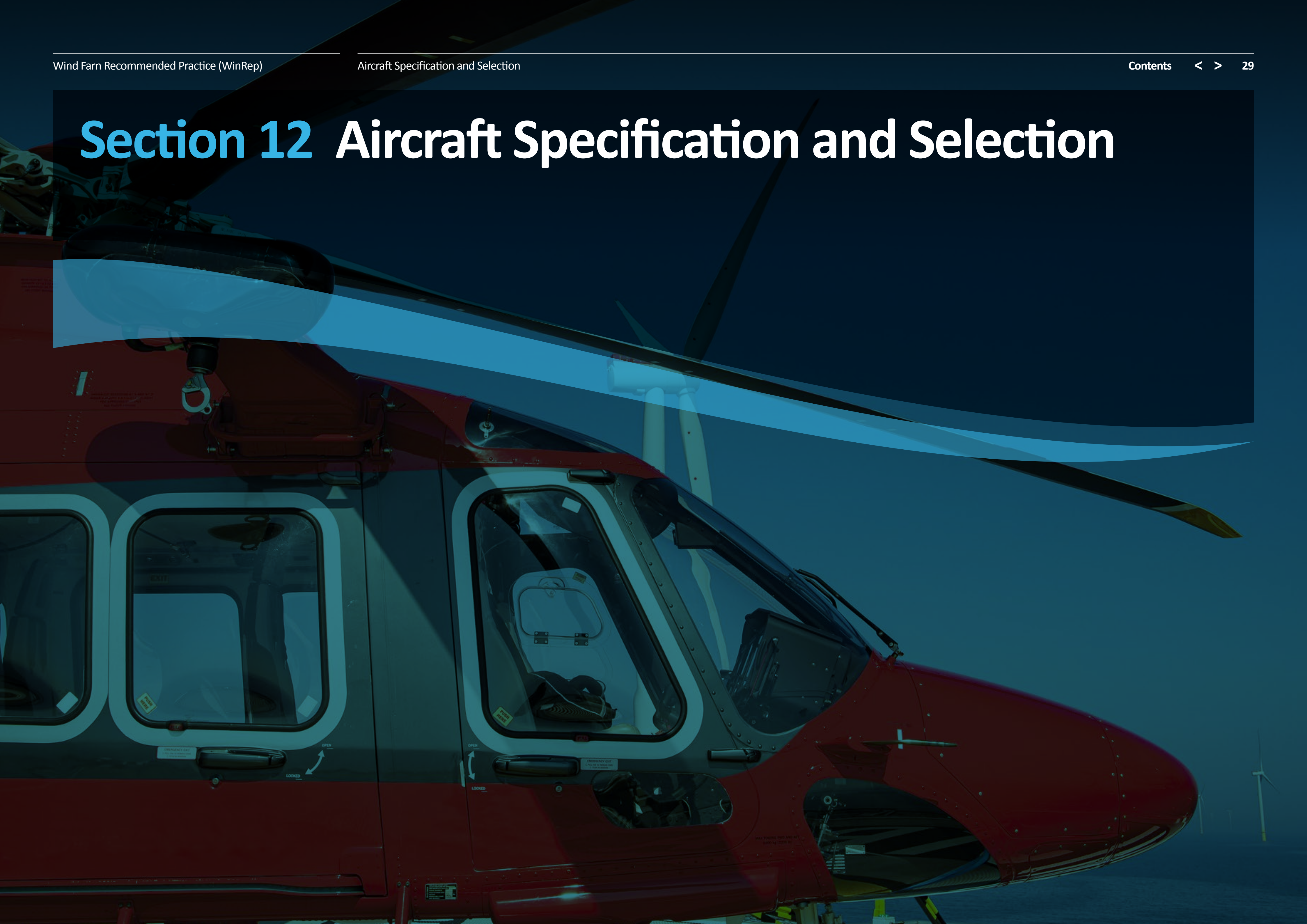
In some regions, multiple air operators are active and are responsible for delivering services to the same customers. There are potential benefits if aviation services are shared but risks must be managed. Focus on the standardisation of procedures and standards is necessary[25]. Collaborating and sharing safety information[26] also delivers benefits. See Section 3.

Where operations by multiple operators in the same uncontrolled airspace occur[27], close liaison on procedures, radio frequencies and potentially a shared information service should be considered[28].

When passengers use multiple air operators, differences in safety equipment, lists of prohibited goods, acceptable baggage and procedures should be minimised by close liaison and collaboration. This is especially important in relation to HHO passengers. Following and adopting the practices outlined in this document will help standardise practices across the industry.

Ensuring that air operators can readily check passengers' identity, qualifications and currency in a standard way is important[29]. In regions with multiple organisations operating, harmonising this process will reduce the administrative burden for all and reduce the chance of errors.

Section 12 Aircraft Specification and Selection



Section 12
Aircraft Specification and Selection

It is best if the bidding air operator proposes the aircraft type to be used against the customers specification, minimum standards and performance requirements. However, the customer will need to carefully assess the aircraft types proposed and ensure requirements are met[30]. Requirements such as payload and range will always be specific to an individual operation but some specifications are in principle standard for offshore operations in support of wind farms.

Introducing a new aircraft type to the fleet for an aircraft operator is a complex task. The operator may have to produce operations manuals and procedures, train flight, maintenance and ground crew, identify and secure a supply of spare parts, train emergency responders and procure new ground handling equipment.

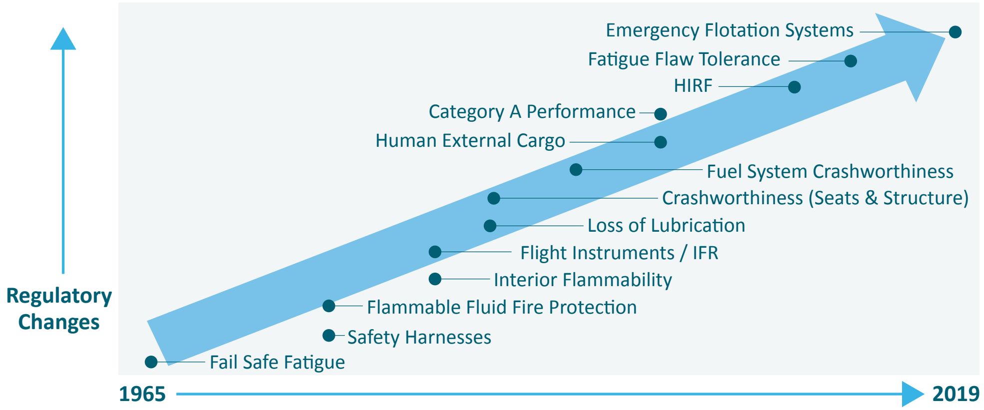
12.1 Certification

Every aircraft produced, and its installed equipment, is certified by aviation authorities before it can receive a certificate of airworthiness and is allowed to fly. The certification of a product is an independent design assessment and confirmation that it meets minimum safety standards established over decades. Aircraft certification regulations are intended to ensure the airworthiness of aircraft by requiring manufacturers and installers of aircraft, components and equipment comply with aircraft design requirements.

Original CAR 6 and CAR 7 requirements were rewritten as FAA 14 CFR part 27 (for normal category rotorcraft, less than 7000 lbs / 3175 kg and 9 passengers) and part 29 (for transport category rotorcraft above 7000 lbs / 3175 kg) in the 1960s. In Europe, JAR 27 and 29 were developed by the Joint Airworthiness Authorities (JAA) based on 14 CFR part 27 and 29 for European Manufacturers. With advent of EASA in 2003, the JARs were migrated into EASA Certification Specifications CS-27 and CS-29. Other competent airworthiness authorities have similar standards or have adopted the FAA or EASA requirements for their jurisdictions.

Certification requirements evolve in time. Safety data and technological advancements lead to amended requirements to improve safety and increase capability. Changing requirements and increasing expectations can make design compliance more complex and more expensive resulting in increased aircraft cost to operators. However, evolution of certification leads to safer and more capable products.

Figure 4



Since the publishing of the original design requirements, significant safety enhancements to design requirements have been made in areas of structural strength and fatigue, crashworthiness, occupant protection, fire protection, bird strike, rotor drive systems, aircraft performance and handling, plus others. Figure 4 depicts the evolution of design requirement improvements over time to enhance the required level of safety.

12.2 Minimum Equipment / Technical Requirements

Helicopters used for wind farm operations require the installation of specialized equipment so the mission can be safely accomplished. Configuring aircraft for these operations is not a trivial task. Careful attention needs to be paid to the aircraft configuration to ensure it can meet its intended function safely and efficiently. The following table details the minimum equipment and technical requirements for helicopters conducting wind farm operations. Note that some equipment in the tables is required by local operating rules in some regions and must be installed.

Aircraft used for wind farm operations and installed equipment are certificated in accordance EASA CS-27 or CS-29, FAA CFR Part 27 or 29, TCCA AWM Chapter 527 or 529 or other authorities equivalent design requirements.

Table 1 includes the equipment or technical requirements considered essential for helicopter wind farm operations.

Table 1 – Essential Equipment and Technical Requirements

Equipment/Functionality	Reference	Notes
Category A Certification	4.2,12.1, 13	
Hoisting System	14.1.1	Certified for Human External Cargo (HEC)
Fixed Hoist Area Flood Lights		Essential for night operations only
Emergency Floats	14.1.2	
Ditching Certification	14.1.3	Certified sea state is to be stipulated by OEM and is to be equal to, or greater than, the forecast sea state conditions.
Emergency Exit Lighting (HEEL)	14.1.6	
Life Rafts	14.1.4	External, auto-inflating life rafts are optional
ELT 406 MHz	14.1.8	
GPS Navigation		
First Aid Kit	14.1.9	
VHF Communication		
VOR/ILS		
Transponder (Mode C or S)		
Radio Altimeter		
Seat Shoulder Harnesses		3 point restraints minimum
HUMS / VMS	14.1.20	Fitted and managed in accordance with HeliOffshore Hums Best Practice
Flight Data Monitoring (FDM)	14.1.21	Fitted and managed in accordance with HeliOffshore FDM Best Practice
Flight Data Recorder (FDR)	14.1.13	Recommended integrated CV/FDR/Camera
External Lights		Required for night operations

Table 2 includes optional equipment for helicopter wind farm operations. Note that some equipment in the table is required by local operating rules in some regions and must be installed. For other regions, consideration should be given to the additional safety benefits when additional equipment is installed.

Table 2 – Optional Technical Requirements

Equipment/Functionality	Reference	Notes
Float Auto-inflation System	14.1.214.1.2	In combination with the emergency flotation system
External, Auto-inflating Life Rafts	14.1.4	
HTAWS	14.1.18	
3 or 4-Axis Autopilot / AFCS	14.1.11	4-Axis autopilot recommended
Autopilot Hover Hold Mode	14.1.11	
IFR Certification	14.1.10	Single or dual pilot (when co-pilot is required)
TCAS / Combined Traffic Detection System	14.1.19	
Obstacle Proximity Warning System		
High Intensity Strobe Lights	14.1.1514.1.15	
Push-out Windows	14.1.5	HUET trains windows not doors
ADELT	14.1.8	
Weather Radar		
Pulsed Lights	14.1.16	For increased visibility and bird protection
ADS-B OUT	14.1.17	Where ADS-B is deployed
ADS-B IN	14.1.17	Where ADS-B is deployed
Bubble Window (Hoist Side)		
Automatic Power Assurance		
Cockpit Voice Recorder (CVR)	14.1.12	
Underwater Locator Beacon	14.1.14	
Height Alert		Integrated within the Radar Altimeter

Section 13 Aircraft Performance

Section 13
Aircraft Performance

Helicopter performance shall be considered in terms of the payload and range. Understanding and specifying the correct helicopter performance for an operation is a specialist task and requires careful consideration to ensure safe operations. Given the nature of the offshore environment and the need to conduct human HHO, single-engine helicopters will not be considered.

Multi-engine helicopters can optionally be certified as “Category A” or “Category B”. Category A certification requires engine isolation (system redundancy and separation) such that it is extremely improbable that failure of one engine will impact another or other flight-critical systems. Category A certification also stipulates requirements for aircraft performance after an engine failure to allow continued safe flight and landing which ensures “…the aircraft is capable of safely aborting or continuing a take-off; continuing controlled flight and landing, possibly using emergency procedures but without requiring exceptional pilot skill or strength”.[31] OEI engine power ratings used to determine Category A performance include a single 2-1/2 minute rating, or separate 30 second and 2 minute ratings that can be used in sequence. In order to provide an adequate level of safety Category A certification is required for Human External Cargo (HEC) certification.

13.1 Aircraft performance specific to HEC operations

If one engine suddenly fails, the other engine will need to increase its power to make up for the lost engine power. This process is not instantaneous. An engine typically needs between 2 and 4 seconds to spool up before it reaches maximum OEI power. While the engine is spooling up, the rotor will lack power and the helicopter will inevitably start to descend. To safely accommodate this change in the helicopter operating condition during HEC operations, the guidance in CS-27, AMC 27.865 c.(12) / CS-29, AMC 29.865 c.(12) or FAA AC 29-2C §29.865 d.(12) / FAA AC 27-1B §29.865 d.(12) has been established by the certification authorities as an acceptable means of compliance to satisfy the HEC performance requirements. (Note: Whilst operations to lighthouses and sea pilot transfers have been conducted for some time, the AC and AMCs were established prior to the development of offshore wind hoisting operations. Therefore, this document provides additional guidance.)

When establishing HEC performance, OEMs are required to consider normal pilot reaction time and drop-down height following an engine failure to maintain a stabilised hover. When hovering (OGE or IGE) at the maximum OEI hover weight, an engine failure should not result in an altitude loss of more than 10 per cent or 4 feet, whichever is greater, of the altitude established at the time of engine failure. In either case, sufficient power margin should be available from the operating engine(s) to regain the altitude lost during the dynamic engine failure and to transition to forward flight.

For HEC operations, the time required to secure[32] the human external cargo and to transition to forward flight (with minimal altitude loss) needs to be assessed. The time required will depend on several factors including; pilot reaction time, hoist operator reaction time, the hoisting environment, the amount of hoist cable deployed, the speed of the hoist, the time to safely secure the HEC, and time to transition to forward flight. As per above, there are two different approaches available in defining OEI ratings after which the engine has to revert to Continuous OEI rating; aircraft which employ 2-1/2 minute or alternatively aircraft which employ 30 second plus 2 minute ratings.

The time required to secure the HEC load and to transition to forward flight has to be accomplished within the time associated with the performance being used without encroachment into the next rating and the rating decision as result of the operators’ risk assessment. (i.e. if the operation cannot be safely accomplished within 30 seconds, performance based on the 2-minute OEI rating, is required).

For all wind farm HHO that is not conducted as part of a SAR mission, HEC performance published in the RFM is to be used. The performance to be used must be established based on assessment of risks based on the specific mission and approved by the applicable National Aviation Authority (NAA). Different missions (beyond hoisting to an Offshore Wind Turbine Nacelle) need to follow the same type of risk assessment. Where any doubt exists clarification with the OEM and/or NAA can be sought.

13.2 Wind benefit

It is standard practice to use 50 percent of the forecasted wind when calculating helicopter performance. When assessing wind benefit for HHO, if accurate wind condition forecasts at the hoisting site are available, and power assurance of the aircraft can be verified prior to the mission in accordance with the OEM procedures, wind or performance benefit of up to 75 percent of the charts actual headwind may be used to calculate OEI hover performance for hoisting operations, if authorized by the Competent Authority. It is recommended that when a wind or performance benefit of greater than 50 percent is used, the power check reading which shows the amount of reserve power available when hovering out of ground effect next to the wind turbine nacelle must be automatically recorded, included in the data produced for each flight and properly stored.

Section 14 Equipment Descriptions

Section 14
Equipment Descriptions

14.1 Hoisting System

The hoisting system includes all equipment (hoist, controls, safety equipment) essential for the hoisting operation. The following provides guidance for hoisting systems used for helicopter wind farm operations.

In 1999, safety requirements for hoisting systems used primarily for Human External Cargo (HEC) operations were amended and increased. To ensure the appropriate level of safety, hoisting systems used in wind farm operations should be certificated in accordance with FAA 14CFR part-27 or 29, or EASA CS-27 or 29 (or equivalent) for Human External Cargo (HEC) using the guidance and acceptable means of compliance contained within FAA AC 27-1B or 29-2C. HEC certification provides an additional level of safety when operating a hoisting system for commercial hoisting operations.

A hoist system which has been approved for HEC needs to be functionally reliable and durable for human operations, and as a minimum includes:

a) Increased structural strength (margins of safety) over non-HEC certified equipment;
b) A primary quick-release system which will sever the hoist cable and jettison the external load in the event of an emergency. The controls for the primary system require two distinct actions (to prevent inadvertent operation) and are to be on the pilot's primary controls (or equivalently accessible location) to allow quick action in the event of cable entanglement or other emergency situation;
c) A backup quick-release system, independent of the primary system, in the event the primary system does not function is required. The backup system also requires more than one distinct action and is typically satisfied by the installation of manual shears which are identified and located so the crewmember can release the cable within a specific time interval. Other independent systems may be used to satisfy this requirement;
d) Intercommunication system to allow for direct communication amongst crewmembers;
e) Protection of the hoist system against the effects of electromagnetic interference and lightning.

Hoist systems are available with cables that are fixed directly to the hoist drum or are equipped with an internal slip clutch which will allow the cable to 'peel-off' the hoist drum in the event the hoist cable becomes snagged or entangled on a platform, deck or other immovable object. It is widely believed that the slip clutch type hoist provides an additional level of safety for aircraft when operating in confined spaces where there is a higher risk of cable entanglement. The type of hoist selected needs careful consideration and risk assessment based on the type of operations due to be conducted.

Hooks which are susceptible to dynamic roll-out must be avoided. The potential for hook dynamic roll-out can be minimized by selecting specific hook-and-eye shape and cross-section combinations.

The phenomena of hook dynamic roll-out is the inadvertent opening of the hook latch and subsequent release of the load. Hook dynamic roll-out occurs during certain ground handling and flight conditions that may allow the lifting eye to work its way out of the hook and typically occurs when either a sling or harness is not properly attached to the hook, is blown by downdraft, is dragged along the ground or through water, or is otherwise placed into a dangerous hook-to-eye configuration.

Hoisting operations involving personnel harnesses should consider EC regulation 965/2012 which includes definitions for Personnel Carrying Device Systems (PCDS) and provides specific guidance (Ref. GM17 Annex 1 Definitions) for personnel devices intended for use in operations involving carriage of HEC on helicopters.

Hoist operators must use appropriate personal protective equipment. As a minimum, this equipment includes a safety harness securely attached to the aircraft structure, gloves for holding and guiding the hoist cable and a helmet with an intercom system for the hoist operator.

14.1.1 Maintenance of Hoists and Hoist Equipment

Hoists systems require specific maintenance to ensure a continued high level of safety and should be maintained as prescribed by the operator's approved maintenance program. The following recommendations apply:

a) Technical logs should be maintained for all hoists and lifting devices to record hoist cycles, maintenance performed, and modifications / Service Bulletins applied;
b) Time and / or cycle life limits should be established for the cable and cable cutting explosive cartridges (squibs);
c) All applicable bulletins, notices and directives or maintenance program published by the manufacturer

of the airframe and the hoist and competent airworthiness authority should be incorporated into the overall maintenance program as appropriate;

d) All lifting devices (baskets, straps, personnel harnesses, personnel lifting devices, and any ancillary associated lifting equipment) that attach to the hoist cable should also be included in the maintenance program;

e) Operators should have dedicated ground support equipment to ensure correct application of the published maintenance procedures.

14.2 Emergency Flotation Systems

Emergency flotation systems are used in the event of a water ditching to allow for time for crew and passengers to safely egress from the helicopter. Systems are certificated in accordance with the design requirements contained within CS/part 27 or 29 (or equivalent) using the guidance contained within FAA AC 27-1B or 29-2C or EASA AMC to CS-27 or 29.

Inflation of emergency floats is required once the aircraft makes contact with the water to provide the required buoyancy. Inflation of the floats can be commanded by the crew or automatically inflated upon contact with water using water immersion switches (or equivalent).

14.3 Ditching Certification

Additional structural and equipment requirements over and above those for emergency flotation systems are contained within CS/part 27 or 29 (or equivalent). The additional requirements require additional structural strength upon impact with the water surface to increase the aircraft survivability and provide requirements for approval and attachment of life vests, life rafts and signalling equipment.

To ensure aircraft stability in the forecast sea state conditions, the certified sea state is to be stated in the OEM Flight Manual and the sea state provided by the manufacturer is not to be exceeded during offshore operations.

14.4 Life rafts

Life rafts used for helicopter operations are approved under TSO/ETSO standards. Life rafts used for wind farm operations should be equipped with an appropriately approved signalling device (ELT or radio) and with an approved offshore survival kit. The life raft capacity needs to be commensurate with the number of occupants carried in the aircraft.

Where available, externally mounted life rafts or life rafts integrated within the flotation system which are automatically inflating are preferred over those internally located.

14.5 Push-out Windows

To improve emergency egress from the aircraft, emergency pushout windows can be employed. Emergency push-out windows can be used as an alternative to aircraft doors to aid in escape from the helicopter in the event of capsize. Window apertures are to be large enough for passenger egress when full equipment / immersions suits / life vests are worn.

14.6 Emergency Exit Lighting (HEEL)

Emergency lighting systems are used to clearly identify and outline emergency exits in the event of ditching to aid in egress from the helicopter in the event of capsize.

14.7 Egress Markings

Emergency exits and operating instructions for doors, windows and emergency equipment need to be clearly indicated. Emergency handles for deployment of emergency equipment need to be obvious and conspicuous.

14.8 Emergency Locator Transmitter (ELT)

TSO approved ELTs are essential and are to be carried on all aircraft. ELTs operating at 406 MHz use satellite coverage to pinpoint its location, and if an aircraft ELT can identify the aircraft by tail number. Each transmitter requires registration and, in the case of fixed aircraft installations, the aircraft identification.

In some regions, such as EASA Member States, an automatic deployable ELT (ADELT) is required by operating rules. ELTs that are automatically deployed, should be buoyant and include crash and immersion switches.

14.9 First Aid kits

First Aid kits are essential for helicopter wind farm operations. The number of first aid kits and contents need to be commensurate with the number of aircraft occupants.

14.10 IFR Certification

IFR certification requires the equipment, system redundancy and aircraft handling qualities to reduce pilot workload under instrument flight. IFR certification requirements differ slightly when considering single or dual pilot operations, but in both cases generally require the installation of an autopilot / AFCS to ensure aircraft handling qualities and stability to maintain pilot workload at acceptable levels. IFR certification also requires the installation of specific equipment and redundancies to ensure that system failures will not unacceptably increase pilot workload when operating under instrument flight. IFR capability, and IFR pilot currency also increases safety in case of entering inadvertent IMC. Requirement for IFR certification are included in CS/part 27 and 29 (or equivalent).

14.11 Autopilot / AFCS

Autopilot / Automatic Flight Control System (AFCS) can vary greatly in complexity and capability. They are used to provide stability augmentation and improve aircraft stability and have varying degrees of automated flight director functions all of which can help reduce crew workload. Autopilots can range from simple 2-axis systems (pitch and roll) to 3-axis (pitch, roll and yaw) to more complex 4-axis (pitch, roll, yaw and collective) systems.

While most 4-axis autopilots will control flight in four-axes, some 4-axis systems also have the capability to hold the hover at a defined height and position.

Further guidance is available in the HeliOfffshore Approach Path Management 3.0 and Automation Guidance 1.0.

14.12 Cockpit Voice Recorder (CVR)

CVRs are used to record communications within the cockpit and aid in accident and incident investigation. Design requirements for CVRs are included in CS/part 27 and 29 (or equivalent). ICAO Annex 6 and local operating rules, where cockpit voice recorders are required, provide additional requirements.

14.13 Flight Data Recorder (FDR)

FDRs are used to record various aircraft parameters and data and aid in accident and incident investigation. Design requirements for FDRs are included in CS/part 27 and 29 (or equivalent). ICAO Annex 6 and local operating rules, where FDRs are required, provide requirements for which aircraft parameters and data is to be recorded and the durations for storage and retention of the stored information.

14.14 Underwater Locator Beacons (ULB)

ULBs are attached to CVRs and FDRs to help locate aircraft wreckage and assist with recovery and facilitate accident investigation. ULBs are crash resistant and include an ultrasonic pulse which is triggered by water immersion.

14.15 High Intensity Strobe Lights (HISL)

HISL are used to increase aircraft conspicuity, especially when operating in congested airspace. White strobe lights which are distinct from red anti-collision lights are normally used to provide greater aircraft visibility.

14.16 Pulsed Lights

Pulsed lights are installed to provide increased aircraft visibility and, in some applications, have been shown to be a bird deterrent. Typically pulsed lights are integrated into the aircraft landing lights, but can be standalone.

14.17 Automatic Dependant Surveillance – Broadcast (ADS-B)

ADS-B is a system used to automatically track aircraft position using data obtained via satellite (GPS) navigation. The aircraft position is periodically broadcast from the ADS-B system (ADS-B Out) and can be used by air traffic management to ensure safe aircraft separation. Air traffic information can also be received (ADS-B In) to increase situational awareness and increase awareness of other air traffic in the operating area.

14.18 Helicopter Terrain Awareness Warning System (HTAWS)

HTAWS provides forward-looking terrain data to increase pilot awareness and help prevent controlled flight into terrain (CFIT). HTAWS relies on an obstacle database that requires periodic updating to ensure recency. Care should be taken when using HTAWS in an offshore environment due to the increasing number of wind farms and moving platforms that exist offshore that may not be in the obstacle database.

14.19 Traffic Alert & Collision Avoidance Systems (TCAS)

TCAS is an aircraft collision avoidance system. The system uses active transponder data to monitor air traffic and provide crew warnings which can reduce the threat of a mid-air collision.

14.20 Health Usage Monitoring System (HUMS) / Vibration Monitoring System (VMS)

HUMS is used to monitor the health and usage of airframe and mechanical components to predict degradation of drive systems, gear-boxes, rotating components and engines to allow proactive corrective action to prevent system failures. Subtle changes in vibration levels or vibration frequency can help maintainers identify issues prior to system or component failure and take the appropriate corrective action.

Basic HUMS uses data from VMS which consists of sensors used to monitor vibration levels and frequencies at key locations on the aircraft. Basic VMS typically measures data from engines, drive shafts, gear boxes, rotors and oil cooler for trending and analysis. In more complex HUMS systems, the VMS data can be combined with data from the engine control system and / or data recorded by a Flight Data Recorder to increase the information available for analysis.

Further guidance is available in the HeliOffshore Health and Usage Monitoring Systems Recommended Practice Guidance and Implementation Guide.

14.21 Flight Data Monitoring (FDM)

FDM is the proactive and non-punitive use of flight data from routine operations to monitor and improve aviation safety. FDM uses data recorded on the aircraft to help identify, quantify, assess and address operational risks. Some regulatory bodies such as EASA under SPA.HOFO.145 mandate FDM for offshore helicopter operations. Further guidance relating to FDM can be found in the HeliOffshore HFDM Recommended Practice.

14.22 Hoist Bags

In wind farm HHO, there is a routine need to convey tools, equipment, spare parts and other provisions. HHO passengers cannot have items in their hands or on their person while being hoisted; HHO passengers need to have their hands free to maintain good balance when touching down in the helicopter hoist area and free from items that could increase injury risk. All accompanying items should be in a separate hoist bag. Over the past 20 years specialized bags have been developed for this purpose. Helicopter operators procedures describe how and where to carry and secure hoist bags. Three standards are commonly used: EN 1492-1 (Flat lifting slings), EN ISO 21898 (Big bags) and ASME B30.9-2014 (Synthetic Webbing Slings: Selection, use and maintenance). Furthermore, as there are no specific standard covering the hoist bags, the following is recommended as guidance:

a) Inspection intervals of six or 12 months are set for the bags (as is normal for the EN 1492 product) plus a daily visual check before use (ASME B30.9-2014);

b) The design of the bag considers centrifugal force in case of a spinning load, which can occur due to rotor downwash (this is included in the EN ISO 21898 but not in the EN 1492);
c) The shape of the bag is considered (cylindrical bags are less likely to spin);
d) Snagging risk is avoided, though it will be necessary to gain a good grip on the bag (Removal Criteria and Rigging Practices from ASME B30.9-2014);
e) Sharp edges are to be avoided;
f) The bag has a secure means of closure to ensure nothing can drop from the bag.

Section 15 Heliport

Section 15
Heliport

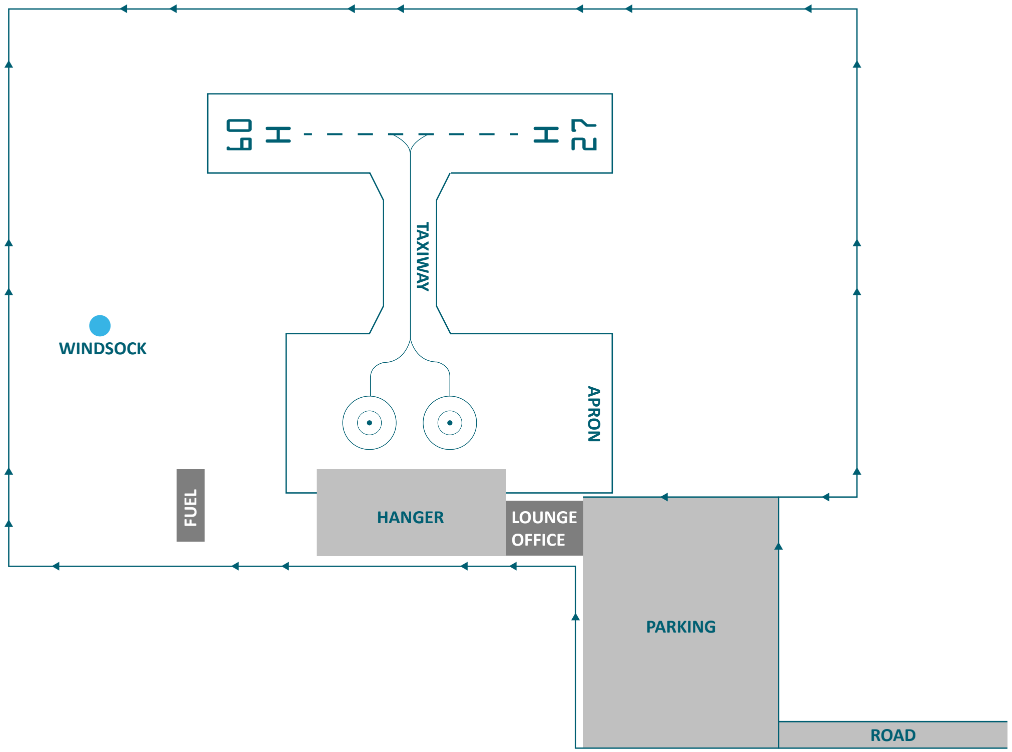
An operating base will need facilities for the air operator that include[33]:

a) A passenger terminal with suitable areas to process passengers and their baggage, issue PPE and changing facilities, conduct safety briefings, and areas to receive and handle any cargo. Wind farm maintenance equipment might be co-located at the terminal. PPE servicing may be on-site or handled at a specialist depot.
b) Flight planning[34] and office space for the air operator.
c) A maintenance facility with a hangar, offices and small workshops. The complexity of what is required depends on the scope of maintenance to be conducted. Major checks may be better conducted at the air operator's normal maintenance base(s). The size and dimensions of the facility, particularly the hangar, may be determined by the helicopter type selected for the operation.
d) Offshore helicopters also need to be periodically washed to minimise corrosion and suitable means of disposing of the dirty water and associated detergent is required.
e) It may be required to have the possibility to prepare and / or store Dangerous Goods[35]. See Section 18.6.

The scale and complexity of a facility can vary depending on the intended operation[36]. A short term project may require some rented space in an existing airport buildings or a portable hangar with offices and a passenger terminal in portable buildings. Long term or higher volume operations deserve more extensive conversion of existing buildings or commissioning purpose-built facilities, although certain portable hangar options are suitable for medium / long term use.

Onshore facilities will need an aviation fuel supply. The quality control of fuel is critical as contaminated fuel can cause the loss of power from all engines[37] – a potentially catastrophic failure mode. This might be a shared facility or a dedicated one. Depending on the volume of fuel usage, they can range from a large fuel farm and bowsers to refuel the aircraft, to portable fuel units near aircraft parking areas. Offshore helidecks can also be equipped with small fuel systems and supplied with fuel in transport containers (typically 5-12 t units). Offshore fuel adds capital and operating expense but can allow the temporary basing of aircraft offshore, allow a wider range of diversion options[38], or more shuttling operations within a wind farm and allow the helicopter to carry more payload[39]. Fuel on unmanned offshore installations is rare in Europe but normal in the US. Consequently, it is not a common practice in all regions for flight crew to refuel their helicopter and so offshore helicopter operators may need to develop further procedures for this. Specific approvals may be required. This highlights that sometimes practices common in one region will be surprising in another because offshore wind farm helicopter operations differ from, for example, oil and gas helicopter operations.

Figure 5 – Example heliport layout



Further to the facilities at the heliport, the surrounding area and location need to be considered. Locating the heliport close to the operational base of the passengers will greatly improve the benefits of the helicopter. Due to their high speed most helicopters will be capable of deploying to a wind farm much quicker than a surface-based vessel. If the passengers need to undertake a long journey to and from the heliport, this key benefit of the helicopter is negated.

If correctly specified, helicopters are capable of operation to and from onshore heliports in low visibility and low cloud conditions during the day and night[40]. To ensure this is possible and the value of the helicopter is maximised, it is key that both the helicopter and the heliport facility are correctly specified. The heliport should have instrument approach facilities in at least two directions and lighting to allow night operations[41]. To ensure the helicopter can carry the maximum payload, both a clear departure and approach path will need to be be available[42].

Rescue and fire fighting

Heliports are subject to state and local rescue and fire-fighting regulations[43]. The minimum fire and rescue provision required at a heliport is variable depending upon factors including the status (licensed or unlicensed), size, aircraft type, movement number and type of operations. This can result in the minimum regulatory required service level falling below that required for the same operation at a licensed commercial airport. In such cases the lower level of service should only be accepted following a joint risk assessment involving the helicopter operator, contracting party and employer of passengers. Care must be exercised to prevent commercial pressure from reducing fire and rescue provision to minimum levels[44].

15.1 Meteorological Information

Timely, accurate weather information is a crucial part of safe aviation operations[45]. To maximise the operational window and use the full capability of the helicopter, a weather reporting station sufficient to be used for flight planning should be installed at the heliport.

15.2 Helicopter Maintenance Facilities

In general terms, the maintenance of the helicopter can be divided into two categories:

a) Light or daily maintenance activities. These are routine and / or small tasks that are required to operate the helicopter. Typically these activities can be conducted at a Line Maintenance Station.
b) Heavy or major maintenance. Planned heavy or deep inspections or component exchange or major repairs. Typically these can only be performed at a Base Maintenance Facility.

A helicopter operator will ordinarily be approved to maintain its own helicopters and have its own maintenance department. In addition to the operator being approved to perform maintenance tasks, the location at which these tasks will be performed must be approved. To receive approval for a maintenance facility, a maintenance organisation must arrange for its national authority to conduct an onsite visit.

The exact requirements of the maintenance facility will finally be determined by the national authority that is issuing the approval so it is not possible to define the specifications of a maintenance facility in this document. Some general guidance of a typical Line Station is given in table 3.

15.3 Supply of the heliport

As outlined in 15.2, the approval of the maintenance facility is subject to the inspection by the national authority overseeing the selected maintenance provider. The dimensions and facilities required at the maintenance base may be, at least partly, defined by the choice of helicopter for the operation. It may be preferable to use a helicopter type that is already in an operators fleet rather than introduce a new helicopter type. The interdependency of heliport requirements, helicopter operator and helicopter type combined with the challenges in defining heliport specifications can introduce significant challenges if the supply of the heliport facility is separated from the supply of the helicopter service.

Figure 6 – ICAO Climb gradient reduction in departure

Because of obstacle B, the gradient cannot be reduced to 3.3% (2.5% + 0.8%) (Cat H, per cent) just after passing obstacle A. The altitude/height or fix at which a gradient in excess of 3.3% (Cat H, 5.0 per cent) is no longer required is promulgated in the procedure.

Obstacles A and B will be promulgated. Mountain promulgated on Aerodrome Obstacle Chart Type C.

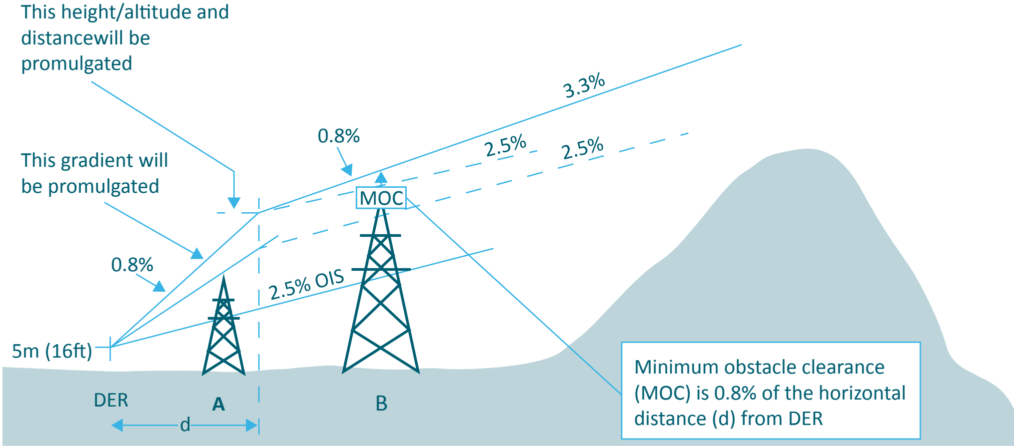
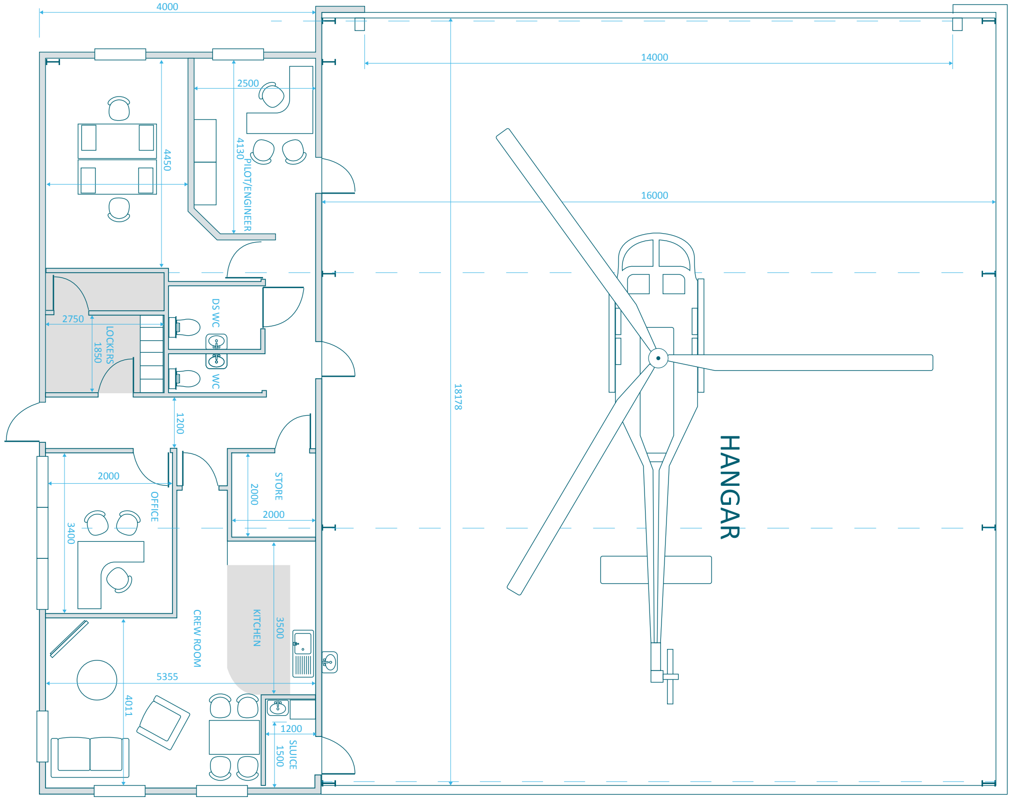


Table 3 – Typical Line Station

Maintenance Facilities
Hangar Floor Area
Helicopter Maintenance Area
Mechanical Workshop
Tool Store
Bonded/Quarantine Area
Toilet & Washing Facilities
Locker Room
Electrical Power
230/250VAC, 50Hz, Single Phase
415VAC, 32A, 3-Phase
240VAC, 16A, 3-Phase
220VAC, 50Hz, Single Phase
28VDC
Compressed Air
Compressor
Fresh Water
Pressurised Water Supply
Heating & Lighting
Office Heating
Office Lighting
Hangar Heating
Hangar Lighting
Equipment
Gantry Hoist
Mechanical Handler
Aircraft GPU
Hydraulic Replenishment Rigs
Engine & Transmission Oil Replenishment Rigs
Engine Washing Rigs
Nitrogen Charging Rig
Work Stands and Steps
Cowling Racks
Component Cleaning Bath
Single Wheel Jack & Adaptors
Aircraft Toolbox
Workshop
Workbench
Bench Vice
Pillar Drill
Safety Equipment for Drilling

Figure 7 – Generic layout of a hangar and line maintenance facility



Section 16 Flight Operations Procedures

Section 16
Flight Operations Procedures

Consideration needs to be given to the frequencies and communication protocols used to ensure situational awareness but avoid overloading individual channels.

16.1 Communications

Two-way radio communication within the boundaries of the wind farm to ensure coordination of all traffic[46] and maintain an alerting service is essential[47]. Multiple assets, such as vessels, helicopters[48] and possibly UAS, can be active provided there is an agreed safe separation maintained between them (e.g. to prevent vessels infringing areas that a helicopter would need in the event of an engine failure) and all parties involved are informed. Before a simultaneous operation of assets is conducted then a joint risk assessment should be conducted and procedures established to ensure separation and communication is maintained throughout normal and abnormal situations. This will also aid emergency response when necessary.

Procedures should be established regarding communication / co-ordination to establish who should lead and the importance of reducing radio noise (unimportant messages / frequency changes / types of radio). With adjacent or nearby wind farms, it is advisable all adopt the same procedures to facilitate the safe sharing and use of helicopters.

Within the setup, it should be assured that the involved assets are capable to use the communication channels. Requirements for participating parties should be established and agreed to allow inter-communication between individuals with handheld comms on individual WTG's, vessels and helicopters.

It is important to keep the amount of communication on the individual channels to a minimum. Ensure that only the essential information is transmitted to avoid distraction from the individual tasks.

It is common for wind farms to use TETRA or similar systems for in-field communication. This can have benefits but also needs consideration. Using a common communication system fully integrated into the helicopter to reduce pilot workload is recommended. The unnecessary changing between systems and / or frequencies should be avoided.

The optimal communications set up will have one central agency to co-ordinate all communication with the helicopter and communication will be kept to the minimum required to perform the operation.

16.2 Traffic Information / Deconfliction

In order to provide a safe environment, traffic information, situational awareness (SA) and tasking of air assets and other assets within, close to and en-route to offshore wind farms are important factors. To aid deconfliction[49], effective and efficient systems and processes are put in place, offshore aviation operators need to ensure on the roles, responsibilities, along with technical and operational expectations have been discussed, agreed and are in place between the main parties – Offshore aviation operator, OWC, applicable NAA and ANSPs.

The G+ GRG provides considerations for OWCs, and the RUK ORAG Issue 2 provides a good example of considerations, using the UK as a case study, in its Annex A.

16.3 Metrological Data

The helicopter operator needs to constantly monitor the development of the weather in case it deteriorates and personnel need to be recovered earlier than planned. It is recommended the helicopter operator has access to in-field weather data and forecasts.

Weather data is distributed via a Meteorological Aerodrome Report (METAR) (current weather report) or a Terminal Aerodrome Forecast (TAF) (weather forecast). Depending on national regulations, these reports can be generated through an automatic weather station or can be provided by qualified personnel. It is recommended that within the planning phase of the OWF and planning of weather measuring equipment, the need for aviation weather reports and possibly the establishment of an automatic aviation weather station is considered[50].

16.4 Adverse Weather Policy

Weather limitations consistent with the capabilities of the aircraft and rescue assets need to be established for the wind farm. There may be variations between WTGs, fixed installations and vessels[51].

16.5 Transport of Baggage / Cargo

The transport of baggage / cargo is subject to the restrictions of the helicopter and national / international regulations. The following should be considered:

a) Weight / volume restrictions of the cargo compartment / cabin. Helicopters have finite volume and weight capacity. Reducing the volume and weight of cargo can maximise the effectiveness of the helicopter;

b) All cargo / baggage needs to be able to be handled by personnel in the helicopter and on the offshore vessel / platform;

c) Baggage / cargo transport will affect the amount of passengers to be transported. Prioritisation might be required;

d) The transport of baggage / cargo within the cabin, in combination with passengers, needs to comply with national regulations, for example, access to emergency exits;

e) All items intended for transport must be suitable and approved for transport by air. See Section 16.6- Dangerous Goods.

16.6 Transport of Dangerous Goods

Some items may endanger the safety of an aircraft or passengers[52]. The air transportation of dangerous materials can either be forbidden or restricted. The following items are defined as dangerous goods (DG). The applicable international regulation applicable to DGs in aviation is ICAO Annex 18 and associated technical Instructions (ICAO DOC 9284) which have been transposed and published by IATA in the DGR. The IATA Dangerous Goods Regulations (DGR) manual is the global reference for shipping dangerous goods by air and the only standard recognized by airlines.

Examples for dangerous goods are:

a) Batteries
b) Gas Cylinders
c) Oil
d) Paint
e) Petrol

Dangerous goods are subdivided in different classes. The following DG classes can be considered for transport on a helicopter if properly packed:

a) Class 2: Gases
b) Class 3: Flammable liquids
c) Class 4: Flammable solids, substances liable to spontaneous combustion; substances that on contact with water emit flammable gases (water reactive substances)
d) Class 5: Oxidizing substances and organic peroxides
e) Class 6: Toxic and infectious substances
f) Class 8: Corrosives
g) Class 9: Miscellaneous dangerous good (except magnetic materials)

The following Classes of DG should NOT be considered for transport on a helicopter:

a) Class 1: Explosives
b) Class 7: Radioactive materials
c) Class 9: Magnetic materials

Before starting operations, the following considerations should be made:

a) Is the transport of DG likely and necessary?
b) Does the helicopter operator have approval to transport DG?
c) If DG are transported, who is responsible for preparation, packing and checking of DG? Most DG are only allowed to be transported if they are transported in specific and certified packing.
d) Have the personnel involved with the transportation of DG by air been trained?[53]
e) What restrictions are expected on the individual flight?

In general, DG would be only transported by air to an offshore location, as the transport back is not as time-critical and checking and packing on an offshore location might not be possible. If transport of DG offshore to onshore is envisaged, the appropriate procedures offshore need to be established and approved, this may require specific approval by the NAA.

The preparation for the transportation of DG will require more time, equipment, competence and qualifications than for general cargo / baggage.

16.7 Cargo HHO to/from vessels

16.7.1 Introduction

It is recognised that Helicopter Hoist Operations (HHO) to and from vessels can be beneficial for the windfarm operations. The regulatory framework for such Vessel HHO is broad and accounts for a broad range of activities not just operations for the wind industry. This section provides guidance tailored specifically for cargo HHO supporting windfarms.

16.7.2 Limitations

Vessel motion is a function of weather, sea state, and the characteristics of the vessel (i.e., length, superstructure, cargo on deck, position of hoist spot, etc.). Vessel motion limitations for landing on a helideck are well established, for conducting HHO to/from a vessel these are less defined. Limitations are subject to flight crew judgement and are part of the pre-mission planning and brief and the pre-hoisting checks.

Note: Unlike vessels with helidecks, it is not typical that non-aviation capable vessels deployed to windfarms are equipped with calibrated helideck motion monitoring system (HMS) or other motion measurement devices.

As a rule, no hoisting is to take place if sea conditions cause sea spray to come over the deck. As vessel crew are involved in the operation it is for the vessel Master to decide if their safe participation can be assured.

16.7.2.1 Vessel

a) Vessel Pitch and Roll shall not exceed 5 degrees
b) Vessel Heave (at the hoist point) shall not exceed 5 metres amplitude
c) Vessel Heave shall not exceed 1.5 metres per second
d) The Vessel Master retains the authority and right to apply further limitations or stop operations in the interest of safety.

16.7.2.2 Weather

a) Wind shall not exceed 50kts (mean wind and excluding gusts)
b) Visibility not less than 3km
c) Cloud Base not less than 600ft
d) Hoisting operations are only conducted in Visual Meteorological Conditions (VMC) with surface visual contact

16.7.2.3 Operational

a) HHO to/from a Vessel shall only be conducted from a helideck or hoist point or suitable hoisting spot

b) The commander of the aircraft shall ensure that the fly away path into wind is sufficiently clear of obstructions such that, in the unlikely event of a single engine fly away, the aircraft can attain VTOSS before turning.

c) HHO to/from a Vessel shall be conducted during day only. Night operations are not permitted.

d) Adequate external hover references for the flight crew must be available, and turbulence environment must be assessed as benign.

16.7.2.4 Ground Crew

Ground crew shall have the training and competence required to carry out their duties. This training shall be conducted by the helicopter operator and shall include at least a manual demonstration, or video instruction, or may be completed as part of the helicopter operator delivered HHOP training.

16.7.2.5 Flight Crew

a) The helicopter operators training manual (OMD) shall include hoisting to/from vessel operations.

16.7.3 General considerations

The vessel's bridge team should, before the arrival of the helicopter, determine the best course/speed combination that result in least deck motion while still maintaining at least bare steerageway. It must be made clear to the vessel's bridge team that heading and speed must be maintained throughout the hoist operation, and any heading changes must be reported to the helicopter crew in good time. The vessel's bridge team shall maintain two-way communications at all times with the helicopter.

The bridge team shall also ensure there remains sufficient sea room to complete the operation. However, responsibility for safe navigation of the vessel remains with the vessel's Master and bridge team.

16.7.4 Briefing with vessel crew

Before initiating any hoisting operations to/from the vessel, the intended operation must be discussed and briefed with the vessel crew involved. A plan for vessel hoisting procedure i.e., steady position and or underway, relative wind, etc must be agreed upon by all parties.

16.7.5 Suitability of the hoisting spot / area

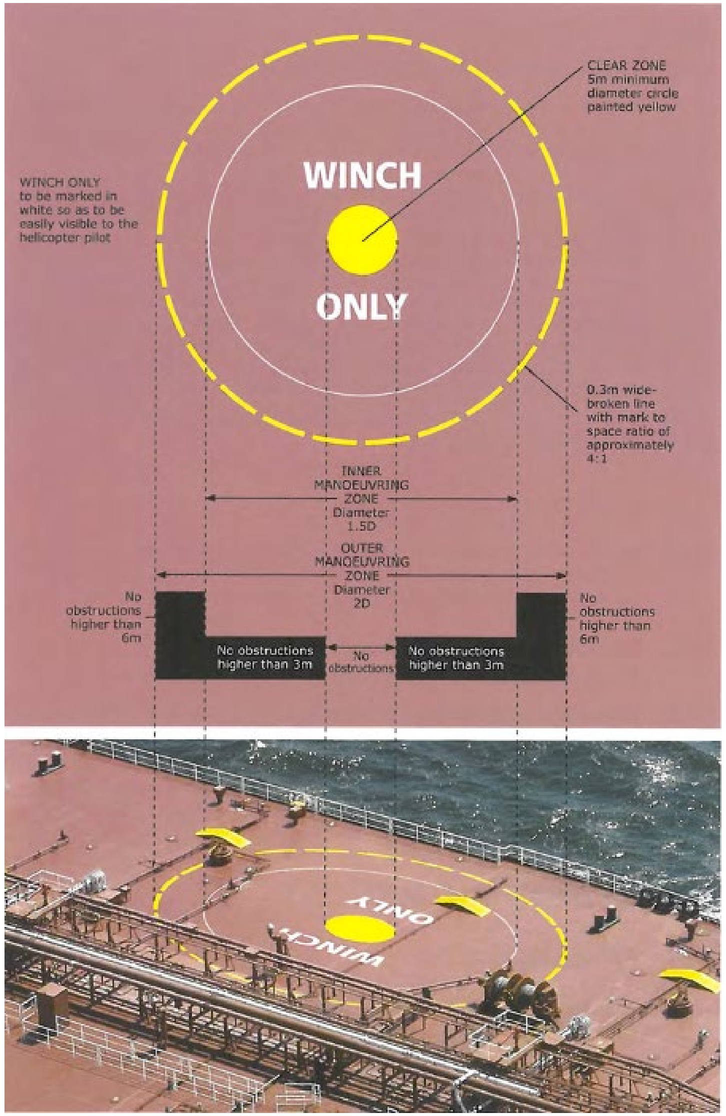
If an approved hoist spot / area is available, this should be used. The hoist area should be minimum 5m in diameter (ideally clear of obstructions with clear approach and exit routes), and with part of the vessel / deck within the PF's and hoist operator's view from the hoisting position.

For additional guidance in terms of size and area of the hoisting zone, the Guide to Helicopter / Ship Operations (International Chamber of Shipping) can be used.

16.7.6 Static electricity

Before any hoisting operations, the flight crew must ensure that the vessel crew taking part in the operation have been briefed on potential static electricity build-up and on procedures to how to make sure the static electricity discharge wire facilitates earthing of the hoist hook.

Reference:



16.7.7 Communication

Before any hoisting operations, the flight crew must ensure that a means of having two-way radio communication have been agreed on with the vessel crew. Hand signals should only be used as a fall-back option. A minimum of hand signals should be agreed upon before hoisting, i.e., signals for "OK," "Stop" and "Abort," flight crew shall maintain visual contact with the ground crew while they are working with the cargo.

16.7.8 Crane and gangway activity

No crane/gangway activity is permitted on a vessel when helicopter hoisting operations are planned and or in progress.

16.7.9 Equipment

Only bags and equipment approved for lifting shall be used and only within the SWL of the said equipment.

16.7.10 Vessel crew

The vessel deck crew shall secure all equipment, check and remove loose objects and/or debris from the agreed hoist spot and surroundings.

During hoisting operations, it is the task of the vessel deck crew to hook and unhook the relevant "cargo" to the hoist hook of the helicopter.

The vessel deck crew must ensure that the static discharge wire touches the vessel before handling the hoist hook.

Caution must be exercised in relation to light hoisting loads, as lightly weighted bags may be prone to move around in the turbulence caused by the helicopter down-draft. For light weight bags or lowering / heaving empty hoist hook in stronger winds, additional weight bags, carried with the helicopter, should be utilised for stabilisation.

Under NO circumstance shall the helicopter hoist hook nor the helicopter hoist wire be secured to any part of the vessel structure.

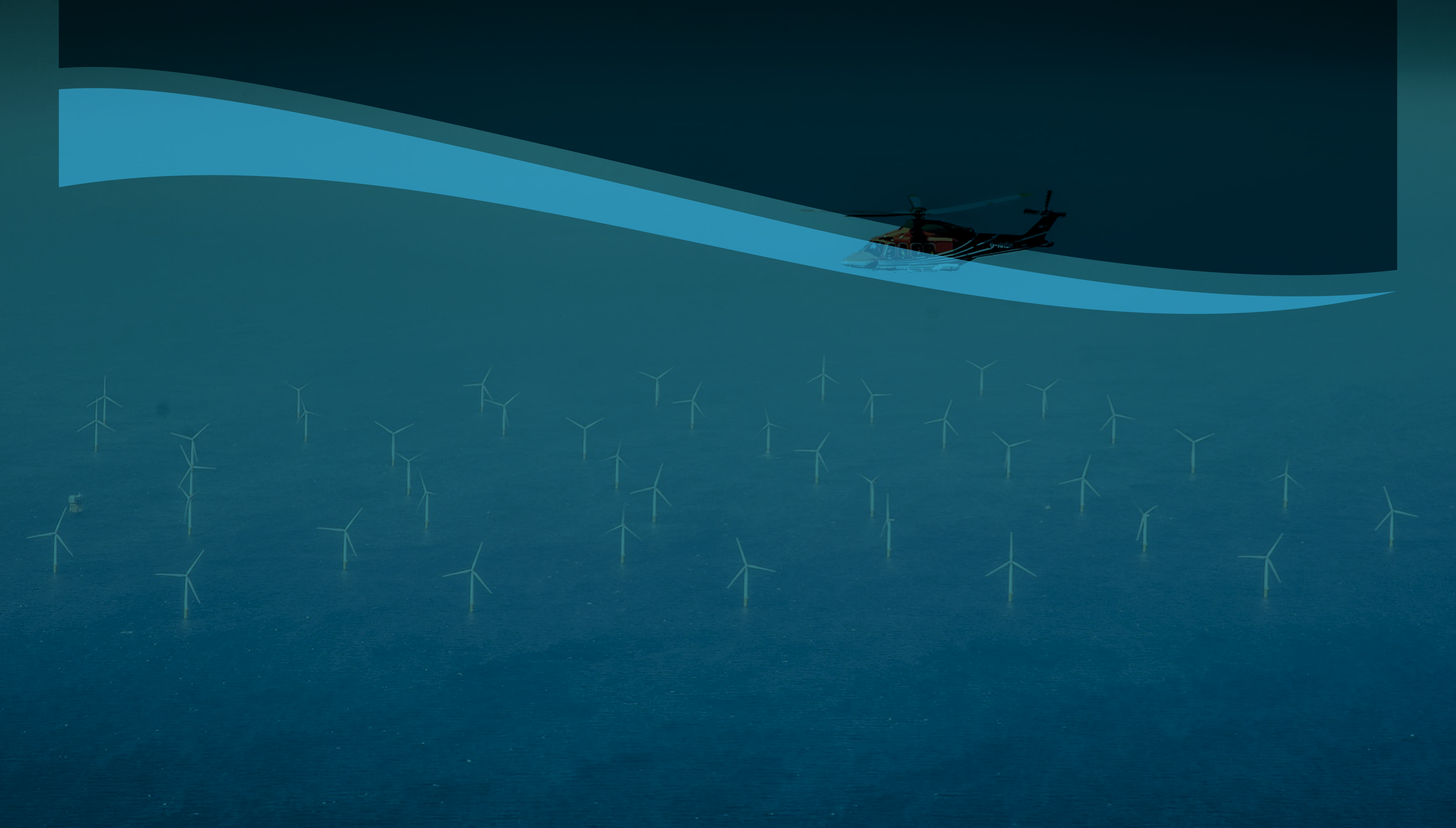
PPE in form of hard hat, gloves, goggles and safety boots should be worn. Hard hat chin strap must be used.

In case of the vessel crew (either deck or bridge) sees any situation developing that may inflict on the safety of the helicopter he or she shall immediately signal to the flight crew either to stop or complexly to abort the operation altogether, either via radio or by hand signals as stated.

16.7.11 Foreign Object Detection on hoist spot/area

Loose objects can cause a significant hazard to helicopter operations. Prior to operations the vessel crew shall secure all equipment, check, and remove loose objects and / or debris from the hoist spot/ area and immediate surroundings. The HLO or deck crew member will have a final check on the hoist spot / area before starting any hoisting operations.

Section 17 Abnormal Conditions



Section 17
Abnormal Conditions

As with any form of transportation to offshore wind farms helicopter operations are complex: many interfaces are required to enable safe and efficient crew transfers to and from wind turbine generators, platforms or ships. The complexity of operations means that – even with strict, binding, procedures in place – abnormal conditions occur and present an operational anomaly to be correctly managed.

Furthermore, exceptional situations may occur during the normal operation of an offshore wind farm. For example, unanticipated events may require the timely evacuation of technicians from a WTG, Platform or ship. In these circumstances, helicopters may be a safe and effective solution.

This section lists and specifies anticipated abnormal conditions, with guidance about how these conditions might be managed.

17.1 Transport of Medically Incapacitated Personnel Unable to Wear Full PPE

In Europe, SPA.HOFO.165 (i) permits the air operator to: "based on a risk assessment, allow passengers, medically incapacitated at an offshore location, to partly wear or not wear life jackets, survival suits or emergency breathing systems on return flights or flights between offshore locations."

A passenger is determined as a 'medically incapacitated passenger' by a medical professional and this information needs to be conveyed to the aircraft commander prior to arrival offshore. The regulation does not rule out the option of a remote diagnosis.

The EASA has included this operational necessity in the Commission Regulation (EU) No 965/2012 – SPA.HOFO.165 (i) and the respective AMC and has determined the requirements operators have to adhere to. The Commission Regulation defines a medically incapacitated passenger as person who is unable to wear the required survival equipment, including life jackets, survival suits and emergency breathing systems (EBSs), as determined by a medical professional. [AMC1 SPA.HOFO.165 (i)]

The operators adhere to the following requirements:

a) The transportation of medically incapacitated passengers is based on a risk assessment;
b) The medical professional´s determination regarding the severity of the injury and the capability of the injured person to wear PPE should be made available to the pilot-in-command / commander prior to arrival at the offshore installation;
c) The operator should establish procedures:
   I. for the cases where the pilot-in-command / commander may accept a medically incapacitated passenger not wearing or partially wearing survival equipment. To ensure proportionate mitigation of the risks associated with an evacuation, the procedures should be based on, but not be limited to, the severity of the incapacitation, sea and air temperature, sea state, and number of passengers on board;
   II. defining under which circumstances one or more dedicated persons are required to assist a medically incapacitated passenger during a possible emergency evacuation, and the skills and qualifications required;
   III. defining the seat allocation for the medically incapacitated passenger and possible assistants in the helicopter types used to ensure optimum use of the emergency exits; and
   IV. defining evacuation procedures related to whether or not the dedicated persons as described above are present.

Provided that the given requirements are met, an operator may transport medically incapacitated passengers onshore, thus offering a safe and effective solution in an exceptional situation and increasing the operational benefit of helicopters for wind farm operators.

If a medically incapacitated person is required to be hoisted, this may be classified a SAR flight, as they may need either an SAR winchman to accompany them during the hoist or need to be lifted by stretcher. Some nations may accept this as a HEMS HHO flight. The same principles discussed above apply.

Different regulators may have their own rules, or it may be necessary to apply for an exemption in advance.

17.2 Helicopters in an evacuation / rescue role

Wind farm operators put in place several safety barriers to assure the safety of technicians working offshore. One of the ultimate safety measures is the evacuation of personnel from platforms, ships or WTGs. The evacuation can take place by use of ships, such as SOVs or CTVs or by use of helicopters.

A helicopter can play a vital and efficient role in the evacuation of an offshore location, since they can be used in severe weather conditions such as high winds and high waves (where most ships have to stop the operation). The helicopter might be the safest option to perform a rescue in some cases. Additionally, helicopters can usually be dispatched on short notice and can perform an evacuation to transport rescued personnel onshore significantly faster than ships.

Based on the mentioned operational and safety benefits of a helicopter, integration of helicopters into Emergency Response Planning should be considered.

17.3 Unknown or Unanticipated Mode / Position of WTG

For HHO, wind farm controllers are normally able to position a WTG into a ‘hoist position’. This position needs be agreed with the air operator and may be helicopter type specific. The Aircraft Commander should be provided with a method to confirm the status of the turbine prior to conducting hoist operations.

Most WTG are equipped with a status light mounted on the nacelle to provide the flight crew information on arrival. A steady green light shows that the WTG is in hoist position. A flashing green light indicates that the WTG is currently being configured into the correct position. If the status light is not illuminated, the WTG shall be treated as a ‘dead turbine’.

A dead turbine is one where it is either not possible to set the WTG in hoist position or it is not possible to confirm it is in hoist position. Close communication in between the crew and wind farm controllers is crucial when operating to dead turbines. Guidelines for a dead turbine include:

a) The Commander should confirm the status of the turbine with the wind farm operator;
b) Prior to starting HHO, the crew should carefully assess the WTG according to the company specific procedures and limits;
c) The crew may decide to perform a test hoist cycle, without a load on the hook, to evaluate the feasibility of the operation;
d) If it is deemed safe to perform HHO, the operation can be continued; otherwise, the HHO has to be aborted.

Offshore WTGs are large structures; both the acceleration of blades and the turning of the nacelle happens slowly. If the configuration of the WTG changes during HHO (for example, the nacelle starts to turn) the hoisting would need to be discontinued immediately until it can be determined that the WTG configuration is again stable. The crew will need to be able to communicate with the wind farm controller during such events and would be expected to file a safety report.

17.4 Hoist failure during HHO

Even though hoist systems are very reliable, technical issues may occasionally arise; it is therefore important to establish and implement safe procedures to cope with non-standard situations.

The hoist can potentially fail during the hoist operation, preventing lowering or raising the passenger / load. If a hoist motor failure is detected, appropriate procedures are needed to secure the hoist cable in the stuck position. Depending on cable length, it may be possible for the passenger / load to be set down safely onto the hoist area and disconnected from the hook. If the hoist motor stops with the cable close enough to the cabin door may be possible for the passenger / load to be recovered into the cabin. In the unlikely event that neither option is possible, the helicopter will need to fly to the next suitable place (often an offshore helideck) where the passenger / load can be set down. A suitable place to set down the passenger or load shall be selected considering the temperature, weather, distance, speed and fuel required. An attempt should be made to secure the passenger with a second line for the transit. If a dual hoist system is fitted, a hoist transfer is possible. However, this should be only done by trained personnel due to the risk of disconnecting the wrong hook.

Section 18 Flight Crew Complement

Section 18
Flight Crew Complement

International regulations defining whether one or two pilots are required for flights to offshore wind farms are not aligned; operations have been conducted with both one and two pilots. It is important to differentiate between simply having two pilots in the aircraft cockpit and having a multicrew concept (MCC) operation. To be effective as a dual crew the pilots must work as an effective team sharing workload and confirming each other's actions. To achieve this, it must be embedded in procedures, trained and practiced[54].

A key aspect is Crew Resource Management (CRM); regulations dictate that multi-crew operations receive this specialist training. This ensures flight crew handling and monitoring duties are appropriately divided, defined and conducted, in line with human factors principles. This helps minimise the risk of errors or threats being mismanaged and can enhance situational awareness[55]. Simply placing a second pilot in an aircraft is not guaranteed to enhance the safety of an operation and may increase risk.

This section only considers single or fully implemented MCC two pilot operations referred to as Multi pilot (MP) operations. Hybrid concepts such as performing some of a flight with two pilots and the remainder with a single pilot are not considered in this document. Mixing multi-pilot and single-pilot operations with the same crews increases risk (ref BFU 3X006-14 D-HDRJ April 2016 final report).

As detailed in Section 13 – Performance, hoisting operations require the helicopter to operate at higher power settings. Consequently, particularly in smaller helicopters, payload can be limited. By adding crew members to the helicopter, the available payload is further reduced. As such, there may be operations where single-pilot crews are considered in order to increase available payload and / or power margins.

Operating a helicopter with a single pilot instead of two pilots will always be cheaper and allow the carriage of more payload. Some helicopter operators may only conduct single-pilot operations or may find that flying with two pilots does not allow them to offer sufficient performance to meet customer OEI requirements[56] without using a larger helicopter. Some helicopter operators may not be able to conduct single-pilot operations or may not have helicopters that can be flown by a single pilot (some aircraft can only be flown by two pilots). Commercial pressure must be removed from the decision to use a single or multi- pilot crew concept. The decision process must be risk-based[57].

18.1 Crew Composition Assessment Tool

The HeliOffshore Working Group has created the Crew Composition Assessment Tool to facilitate a common, risk-based, methodology toward the selection of single or multi- pilot operations. Each wind farm operation is unique. Some aspects of the operation may be practically fixed such as airspace congestion or the level of Air Traffic Control service availability. Other aspects, such as night flights or the helicopter equipment, are not fixed. Each of these has an influence on selecting the appropriate crew composition.

When considering crew composition, the twelve most important aspects of a wind farm operation have been identified, and their influence quantified. Using the Crew Composition Impact Tool, it is possible to objectively rate a wind farm operation and review the impact of each aspect.

18.1.1 Using the Crew Composition Assessment Tool

Figure 8 shows the Crew Composition Tool. Topics are listed in the left column and an explanation for each topic is given in Table 4.

For each topic, three impact assessment levels are identified (low, medium, high).

The number in the light blue row is the impact rating of each topic, based on the assessment level.

For example, if the wind farm requires a flight time of 100 min, the assessment level would be 'medium', and therefore the impact rating is 29. To use the Crew Composition Tool all the topics must be rated for the operation being assessed. Once every topic has been rated, add all of the impact ratings together to obtain a total score for the wind farm. A specific worked example can be found in Annex 3.

Figure 8 – Crew Composition Tool

Topic	Impact assessment level		
	Low	Medium	High
Flight time (Minutes)	<60	60-120	>120
	9	29	54
Congestion	Sole use	Multiple assets	Multiple assets and adjacent wind farm
	10	50	80
Aircraft equipment	4 axis, SFD	4 axis	3 axis
	11	16	51
Deconfliction	Enroute and at airfield	Enroute or airfield	None
	11	26	54
Vessel landing	None	Possible but unplanned / infrequent	Planned or considered
	0	44	54
Vessel hoisting	None	Unplanned	Planned or considered
	0	43	59
IFR / VFR	VFR	VFR and IFR recovery	Planned IFR
	7	46	64
IMC / VMC	VMC	VMC in wind farm IMC recovery / enroute	IFR departures and arrival planned
	9	49	67
Flight hours	<2	2-4	>4
	9	31	55
Day / Night	Day only	Night transit only	Night Ops
	4	46	85
Flight crew recency (Days)	>100	50-100	<50
	16	29	49
Flight crew experience	Extensive	Recommended	Minimum
	7	37	74

Table 4 – Crew Composition Topic Description

Topic	Description
Flight time	What is the expected flight time in minutes, from shore until the shutdown of the aircraft?
Congestion	Congestion of airspace (measured in terms of other users for the offshore portion, simultaneous drone ops, other users of wind farm airspace +/- 10 Nm)?
Aircraft equipment	Is the aircraft fitted with a fully serviceable 3-axis or 4-axis autopilot? Does the helicopter have a cockpit with synthetic flight displays (SFD) that integrate engine, warning and limitation indications that lower pilot workload?
Deconfliction	Does the Air Traffic Control service ensure separation and deconfliction for any or some of the flight?
Vessel landing	Will vessel landings be conducted? Planned = a foreseen, expected, part of the operation. Unplanned= In reaction to an unforeseen event, not part of the planned operation, one off or rare event.
Vessel hoisting	Will vessel hoisting be conducted? Planned = a foreseen, expected, part of the operation. Unplanned= In reaction to an unforeseen event, not part of the planned operation, one off or rare event.
IFR / VFR	Will portions of the flight be conducted under IFR rules? Is this only for recovery if weather unexpectedly deteriorates or is it expected that parts of the flight will be conducted IFR?
IMC / VMC	Will portions of the flight be conducted in IMC? Is this only for recovery if weather unexpectedly deteriorates or is it expected that parts of the flight will be conducted IMC such as departures or arrivals from onshore?
Flight hours	The number of planned flight hours per crew, per day.
Day / Night	Are flights only conducted during daytime? Or are portions of the flight planned to be conducted at night such as the departure or arrival onshore? Are entire flights to be conducted at night?
Flight Crew recency	Recency how many similar operations (HHO or deck landings) has the crew performed in the last 90 days? A more recent crew is deemed safer than a crew that has not recently performed the type of operation.
Flight Crew Experience	Flight Crew Experience as defined in Section 19.7.

The minimum possible impact rating for an operation is 115 and the maximum is 746. The impact rating that has been obtained is then transposed onto the Crew Composition Scale in Figure 9.

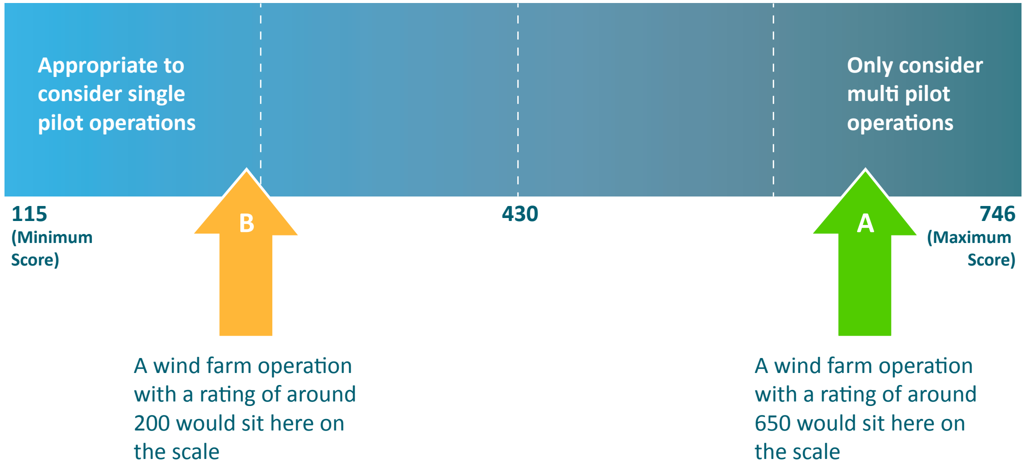
A wind farm operation with a high impact rating, as indicated by Arrow A, falls into the area where only multi-pilot (MP) operations should be considered.

A wind farm operation with a low impact rating, as indicated by Arrow B, falls into the area where it is appropriate to consider single-pilot operations.

Some aspects of a wind farm operation, such as the flight time, may be fixed. Some aspects of a wind farm operation, such as aircraft equipment, are not fixed. The impact of selecting an aircraft with different equipment may be assessed by using the tool. Using the tool, it is also possible to see the impact of making different choices and altering the operation. For example, choosing not to conduct flights at night, no vessel landings or vessel hoisting will produce a lower impact rating than an operation that has night flights and vessel operations.

Further guidance including a worked example using the crew composition assessment tool can be found in Annex 3.

Figure 9 – Crew Composition Scale



Section 19 Training and Competence

Section 19
Training and Competence

This section covers training of passengers in the context of helicopter operations in support of the offshore wind industry and in addition covers training for pilots and technical crew members (hoist operators) collectively referred to as flight crew. Being a passenger on an offshore helicopter is significantly different to being a passenger on a commercial flight between airports. The passenger will need to wear, understand and be able to use specialist PPE2. If undertaking a hoist transfer, the hoisted passenger takes an active role so must have the training and competence required.

Note: the training necessary for a 'wind technician' to perform their role on site is not included here.

The undertaking and successful completion of passenger training is necessary because the method of transport to the work place is out of the ordinary; the potentially isolated destination is out of the ordinary; and the passenger is exposed to elements of nature that are out of the ordinary when compared to normal methods of transport.

Using competent personnel to perform tasks reduces operational risk. A standard is set, for the individual, for the organisation, for the passengers and for the industry. It is essential that an OWC seeking to employ the services of a helicopter operator is satisfied by the initial and recurrent training undertaken by both the helicopter operator's personnel and the OWC's personnel. Both the helicopter operator and the OWC have an obligation to reduce any risk possible. This is jointly achieved through:

a) Rules and procedures, permits and validations at the helicopter operator level;
b) Specific training to be performed by the helicopter operator and passengers;
c) Confident and competent use of special safety equipment.

There is considerable overlap between the regulations of the European Air Safety Agency, the Federal Aviation Administration (USA), Transport Canada and the Civil Aviation Safety Authority (Australia), however an OWC must ensure that the helicopter operation is performed in accordance with the relevant local regulations. The helicopter operator must provide evidence of an approval to operate in accordance with the local regulations.

19.1 Passengers

The safe and efficient delivery of passengers to helidecks or wind turbine nacelles is dependent on training and assessment.

Passengers carried by helicopter to / from offshore installations and vessels must undertake training relevant to that environment and appropriate to the method of transportation. For example, passengers who are expected to travel only between helidecks and heliports must undergo training relevant to the offshore environment but need not be trained in hoist operations. Any passenger who is to deploy direct to the nacelle of a wind turbine or hoisted to a vessel or a platform must undergo the additional training relevant to that means of transfer.

19.1.1 Competence

All passengers travelling offshore by helicopter are to have completed Helicopter Underwater Escape Training (HUET)[58], including Compressed Air – Emergency Breathing System (CA-EBS) training for those regions where CA-EBS is necessary due to regulation or risk assessment. The training is to be to a recognized standard (such as OPITO), use a Modular Egress Training Simulator (METS) or equivalent that simulates a helicopter cabin that submerges and can invert. The HUET course should include appropriate sea survival training including the use of representative survival equipment (for example, life jackets, survival suits and CA-EBS where used) and the deployment and boarding of liferafts. This training is to be valid for up to four years (unless local regulation requires a higher frequency).

Other training, such as the Global Wind Organisation (GWO) Basic Safety Training or equivalent, and local site inductions, may also be required before travel offshore.

Any passenger who is to be transferred to or from a nacelle, installation or vessel by Helicopter Hoist Operations (HHO) is to also undergo Helicopter Hoist Operations Passenger (HHOP) training[59].

The HHOP training is to cover both the general aspects of transfer from a helicopter via hoisting, and the aspects specific to the helicopter type being used, as well as any specific to the operator. The approval received by the passenger on successful completion of the training is specific to the helicopter type / configuration on which training was received.

Differences training can be delivered to extend a passenger's training approval to cover additional helicopter types / configurations. Where there are fundamental differences in techniques due to helicopter and equipment configurations, differences training will be required. Configuration differences may include the side the host is fitted, variants with or without steps, different hook / harness connections. Special attention is needed on connecting and disconnecting and the hazard of static electricity discharge. Operators are encouraged to minimize any operator specific procedural differences that cannot be adequately covered during a passenger briefing video.

The HHOP training provider needs to maintain accurate records of training delivered and issue proof of competence to the training recipient and their employer (unless the trainee is self-sponsored). Responsibility for maintaining records of individual HHO passenger's training and their experience sits with the individual and their employer; they need to be able to prove qualification and currency to the air operator.

19.1.2 Helicopter Hoist Passenger Training HHOP

HHOP training is divided into four categories:

a) Initial: Comprehensive training and competence check, including classroom instruction and graduated practical scenarios, ideally using ground hoist training facilities before helicopter training to qualify a HHOP to undertake HHO from a specific helicopter type. This is to be valid initially for two years but its validity can be extended by two years after each subsequent Renewal Course. The Renewal Course must be completed before the current expiry date.
b) Recurrent: HHO training and competence check provided to ensure a HHOP maintains a minimum frequency of experience when they have not conducted HHO within the last 90 days.
c) Renewal: Classroom training provided to current and approved HHOPs update the HHOP on any new considerations in HHO and extend the validity of their existing approval.
d) Differences: Classroom and, when appropriate, practical training for current and approved HHOPs to convert them to an alternative helicopter type or configuration. Differences training is valid for up to two years.

19.1.2.1 HHOP Initial Training Syllabus

19.1.2.1.1 Theoretical Training General

a) Hoist training validity, mental and physical health, Alcohol / medicine
b) General helicopter safety
    - Safe zones / danger areas around the helicopter
    - When and how to approach a helicopter
    - Loose items on the ground (FOD)
    - "Is this normal?" (to teach the HHOP to question things they have not seen before)
    - Cargo handling.
c) Instruction on standard flight profiles and performance.
    - Landing and departure profiles (VTOL, PC1, PC2e)
    - Helicopter performance (OEI)
    - The importance of having the correct weights of cargo for each flight.
d) Instruction on PPE for helicopter hoist operations
    - Harness
    - Connector hoist strap
    - Helmet
    - Immersion suit
    - Life vest
    - STASS / CA-EBS
    - Radio equipment
    - Ear and eye protection
    - Packing of cargo bags (with special attention on the closing)
e) Hand signals (see Annex 2)
    - The HHOP signals:
        - two-meter signal,
        - Ready to be hoisted / clear of cable
    - Hoist operator signals:
        - Detach from cable / go to safe zone
f) Risks of electro-static discharge and counter measures (general)
g) Hoist procedures (general)
    - Buddy check
    - Spinning and swinging procedures for the HHOP (how to avoid and counter act)
    - Standing clear of hoist area until cargo / hook is down
    - Securing passengers and cargo in the helicopter
h) Communication
    - Standard communication procedures (challenge and response / closed loop communication)
i) Safety culture and reporting
j) Instruction on special equipment (advanced)
    - High line
    - Stretcher
    - Rescue bag

19.1.2.1.2 Theoretical training Operator specific:

a) Introduction to the specific type of helicopter
    - Safe zones / danger areas around the specific helicopter
    - General introduction to the helicopter.
    - If fire and rescue training has been received, when, where and what fire suppressor to be applied.
b) Hoist equipment
    - Helicopter specific equipment (hoist hook assembly, attachment points).
    - Personal specific equipment (hoist harness, hoist strap)
c) Hoist procedure
    - The difference between being secured in the cabin and on the hoisting hook
    - Pickup / set down
d) Hoist emergency procedures
e) Site specific communications procedures
f) Operational limits with regards to HHO (company and wind farm specific)
g) Static discharge cable and specific procedures if any for that specific type of WTG
h) Instruction on rescue tools on hoist areas (if applicable)

Practical ground training

a) Donning of PPE for helicopter hoist operation including buddy check
b) Preparation of equipment and luggage
c) Use of hoist equipment (connecting disconnecting hoist strap to / from hoist hook)
d) Safety procedures in the cabin during hoist operations, specifically the difference between being on the hoist hook and secured in the cabin
e) Complete hoist procedure simulated from pickup at the WTG to being hoisted down to the WTG. Including hand signals and radio communication
f) Training while wearing PPE for offshore operations

g) Transfer of cargo via hoist and cabin procedures
h) Use of emergency equipment (if applicable)

Practical in-flight training

a) Radio check between helicopter and HHO passengers
b) Standard HHO procedure with pickup and set down
   - Including connection and disconnection from hoist hook and attachment points in the cabin
   - All standard procedures in the cabin (positioning in seat and donning seatbelt)
c) Demonstrating hand signals
   - Hoist operator crossed arms, HHO passenger two-meter signal and ready to be hoisted / clear of cable.
d) In-flight briefing
e) Safety procedures in the cabin during hoist operations
f) HHO to the ground and / or hoist training platform
g) Connecting and disconnecting hoist harness strap to / from hoist hook (independently)
h) Pick-up of passenger including departure, recovery to and securing in the cabin
i) Transfer of cargo

In order to have a solid command of the procedure at least five hoist cycles must be practiced in the initial course.

The five hoist cycles can be a combination of:

a) Hoist crane in the training facility;
b) Dry training in the cabin;
c) Actual hoist cycles in the helicopter in flight (minimum three cycles).

19.1.3 Passenger Training Overview

See Table 4 for an overview of passenger training.

19.2 Aircrew – Pilots

In general, aviation regulators provide considerable guidance regarding requirements for aviation qualifications. Aviation regulators approve the training syllabi proposed by helicopter training providers and operators to achieve the required output standards. At the industry level, trade associations and individual customers have taken the opportunity to propose additional requirements to account for particular operational activities such as hoisting to an offshore wind turbine. Operators are expected to comply with these requirements to assure duty-holders and mitigate operational risks. These criteria build on the regulatory foundations, are often based on international accident / incident recommendations and are intended to be specific to the role being performed.

Pilots employed by helicopter operators have adequate training to achieve the necessary qualifications and competence to perform their role.

Aircrew undergo training in an approved FSTD at a frequency of at least every six months. Level C or Level D FFS (or type -specific Type III, IV or V devices as described in ICAO Doc 9625 Vol 2) are used where available for the type.

Table 4

Course	Theory	Ground Training	HHO at the training site	HHO at the WTG/ elevated platform	Validity
Initial	Yes	Yes	3	2	4 years
Recurrent	Yes	Yes	No	No	90 days
Renewal	Yes	Yes	2	No	2 years
Differences	Yes	Yes	No	No	4 years

Where an FFS or ICAO 9625 equivalent is not available for the aircraft type or where the configuration of the FFS is not sufficiently representative of the contracted commercial aircraft, FTDs may be used in accordance with the following guidelines:

a) FTD Level 3 or equivalent for medium rotorcraft above 3175 kg (7,000 lb);
b) FTD Level 2 for small rotorcraft with a maximum weight of 3175 kg (7,000 lb) or less and certified with nine or less passenger seats

In order to perform an offshore helicopter flight in support of a wind farm a pilot will:

19.2.1 Hold a relevant license:

a. CPL (H) + Instrument Rating for single pilot operations
   i. Co-pilot in multi pilot operations
b. ATPL (H)
   i. For commander operating in a multi pilot setup

19.2.2 Hold a relevant helicopter type rating and meet national requirements:

c. A pilot must have undertaken a regulator-approved training course, including ground and air assessment, to receive a helicopter type rating. Where a Full Flight Simulator exist this should be used during training.
d. Minimum training for type-ratings is described in the manufacturers Flight Training Syllabus / Operational Suitability Data (OSD) where applicable.
e. Pilot competence on type is assessed annually as part of their License Proficiency Check.

19.2.3 Demonstrate operating proficiency:

f. An Operator Proficiency Check (OPC) is specific to the helicopter operator and shall reflect the normal operating environment in which the pilot will be / is employed. The OPC should be performed twice a year with not more than six month in between. OPC is not considered as training. OPC is a test of competence.

g. Minimum requirements for OPC
   i. As pilot flying, 2:00 h/min

For HHO operations, an additional HHO check is required to assure the competence of the pilots and TC during HHO. This check should be performed in the aircraft, unless an alternative means of compliance is available. The HHO check should not be less that 0:30h/min and may be performed in the same flight as the standard annual training.

19.3 Recurrent Training Pilots:

The operator should have established a recurrent training program. Minimum training for each pilot as pilot flying should be at least the same time as requirements for OPC.

Aviation is moving towards evidence based training (EBT). Until the transition to EBT for offshore helicopter operations is completed, the recurrent training will contain, but not be limited to, the following items:

a) Engine Failures before and after TDP/LDP
   - Clear area, helipad and on elevated helideck as applicable.
b) Engine Failure during approach, including single engine go-around
c) Un-announced dual engine failure with autorotation;
   - Performed IMC for IFR operations
d) Engine fire
e) Tail rotor control or tail rotor failure
f) Hydraulic failure
g) One dilemma based exercise
h) Instrument failures
i) RNAV approach (where the aircraft has the capability)
j) One coupled IFR approach and one manual IFR approach
k) For HHO operations;
   - Engine failure during hoist
   - Hoist failure during hoist
   - Hoist runaway
   - Loss of communication during hoist

As the industry progresses towards evidence based training this list of requirements will be adjusted to reflect this. Training should be conducted at the threshold of operational situations where failures and exercises are initiated during high workload phases of flight but are not compounded to create unrealistic or artificial situations.

19.3.1 Line Orientated Flight Training (LOFT)

In addition to the above training requirements the operator will have a LOFT program. LOFT is normally carried out as part of initial or recurrent flight crew training. It involves a flight conducted in real time and representative of line operations but includes special emphasis on abnormal situations which involve communications, management and leadership. The emergencies / abnormalities which will be encountered will not be pre-briefed.

LOFT Scenarios are best developed from operational data and represent situations that have been encountered during operations. Using HFDM trends is helpful in identifying areas that organisations can focus on.

A LOFT session will not normally be interrupted except in extreme and unusual circumstances. Repositioning the simulator and repeating problems is inconsistent with the principles of LOFT. Part of the benefit of LOFT is derived from an individual or crew being able to quickly appreciate the results, either positive or negative, of operational decisions. After completion of such a session, a thorough debriefing will be made of all aspects. This may be accomplished by an initial self-debriefing by the crew, followed by the instructor's debriefing.

LOFT should not be used as a method of checking the performance of individuals. Instead, it is a validation of training programs and operational procedures. Frequency and duration: At least One LOFT session completed every 12 months, sessions a minimum 2:00 h training in a FFS where one exists or an FNPT.

19.4 Flight Crew – Technical Crew and Pilots

A Technical Crew member must have sufficient training to achieve the necessary qualifications to perform their role. The Hoist Safety Promotion Working Group of the European Safety Promotion Network Rotorcraft (ESPN-R) has produced a white paper that provides recommended practice for technical crew member training. See Annex 1.

For operations to offshore wind farms it is also recommended that flight crew pass additional relevant assessments:

a) Helicopter Underwater Escape Training (HUET). Aircrew employed in the offshore environment must undergo and pass this training to demonstrate their ability to escape from a ditched helicopter. As appropriate to local regulations and industry good practice, including the use of compressed air emergency breathing systems (CA-EBS).
b) Carriage of Dangerous Goods. A helicopter operator approved by their regulator to carry Dangerous Goods (DG) will follow the guidance provided by the International Air Transport Association (IATA). This includes ensuring that aircrew understand and can correctly implement the specific requirements for carrying different objects and packages categorised as DG.
c) First Aid, Fire-fighting, Crew Resource Management.

19.5 Overview

See Table 5 for the frequency of training and assessment for pilots, technical crew and passengers employed in offshore helicopter operations.

Table 5 – Frequency of Assessment

Training	Pilots	Technical Crew	Passengers
HUET	Every 36 months	Every 36 months	Every 48 months
HHO - Recurrent - Renewal	In accordance with Operations Manual	In accordance with Operations Manual	- 1 hoist cycle in 90 days or 90 day recurrent training - Every 24 months
License Proficiency	Every 12 months	N/A	N/A
Operator Proficiency	Every 6 months	Every 12 months	N/A
Line Check	Every 12 months	Every 12 months	N/A
Dangerous Goods	Every 24 months	Every 24 months	If required
Related Ground Training	Every 36 months	Every 36 months	N/A

19.6 Flight Crew Experience

The legal and regulatory minimum requirements for air crew experience is not standard or aligned between international regulators and is, in some cases, lower than accepted by the industry. Regulatory standards are the minimum required to perform a task or function and do not necessarily reflect the specific requirements of a particular mission or task such as offshore hoisting to a wind turbine nacelle.

Table 6 and 7 include guidance to help create a known and quantifiable standard for operations to offshore wind farms. Whilst the minimum experience for flight crew is shown for transparency, both the helicopter operator and the OWC must conduct a risk assessment and demonstrate using flight crew with low experience is justified in terms of the risk profile it represents to the operation.

Table 6 – Single Pilot / Commander Multi Pilot / Offshore Hoisting

Topic	Minimum	Recommended	Extensive
Total Hours (Helicopter)	1,000	1,000	2,000
Total Hours in Multi Engine	100, or 25 hours under instruction on type	500	500
Total Hours in Command	1,000 or 1,000 as co-pilot in HHO, of which 200 as PICUS**	1,000 or 1,000 as co-pilot in HHO, of which 200 as PICUS**	1,000
Total Hours in Command / Multi Engine	N/A	200	500
Total Hours on contract type	25	50	100
Offshore Flying Hours	0	50	500
Hoist Cycles (1 down & up)	50 (of which 20 at night if ops conducted)	100 (of which 50 at night if ops conducted)	150 (of which 100 at night if ops conducted)

** Pilot In Command Under Supervision

Table 7 – Multi-Pilot Co-Pilot / Offshore

Topic	Minimum	Recommended	Extensive
Total Hours (Helicopter)	200	300	500
Total Hours in Multi Engine	15	15	250
Total Hours in Command	25	50	100
Total Hours in Command / Multi Engine	N/A	N/A	N/A
Total Hours on contract type	15	15	50
Offshore Flying Hours	0	10	50
Hoist Cycles (one down and up) [If hoisting conducted]	Operator Hoist Training Programme Completed	50	50 (of which 20 at night if ops conducted)

** Pilot In Command Under Supervision

19.7 Hoist mission simulator training

In response to an increasing demand for effective, low-cost and practical hoist operator training, hoist simulation devices have been developed by several providers. These are primarily aimed at developing the unique skill set of helicopter hoist operators. Hoist simulators are intended to supplement, rather than replace actual aircraft training. However, time spent in a simulator prior to practical in-flight training is likely to maximise the proficiency of the hoist operator and reduce possible additional training costs in the real aircraft.

High fidelity simulated training is well accepted and increasingly considered to be indispensable for pilot training; this technology has been transferred to benefit hoist operators. Various hoist operation training concepts are available such as training tower, virtual reality, mixed reality or dynamic simulator. Some simulators can provide training for more advanced mission scenarios such as operations to wind turbine nacelles or moving vessel decks.

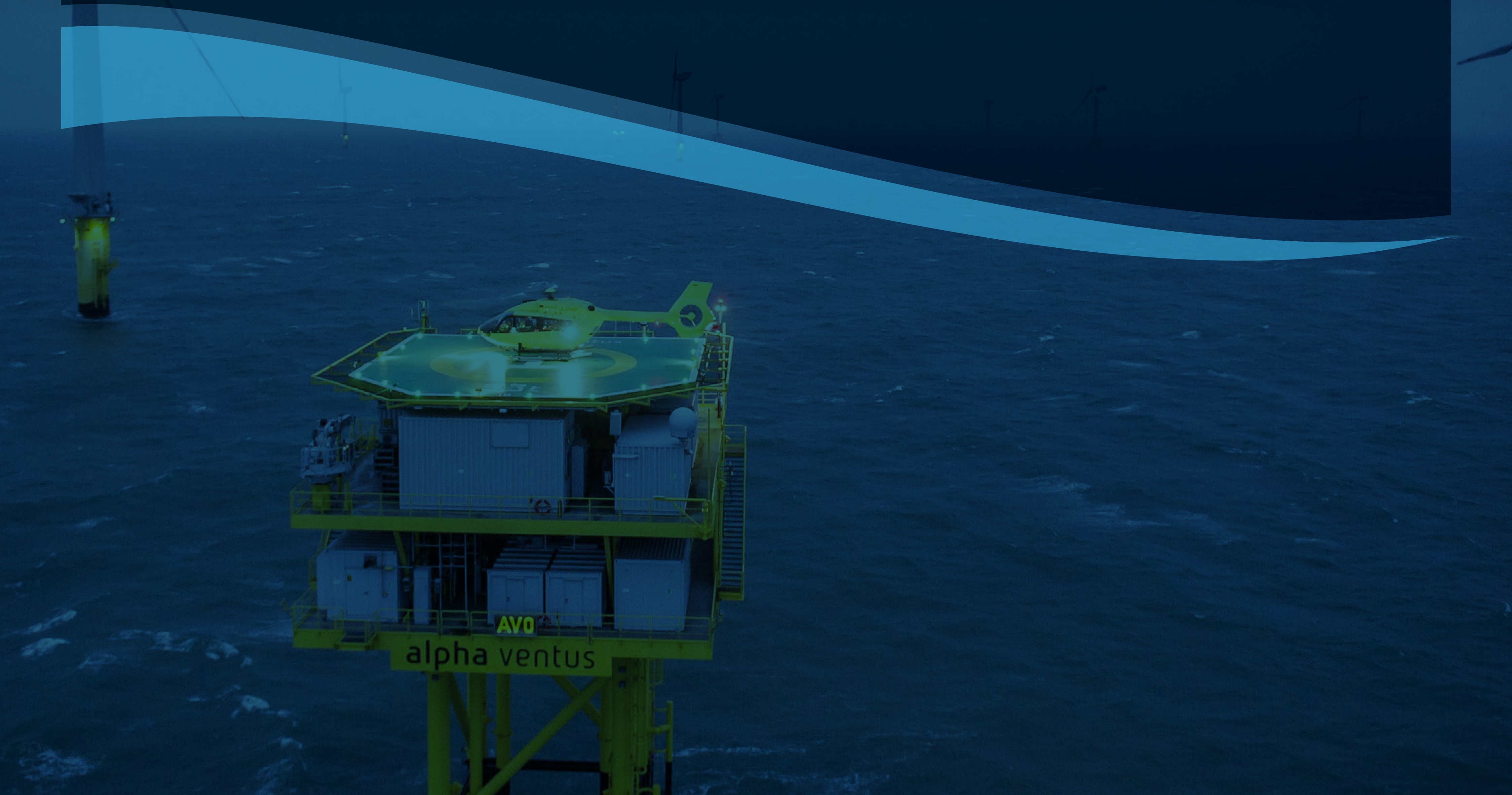
Advanced hoist simulators can be reconfigured to replicate different helicopter fuselages and perform "On-Type" training. With high fidelity mixed reality simulators, the trainee can benefit from a fully immersive training experience with cable tension, and effects of turbulence or movement accurately incorporated. Some hoist simulators can be linked with a full-flight helicopter simulator and replicate the interaction of the helicopter crew with the hoist operator during interactive missions improving Crew Coordination training.

Nevertheless, fidelity must also be balanced with cost to achieve the most efficient training value.

Advantages of using a simulator for hoist operator training can include:

a) Safe environment for training
b) Advanced training such as simulated malfunctions, emergency and abnormal conditions.
c) Practice communication and CRM before actual flight training.
d) Practice Standard Operating Procedures.
e) Improved trainee proficiency.
f) Perform more repetitions of a procedure, a task or an event.
g) Ability to perform high-fidelity mission rehearsal with different scenarios and weather conditions added for realism.
h) Lower training costs vs actual flying.
i) Lower environmental impact vs actual flying.
j) Enhance safety and efficiency.

Section 20 Helicopter Oil and Gas Transport Flights in Proximity of Windfarms



Section 20
Helicopter Oil and Gas Transport Flights in Proximity of Windfarms

20.1 Introduction

Offshore helicopter transport flights to oil and gas installations must consider the location and potential impact of wind turbines in the offshore environment. At some locations individual or pairs of wind turbines have been installed relatively close to existing oil and gas infrastructure, often to provide an electrical supply to the installation. In other locations, very large wind farms have been developed with dimensions of many miles of lateral extent which may contain over 100 large wind turbines. Most of today's operational wind farms are located within territorial waters, while some of the future wind farms being scoped, under development and under construction can be found up to 100 miles from the coast. Whilst most turbines are fixed to the seabed in relatively shallow seas, the emerging development of floating foundations for wind turbines allows their positioning in deep water locations.

The benefits of the co-existence of Windfarms and oil and gas installations for offshore aviation activities can include an increase in search and rescue assets, an increase in helidecks/safe landing areas, improvements in communication, offshore weather services, flight tracking and co-ordination facilities.

The height of current wind turbines can exceed 1000ft from the sea to the top of a blade at its highest point, current trends are towards larger wind turbines and this height is set to increase. Any turbine with a maximum height exceeding 500ft Above Sea Level (ASL) may increase the Minimum Safe Altitude (MSA). Standard MSA offshore is usually considered to be 1500ft ASL, but the revised MSA in some areas is now over 2000ft ASL. It should be noted that, in some windfarms, not all turbines in a field will have lights. Typically, wind turbines have lights on the nacelles rather than on the blade tips.

During construction windfarms are often supported by multiple vessels, typically this includes very large cranes which may not be depicted on aviation charts and may be considered as a temporary obstacle. Windfarms may be supported by helicopters conducting a range of operations which include passenger transport, Helicopter Hoist Operations, Helicopter Emergency Medical Service and Search and Rescue operations. In addition to manned aircraft windfarms may use unmanned aircraft systems (UAS / RPAS).

It should be noted that there are no internationally aligned or mandated requirements for offshore flight communications, planning or deconfliction. Windfarms are often located in uncontrolled non segregated airspace, although some may have formal Transponder Mandatory Zones (TMZs) in place.

20.2 Flight Planning Considerations

When offshore helicopters become aware that their flight will take them over or close to wind turbines or windfarms, the following points should be considered:

1. Check latest aviation charts and NOTAMS to ascertain exact location of wind turbines, lateral extent of windfarms and maximum height of blades.
2. Revised MSA enroute for IFR flights.
3. Safe altitude and routing for VFR flights.
4. HTAWS database updates may lag behind the details of current wind farm configurations due to their rapid development.
5. As when flying over land or obstacles at sea, the presence of a windfarm should be considered regarding descent below MSA when IMC.
6. Consider location of offshore installation relative to a windfarm so that the best direction for ARA, offshore 'let-down', approach and departure can be used. Operators should always conduct a stabilised approach.
7. Consider the proximity and height of the windfarm impinging on the ability to conduct a safe OEI missed approach or departure.
8. Deconfliction with other helicopters or RPAS/ UAS that may be supporting the windfarm during routine operations and maintenance or construction phases.
9. Be aware of any changes in place due to ATC radar coverage or radio communication that may have been affected by shielding from the wind farm.

20.3 Industry Guidance

In order to facilitate the safe interaction of 'Oil and Gas' support flights in the proximity of wind farms, several key UK stakeholders came together for a series of meetings between Dec 2022 - Apr 2023. The main UK offshore helicopter operators and other industry stakeholders agreed to operating guidelines for their flights operating in proximity to wind farms. They agreed that 'In the vicinity of a windfarm' is defined as within 3nm of a windfarm, and they would apply day/ VFR weather limits within this distance.

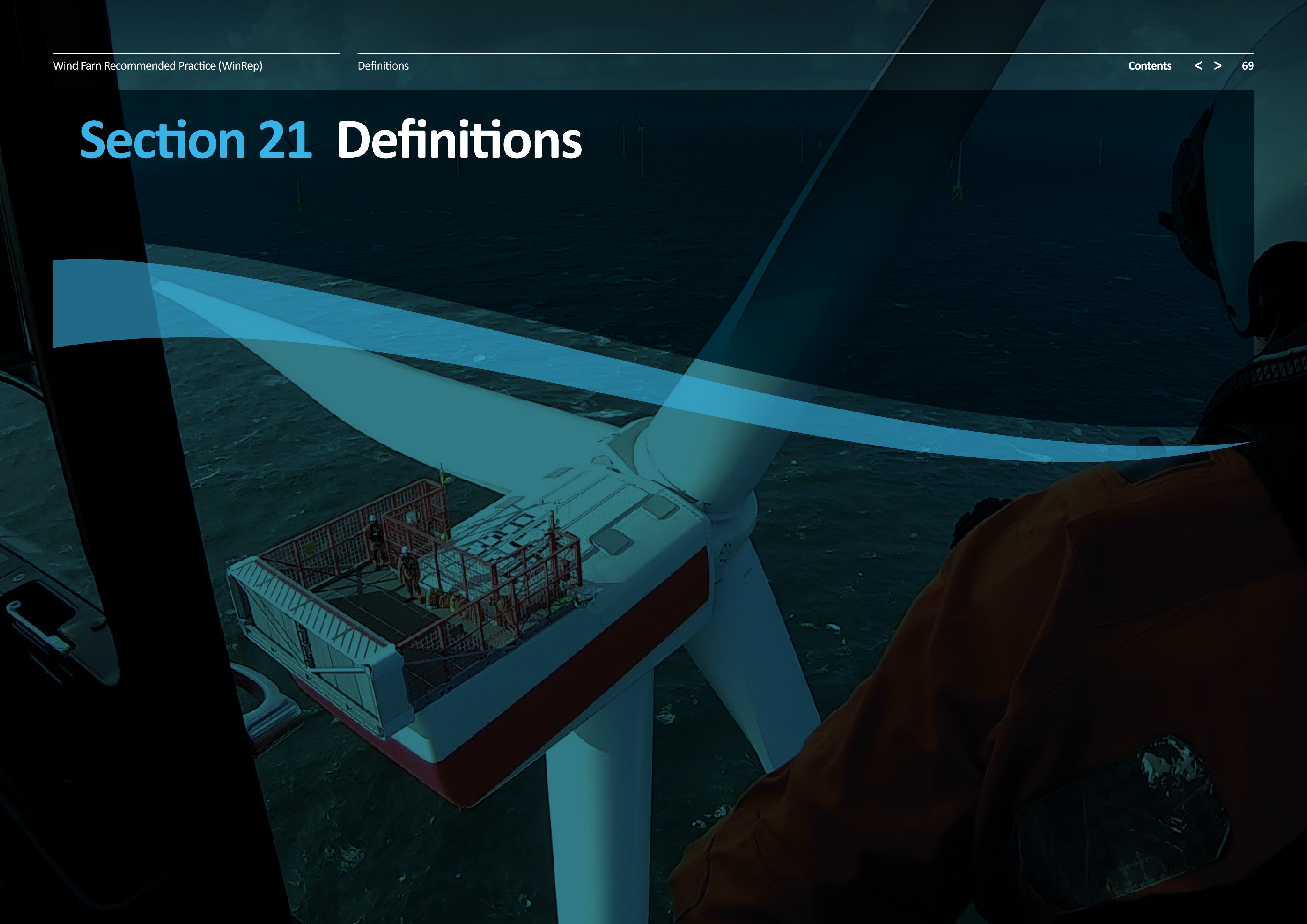
When operating VFR in or around a wind farm it is not always necessary to see the blade tips at their highest point, only the nacelle. This is the most substantial part of the wind turbine and is where any lights will be located. Currently these are regularly in excess of 400ft AMSL. The largest planned turbines over the next few years will have nacelles at around 600ft. When conducting operations within windfarms, operators should identify and mitigate the specific hazards caused by meteorological conditions. Operators will state minimum values for visibility and cloud base above nacelle height as well as other relevant factors in their Standard Operating procedures (SOP's).

20.4 Other Considerations

Overflight of a windfarm is essentially similar to flying over terrain where a safe forced landing (ditching) caused by a serious inflight emergency might be compromised by the presence of the turbines. In VFR conditions a helicopter may be able to fly between the wind turbines to perform a ditching if the layout of the turbines and presence of support vessels allows. When flying in IFR conditions, with a low cloud base, the presence of the wind turbines would prevent a safe descent to ditch within the windfarm. Whilst this is similar to flying IFR over land it does represent an additional consideration to offshore helicopter operators who are used to having the option to 'let-down' over the sea in an emergency situation (e.g. uncontrollable baggage bay fire) using the weather radar to avoid obstructions. Operators will need to identify the hazards associated with operations in proximity to windfarms and mitigate the risk accordingly.

Some windfarms may have helidecks located within or on the periphery of their boundaries. Additionally, flights to support vessels during the construction phase may be required. Typically, large turbines are spaced hundreds of meters apart but the distance between turbines and layout varies in order to optimise the windfarm. Flights within a windfarm are currently only conducted in day VFR conditions. Flights should be conducted to ensure a stabilised approach, that the path for missed approach and departure permit the aircraft to remain clear of obstacles, all whilst following the profiles prescribed in the aircraft flight manual, accounting for abnormal conditions such as single engine performance.

Section 21 Definitions



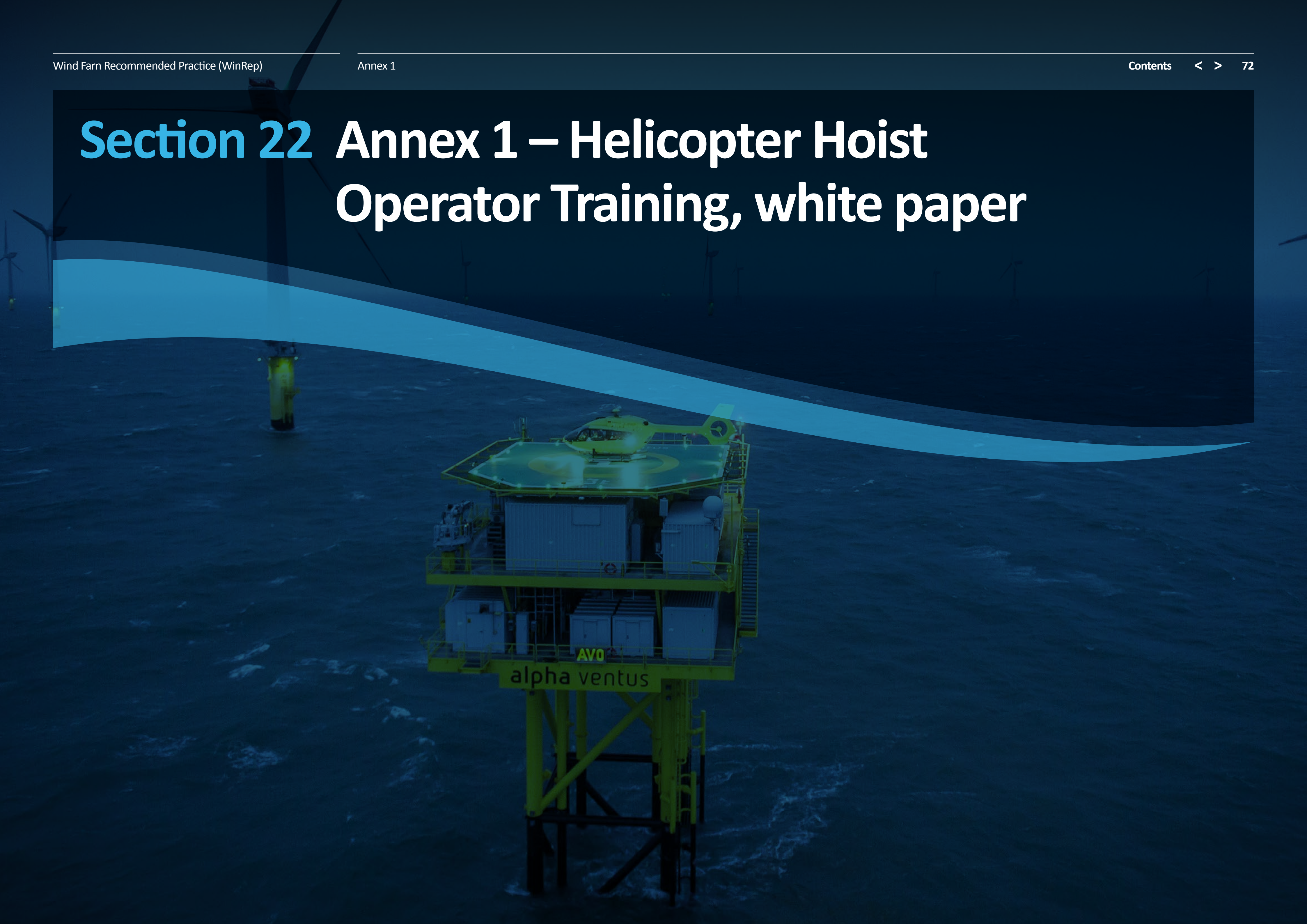
Section 21
Definitions

Abbreviation	Definition
A/C	Aircraft
AC	Advisory Circular
ADELT	Automatically Deployed Emergency Locator Transmitter
ADs	Airworthiness Directives
ADS-B	Automatic Dependent Surveillance - Broadcast
AFCS	Helicopter Automatic Flight Control System
AIP	Aeronautical Information Publication
ALARP	As Low As Reasonably Practical
AMCs	Acceptable Means of Compliance
ANSP	Air Navigation Service Provider
AOC	Air Operator's Certificate
ASME	American Society of Mechanical Engineers
ATC	Air Traffic Control
ATPL(H)	Air Transport Pilot License (Helicopter)
BC	Base Captain
BFU	Bundesstelle für Flugunfalluntersuchung - German Federal Bureau of Aircraft Accident Investigation
BM	Base Manager
BVLOS	Beyond Visual Line of Sight
CA-EBS	Compressed Air Emergency Breathing System
CAA	Civil Aviation Authority
CAR	Civil Aviation Requirement
CAT	Commerical Air Transport
CFIT	Controlled Flight Into Terrain
CFR	Code of Federal Regulations
CP	Chief Pilot
CPL	Commerical Pilot's License
CRM	Crew Resource Management
CTV	Crew Transport Vessel
CV	Cockpit Voice (should be CVR)
DER	Departure End of Runway
DG	Dangerous Goods
DGR	Dangerous Goods Regulations
EASA	European Union Aviation Safety Agency
EBS	Emergency Breathing System
EBT	Evidence Based Training
EC	European Commission
ELT	Emergency Locator Transmitter
ERP	Emergency Response Plan
ESPN-R	European Safety Promotion Network - Rotorcraft
ETSO	European Technical Standard Orders
FAA	Federal Aviation Administration
FCOM	Flight Crew Operating Manual
FDM	Flight Data Monitoring
FDR	Flight Data Recorder
FFS	Full Flight Simulator
FNPT	Flight Navigation Procedure Trainer
FOD	Foreign Object Debris
FSTD	Flight Simulator Training Device
FTD	Flight Training Device
G+ GRP	G+ Good practice guidelines for safe helicopter operations in support of the global offshore wind industry
GPS	Global Positioning System
GPU	Ground Power Unit
GWO	Global Wind Organisation
HEC	Human External Cargo
HEEL	Helicopter Emergency Exit Lighting
HEMS	Helicopter Emergency Medical Services
HESLO	Helicopter External Sling Load Operations
HFDM	Helicopter Flight Data Monitoring
HHO	Helicopter Hoist Operations
HHOP	Helicopter Hoist Operations Passenger
HIRF	High Intensity Radiated Field
HISL	High Intensity Strobe Lights
HOFO	Helicopter Offshore Operations
HTAWS	Helicopter Terrain Awareness and Warning System
HTZ	Helicopter Traffic Zones
HUET	Helicopter Underwater Escape Training
HUMS	Health and Usage Monitoring System
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
IGE	In Ground-Effect
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
IMS	Integrated Management System
ISO	International Organisation for Standardisation
JAA	Joint Aviation Authority
LDP	Landing Decision Point
LOFT	Line Oriented Flight Training
MCC	Multi Crew Concept
METAR	Meteorological Aerodrome Report
MOC	Minimum Obstacle Clearance
MP	Multi Pilot
NAA	National Aeronautic Association
NHEC	Non-Human External Cargo
Nm	Nautical Miles
NOTAMS	Notices to Airmen
NPH	Nominated Post Holder
O&M	Operations and Maintenance
OEI	One Engine Inoperative

Abbreviation	Definition
OEM	Original Equipment Manufacturer
OGE	Out of Ground-Effect
OPC	Operator Proficiency Check
OSD	Operational Suitability Data
OWC	Offshore Wind Company
PC	Performance Class
PCDS	Personnel Carrying Device Systems
PPE	Personal Protective Equipment
RFM	Rotorcraft Flight Manual
RNAV	Area Navigation
RUGO	Renewable and Unmanned Aircraft Systems - Guidelines for Operations
RUK ORAG	Renewables UK Offshore Renewables Aviation Guidelines
SA	Situational Awareness
SAR	Search and Rescue
SARPS	Standards and Recommended Practices
SFD	Synthetic Flight Displays
SMS	Safety Management System
SOP	Standard Operating Procedure
SOV	Service Operations Vessel
SPA	Specific Approval
SPO	Specialised Operations
STASS	Short Term Air Supply System
TAF	Terminal Aerodrome Forecast
TC	Type Certificate
TCAS	Traffic Collision Avoidance System
TCM	Technical Crew Member
TDP	Take-Off Decision Point
TETRA	Terrestrial Trunked Radio
TSO	Technical Standard Orders
UAS	Unmanned Air System

Abbreviation	Definition
ULB	Underwater Locator Beacons
VAC	Volts Alternating Current
VDC	Volts Direct Current
VFR	Visual Flight Rules
VHF	Very High Frequency
VHM	Vibration Health Monitoring
VMC	Visual Meteorological Conditions
VMS	Vibration Monitoring System
VOR	VHF Omnidirectional Radio Range
VTOL	Vertical Take-Off and Landing
WTG	Wind Turbine Generator
WX-minima	Weather Minima

Section 22 Annex 1 – Helicopter Hoist Operator Training, white paper



Section 22
Annex 1 – Helicopter Hoist Operator Training, white paper

European Safety Promotion Network Rotorcraft
TO SERVE THE COMMUNITY

Helicopter Hoist Operations are very challenging and at risk. In order to enhanced safety and efficiency, a proper training of the Hoist Operator shall be promoted and stimulated within the industry.

Helicopter Hoist Operation has to be considered as a full crew mission concept where responsibilities and leadership moved within the crew during the mission.

During the flight, Pilots, Hoist Operators, Rescuers, Medical Personals and others HECs are identified as a group of interdependent individuals working together to complete a specific task. The Crew, considered as a team, must depend on one another's knowledge, skills, and abilities to achieve the same goal.

This document centered on the Hoist Operator, aims to highlight the different training phases and cycles of the Hoist Operator from ab-initio to Senior Trainer. Considering the interactions with other crewmembers and specificities of the mission, the Hoist Operator training philosophy cannot be focused on the use of the hoist system only. It must cover essential aspects of Helicopter Hoist Operation including, but not limited to, Crew Resources Management, Airmanship etc.

This industry standard is not in contradiction with EASA Air OPS 965, it is furthermore a recommended guideline to create a competence based training scenario from ab initio to senior HHO trainer. This industry standard may not be legally binding; it was developed by a group of métier experts and therefore be regarded as state of the art.

1 Introduction

The aim of this whitepaper is to propose an industry standard for Hoist Operator Technical Crew Member based on the existing regulation (EU) 965/2012 on Air Operations in order to clarify (but not limited to) Hoist Operator prerequisites, training, checking and assignment into duties.

Despite an important volume of information, the "Regulation (EU) 965/2012 on air operations" is leading to interpretation creating an unbalanced level of standardization within Europe. Moreover, this phenomenon is enhanced because EASA defines Hoist Operator Technical Crew Member "training and checking" in an AMC (AMC1 SPA.HHO.130 (f) (1)) without license requirement.

From this statement the ESPN-R Hoist Safety Promotion working group would like to highlight the significant need to standardize this growing market of Helicopter Hoist Operations (HEMS, off shore wind energy, etc.) and therefore a potential increasing number of occurrences, by creating an industry standard in order to increase safety in hoist operations of all types. Furthermore, another aim is to clearly define duties and responsibilities of the Hoist Operator Technical Crew Member through the creation of a harmonized Hoist Operator industry standards.

This recommendation may have an impact on operators who are involved in helicopter rescue operations but also on operators which are performing offshore wind turbines and Pilot transfer operations, if not complying yet with the current training standards. National authorities, OEM *(Original Equipment Manufacturer)* and ATO *(Aviation Training Organisation)* might be associated to this initiative to define clearly training and checking requirements.
In addition, in order to avoid confusion with other ESPN-R working groups, this document will only cover Hoist Operator Technical Crew Member prerequisites, training, checking and assignment into duties and will not cover the peculiarities of HEMS and NVIS Technical Crew Members. However, the Hoist Safety Promotion working group recommend making the exchange of information between the different working groups easier.

In conclusion, by promoting advanced, improved and accurate sets of standards for the Hoist Operator Technical Crew Member it will necessarily improve safety and efficiency in Helicopter Hoist Operations.

Note: For operators with proven/existing experience: the grandfathering of standards needs to be carefully considered. For newly to be trained hoist operators the changed guidelines enable more opportunities to maintain and obtain justified and documented permission of the respective operation.

A "grandfathering right" is foreseen to be granted to experienced Hoist Operators with the target to being not detrimental to the overall safety target. It is to be evaluated on a case by case basis and credits should be granted on basis of proportionality in considering several criteria.

2 Sources

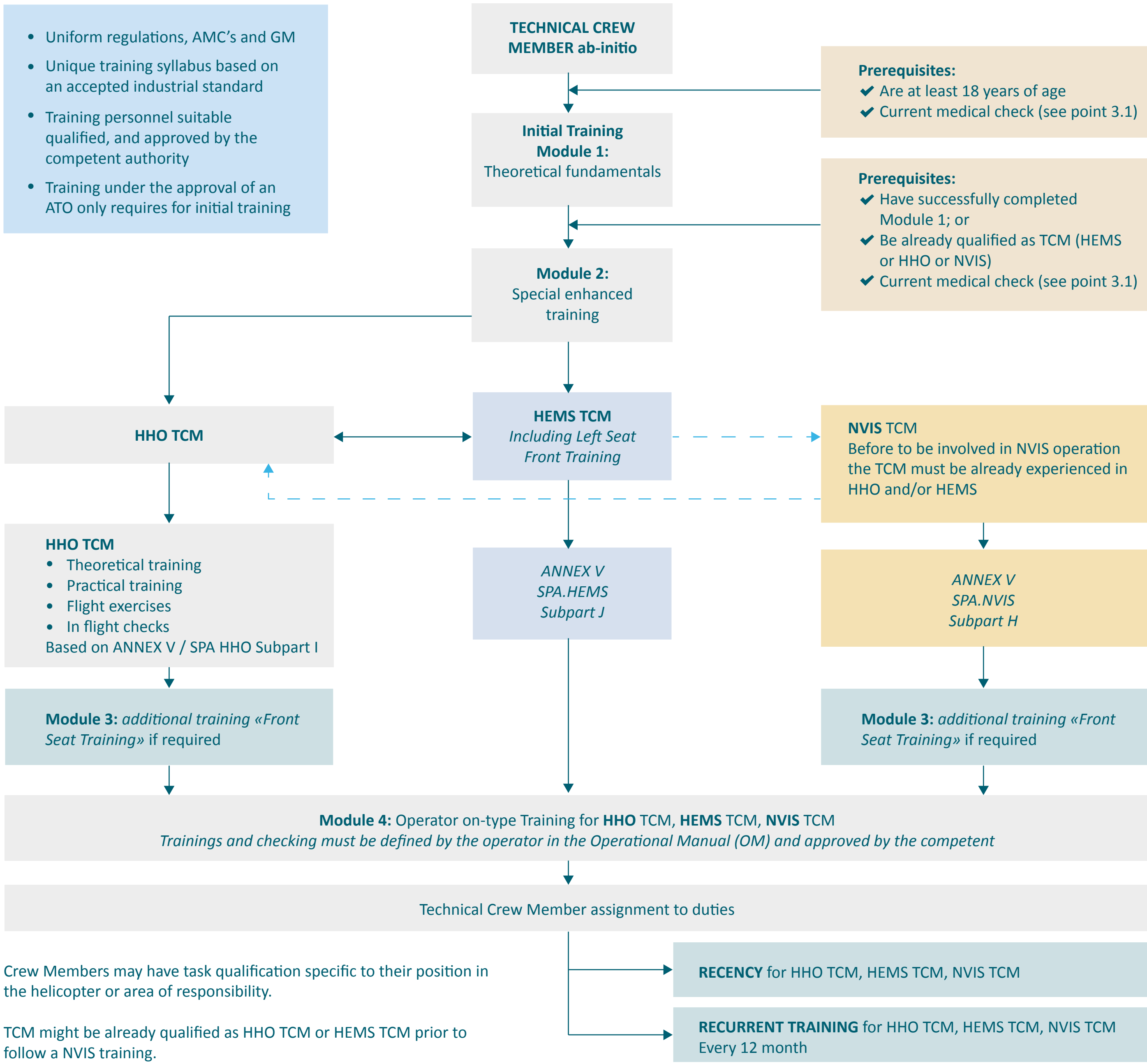
- EASA Regulation (EU) 965/2012 on Air Operations;
- BG_Verkehr_DGUV_I_214-911
- BAZL Flughelfer Syllabus;

3 Initial Helicopter Technical Crew Member (ab-initio TCM)

Considering the already existing EASA set of regulations, the ESPN-R Hoist Operation Safety Promotion group suggest and recommend a more effective “modular” way to train ab-initio TCM.

Note:

- SPA.HHO.130 (a): The operator shall establish criteria for the selection of flight crew members for the HHO task. ESPN-R:” The operator shall establish criteria for the selection of the Technical Crew Member as for Flight Crews Members”.
- Module 3: For single Pilot operation only and according to the aircraft configuration. If required, this module must be followed as per HEMS Technical Crew Member training (AMC1 SPA.HEMS 130(e)).
- A credit-program may be developed by the operator for Technical Crew Member. According to the previous working experience, it might be possible for the ab-initio TCM to validate parts of the module 1. Also, concerning the HHO Technical Crew Member, a “Grand Father Law” program might be developed for already experienced Hoist Operator.



3.1 Prerequisites for ab-initio Technical Crew Member

In order to be accepted in an initial HHO TCM training the candidate shall fulfil the following requirements:

(1) Are at least 18 years of age;
(2) Holds medical check in accordance with medical requirements to EASA Air OPS 965", e.g. Medical class 2 or occupational medical examination (per local requirements, e.g. G41 for German standards – **link**)

3.2 Module 1 – Initial Technical Crew Member Training – *ref: ORO.TC.115*

The definition of module 1 is developed considering a European ab-initio student without any experience neither in helicopter operation nor in aviation in general.

Following the 965/2012 ORO.TC, the ESPN-R suggest a common "Industry standard" approach creating by this way a shared basis of theoretical fundamentals knowledge for all TCM prior to be involved in more advance training in HHO, HEMS and NVIS.

The responsibility to provide the training belong to the Operator. However, the ESPN-R recommend the use of third parties (i.e. an ATO certified for this type of training) to guaranty a high level of standardization.

Prior to proceed through the Basic Hoist Operator (or HEMS, or NVIS*) training the ab-initio Technical Crew Member must be taught on the following topics:

Theoretical Fundamentals:
Training should include Human Factor subjects such as mission preparation, risk assessment and mitigation, briefings / debriefings, procedures and check lists, verifications (checks, double checks and cross-checks), using proper tooling, attitudes: how to avoid risk taking, banalization of violations, team pressure (clannish structure), and perhaps basic physiological factors (e.g. involved in being afraid of heights, spinning effects), occurrence reporting, etc.;

Module 01 – Theoretical Fundamentals, Initial Technical Crew Member Training:

Module 1*	**Topics to be covered**	**Contents (not limited to)**	***Guideline for recommended minimum duration of training***	***References***
Module 1.1	Basic airmanship and aviation basic knowledge	• General aviation theory *(including aviation weather);* • Helicopter, theory of flight; • Aviation terminology; • Aviation regulations; • Duties and responsibilities required of TCM.	40 hours	Regulation (EU) 965/2012 on air operations AMC1 ORO.TC.115 (1)
Module 1.2	Communication and Crew Resources Management	• Communication between TCM and flight crew members including common language and terminology; • Relevant CRM elements of ORO.FC 115 and 215.	20 hours	Regulation (EU) 965/2012 on air operations AMC1 ORO.TC.110(a)
Module 1.3	Safety on helicopter including firefighting and smoke training	• Individual protection (PPE); • The typical danger area of helicopter; • Safety on board; • In flight hazards; • The classification of fires and the appropriate type and techniques of application of extinguishing agents, the consequences of misapplication, and of use in a confined space; • The general procedures of ground-based emergency services at aerodromes.	6 hours	Regulation (EU) 965/2012 on air operations AMC1 ORO.TC.115 (2)
Module 1.4	Aero-medical aspects of the flight and first aid	• Physiological effects of flying; • Instruction on first aid and the use of first-aid kits.	6 hours	Regulation (EU) 965/2012 on air operations AMC1 ORO.TC.115(6)
Module 1.5	Emergency training and use of emergency equipment	• Emergency egress; • Reaction to emergencies involving fire and smoke and identification of the fire sources.	8 hours	Regulation (EU) 965/2012 on air operations AMC1 ORO.TC.115 (2)
Module 1.6 As required for assignment into duty	Survival training appropriate to the type and area of operation	• Sea; • Mountain; • Polar; • Jungle; • Desert.	/	Regulation (EU) 965/2012 on air operations AMC1 ORO.TC.115 (3) + (5)
Checks	Theoretical fundamentals training for Technical Crew Member is validated after completion of a written test.	• Multiple choice Questions: 100 questions covering the different topics. *75% of correct answers to pass the exam.*	1.5 Hours	Regulation (EU) 965/2012 on air operations AMC1 ORO.TC.110 (4) + ESPN-R Proposal

**Elements of training that require individual practice may be combined with practical checks.*

Initial personal airborne evaluation:

In order to familiarize the trainee, a minimum of one flight shall be performed to evaluate how the ab-initio TCM candidate is behaving in flight.

	Topics to be covered	Contents (not limited to)	*Guideline for recommended minimum duration of training*	*References*
personal evaluation	The aims of the flight is to assess the initial capabilities of the ab-initio TCM.	Assess: • Potential motion sickness; • Fear of heights; • Vertigo; • Basic airmanship.	1-2 hours in different flight	N/A Company internal evaluation/recruitment process, if applicable.

Trainers:
The Initial TCM theoretical fundamentals training shall be provided by an experienced and qualified Technical Crew Member approved by the operator.

The ESPN-R Hoist Safety Promotion working group suggest to clarify this point adding in the actual set of standards a dedicated "Trains the Trainers" for Technical Crew Member. See Annex 01.

Prior to be involved as Instructor for the company the Hoist Operator will have to be evaluated considering several criteria.

Criteria's to become a Hoist Operator Instructor (Annex 01):

- Passed annual company assessments;
- Passed CRM trainer course;
- Passed a teaching (theoretical) and training skills (practical) course;
- Have ***five years of full time experience*** in the operator specific types of hoist operation;
- Have successfully performed minimum ***500 hoist (HEC)*** **Hoist Cycles as described in this document.*

3.3 Initial Helicopter Hoist Operation Technical Crew Member

This section will cover only HHO TCM but the same process could be applied to HEMS TCM and NVIS TCM.

3.4 Prerequisites for ab-initio Helicopter Hoist Operations Technical Crew Member

- Have successfully completed the module 1, "Fundamentals Training" initial Technical Crew Member; or
- be already qualified as "HEMS TCM" (with a valid Initial TCM qualification); and/or be already qualified as "NVIS TCM" (with a valid Initial TCM qualification);
- Holds medical check in accordance with medical requirements to EASA Air OPS 965", e.g. Medical class 2 or industrial medical check (per local requirements, e.g. G41 for German standards – link)

3.5 Module 02 – Specialized Enhanced Training* "Basic Hoist Operator Technical Crew Member" – SPA.HHO.130(f)(1)

After completion of the initial TCM training the ab-initio Hoist Operator must follow a basic Hoist Operator training provide by the operator or an ATO certified for this type of training. The ESPN-R recommend the use of third parties to guaranty a high level of standardization.

If available, the ab-initio HHO TCM could perform part of the initial flight activity on hoist operation simulation devices like procedural tower, HHO dynamic simulator or using Virtual Reality. It may increase safety and efficiency and will reduce environmental impact and training costs.

Whatever could be the Hoist Operation simulator it shall be assessed (a performance based approach is recommended) by the organisation / operator in order to provide credits to the training.

This training program is not helicopter "type" related and can be provide on any certified helicopters fitted with a hoist as per SPA.HHO 110 & AMC1 SPA.HHO.110 (a).

Also ESPN-R recommend to not perform combined activities with an HHO ab-initio pilot (could lead to negative/non-efficient training) and that the full training program shall be ended within 2 months (training efficiency).

After completing the "Specialized Enhanced Training" the trainee will be released with a basic Hoist Operator qualification and will be cleared to proceed through the Operator Specific Training (on helicopter type and mission/procedure/equipment specifics).
For the flight training syllabus see ANNEX 02.

** "Specialized Enhanced Training", state for: HHO or HEMS or NVIS Technical Crew Member.*

Training objectives:
The students will be provided with the information and instructions necessary to perform safely basic hoist operations. The students will receive theoretical and practical knowledge about the optional equipment as described below. To operate the hoist in accordance with the requirements of the appropriate flight manual and hoist manufacturers operator manual, when applicable.

The students will be familiar with the hoist operation procedures and also be able to use it practically under normal and emergency/abnormal conditions.

The student will be able to perform, NHEC, single (and double) HEC lifts, in clear and confined areas.

Note: existing regulation (EU) 965/2012 on Air Operations defines hoist cycles (SPA-HHO.130) as: Hoist cycle each of which shall include a transition from and to the hover, ideally, one hoisting down and up of the hook with either delivering or picking up a person or an object to or from a surface (land, sea, deck, raft etc.)

Module 02 – Specialized Enhanced Training – Basic Hoist Operator Technical Crew Member:

Module 2*	**Topics to be covered (not limited to)**	**Contents (not limited to)**	***Guideline for recommended minimum duration of training***	***References***
Theoretical	• Limitations; • Hoist system (advance or general description); • Aircraft and equipment preparation; • Normal and emergency procedures; • Inter-communication and radio-equipment; • Safety during hoist operation; • Risk assessment method; • Situation awareness; • CRM and crew coordination concept specific to HHO; *Hoist system description will be done on type (advance) or not on type (general description).	• General aircraft limitations; • Effect of the movement of personnel on the center of gravity and mass during HHO; • Effect of the movement of personnel on performance during normal and emergency flight conditions; • Fitting and use of the hoist; • Personal Protective Equipment *(PPE)* specific to HHO; • Preparing the helicopter and hoist equipment for HHO, • The duties and responsibilities in the HHO role; • Techniques for guiding Pilots over HHO sites; • Techniques for handling HHO passengers; • Area reconnaissance ; • Normal hoist procedures; • Knowledge of emergency hoist equipment; • Hoist system emergency procedures (i.e. mechanical, electrical, etc.); • Abnormal situations (i.e load spinning and/or swinging, loss of communication, etc); • Aircraft malfunctions and emergency procedures; • Safety around the helicopter (*Danger of static electricity discharge*, Awareness of specific dangers relating to the operating environment, *collision avoidance*);	30 hours	Regulation (EU) 965/2012 on air operations AMC1 SPA.HHO.130(f)(1)(c) + ESPN-R PROPOSAL
Practical	• Hoist system; • Aircraft and equipment preparation;	• Hoist system description on real aircraft; • Handling of hoist control; • Hoist pre-flight checks; • Handling of PPE; • Cabin and equipment preparation; • Operation of inter-communication and radio equipment;	6 hours	ESPN-R PROPOSAL

Flight A draft syllabus for the flight activity is available for example in ANNEX 02	***-Day operations only-*** ***-On-shore operations* only-*** • Crew preparation; • Aircraft and equipment preparation; • Use of the hoist, normal and emergency procedures; • Use of ICS; • Check and use of PPE and other equipment; • Basic principles of voice communication/marshalling; • Techniques for guiding pilots over HHO sites • Clear** area hoist operations; • Non HEC lifts; • HEC lifts; • CRM and crew coordination concept specific to HHO. **according to the ab-initio Hoist Operator progression, it might be possible to perform confined area winching.	• Pre-flight briefing; • Preparing the helicopter and specialist equipment for HHO; • Weight and center of gravity management; • Operation of inter-communication and radio equipment; • Performed hoist checks and pre-winching checks; • Guidance over HHO sites; • Standard winching circuit; • Aircraft positioning using standard phraseology between Hoist Operator and Pilot; • Horizontal and vertical rotor and tail clearance; • Operation of hoist equipment; • **Non HEC single lift** (use of load) on clear area; • Hoist malfunctions and emergency procedures (i.e. mechanical, electrical, loss of communication, etc.); • Aircraft malfunctions and emergency procedures, including simulation of an engine failure; • **HEC Single and double lifts;** • **HEC Single and double lifts;** • Techniques for handling HHO passenger; • Standard hand signals; • Control of the swing and spinning avoidance; • Area reconnaissance, detection of specific dangers relating to the operating environments *(Risk assessment method)*; • Elements of CRM like decision making, situation awareness (not limited to); • De-briefing.	A minimum of 50 *hoist cycle must be perform by the ab-initio Hoist Operator (25 NON HEC+25 HEC). As for the flight crew members (SPA-HHO.130) the ESPN-R suggest to define a number of minimum *hoist cycle to be perform during the specialized enhanced training for Hoist Operator. The training concept is based on a competence based and the recommended number of hoist cycle may be reduced or increased, based on the demonstrated performance skill of the student.	Regulation (EU) 965/2012 on air operations AMC1 SPA.HHO.130(f)(1)(c) + ESPN-R PROPOSAL
Theoretical Checks	Specialized Enhanced Training for Technical Crew Member is validated after completion of a written test and a flight check.	• Multiple Choice Questions: 50 questions covering the different topics. *75% of correct answers to pass the exam.*	1 hour	Regulation (EU) 965/2012 on air operations AMC1 SPA.HHO.130 (f)(1) + AMC1 ORO.TC.110 (4) + ESPN-R PROPOSAL
Flight checks	In-flight checking must be performed by day only and on a clear area covering all aspect of the flight training phase including Hoist malfunctions and emergency procedures; The checks have to be performed with HEC. The HO trainer can assess the Hoist Operator under supervision with oral checks.	• Pre-flight briefing; • Preparing the helicopter and specialist equipment for HHO; • Communication; • Use of the hoist system; • Area reconnaissance, detection of specific dangers relating to the operating environments; • Guidance over HHO sites; • Single and/or double HEC lifts • Hoist malfunctions and emergency procedures; • Situation awareness • De-briefing	1.5 hours	Regulation (EU) 965/2012 on air operations AMC1 SPA.HHO.130 (f)(1) + AMC1 ORO.TC.110 (3) + ESPN-R PROPOSAL

Trainers:
The basic Hoist Operator TCM training shall be provided by an experienced and qualified HHO Technical Crew Member.

The ESPN-R Hoist Safety Promotion working group suggest to clarify this point adding in the actual set of standards a dedicated trains the trainers for Technical Crew Member – see Annex 01/ flow chart /3.2 Trainers.

Optional training:
Following the "Special Enhanced Training" and prior to be involved in the "Operator on-type Training" it is possible for the HHO TCM to be trained in *more based scenarios operations* as (but not limited to) *HHO in rescue duties*.

3.6 Module 3 – Additional Training "Front Seat Training"

For single pilot HEMS operation only and according to the aircraft configuration.
If required, this module must be followed as per HEMS Technical Crew Member training *(AMC1 SPA.HEMS 130(e)).*

3.7 Module 4 –Operator on-type Training for Hoist Operator Technical Crew Member

Training and checking must be defined by the operator in the Operational Manual (OM) and approved by the competent authority. It might include an "on type" training. The chart below is given for indication as "the operator should determine the content of the Conversion or Differences* training … (AMC2 ORO.TC.120 & 125)".

*Differences training- ORO.TC.125: Each Technical Crew Member shall complete differences training when changing equipment or procedures on types or variants currently operated.

Module 04 – Operator on-type Training – Hoist Operator Technical Crew Member:

Module 4	**Topics to be covered (not limited to)**	**Contents (not limited to)**	***Guideline for recommended minimum duration of training***	***References***
Theoretical	• Technical aspect of the aircraft; • Technical aspect of the hoist; • Company specific procedures and phraseology; • Dangerous goods; • Passenger briefing; • CRM and crew Coordination. • Specific knowledge about the local mission area (e.g. web-based obstacle maps) • Specific rescue equipment used by the operator	• ”On type” aircraft limitations; • ”On type” hoist system and Limitations;	Specified by the operator	Contents as per AMC1 ORO.TC.120 & 125. + ESPN-R Proposal
Practical	• Hoist system; • Aircraft and equipment preparation; • Location of on-board fire extinguisher; • Location of normal and emergency exits; • Location of safety equipment; • Preparing and handling of the specifically used rescue equipment	• ”On type” aircraft limitations; • ”On type” hoist system and Limitations;	Specified by the operator	Contents as per AMC1 ORO.TC.120 & 125. + ESPN-R Proposal
Flight	• Company specific procedures and phraseology; • Task-specific training *(as Hoist Operator)* • CRM and crew Coordination		Specified by the operator	Contents as per AMC1 ORO.TC.120 & 125. + ESPN-R Proposal
Proficiency Flight checks	**As per flight crew** AMC1 SPA.HHO.130 (f)(1)	• Local area meteorology; • HHO flight planning; • Normal and simulated HHO procedure incl. correct use of the HHO checklists • HHO departures; • Transition to and from the hover at the HHO site; • Normal and simulated emergency HHO procedures; • CRM and crew Coordination.	Specified by the operator	Regulation (EU) 965/2012 on air operations AMC1 SPA.HHO.130 (f)(1) + AMC1 ORO.TC.110 (3) + ESPN-R PROPOSAL

4 Conditions for assignment to duties / reference oro.Tc.105

4.1 Hoist Operator Technical Crew Member

(a) Technical crew members in commercial air transport HHO (HEMS, NVIS) operations shall only be assigned duties if they:

(1) have completed all applicable training required by this document to perform the assigned duties or be already experienced as a hoist operator (with grandfather rights).

Grandfather rights
For operators with proven/existing experience: the grandfathering of standards needs to be carefully considered.

For newly to be trained hoist operators the changed guidelines enable more opportunities to maintain and obtain justified and documented permission of the respective operation.

A "grandfathering right" is foreseen to be granted to experienced hoist operators with the target to being not detrimental to the overall safety target. It is to be evaluated on a case by case basis and credits should be granted on basis of proportionality in considering several criteria.

Criteria:
- 2 years of operational activity;
- 200 HEC *hoist cycle as the minimum;
- fill the proven/existing experience, aeronautic, and operational background.

(2) have been checked as proficient to perform all assigned duties in accordance with the procedures specified in the operations manual.
(3) are physically and mentally fit to safely discharge assigned duties and responsibilities; (Ref: GM1 ORO.TC.105 Conditions for assignment to duties).

4.2 Self-employed, freelance, part-time Hoist Operator Technical Crew Member /ORO.TC.105

(b) Before assigning to duties Technical Crew Members who are self-employed and/or working on a freelance or part-time basis, the operator shall verify that all applicable requirements of this Subpart are complied with, taking into account all services rendered by the technical crew member to other operator(s) to determine in particular:

(1) the total number of aircraft types and variants operated;
(2) the applicable flight and duty time limitations and rest requirements

5 Recency – SPA-HHO.130 "Crew Requirements"

Hoist Operator Technical Crew Member conducting Helicopter Hoist Operations shall have completed in the last 90 days:

(1) when operating by day: any combination of **three day or night **cycles**, each of which shall include a transition to and from the hover.
(2) When operating by night: **three night hoist **cycles**, each of which shall include a transition to and from the hover.

****Hoist cycle:** Hoist cycle each of which shall include a transition from and to the hover, ideally: one hoisting down and up of the hook with either delivering or picking up a person or an object to or from a surface (land, sea, deck, raft etc.)

6 Recurrent Training – ORO-TC.135 "Recurrent Training"

(a) Within every 12-month period, each Technical Crew Member shall undergo recurrent training relevant to the type or class of aircraft and equipment that the Technical Crew Member operates. Elements of CRM shall be integrated into all appropriate phases of the recurrent training.
(b) Recurrent training shall include theoretical and practical instruction and practice.

The ESPN-R recommend that in addition to the ORO.TC.135 and AMC1. ORO.TC.135, the Hoist Operations Technical Crew Member should perform flight activities including hoist operations or perform, when available, an activity on a simulation device in line with a competency-based approach.

7 Miscelleaneous

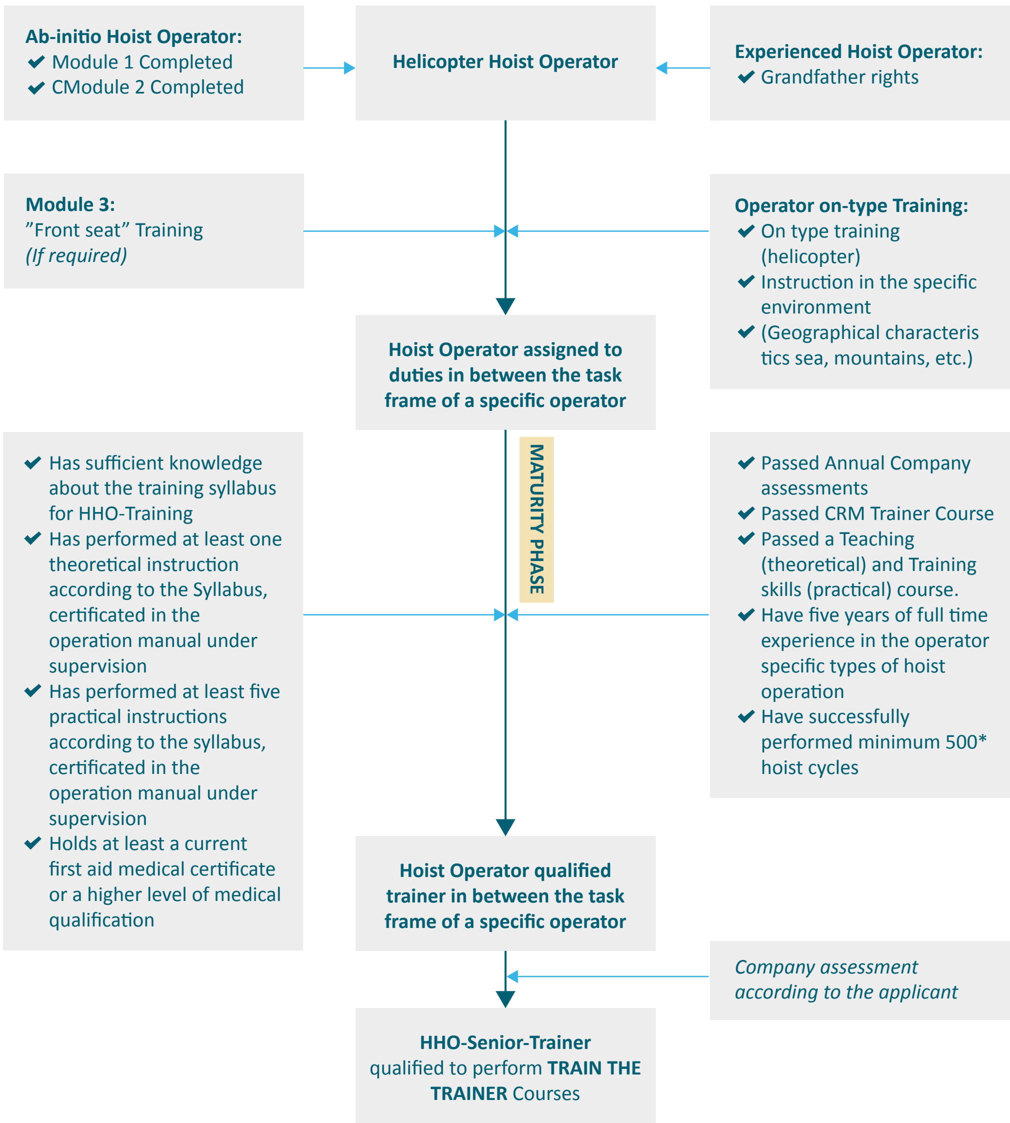
(a) ESPN-R hoist safety promotion working group proposes, flight crew members (Pilots) involved in hoist operations and HHO passengers (e.g. scheduled/ commercial passenger transport) have to perform a standardized initial training that should be conducted in accordance with uniform authority regulations or based on another acceptable industrial standard (which is not covered in this document) prior starting HHO duties.

(b) It is **not recommended** to train both HHO Pilot ab-initio and HHO TCM ab-initio together at the same time.

(c) This document is not related to HEMS, NVIS, External sling load operations and task specialists.

Annex 1

1 From Hoist Operator to Senior Hoist Operator Trainer:



2 Module 01 trainings syllabus HHO Instructor – Learning & Teaching

The basic requirement for a HHO trainer is the successful completion of an assessment. The focus here is on soft skills such as:

- Character suitability;
- Safety-conscious action;
- CRM principles in relation to the Helicopter Hoist Operation;
- Conscious action in stress situations.

Training section – Learning and teaching			
Module 01	**Topics to be covered (not limited to)**	**Contents (not limited to)**	***Recommended minimum duration of training (hh:mm)***
Index 1 Theoretical	• Basics of learning	• Basics of adult education • motivation • Perception and understanding • Behavior and transmission • Learning obstacles / Learning incentives • learning progress • learning methods	3:00
Index 2 Theoretical	• The teaching activities	• The role of the teacher / instructor • Basics of successful teaching • lesson planning • learning objectives • Teaching aids and media • forms of teaching • communication	3:00
Index 3 Theoretical	• Group dynamic processes	• Advantages and disadvantages of group dynamics • What does group dynamics mean? • The group phases • Watch group • Communication patterns in the group • Hierarchies or roles in a group • Development of standards in groups • Analyzing groups • Identify group potential • Controlling and influencing groups • Promoting group and team development • Countering conflicts and resistance within the group • Get group feedback	3:00
Index 4 Practical	• Practical exercises	• teaching samples	3:00
For Indication, The training section "Learning and Teaching" is based on the standard of the training certificate ADA "Training of Trainers" issued by the German Chamber of Industry and Commerce and the Chamber of Skilled Crafts.			
			12.00

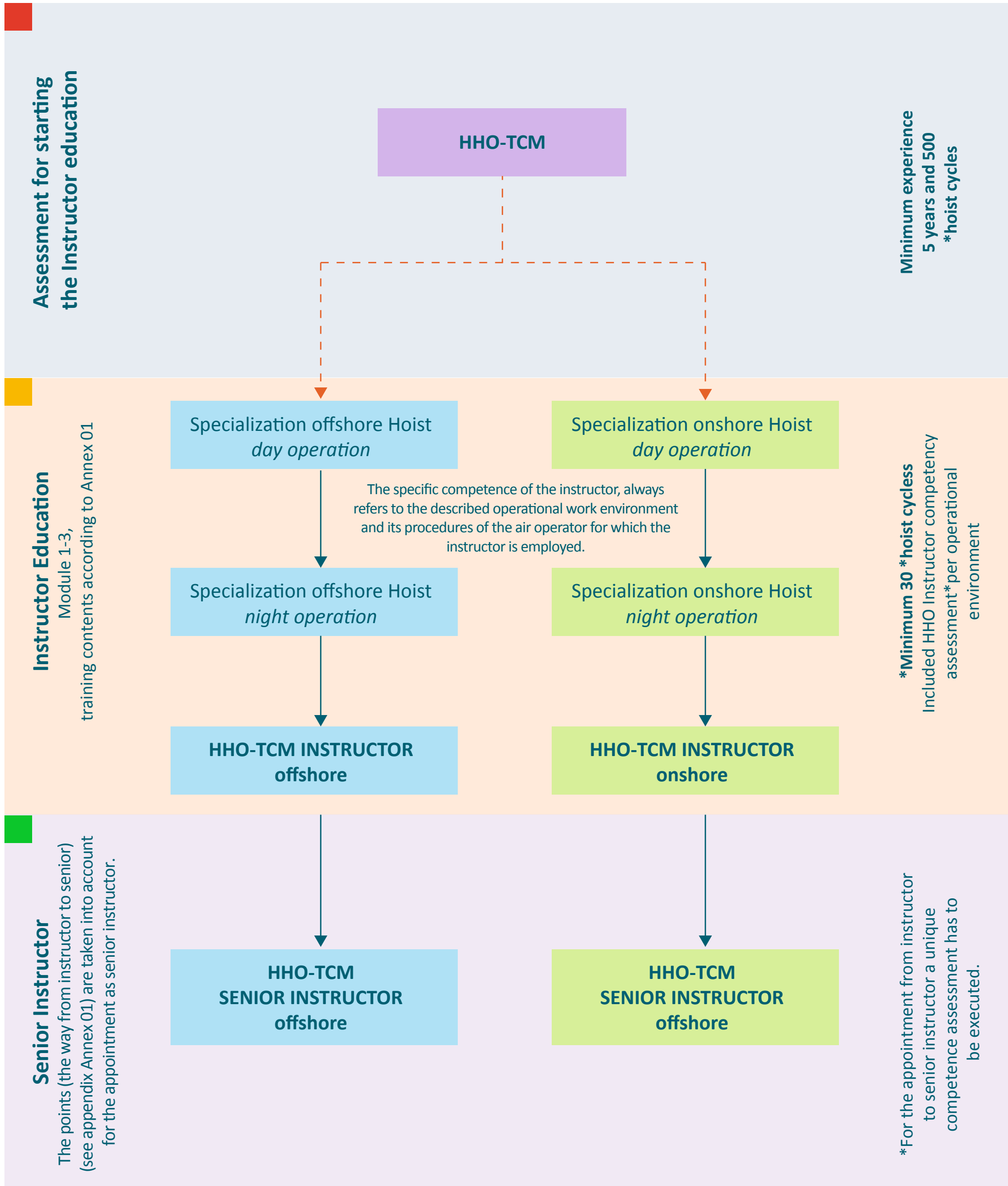
3 Module 02 Trainings syllabus HHO Instructor – Theoretical Activities

Training section – Theory			
Module 02	**Topics to be covered (not limited to)**	**Contents (not limited to)**	***Recommended minimum duration of training (hh:mm)***
Index 1 Theoretical	• Standard procedures and basic knowledge	• Repetition and standardization of the basic knowledge from the HHO basic training as well as the extended sectors of the HHO duties.	03:00
Index 2 Theoretical	• Crew coordination concept	• Crew cooperation during training flights	01:30
Index 3 Theoretical	• Placing of emergency procedures	• Recording of emergency procedures during the training of HHO crewmembers.	01:30
Index 4 Theoretical	• Proficiency checks	• Basics of the execution of proficiency checks in the HHO operation at HHO-TCM.	01:30
Index 5 Theoretical	• Legal regulations at law	• Aviation legal regulations on helicopter hoist operation and the associated instructor activity.	01:00
Index 6 Theoretical	• Documentation and verification	• Providing the legally compliant documentation; • Filling in the flight training course files; • Check flight forms and the archiving periods associated with them.	01:00
Theoretical Checks	• Knowledge examination	• Multiple Choice Questions covering knowledge from the indexes 1-6; *75% of correct answers to pass the exam.*	01:00
			10.30

4 Module 03 Trainings syllabus HHO Instructor – Flight Activities

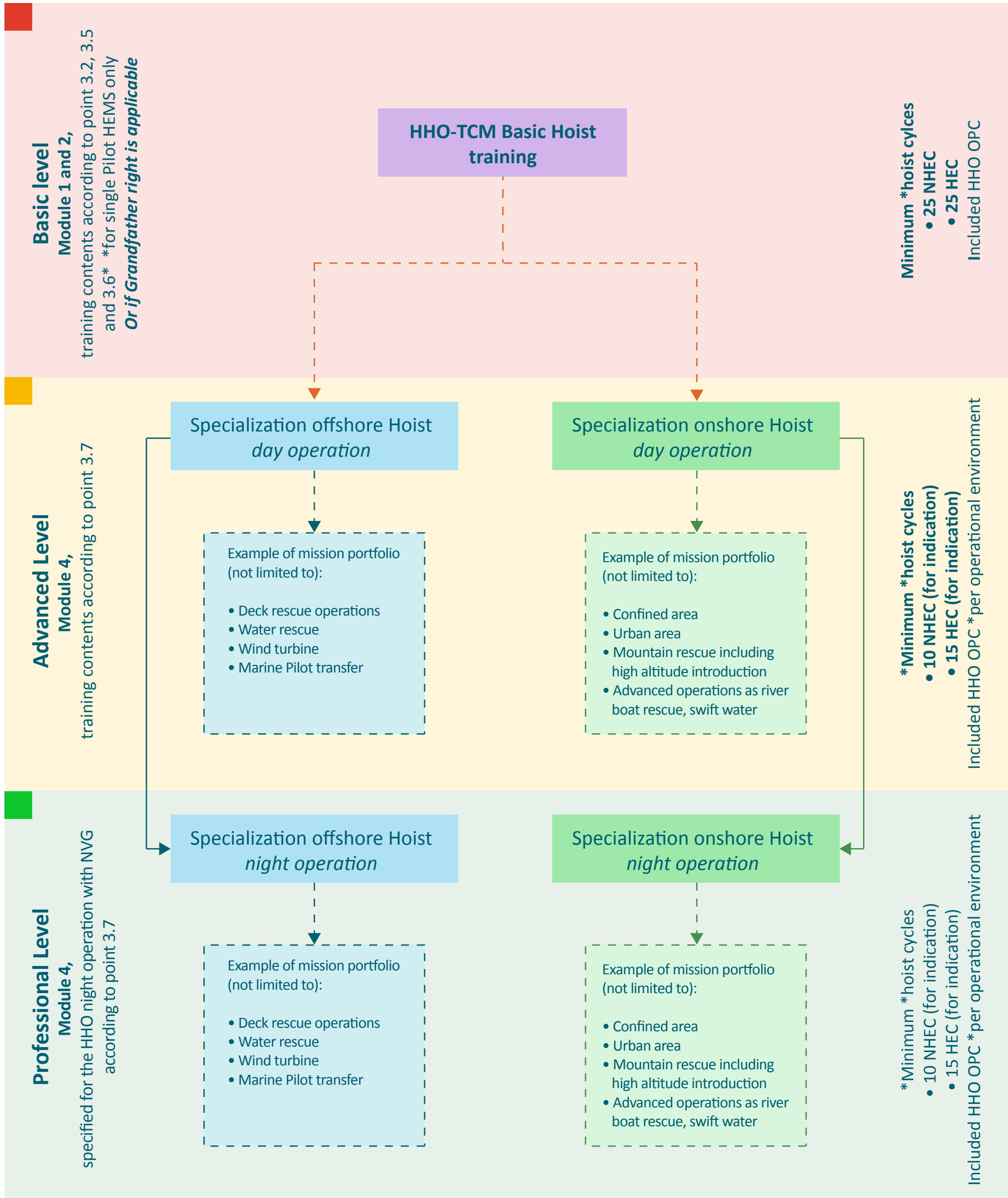
Practical training				
Module 03	**Topics to be covered (not limited to)**	**Contents (not limited to)**	***Recommended duration of training- performance based approach***	
			Flight time	*** Hoist cycles**
Index 1 Flight	Standardisation of procedures	• Standard procedure in Helicopter Hoist Operation; • Emergency procedure in the Helicopter Hoist Operation;	02:00	9
Index 2 Flight	Crew cooperation	• Training of crew cooperation during training flights in real environment in Helicopter Hoist Operation;	00:30	3
Index 3 Flight	Training HHO students	• Procedures for the training of HHO crew members; At the beginning, a different instructor is used as a student, in the second step it is a real training situation for primary school students of HHO crew members;	01:15	6
Index 4 Flight	Emergency procedures	• Recording of emergency procedures during the training of HHO crew members; • How do I intervene sensibly? • Safety-/ Situation and awareness.	01:15	4
Index 5 Flight	Flight training and proficiency checks	• Simulation of proficiency checks based on the legal requirements under consideration of minimum flight time and minimum *hoist cycles in real operational environment.	01:00	5
Checks Flight	Competency assessment	• Examination and evaluation of the theoretical and practical training contents module 2 and module 3 in the form of a simulated acceptance of a proficiency check of a HHO crewmember. The HHO crewmember is simulated by an experienced HHO Instructor.	00:30	3
			06:30	**30 *Hoist cycles Estimation Guideline**

5 Example for step process HHO TCM training – From HO to HO Senior Instructor



Annex 2

1 Example for step process HHO TCM training – from basic HO to HO



*OPC: Operator Proficiency Check

2 Example for syllabus proposal for flight activities Module 02 – Basic Hoist Operator

Scoring method	
D	Demonstration;
1	Performance above average;
2	Detects errors independently and eliminates them. Training goal achieved;
3	Makes occasional mistakes, exercise must be repeated;
4	Frequently makes mistakes, must be corrected, repeat exercise.

ab-initio hoist operator training syllabus	Manouvers/tasks/procedures	Flights 1	2	3	4	5	6	7	8	9	10	Final Result
	Pre-flight briefing											
	Preparing the helicopter and specialist equipment for HHO											
	Weight and center of gravity management											
	Operation of inter-communication and radio equipment											
	Communication											
	Performed hoist checks and pre-winching checks											
	Guidance over HHO sites											
	Standard winching circuit											
	Aircraft positioning using standard phraseology between Hoist Operator and Pilot;											
	Horizontal and vertical rotor and tail clearance;											
	Operation of hoist equipment;											
	Non HEC single lift (use of load) on clear area;											
	Hoist malfunctions and emergency procedures;											
	Aircraft malfunctions and emergency procedures, including simulation of an engine failure (fly away);											
	HEC Single and double lifts;											
	Techniques for handling HHO Passenger;											
	Standard hand signals;											
	Control of the swing and spinning avoidance;											
	Area reconnaissance, detection of specific dangers relating to the operating environments;											
	Elements of CRM like decision making, situation awareness (but not limited to);											
	De-briefing;											

Scoring method: After each flight the HO Instructor will evaluate and give a score to the student. The scoring method might be defined by the operator (and/or an ATO) and can use numbers or letters, the final score (after completing the 25NHEC + 25HEC *hoist cycles) must be above the limit defined by the Operator. In addition, the Operator might define a minimum level to obtain for each flight sortie, If the level is not reached the student shall perform the same sortie again.

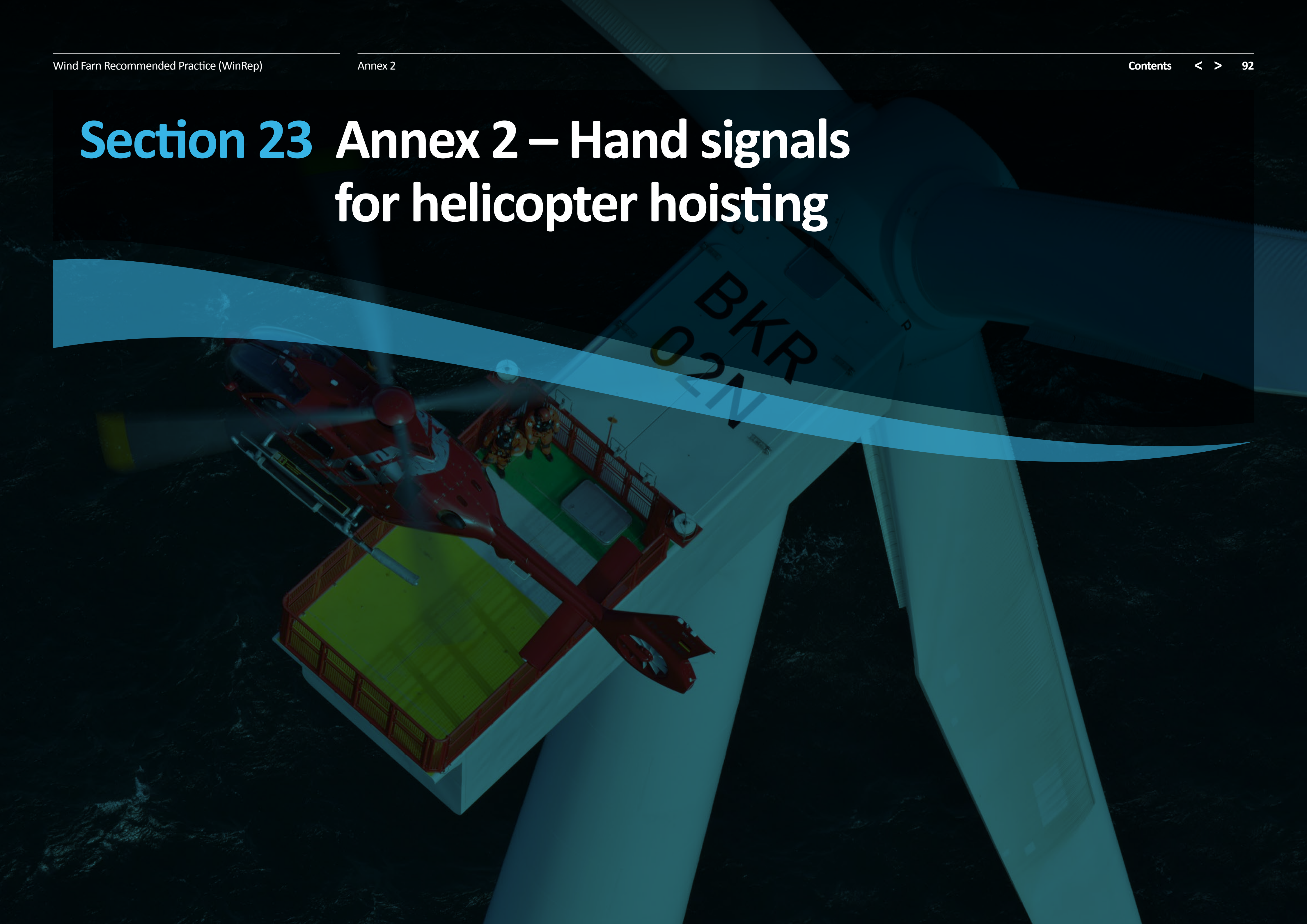
Note: the training concept is based on a competence based and the recommended number of hoist cycles *hoist cycles may be reduced or increased, based on the demonstrated performance skill of the student. *hoist cycles (as per SPA-HHO.130):. Hoist cycle each of which shall include a transition from and to the hover, ideally hoisting down and up of the hoist hook with either delivering or picking up a person or an object to or from a surface (land, sea, deck, raft etc.

ESPN-R Hoist Safety Promotion working group

Participants:

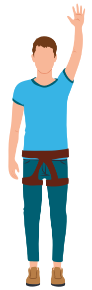
- **Christoph Hess, Karl Mueller** – Swiss Air Force
- **Klaus Hopf** – Bavarian Helicopter Police Squadron
- **Sebastian Schneider** – DRF Luftrettung
- **Peter Schellig** – ADAC Luftrettung
- **Walter Traversa, Michele Valenza** – Babcock Italie
- **Kim Gardberg** – CHC
- **Andrea Walser** – REGA
- **Fabrice Legay, Jan Loncke** – EASA
- **Julien Eymard, Dario De Liguoro** – Leonardo Helicopters
- **Bernd Osswald, Rupert Gleissl, Alexander Weissenboeck** – Airbus Helicopters Germany

Section 23 Annex 2 – Hand signals for helicopter hoisting

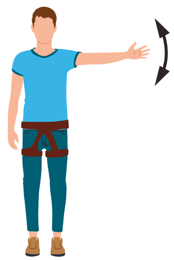


Section 23
Annex 2 – Hand signals for helicopter hoisting

Hand Signals for helicopters

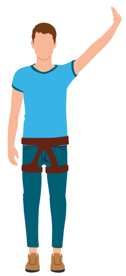

Pick me up next
(Hold one arm straight up)

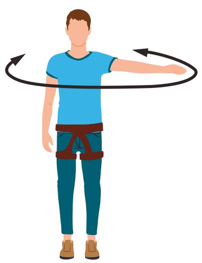

Hoist up
(Make circles with a vertical forearm)

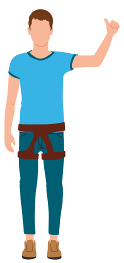

Hoist down
(Wave straight arm up and down)

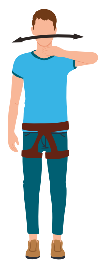

Take me that way
(Point in desired direction)


Abort / Go Away
(Wave hands across face)


STOP!
(Use palm of hand towards pilot)


Level off
(Wave straight arm horizontally)


Ready / OK!
(Thumb outstretched pointing sideways)


CANCEL!
(Knife-hand cutting throat)

Section 24 Annex 3 – Crew Composition Tool worked example

Section 24
Annex 3 – Crew Composition Tool worked example

Using the crew Composition Table. This section is a worked example of using the Crew composition tool to assess operations to a specific wind farm.

Step 1

All of the topics in the Crew Composition Tool must be assessed and a score for each topic must be obtained. For this example, the following hypothetical wind farm and operational details are considered:

The operation is planned to fly technicians from an airport to a wind farm located relatively close to the shore. After hoisting the technicians to the Wind Turbines it is planned to land the helicopter on an offshore helideck that is located within the wind farm. The planned flight time from shore until the shutdown of the helicopter is 57 minutes. No other wind farms in the area are using helicopters and there are no simultaneous operations of Unmanned Aerial Vehicles (UAV, Drones).

The operation will be flown with a helicopter that is equipped with a 4-axis Autopilot and a Synthetic Flight Display System that integrates engine and warning systems to lower pilot workload.

The airspace is covered by an Air Traffic Control Service that provides separation and deconfliction from other traffic at the airfield onshore but not enroute or in the wind farm.

Operations to vessels are not to be conducted. Flights will be flown in VMC conditions under VFR rules unless the weather deteriorates and then it is expected that the crew will transition to IMC conditions and recover under IFR rules.

It is planned that each crew will log less than two hours flight time per day and all flights will be conducted during daylight. Crews each have over 2000 hours flight time in helicopters and meet the extensive experience criteria in Flight Crew Experience c) and maintain a recency of 100 hours of hoisting experience within the last 90 days.

Table 4 Crew Composition Topic Description provides an expanded explanation of each topic that needs to be rated.

Table 4 – Crew Composition Topic Description

Topic	Description
Flight time	What is the expected flight time in minutes, from shore until the shutdown of the aircraft.
Congestion	Congestion of airspace (measured in terms of other users for the offshore portion (simultaneous drone ops, other users of wind farm airspace +/- 10 Nm)
Aircraft equipment	Is the aircraft fitted with a fully serviceable 3 axis or 4 axis autopilot. Does the helicopter have a cockpit with synthetic flight displays (SFD) that integrate engine, warning and limitation indications that lower pilot workload.
Deconfliction	Does the Air Traffic Control service ensure separation and deconfliction for any or some of the flight.
Vessel landing	Will vessel landings be conducted.
Vessel hoisting	Will vessel hoisting be conducted.
IFR / VFR	Will portions of the flight be conducted under IFR rules, is this only for recovery if weather unexpectedly deteriorates or is it expected that parts of the flight will be conducted IMC such as departures or arrivals from onshore.
IMC / VMC	Will portions of the flight be conducted in IMC, is this only for recovery if weather unexpectedly deteriorates or is it expected that parts of the flight will be conducted IMC such as departures or arrivals from onshore.
Flight hours	The number of planned flight hours per crew, per day.
Day / Night	Are flights only conducted during daytime or are portions of the flight planned to be conducted at night.
Flight Crew recency	Recency how many similar operations (HHO or deck landings) has the crew performed in the last 90 days – A more recent crew is deemed safer than a crew that has not recently performed the type of operation.
Flight Crew experience	Flight Crew Experience as defined in section 21.11.

Using the information for this hypothetical wind farm operation the Impact Assessment Level for each topic is obtained by using the Crew Composition Tool in Figure 8. The Impact Assessment Level in this example is depicted by an orange circle for each topic. Individual scores are indicated in the right hand column and the total is at the bottom.

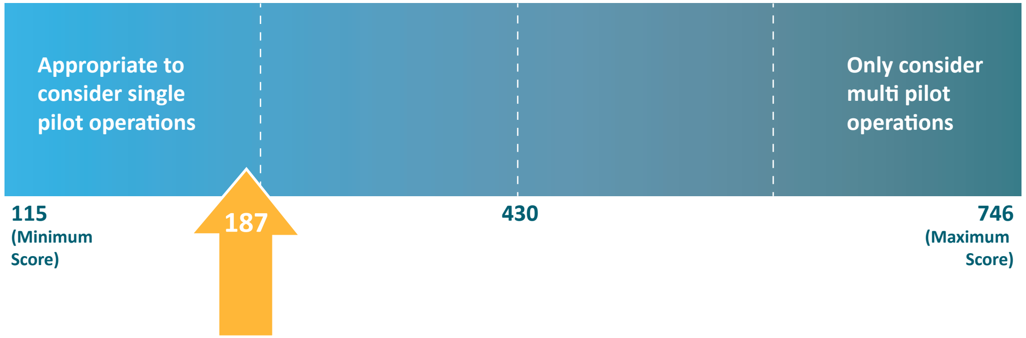
Figure 8

Topic	Impact assessment level			Score
	Low	Medium	High	
Flight time (Minutes)	<60	60-120	>120	**9**
	9	29	54	
Congestion	Sole use	Multiple assets	Multiple assets and adjacent wind farm	**10**
	10	50	80	
Aircraft equipment	4 axis, SFD	4 axis	3 axis	**11**
	11	16	51	
Deconfliction	Enroute and at airfield	Enroute or airfield	None	**26**
	11	26	54	
Vessel landing	None	Possible but unplanned / infrequent	Planned or considered	**0**
	0	44	54	
Vessel hoisting	None	Unplanned	Planned or considered	**0**
	0	43	59	
IFR / VFR	VFR	VFR and IFR recovery	Planned IFR	**46**
	7	46	64	
IMC / VMC	VMC	VMC in wind farm IMC recovery / enroute	IFR departures and arrival planned	**49**
	9	49	67	
Flight hours	<2	2-4	>4	**9**
	9	31	55	
Day / Night	Day only	Night transit only	Night Ops	**4**
	4	46	85	
Flight crew recency (Days)	>100	50-100	<50	**16**
	16	29	49	
Flight crew experience	Extensive	Recommended	Minimum	**7**
	7	37	74	
		Total		**187**

The total score for the operation being considered is 187

Step 2

Using the total score obtained in step 1, the impact assesment level total is transposed onto the Crew Composition Scale in Figure 9, in this example it is indicated with an orange arrow.



In this example the total score for the operation is 187. An OWC sets the score above which it will only consider multi pilot operations this value will be referred to as the Impact Assessment Threshold. An OWC sets the Impact Assessment Threshold as a common value for all of its operations. This objective risk based assessment of an operation allows a common and evidence based approach to the selection of the appropriate crew composition.

Further uses of the Crew Composition Tool

The Crew Composition Tool allows the impact of changes to the operation to be reviewed. Using the same example we can consider what the impact would be if the operation were to be flown by a less experienced crew. This could happen during a contract where the helicopter operator would like to introduce a less experienced crew member to the operation.

Using the flight crew experience Tables 6 and 7 here we consider the impact to the operation if the flight crew no longer all meet the extensive criteria and now only meet the Recommended criteria.

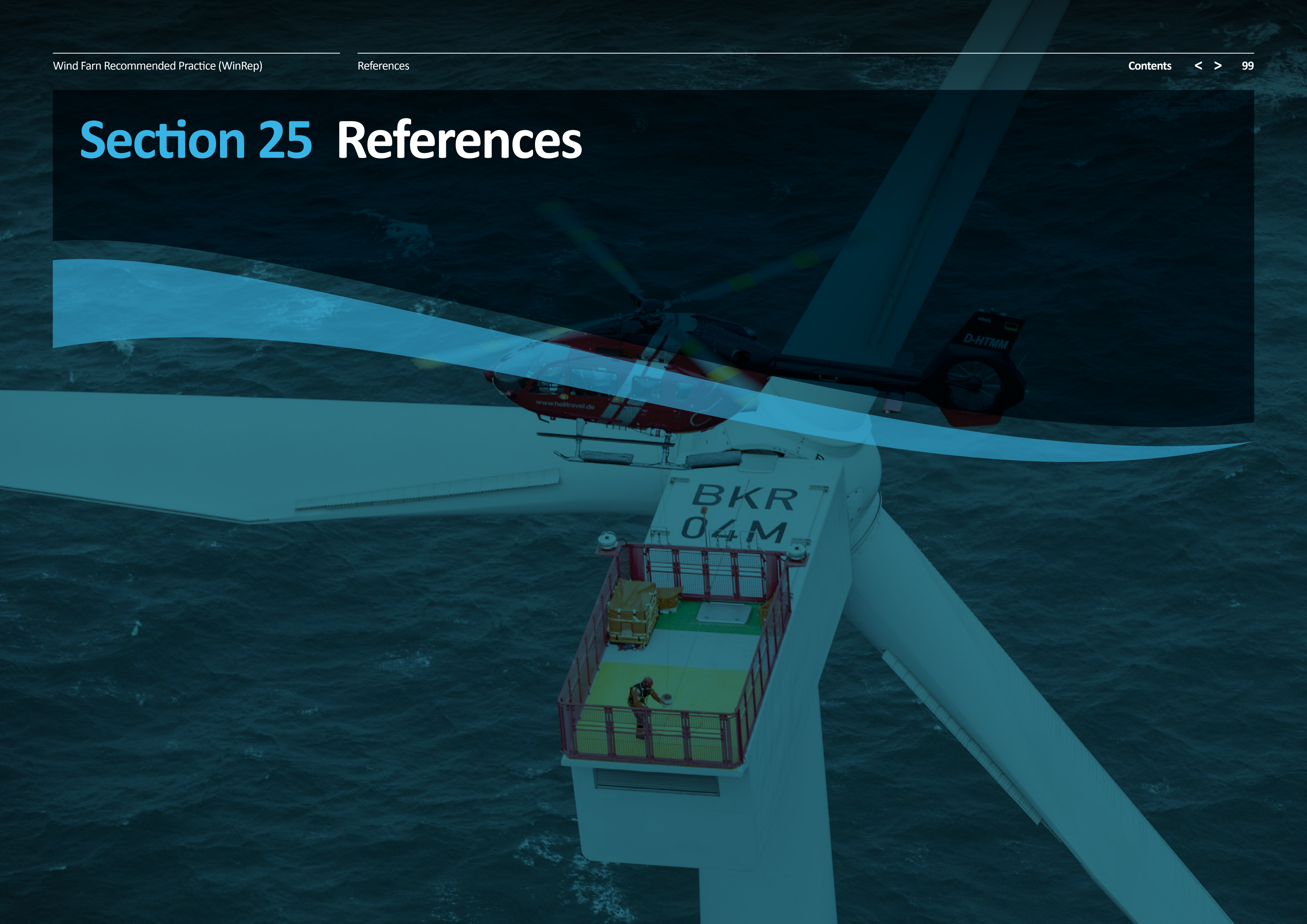
The score for the flight crew experience would change from 7 to 37 as depicted below.

	Extensive	Recommended	Minimum	
Flight crew experience	7 →	37	74	**7**
		Total		**217**

This would increase the total score from 187 to 217 and indicate that if the operation is to be conducted by a flight crew with less experience it would be less appropriate to consider a single pilot operation than the same operation flown by a crew meeting the Extensive Flight Crew Experience requirements.

Using the Flight crew Assessment tool in this way allows an OWC to consider the most appropriate flight crew composition and objectively assess the impact of operational changes. Where helicopter services are shared or delivered by a third party Alignment on the Impact Assessment Threshold between OWC's is recommended.

Section 25 References



Section 25
References

[1] Safety Performance Model (Standards and Oversight)

[2] Safety Performance Model (Safety Intelligence)

[3] In Broad terms EASA is covering Europe and the FAA is covering the United States of America, although other regions also adopt some or all of the same material.

[4] Missing from Word file

[5] Safety Performance Model, Supply Chain

[6] Safety Performance Model, Aircraft Capability

[7] UK CAA CAP 437

[8] Safety performance Model, Passenger Briefing

[9] Safety Performance Model, Collision In Air

[10] Safety Performance Model, Competency

[11] Safety Performance Model, Standards and Oversight

[12] Safety Performance Model, Safety Leadership/Culture

[13] Safety performance Model, Competency

[14] Safety performance Model, Personnel Readiness

[15] Safety performance Model, Effective Flight Planning

[16] Safety performance Model, Dangerous Goods

[17] Safety Performance Model, Security and Check-in Control

[18] Safety Performance Model, Offshore Alternates

[19] Safety Performance Model, Aircraft Capability

[20] Safety Performance Model, Standards and Oversight

[21] Safety Performance Model, Competency

[22] Safety Performance Model, Safety Leadership/Culture

[23] Safety performance Model, Effective Management System

[24] Basis FSF BARS

[25] Safety Performance Model, Standards and Oversight

[26] Safety Performance Model, Safety Intelligence

[27] Safety Performance Model, Multiple Helicopter Operations

[28] Safety Performance Model, Enhanced Situational Awareness

[29] Safety Performance Model, Check-in Control

[30] Safety performance Model, Aircraft Capability

[31] AC 29.908A(b) Definition for Continued safe flight and landing.

[32] "Secure" should preferably be understood as HEC recovery to a position in the cabin and safely attached to the helicopter or alternatively to a position, as a minimum, above the landing gear or safely deployed back to the hoist platform. The decision taken should rely on the operator's risk assessment and operating procedures considering the highlighted factors.

[33] Safety Performance Model, Heliport/Helideck Design

[34] Safety Performance Model, Effective Flight Planning

[35] Safety performance Model, Dangerous Goods

[36] Safety Performance Model, Heliport and Helideck Management

[37] Safety Performance Model, Fuel Checks

[38] Safety Performance Model, Fuel Reserves

[39] Safety Performance Model, Effective Flight Planning

[40] Safety Performance Model, Night/IFR Flight Management

[41] Safety Performance Model, Detect/Avoid Obstacles

[42] Safety Performance Model, Enhance Spaces/Reduce Obstacles, ICAO Annex 14 Volume II

[43] Safety Performance Model, SAR/Emergency Response

[44] Safety Performance Model, Post-Accident

[45] Safety Performance Model, Regular reports/Forecasts

[46] Safety Performance Model, Collision In Air

[47] Safety Performance Model, Alerting

[48] Safety performance Model, Multiple Helicopter Operations

[49] Safety Performance Model, Regular reports/Forecasts

[50] Safety Performance Model, Regular reports/Forecasts

[51] Safety Performance Model, Adverse Weather Policy/Use

[52] Safety Performance Model, Dangerous Goods

[53] Safety Performance Model, Competency

[54] Safety Performance Model, Competency

[55] Safety performance Model, Enhanced Situational Awareness

[56] Safety Performance Model, Aircraft Capability

[57] Safety Performance Model, Multi-crew Operations

[58] Safety Performance Model, Underwater Escape

[59] Safety Performance Model, Competence

WinReP specialists are encouraged to participate in our online, secure collaboration tool: HeliOffshore Space.

You can find out more about HeliOffshore, our safety plan, and the workstreams at
www.helioffshore.org

This guidance will be updated regularly. If you have comments or suggested amendments, please email:
info@helioffshore.org

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