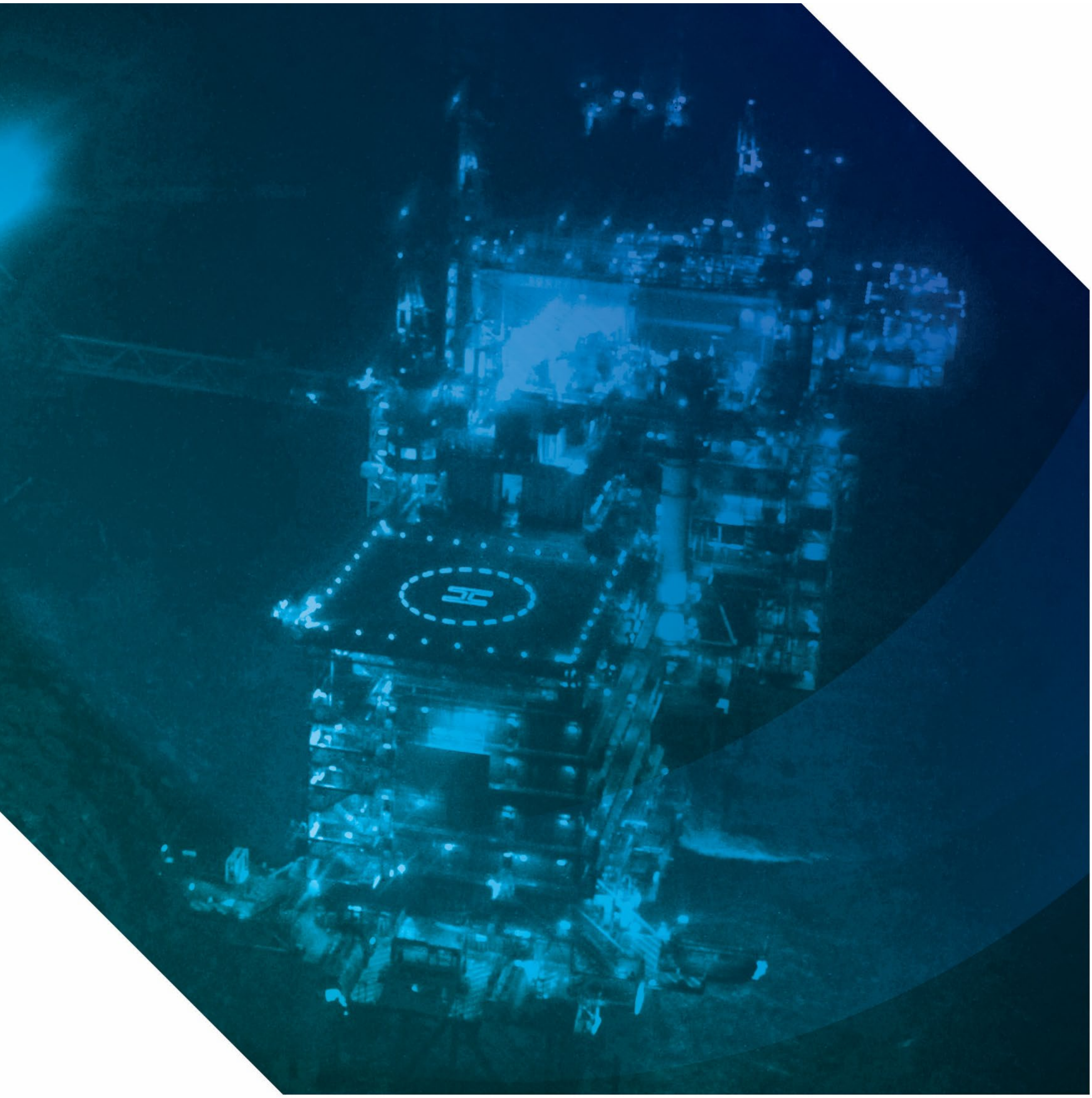
Safety Regulation Group

Standards for offshore helicopter landing areas

CAP 437



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The latest version of this document is available in electronic format at www.caa.co.uk/CAP437

Contents

Revision history

Edition 1 **September 1981**

The first edition of CAP 437 was published to give guidance on the criteria applied by the CAA in assessing the standard of helicopter offshore landing areas for worldwide use by helicopters registered in the UK. The criteria in the CAP relating to fixed and mobile installations in the area of the UK Continental Shelf were based on the helicopter landing area standards of the Department of Energy. Additional criteria were given relating to vessels used in the support of offshore mineral exploitation and tankers, cargo vessels and passenger vessels which were not subject to the Department of Energy certification. These criteria were evolved following consultation with the Department of Trade (Marine Division) and the Inter-governmental Maritime Consultative Organisation. In addition to explaining the reasons behind the chosen criteria, the first edition of CAP 437 described their application to particular classes of landing area.

Edition 2 **December 1993**

The guidance in CAP 437 was revised in the light of International Civil Aviation Organization (ICAO) recommendations and Health and Safety Executive (HSE)/CAA experience gained from offshore helideck inspections.

Edition 3 **October 1998**

Amendments were made to incorporate the results of valuable experience gained by CAA staff during three and a half years of offshore helideck inspecting with the HSE and from cooperation with the British Helicopter Advisory Board (BHAB). Analysis of the results of the inspection regime, completed in April 1995, resulted in changes to the way in which helidecks were authorised for use by helicopter operators. Other changes reflected knowledge gained from accidents, incidents, occurrences and research projects. The section concerning the airflow environment, and the impact on this environment from exhaust and venting systems, was revised. Also the paragraph numbering was changed for easier reference.

Edition 4 **September 2002**

The CAP was amended to incorporate new house-style.

Edition 5 **August 2005**

The CAP was extensively revised to incorporate valuable experience gained from CAA funded research projects conducted with the support of the UK offshore industry into improved helideck lighting, helideck environmental effects and operations to moving helidecks. The sections concerning helideck lighting were considerably revised to ensure that UK good practice adequately reflected the changes made in 2004 to the ICAO Standards and Recommended Practices (SARPs) for TLOF lighting. The fifth edition also pulled together revised requirements harmonised amongst North Sea States as a result of initiatives taken by the Group of Aerodrome Safety Regulators (GASR) Helideck Working Group.

Edition 6 **December 2008**

The sixth edition is revised to incorporate further results of valuable experience gained from CAA funded research projects conducted with the support of the UK offshore industry into improved helideck lighting and the conclusion of projects, jointly funded with the Health and Safety Executive (HSE), relating to offshore helideck environmental issues. In respect of helideck lighting, a detailed specification for stage 2 lighting systems (addressing illumination of the heliport identification 'H' marking and the Touchdown/Positioning Marking Circle) is provided in an Appendix; and a new reference to the final specification for helideck status lights systems is provided in Chapter 4. In regard to now-completed helideck environmental projects, Chapter 3 provides formal notification of the new turbulence criterion and the removal of the long-standing vertical flow criterion.

The sixth edition has also been amended to include new ICAO SARPs relating to offshore helidecks and shipboard heliports, which generally become applicable from November 2009. This edition has also been revised to include material which is part of the fourth edition of the International Chamber of Shipping (ICS) Guide to Helicopter/Ship Operations, published in December 2008. For the first time, provisions are included for the design of winching area arrangements located on wind turbine platforms.

Edition 6 amendment 01/2010 **April 2010**

This amendment was issued to provide operators with Additional Guidance Relating to the Provision of Meteorological Information from Offshore Installations. Editorial amendments convenient to be included at this time have also been incorporated.

Edition 6 amendment 01/2010 August 2010

This amendment was issued to correct an error in Chapter 10, paragraph 2 that referred to a requirement for a medium intensity (rather than a low intensity) steady red obstruction light. The opportunity has been taken to update part of Chapter 4 relating to helideck lighting and part of Chapter 5 relating to the location of foam-making equipment. Editorial amendments convenient to be included at this time have also been incorporated.

Edition 7 May 2012

The seventh edition is revised to incorporate the full and final specification for the Helideck Lighting Scheme comprising Perimeter Lights, Lit Touchdown/Positioning Marking Circle and Lit Heliport Identification 'H' Marking.

The seventh edition has also been updated to reflect ICAO SARPs for Annex 14 Volume II due to become applicable for States from November 2013. Provisions for the design of winching area arrangements located on wind turbines, first introduced at the sixth edition, has been reviewed and updated to reflect current best practice with the benefit of lessons learned through various industry forums attended since 2008.

Edition 7 amendment 01/2013 February 2013

This amendment was issued to clarify aspects of the final specification and installation arrangements for the Lit Touchdown/Positioning Marking Circle and Lit Heliport Identification Marking. Further amendments convenient to be included at this time have also been incorporated.

Edition 8 December 2016

The eighth edition presents several new topics not previously addressed in CAP 437 including a risk assessment for helicopter operations to helidecks in the UKCS which are sub-1D and criteria for parking areas. In addition there is a comprehensive update on the section related to helideck surface including new friction requirements for flat helidecks with micro-texture finishes and for profiled helidecks. An update on best practice for temporary combined operations, multiple platform configurations and helideck movement are also included. This amendment is issued to present the final specification and the installation arrangements for the Lit Touchdown/ Positioning Marking Circle and Lit Heliport Identification Marking. Finally, the European Aviation Safety Agency (EASA) Requirements for Air Operators, Operational Requirements Part-OPS, Annex VI Part SPA (AMC1 SPA.HOFO.115 Use of offshore locations) are reflected in Appendix material.

Edition 8 amendment 01/2018 September 2018

This amendment is issued to clarify aspects of the final specification and installation arrangements for the Lit Touchdown/ Positioning Marking Circle and Lit Heliport Identification 'H' Marking, now with the benefit of in-service experience and lessons learned from completion of equipment approvals by CAA International. The requirement for floodlighting to aid the visual task of final approach, hover and landing is removed. In anticipation of a comprehensive update to the heliport rescue and fire-fighting requirements in Annex 14 Volume II, Chapter 5 has been re-written to amplify new international best practices. The NUI fire-fighting scheme in Appendix material has been updated including with-drawl of the 2011 industry letter.

A further update of the helideck surface section is presented with the introduction of a new helideck contamination scale, waiving of full-scale testing of legacy profiled helidecks, and further refinements to best practice including an update to the Friction Survey Protocol. Finally, the European Aviation Safety Agency (EASA) Requirements for Air Operators, Operational Requirements Part-OPS, Annex VI Part SPA (AMC1 SPA.HOFO.115 Use of offshore locations) has been refined in Appendix A to ensure it fully reflects best practice for operations on the UKCS.

Edition 8 amendment 02/2021 July 2021

This amendment is issued to address changes required within Chapters 7 & 8 to reflect current best practice in light of revisions to regulations and guidance resulting from experience and research carried out within the wider aviation fuelling community. As well as addressing the need for standardisation of training and competency of personnel involved in offshore helideck activities and the fuel supply chain, the main body of changes centre around removal of Filter Monitor filtration elements from use and the alternative control measures required to allow their safe removal or replacement to eradicate the possibility of Super-Absorbent Polymer migration from refuelling equipment to aircraft. There is also an attempt to standardise some areas of common terminology and methodology.

The CAA identified ground handling in its Safety Plan as one of the 'Significant Seven' – the main seven areas of risk for the UK Aviation sector. Therefore, with the endorsement of CAA through the Ground Handling Operations Safety Team (GHOST), a working sub-group was convened in May 2018 that sought to address the risks specific to the offshore environment. The main deliverable from the initiative has been to bring standardisation to ground operations and dangerous goods procedures right across the offshore helicopter operators, that allows them to discharge the responsibilities imposed by UK Regulation (EU) 965/2012 (Air Operations), Annex III, Part ORO.GEN.110 e) and f).

Edition 9 February 2023

The ninth edition comprises updates to the material on helideck movement in Chapter 6 and the meteorological information content in Chapter 6 and Appendix E. The guidance on helideck surface in Chapter 3 has been modified and flow charts added to improve clarity, and the specifications for helideck status lights and helideck monitoring system repeater lights have been collected together with the specification for the helicopter hoist status light in Appendix J. The protocol for regulating operations to NUI's in abnormal states contained in Appendix I has been substituted with a new, simplified version. Minor changes to Appendix K have been introduced to resolve ambiguities.

Foreword

Introduction

1. This publication, re-named Standards for Offshore Helicopter Landing Areas at seventh edition, has become an accepted world-wide source of reference. The eighth edition introduced a number of additions and revisions which were updated in Amendment 1 to the eighth edition, including:

   - A risk assessment for helicopter operations to sub-1D helidecks in the UKCS and criteria for parking areas.
   - A comprehensive update of the section related to helideck surfaces including new friction requirements for flat helidecks with micro-texture finishes and for profiled helidecks.
   - An update on best practice for temporary combined operations, multiple platform configurations and operations to moving helidecks.
   - The Acceptable Means of Compliance material (AMC1 SPA.HOFO.115) associated with the use of offshore locations in the European Aviation Safety Agency (EASA) Requirements for Air Operators, Operational Requirements Part-OPS, Annex VI Part SPA (applicable in EU legislation from 01 July 2018), reproduced in CAP 437 Appendix A has been updated to customise it for operations on the UK Continental Shelf (UKCS).
   - The specification and installation arrangements for the Lit Touchdown/Positioning Marking Circle and Lit Heliport Identification ‘H’ Marking has been refined. The TD/PM Circle and Heliport Identification ('H') Marking lighting forms an acceptable alternative to floodlights in International Civil Aviation Organization (ICAO) Annex 14 Volume II and provision of an equivalent circle and H scheme that meets national requirements is effectively mandated in Europe through the implementation of the European Aviation Safety Agency (EASA) Requirements for Air Operators, Operational Requirements Part-OPS, Annex VI Part SPA, AMC1 SPA.HOFO.115 Use of offshore locations.

General

2. CAP 437 presents the criteria required by the CAA in assessing the standards of offshore helicopter landing areas for world-wide use by helicopters registered in the UK. These landing areas may be located on:

    - fixed offshore installations;
    - mobile offshore installations;
    - vessels supporting offshore mineral exploitation;
    - vessels supporting offshore renewable energy;
    - offshore wind farms; or
    - other vessels, e.g. tankers, cargo vessels, passenger vessels.

3. If an offshore helideck does not meet and maintain the criteria in CAP 437, or if a change to the helideck environment is proposed, the case should be referred to the Helideck Certification Agency (HCA) in the first instance to enable them to collate information on behalf of the helicopter operators so that the process for authorising the use of the helideck can be completed in a timely fashion. Early consultation with the HCA is essential if maximum helicopter operational flexibility is to be realised and incorporated into the installation design philosophy. It is important that changes are not restricted to consideration of the physical characteristics and obstacle protected surfaces of the helideck. Of equal, and sometimes even greater, importance are changes to the installation or vessel, and to adjacent installation or vessel structures which may affect the local atmospheric environment over the helideck (and adjacent helidecks) or approach and take-off paths. In the case of ‘new-builds’ or major modifications to existing Installations that may have an effect on helicopter operations, the CAA has published guidance on helideck design considerations in CAA Paper 2008/03, which is available to assist with the interpretation and the application of criteria stated in CAP 437.

4. The criteria in this publication relating to fixed and mobile installations in the area of the UKCS, whether they are operating for oil and gas or renewable energy sectors, provide standards which are accepted by the HSE and referred to in HSE offshore legislation. The criteria address minimum standards required

in order to achieve a clearance which will attract no helicopter performance (payload) limitations. CAP 437 is an amplification of internationally agreed standards contained in ICAO Annex 14 to the Convention on International Civil Aviation, Volume II, 'Heliports'. Additionally, it provides advice on 'best practice' obtained from many aviation sources. 'Best practice', naturally, should be moving forward continuously and it should be borne in mind that CAP 437 reflects 'current' best practice at the time of publication. There may be alternative equivalent means of meeting the criteria presented in CAP 437 and these will be considered on their merits.

5. Additional criteria are given relating to vessels used in support of offshore mineral exploitation or renewable energy, which are not necessarily subject to HSE offshore regulation and also for other vessels such as tanker, cargo and passenger vessels.

6. In this publication, the term 'helideck' refers to all helicopter landing areas on fixed or floating offshore facilities used for the exploration or exploitation of oil and gas or exploitation of renewable energies. For helicopter landing areas on vessels the ICAO term 'shipboard heliport' may be used in preference to 'helideck'.

7. Whenever the term 'CAA' is used in this publication, it means the UK Civil Aviation Authority unless otherwise indicated.

8. As standards for best practice, this document applies the term "should" when referring to either an ICAO Standard or a Recommended Practice. The term "may" is used when a variation or alternative approach could be acceptable to the CAA. The UK HSE accepts that conformance with CAP 437 will demonstrate compliance with applicable offshore regulations. CAP 437 is under continuous review resulting from technological developments and experience; comments are always welcome on its application in practice. The CAA should be contacted on matters relating to interpretation and applicability of these standards and Aviation Law.

ICAO

9. At international level the UK CAA continues to participate in the ICAO Heliport Design Working Group (HDWG) tasked with the substantial revision of Annex 14 Volume II including a review of the International Standards and Recommended Practices relating to offshore helidecks and shipboard heliports and supporting guidance material in the Heliport Design and Services Manual (doc. 9261). A further package of amendments was submitted for approval by the ICAO Air Navigation Commission (ANC) during the first half of 2018, with a view to their being adopted by the Council in March 2020, to become effective in July 2020 and applicable to States from November 2020. Except for chapter 6, the amendments substantially relate to onshore surface level and elevated heliports and the impact on offshore helidecks is expected to be fairly minor. The 2016 edition of Annex 14 Volume II presented an ICAO recommendation related to the drive to reduce the height of essential non-frangible objects around a helideck and shipboard heliport, was supported by the 8th Edition of CAP 437, with a recommendation for implementation on new builds by no later than 10 November 2018. CAA understands that many new build projects are already complying with the new recommendation, and this is fully supported. The latest work programmes of the ICAO HDWG have included a comprehensive review of Chapter 6, Rescue and Fire-Fighting Services (RFFS), and the supporting guidance in the Heliport Design & Services Manual. This substantial piece of work that, for the first time, presents standards and recommended practices for RFFS on helidecks, resulted in a redraft of chapter 5 in CAP 437 8th Edition, amendment 1.

Helideck Licensing/Certification

10. In February 2014, following a series of fatal accidents and incidents in the North Sea, CAA commissioned and published a safety review of offshore public transport helicopter operations in support of the exploitation of oil and gas; reported in CAP 1145. With regard to helidecks, it was noted that the CAA's drive to certificate helidecks had received the support of the helicopter operators who viewed a tighter control of the helideck and its environment as a

positive step to improving safety. The report added that “certification directly by the CAA or through an appropriately qualified entity would provide the framework for raising standards on helidecks.” As a consequence, an action (A13) was raised for CAA to assume responsibility for the certification of UK helidecks and to consult with industry on how to achieve this. The outcome from the subsequent consultation conducted via CAP 1295 “Consultation: The CAA's intention to assume responsibility for the certification of UK helidecks”, was reported in September 2016 in CAP 1386 “Safety review of offshore public transport helicopter operations in support of the exploitation of oil and gas. Progress report: 2016”. Summarising the outcome from the CAP 1295 consultation in May 2015, CAP 1386 noted that, although the CAA-chaired Offshore Helicopter Safety Action Group (OHSAG) was supportive of a certification scheme, it could not be implemented without appropriate legal authority which it was estimated would take several years to establish.

11. As there is little prospect of changing the primary legislation, the Civil Aviation Act, in the foreseeable future to enable the CAA to formally licence the helidecks, the CAA is working with the Helideck Certification Agency (HCA) and the helicopter operators to identify alternative ways of improving helideck standards. This has already involved CAA taking over the running of the Helideck Technical Committee meetings, and more CAA staff being trained to oversee HCA activities.

12. Since the mid-1990’s the offshore helicopter operators, in seeking to discharge the duty placed on them by the UK Air Navigation Order (ANO) have used the services of the HCA to inspect and certificate helidecks operated on the UKCS, to satisfy the helicopter operators that they are ‘fit for purpose’. Previous editions of CAP 437 have noted that the procedure described for authorising the use of helidecks on fixed and floating installations operating on the UKCS is co-ordinated by the HCA in a process which involves OEUK; the British Rig Owners’ Association (BROA); and the International Association of Drilling Contractors (IADC) and members’ individual owner/operator safety management systems. RenewableUK can now be added to the list as HCA also authorise helidecks and winching area designs which are used to service the growing offshore renewable energy sector.

13. In addition to administering the certification process on behalf of the helicopter operators, HCA presently assumes the role of chairing the Helideck Technical Committee (HTC) which includes senior operational flying staff from all the offshore helicopter operators. In future, determining the governance structure of the HTC, and how (specifically by whom) the Helideck Limitations List (HLL) is controlled and amended, will form part of the detailed review needed to develop an effective CAA-led scheme for the certification of helidecks. As an initial step CAA has taken on the role of Secretary of the HCA HTC, producing the minutes for meetings three times a year and ensuring that actions and outcomes are discharged effectively. Currently the HCA Helideck Technical Committee functions to ensure that standardisation is achieved between the offshore helicopter operators in the development and application of operational policies and limitations and that non-compliances, where identified, are treated in a consistent manner by each operator. The HCA publishes these in the Helideck Limitations List (HLL) which contains details of known helidecks including any operator-agreed limitations applied to specific helidecks in order to compensate for any failings or deficiencies in meeting CAP 437 criteria such that the safety of flights is not compromised.

14. Accepting that the process described above is an industry-agreed system, the legal responsibility for the suitability of offshore helicopter landing areas, ahead of the introduction of a legally binding certification scheme, rests ultimately with the helicopter operators. The CAA accepts the process described above as being an acceptable way in which the assessment of the CAP 437 criteria can be made but is seeking to develop the model into a CAA-led certification scheme. The CAA, in discharging its regulatory responsibility, will audit the application of the process on which the helicopter operator relies. As part of the flight operations function for the oversight of the AOC holder, CAA Flight Operations is forging closer ties with the HCA to review and audit their procedures and processes, to assess how they assist the present legal responsibilities and requirements of the offshore helicopter operators, and how these arrangements might be used to inform a future CAA-led scheme. At the present time helidecks on the UKCS continue to be regarded as ‘unlicensed

landing areas' and offshore helicopter operators are required to satisfy themselves that each helideck to which they operate is fit for purpose.

Inbound Flight Preparation

15. UK Regulation (EU) 965/2012 (Air Operations), Annex III, Part ORO.GEN.110 e) and f) require an Operator to:

- ensure that all personnel assigned to, or directly involved in, ground and flight operations are properly instructed, have demonstrated abilities in their particular duties and are aware of their responsibilities and the relationship of such duties to the operation as a whole and,
- have established procedures and instructions for the safe operation of each aircraft type, containing ground staff and crew member duties and responsibilities, for all types of operation on the ground and in flight. Procedures and instructions do not require crew members to perform any activities during critical phases of flight, other than those required for the safe operation of the aircraft. Procedures and instructions for a sterile flight crew compartment are also included.

16. In addition, operators are also required to establish, implement, and maintain a management system that includes:

- the identification of aviation safety hazards entailed by the activities of the operator, the evaluation, and the management of associated risks, including taking actions to mitigate the risk, and to verify their effectiveness,
- documentation of all management system key processes, including a process for making personnel aware of their responsibilities and a procedure for amending the documentation,
- a function to monitor compliance of the operator with the relevant requirements. Compliance monitoring includes a feedback system of findings to the accountable manager, to ensure effective implementation of corrective actions as necessary.

17. Having identified that in the operational environment for offshore helicopters there has been an absence of standardized procedures to ensure that flight preparation is conducted in a safe and compliant manner in accordance with the operator's defined procedures and the regulations, Appendix K has been established to ensure the standardisation of procedures under which all aspects of the inbound flight preparation should be performed. Appendix K also allows helicopter operators to more effectively monitor compliance with their implemented procedures to ensure safe activities, and in doing so, to also be compliant with the requirement to monitor activities of the organisation carried out under the supervision of the nominated persons, as well as any outsourced activities in accordance with ORO.GEN.205, and for compliance with the contract, as established by AMC1 ORO.GEN.200 (a) 6.

18. The control and management of the inbound Commercial Air Transport flight sector from an offshore location is critical to ensure that it is compliant to both regulatory and helicopter operator's requirements (referred to as the 'operator' in Appendix K) so that the safety and security of the aircraft, passengers and crew is not compromised. In addition, it is important that requirements are consistently adhered to at all locations where a flight departure is being conducted. Variations to Appendix K may apply to normally unattended installation (NUI's) operations.

Glossary of terms and abbreviations

AAIB	Air Accidents Investigation Branch
ADL	Above Deck Level
AIP	Aeronautical Information Publication
AMSL	Above Mean Sea Level
ANC	Air Navigation Commission
ANO	The Air Navigation Order
AOC	Air Operator's Certificate
BS	British Standard
CAFS	Compressed Air Foam System
CFD	Computational Fluid Dynamics
Class societies	Organisations that establish and apply technical standards to the design and construction of marine facilities including ships.
CNAF	Compressed Non-Asbestos Fibre
D-circle	A circle, usually hypothetical unless the helideck itself is circular, the diameter of which is the D-value of the largest helicopter the helideck is intended to serve.
D-value	The largest overall dimension of the helicopter when rotors are turning. This dimension will normally be measured from the most forward position of the main rotor tip path plane to the most rearward position of the tail rotor tip path plane (or the most rearward extension of the fuselage in the case of Fenestron or Notar tails).
DIFFS	Deck Integrated Fire-fighting System
DSV	Diving Support Vessel
EASA	European Aviation Safety Agency
EPU	Earth Proving Unit

Falling 5:1 gradient	A surface extending downwards on a gradient of 5:1 measured from the edge of the safety netting located around the landing area below the elevation of the helideck to water level for an arc of not less than 180° that passes through the centre of the landing area and outwards to a distance that will allow for safe clearance from obstacles below the helideck in the event of an engine failure for the type of helicopter the helideck is intended to serve. For helicopters operated in Performance Class 1 or 2 the horizontal extent of this distance will be compatible with the one-engine inoperative capability of the helicopter type to be used.
FFAS	Fixed Foam Application System
FMS	Fixed Monitor System
FOD	Foreign Object Debris/Damage
FPSO	Floating Production Storage and Offloading units
FSU	Floating Storage Unit
HCA	Helideck Certification Agency. The HCA is the certifying agency acting on behalf of the UK offshore helicopter operators that audits and inspects all helidecks and shipboard heliports on offshore installations and vessels operating in UK waters to the standards laid down in CAP 437.
HDWG	Heliport Design Working Group (of ICAO Aerodromes panel)
Helideck	A helicopter landing area located on a fixed or floating offshore facility.
HHOP	Helicopter Hoist Operations Passengers
HLAC	The Helicopter Landing Area Certificate issued by the HCA, and required by UK offshore helicopters operators, to authorise the use of a helideck or shipboard heliport.
HLL	Helideck Limitations List. Published and distributed by the HCA in UKCS or other National Authority accepted bodies in other European States.
HLO	Helicopter Landing Officer
HMS	Helideck Monitoring System

HSC	Health and Safety Commission
HSE	Health and Safety Executive
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ICP	Independent and competent person as defined in the Offshore Installations (Safety Case) Regulations 2015 who is selected to perform functions under the verification scheme.
ICS	International Chamber of Shipping
IMO	International Maritime Organization
ISO	International Organization for Standardization
JIG	Joint Inspection Group
Landing area	A generic term referring to the load-bearing area primarily intended for the landing and take-off of aircraft. The area, sometimes referred to as the Final Approach and Take-Off area (FATO), is bounded by the perimeter line and perimeter lighting.
LED	Light Emitting Diode
LFL/LEL	Lower Flammable Limit/ Lower Explosive Limit
LOS	Limited Obstacle Sector(s). The 150 degree sector within which obstacles may be permitted, provided the height of the obstacles is limited.
MEK	Methyl Ethyl Ketone
MMMF	Man-Made Mineral Fibres
MSI	Motion Severity Index
MTOM	Maximum Certificated Take-Off Mass
NAI	Normally Attended Installation
NDB	Non-Directional Beacon
NM	Nautical Mile(s)
NUI	Normally Unattended Installation

OFS	Obstacle Free Sector. The 210^0 sector, extending outwards to a distance that will allow for an unobstructed departure path appropriate to the helicopter the helideck is intended to serve, within which no obstacles above helideck level are permitted. For helicopters operated in Performance Class 1 or 2 the horizontal extent of this distance will be compatible with the one-engine inoperative capability of the helicopter type to be used.
OEUK	Offshore Energies UK (formerly known Oil and Gas UK and as the United Kingdom Offshore Operators Association (UKOOA)).
OIAC	Offshore Industry Advisory Committee
OMAHAC	Offshore Major Accident Hazard Advisory Committee
OIS	Offshore Information Sheet
OHWN	Offshore Helicopter Weather Network (provided under contract to OEUK)
OPITO	Offshore Petroleum Industry Training Organisation
PAI	Permanently Attended Installation (same as NAI)
Parking area	An extension to the Landing Area designed to accommodate a parked helicopter.
Passive fire retarding surface	Constructed in the form of a perforated surface or grating, which contains numerous holes that allow burning fuel to rapidly drain through the surface of the helideck.
PCF	Post-Crash Fire
Perimeter D marking	The marking located in the perimeter line expressed in whole numbers; i.e. the D-value (see above) rounded up or down to the nearest whole number.
PPE	Personal Protective Equipment
PTA	Parking Transition Area. An area free of obstacles located between the landing area and the parking area.
PTFE	Polytetrafluoroethylene
QA/QC	Quality Assurance/ Quality Control
RD	Rotor Diameter

RFF	Rescue and Fire-fighting
RFFS	Rescue and Fire-Fighting Services
RMS	Ring-Main System (as an alternative to DIFFS or FMS on an existing installation)
ROCC	Radio Operators Certificate of Competence
R/T	Radiotelephony
RWD	Relative Wind Direction
SASF	Southern Aviation Safety Forum
Shipboard heliport	A heliport located on a vessel which may be purpose-built or non-purpose-built.
SHR	Significant Heave Rate
SOLAS	The International Convention for the Safety of Life at Sea
Solid plate helideck	A helideck having a surface design set to a fall or camber which allows fuel to drain across the solid surface to a suitable drainage collection system.
TD/PM circle	Touchdown/Positioning Marking Circle. Described as the Aiming Circle in earlier editions of CAP 437, the TD/PM Circle is the aiming point for a normal touchdown (landing) so located that when the pilot's seat is over the marking, the whole of the undercarriage will be within the landing area and all parts of the helicopter will be clear of any obstacles by a safe margin. **NOTE:** It should be noted that only correct positioning over the TD/PM Circle will ensure proper clearance with respect to physical obstacles and provision of ground effect and provision of adequate passenger access/egress.
T value	The maximum allowable mass marking expressed in tonnes, presented to one decimal place and rounded to the nearest 100kg followed by the letter "t".
UKCS	United Kingdom Continental Shelf (Geographical area)
UPS	Uninterruptable Power Supply

Verification scheme	A suitable written scheme as defined in the Offshore Installations (Safety Case) Regulations 2015 for ensuring the suitability and proper maintenance of safety and environmental critical elements (SECEs).
VMC	Visual Meteorological Conditions
WMO	World Meteorological Organization
WSI	Wind Severity Index
WTG	Wind Turbine Generator

Chapter 1

Introduction

History of development of criteria for offshore helicopter landing areas, 1964-1973

1.1 In the early 1960s it became apparent that there would be a continuing requirement for helicopter operations to take place on fixed and mobile offshore installations. Various ideas were put forward by oil companies and helicopter operators as to the appropriate landing area standards for such operations. In 1964, draft criteria were published which used helicopter rotor diameter as a determinant of landing area size and associated obstacle-free area. In the light of experience and after further discussions, the criteria were amended and re-published in 1968. These criteria were then, and still are, based upon helicopter overall length (from the most forward position of main rotor tip to the most rearward position of tail rotor tip plane path, or rearmost extension of the fuselage in the case of fenestron or Notar tails). This length is commonly referred to as ‘D’ for any particular helicopter as the determinant of landing area size, associated characteristics, and obstacle-protected surfaces.

Department of Energy and the Health and Safety Executive guidance on the design and construction of offshore installations, 1973 onwards

1.2 In the early 1970s, the Department of Energy began the process of collating guidance standards for the design and construction of ‘installations’ – both fixed and mobile. This led to the promulgation of the Offshore Installations (Construction and Survey Regulations) 1974, which were accompanied by an amplifying document entitled ‘Offshore Installations: Guidance on the design and construction of offshore installations’ (the 4th Edition Guidance). This guidance included criteria for helicopter landing areas which had been slightly amended from those issued in 1968. During 1976 and 1977, the landing area criteria were developed even further during a full-scale revision of this document, following consultations between the CAA, the British Helicopter Advisory Board and others. This material was eventually published in November 1977 and amended further in 1979. This latter amendment introduced the marking of the landing area to show the datum from which the obstacle-free area originated, the boundary of the area, and the maximum overall length of helicopter for which operations to the particular landing area were suitable. The first edition of CAP 437 was published in 1981, amended in 1983 and revised in December 1993 (second edition) and October 1998 (third edition). Following a further amendment in January 2001, a fourth edition of CAP 437, incorporating the new house style, was placed on the Publications section of the CAA website at www.caa.co.uk in September 2002. This was superseded by the fifth edition of CAP 437 in August 2005 and a sixth edition in December 2008. Following two interim amendments, a seventh edition was published in May 2012 and updated in February 2013. The major changes incorporated into this latest eighth edition are summarised in the revision history on page 11.

1.3 In April 1991 the Health and Safety Commission (HSC) and the Health and Safety Executive (HSE) took over from the Department of Energy the responsibility for offshore safety regulation. The Offshore Safety Act 1992, implementing the Cullen recommendations following the Piper Alpha disaster, transferred power to the HSE on a statutory footing. The HSE also took over sponsorship of the 4th Edition and Section 55 ‘Helicopter landing areas’ referring to all installations.

1.4 Since April 1991, the HSE has introduced five sets of modern goal-setting regulations which contain provisions relating to helicopter movements and helideck safety on offshore installations. These update and replace the old prescriptive legislation. The provisions are as follows:

	Regulations	Covers
1	The Offshore Installations (Offshore Safety Directive)(Safety Case etc) Regulations 2015 (SCR 2015)	**Regulation 2** defines a major accident and this includes an event involving a fire, explosion… causing, or with a significant potential to cause death or serious personal injury to persons on the installation or engaged in an activity on or in connection with it. It is also defined as an event involving major damage to the structure of the installation or plant affixed to it. Although the specific SCR 2005 reference to helicopter collision has been removed, both SCR 2015 definitions are taken to include helicopter collision. **Regulation** 2 defines safety and environment -critical elements (SECEs) and **Regulations 9 and 10** refer to a verification scheme for ensuring that the SECEs will be suitable and remain in good repair and condition. Helidecks and their associated systems are deemed to be SECEs. **Regulations 15 and 19** require the submission of a design notification containing the particulars specified in Schedule 5. **Regulation 16(1)** requires that a safety case should demonstrate: the adequacy of the safety management system to ensure compliance with relevant statutory provisions; the adequacy of arrangements for audit; that all major accident risks have been identified and evaluated; and that suitable measures will be taken to control those risks and to ensure that the relevant statutory provisions will be complied with. When assessing the major accident hazard scenarios, the potential for a major environmental incident should be assessed. If a major environmental incident risk is identified, suitable measures should be put in place. Any equipment that provides this protection is deemed as a safety and environmental-critical element (SECE). The Duty Holder is responsible for collating a list of these items and should be able to demonstrate their condition, availability and reliability through setting out performance standards (PS). Verification is a vital method of assuring a continued and efficient safe operation. Verification inspections should be routinely

	Regulations	Covers
		carried out by an independent third party, to demonstrate that SECE remains effective.
2	The Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995 (PFEER) (SI 1995/743)	**Regulation 6(1)(c)** requires a sufficient number of personnel trained to deal with helicopter emergencies to be available during helicopter movements. **Regulation 7** requires the operator/owner of a fixed/mobile installation to ensure that equipment necessary for use in the event of an accident involving a helicopter is kept available near the helicopter landing area. Equipment provided under **Regulation 7** must comply with the suitability and condition requirements of **Regulation 19(1)** of PFEER. **Regulations 9, 12 and 13** make general requirements for the prevention of fire and explosion, the control of fire and explosion which would take in helicopter accidents. **Regulation 17** of PFEER requires arrangements to be made for the rescue of people near the installation from helicopter ditchings.
3	The Offshore Installations and Pipeline Works (Management and Administration) Regulations 1995 (MAR) (SI 1995/738)	**Regulation 8** requires people to co-operate with the Helicopter Landing Officer to enable them to perform their function referred to in **Regulation 13. Regulation 11** requires comprehensible instructions to be put in writing and brought to the attention of everybody to whom they relate. Circumstances where written instructions might be needed include helideck operations (particularly if involving part-time helideck crew). **Regulation 12(b**) requires arrangements which are appropriate for health and safety purposes to be in place for effective communication between an installation, the shore, aircraft and other installations. Arrangements must also be in place for effective communication where a helicopter is to land on or take off from an installation aboard which there will be no person immediately before landing or after the take-off, and between the helicopter and a suitable offshore installation with persons on board or, where there is no suitable installation, suitable premises ashore. **Regulation 13** requires the operator/owner of a fixed/mobile installation to

	Regulations	Covers
		ensure that a competent person is appointed to be in control of helideck operations on the installation (i.e. the Helicopter Landing Officer (HLO)), is present on the installation and is in control throughout such operations, and procedures are established and plant provided as will secure so far as is reasonably practicable that helideck operations including landing/take-off are without risks to health and safety. **Regulation 14** requires the duty holder to make arrangements for the collection and keeping of meteorological and oceanographic information and information relating to the movement of the offshore installation. This is because environmental conditions may affect helicopter operations and the ability to implement emergency plans. **Regulation 19** requires the operator/owner of an offshore installation to ensure that the installation displayed its name in such a manner as to make the installation readily identifiable by sea or air; and displays no name, letters or figures likely to be confused with the name or other designation of another offshore installation.
4	The Offshore Installations and Wells (Design and Construction, etc.) Regulations 1996 (DCR) (SI 1996/913)	**Regulation 11** – Helicopter Landing Area requires the operator/owner of a fixed/mobile installation to ensure that every landing area forming part of an installation is large enough, and has sufficient clear approach/departure paths, to enable any helicopter intended to use the landing area safely to land and take off in any wind and weather conditions permitting helicopter operations, and is of a design and construction adequate for its purpose.
The HSE has published guidance documents on SCR, MAR and DCR and, in the case of PFEER, combined guidance and an Approved Code of Practice.		

1.5 In February 2005 UKOOA (now OEUK) published “Guidelines for the Management of Offshore Helideck Operations” (Issue 5) preceded in 2004 by an HSE publication ”Offshore Helideck Design Guidelines” which was sponsored by the HSE and the CAA, and endorsed by the Offshore

Industry Advisory Committee – Helicopter Liaison Group (OIAC-HLG). The UKOOA ‘Guidelines’ have now been superseded by the Oil and Gas UK (OGUK) “Guidelines for the Management of Aviation Operations” (Issue 6, April 2011) which are in the process of being updated. The "Offshore Helideck Design Guidelines” have been withdrawn by the HSE and the OIAC has been replaced by OMAHAC (Offshore Major Accident Hazard Advisory Committee) but with no dedicated Helideck Liason Group attached.

Applicability of standards in other cases

1.6 For vessels engaged in supporting mineral exploitation (such as crane or derrick barges, pipe-laying vessels, diving support vessels, seismic research vessels, etc.), which are not classed as ‘offshore installations’ and so are not subject to a verification scheme, the CAA recommends the application of the Chapter 9 standards for helicopter landing areas as contained in this CAP. Compliance with this recommendation will enable helicopter operators to fulfil their own legal obligations and responsibilities.

1.7 On other merchant vessels where it is impracticable for these standards to be achieved, for example where the landing area has to be located amidships or is non-purpose-built on a ship’s side, further criteria to be used are included in Chapter 9 of this publication. Criteria for helicopter winching areas on ships and on renewable energy wind turbines are presented in Chapter 10. For heli-hoist operations, whether to shipboard winching areas or at wind turbines, specific operational guidance should be obtained from the helicopter operator or, where a query has to do with the design of the winching area, from the agency responsible for certification of the winching area.

1.8 It is not expected that heli-hoist operations will routinely occur to support installations; whether they are engaged in supporting oil and gas operations or renewable energy operations (e.g. Offshore Converter Platform), except where these are utilised for occasional use only; in this case a winching area may be permitted in lieu of a landing area. An "occasional use" winching area is defined as an area where it is not expected to exceed 12 hoist operations per year.

Worldwide application

1.9 It should be noted that references are made to United Kingdom legislative and advisory bodies. However, this document is written so that it may provide minimum standards applicable for the safe operation of helicopters to offshore helidecks throughout the world.

1.10 CAP 437 is therefore particularly relevant to UK (G) registered helicopters operating within and outside the UKCS areas; whether or not they have access to the UK authorisation process. In cases where the UK authorisation process is not applicable or available, helicopter operators should have in place a system for assessing and authorising the operational use of each helideck. Within Europe, through the European Aviation Safety Agency (EASA) Requirements for Air Operators, Operational Requirements Part-OPS, Annex VI Part SPA, authorisation of each helicopter landing area is a specific requirement laid down in Part HOFO (Helicopter Offshore Operations) with guidance on the criteria for use of offshore locations given in an 'acceptable means of compliance' (AMC) (AMC1 SPA.HOFO.115 'Use of offshore locations' which is reproduced in CAP 437, Appendix A). Throughout the range of operations covered by Part-SPA.HOFO, which became applicable to States from 1 July 2018, agreement has been made to share all helideck information between helicopter operators by the fastest possible means. An example of a typical template is shown in Figure 1 of GM1 SPA.HOFO.115.

1.11 Other helicopter operators, who operate outside the areas covered by EASA Requirements for Air Operators and who are using this document, are recommended to establish a system for assessing and authorising each helideck for operational use. It is a fact that many installations and vessels do not fully comply with the criteria contained in the following chapters. A system for the assessment of the level of compliance, with processes and procedures for the management of rectification actions (where practicable) plus a system for imposing compensating operational limitations (where rectification actions are impractical), is often the only fail-safe way of ensuring that the level of safety to flights is not compromised.

Chapter 2

Helicopter performance considerations

General considerations

2.1 The criteria for helicopter landing areas on offshore installations and vessels result from the need to ensure that UK registered helicopters are afforded sufficient space to be able to operate safely at all times in the varying conditions experienced offshore.

2.2 The helicopter's performance requirements and handling techniques are contained in the Rotorcraft Flight Manual and/or the operator's Operations Manual.

2.3 Helicopter companies operating for public transport are required to hold an AOC which is neither granted nor allowed to remain in force unless they provide procedures for helicopter crews which safely combine the space and performance requirements mentioned above.

Safety philosophy

2.4 Aircraft performance data is scheduled in the Flight Manual and/or the Operations Manual which enables flight crew to accommodate the varying ambient conditions and operate in such a way that the helicopter has sufficient space and sufficient engine performance to approach, land on and take off from helidecks in safety.

2.5 Additionally, Operations Manuals recognise the remote possibility of a single engine failure in flight and state the flying procedures and performance criteria which are designed to minimise the exposure time of the aircraft and its occupants during the short critical periods during the initial stage of take-off, or final stage of landing.

Factors affecting performance capability

2.6 On any given day helicopter performance is a function of many factors including the actual all-up mass; ambient temperature; pressure altitude; effective wind speed component; and operating technique. Other factors, concerning the physical and airflow characteristics of the helideck and associated or adjacent structures, will also combine to affect the length of the exposure period referred to in paragraph 2.5. These factors are taken into account in the determination of specific and general limitations which may be imposed in order to ensure adequate performance and to ensure that the exposure period is kept to a minimum. In many circumstances the period will be zero. It should be noted that, following a rare power unit failure, it may be necessary for the helicopter to descend below deck level to gain sufficient speed to safely fly away, or in extremely rare circumstances to land on the water. In certain circumstances, where exposure periods would otherwise be unacceptably long, it will probably be necessary to reduce helicopter mass (and therefore payload) or even to suspend flying operations.

Chapter 3

Helicopter landing areas – Physical characteristics

General

3.1 This chapter provides criteria on the physical characteristics of helicopter landing areas (helidecks) on offshore installations and some vessels. Where a scheme of verification is required it should state for each helicopter landing area the maximum size (overall length) of the helicopter authorised to use the landing area expressed in terms of D-value and the maximum certificated take-off mass (MTOM) of the helicopter for which that area is being authorised with regard to its structural limitations, expressed as a 't' value. Where criteria cannot be met in full for a particular type of helicopter it may be necessary to promulgate operational restrictions in order to compensate for deviations from these criteria. The helicopter operators are notified of any restrictions through the Helideck Limitations List (HLL).

3.2 The criteria which follow are based on helicopter overall length and mass. This data is summarised in Table 1 below.

Table 1: D-value, 't' value and other helicopter type criteria

Type	D-value (m)	Perimeter ‘D’ marking	Rotor diameter (m)	MTOM (kg)	‘t’ value	Landing net size
Bolkow Bo 105D	12.00	12	9.90	2400	2.4t	Not recommended
EC135	12.20	12	10.20	2980	3.0t	Not recommended
AW109	13.05	13	11.93	2600	2.6t	Small
BK 117/ EC145	13.63	14	11.00	3800	3.8t	Not recommended
Dauphin AS365 N2	13.68	14	11.94	4250	4.3t	Small

Type	D-value (m)	Perimeter 'D' marking	Rotor diameter (m)	MTOM (kg)	't' value	Landing net size
Dauphin AS365 N3	13.68	14	11.94	4300	4.3t	Small
EC155	14.30	14	12.60	4920	4.9t	Medium
AW169	14.65	15	12.12	4800	4.8t	Medium
Sikorsky S76	16.00	16	13.40	5307	5.3t	Medium
AW139	16.62	17	13.80	7000	7.0t	Medium
AW189	17.60	18	14.60	8600	8.6t	Medium
EC175	18.06	18	14.80	7800	7.8t	Medium
Super Puma AS332L	18.70	19	15.60	8599	8.6t	Medium
Bell 214ST	18.95	19	15.85	7938	7.9t	Medium
Super Puma AS332L2	19.50	20	16.20	9300	9.3t	Medium
EC225	19.50	20	16.20	11000	11.0t	Medium
Sikorsky S92A+	20.88	21	17.17	12565	12.6t	Large
Sikorsky S61N	22.20	22	18.90	9298	9.3t	Large
AW101	22.80	23	18.60	15600	15.6t	Large

NOTE: Where skid-fitted helicopters and/or a deck integrated fire-fighting system (DIFFS) are in use on a solid plate helideck, landing nets are not recommended and should not be fitted.

Helideck design considerations – Environmental effects

Introduction

3.3 The safety of helicopter flight operations can be seriously degraded by environmental effects that may be present around installations or vessels and their helidecks. The term "environmental effects" is used here to represent the effects of the installation or vessel and/or its systems and/or processes on the surrounding environment, which result in a degraded local environment in which the helicopter is expected to operate. These environmental effects are typified by structure-induced turbulence, turbulence and thermal effects caused by gas turbine exhausts, thermal effects of flares and diesel exhaust emissions, and unburnt hydrocarbon gas emissions from cold flaring or, more particularly, emergency blow-down systems. It is almost inevitable that helidecks installed on the cramped topsides of offshore installations will suffer to some degree from one or more of these environmental effects, and controls in the form of operational restrictions may be necessary in some cases. Such restrictions can be minimised by careful attention to the design and layout of the installation topsides and, in particular, the location of the helideck.

3.4 Advice on the design and placement of offshore helidecks is provided in this document, and includes certain environmental criteria (see paragraph 3.8). These criteria have been set to define safe operating boundaries for helicopters in the presence of known environmental hazards. Where these criteria cannot be met, a limitation is placed in the HLL. These entries are usually specific to particular combinations of wind speed and direction, and either restrict helicopter mass (payload), or prevent flying altogether in certain conditions.

3.5 The HLL system is operated for the benefit of the offshore helicopter operators and should ensure that landings on offshore helidecks are properly controlled when adverse environmental effects are present. On poorly designed helidecks, severe operational restrictions may result, leading to significant commercial penalties for an installation operator or vessel owner. Well designed and ‘helicopter friendly’ platform topsides and helidecks should result in efficient operations and cost savings for the installation operator.

NOTE: It is important that the helicopter operators through the agency responsible for the certification of the helideck are always consulted at the earliest stage of design to enable them to provide advice and information so that the process for authorising the use of the helideck can be completed in a timely fashion and in a manner which ensures that maximum helicopter operational flexibility is realised. Information from helideck flow assessment studies (see paragraphs 3.9 and 3.10) should be made available to the helicopter operators as early as possible to enable them to identify any potential adverse environmental effects that may impinge on helicopter flight operations and which, if not addressed at the design stage, could lead to operational limitations being imposed to ensure that safety is not compromised.

Helideck design guidance

3.6 A review of offshore helideck environmental issues (see CAA Paper 99004) concluded that many of the decisions leading to poor helideck operability had been made in the very early stages of design, and recommended that it would be easier for designers to avoid these pitfalls if comprehensive helideck design guidance was made available to run in parallel with CAP 437. As part of the subsequent research programme, material covering environmental effects on offshore helideck operations was commissioned by the HSE and the CAA. This material is now presented in CAA Paper 2008/03: "Helideck Design Considerations – Environmental Effects" and is available on the Publications section of the CAA website at www.caa.co.uk/ publications. It is strongly recommended that platform designers and offshore duty holders consult CAA Paper 2008/03 at the earliest possible stage of the design process.

3.7 The objective of CAA Paper 2008/03 is to help platform designers to create offshore installation topside designs and helideck locations that are safe and 'friendly' to helicopter operations by minimising exposure to environmental effects. It is hoped that, if used from 'day one' of the offshore installation design process when facilities are first being laid out, this manual will prevent or minimise many helideck environmental problems at little or no extra cost to the design or construction of the installation.

Design criteria

3.8 The design criteria given in the following paragraphs represent the current best information available and should be applied to new installations, to significant modifications to existing installations, and to combined operations (where a mobile platform or vessel is operating in close proximity to another installation). In the case of multiple platform configurations, the design criteria should be applied to the arrangement as a whole.

NOTE: When considering the volume of airspace to which the following criteria apply, installation designers should consider the airspace up to a height above helideck level which takes into consideration the requirement to accommodate helicopter landing and take-off decision points or committal points. This is deemed to be up to a height above the helideck corresponding to 30 ft plus wheels-to-rotor height plus one rotor diameter.

3.9 All new-build offshore helidecks, modifications to existing topside arrangements which could potentially have an effect on the environmental conditions around an existing helideck, or helidecks where operational experience has highlighted potential airflow problems should be subject to appropriate wind tunnel testing or Computational Fluid Dynamics (CFD) studies to establish the wind environment in which helicopters will be expected to operate. As a general rule, a limit on the standard deviation of the vertical airflow velocity of 1.75 m/s should not be exceeded. The helicopter operator should be informed at the earliest opportunity of any wind conditions for which this criterion is not met. Operational restrictions may be necessary.

NOTE 1: Following completion of the validation exercise, the provisional limit on the standard deviation of the vertical airflow velocity of 2.4 m/s specified in CAP 437 fifth edition was lowered to a threshold advisory limit of 1.75 m/s. This change was made to allow for flight in reduced cueing conditions, for the less able or experienced pilot, and to better align the associated measure of pilot workload with operational experience. However, it was known at the time that the lower criterion is close to onshore background turbulence levels, and that it would be unusual for a helideck not to exceed the lower threshold limit for at least some wind speeds and directions. In consideration of this the lower threshold limit of 1.75 m/s is intended to draw attention to conditions that might result in operating difficulties and to alert pilots to exercise caution, unless, or until, operating experience has confirmed the airflow characteristics to be acceptable. Therefore, the lower limit functions as the baseline which may be refined in light of in-service experience. Conversely if the airflow significantly exceeds the upper criterion of 2.4 m/s it may be advisable to consider modifications to the helideck to improve airflow (such as by increasing the air-gap), if operating restrictions are to be avoided. It is recommended that use is made of the helicopter operators' existing operations monitoring programmes to include the routine monitoring of pilot workload and that this be used to continuously inform and enhance the quality of the HLL entries for each platform (see CAA Paper 2008/02 – Validation of the Helicopter Turbulence Criterion for Operations to Offshore Platforms).

NOTE 2: Following the establishment of the new turbulence criterion for helicopters operating to offshore installations, the need for retention of the long-standing CAP 437 criterion related to a vertical wind component of 0.9 m/s has been reviewed. As it has not been possible to link the criterion to any helicopter performance (i.e. torque related) or handling (pilot work related) hazard, it is considered that the vertical mean wind speed criterion can be removed from CAP 437. The basis for the removal from CAP 437 is described in detail in CAA Paper 2008/02 Study II – A Review of 0.9 m/s Vertical Wind Component Criterion for Helicopters Operating to Offshore Installations.

3.10 Unless there are no significant heat sources on the installation or vessel, offshore duty holders should commission a survey of ambient temperature rise based on a Gaussian dispersion model and supported by wind tunnel tests or CFD studies for new-build helidecks, for significant modifications to existing topside arrangements, or for helidecks where operational experience has highlighted potential thermal problems. When the results of such modelling and/or testing indicate that there may be a rise of air temperature of more than 2°C (averaged over a three-second time interval), the helicopter operator should be consulted at the earliest opportunity so that appropriate operational restrictions may be applied.

3.11 Previous editions of CAP 437 have suggested that 'some form of exhaust plume indication should be provided for use during helicopter operations, for example, by the production of coloured smoke'. Research has been conducted into the visualisation of gas turbine exhaust plumes and guidance on how this can be achieved in practice has been established. This work is now reported in CAA Paper 2007/02 which recommends that consideration should be given to installing a gas turbine exhaust plume visualisation system on platforms having a significant gas turbine exhaust plume problem in order to highlight the hazards to pilots and thereby minimising its effects by making it easier to avoid encountering the plume. It is further recommended that use is made of the helicopter operators' existing operations monitoring programmes to establish and continuously monitor the temperature environments around all offshore platforms. This action is aimed at identifying any 'problem' platforms, supporting and improving the contents of the HLL, identifying any new problems caused by changes to platform topsides or resulting from combined operations, and identifying any issues related to flight crew training or procedures.

3.12 The maximum permissible concentration of hydrocarbon gas within the helicopter operating area is 10% Lower Flammable Limit/ Lower Explosive Limit (LFL/LEL). Concentrations above 10% LFL/LEL have the potential to cause helicopter engines to surge and/or flame out with the consequent risk to the helicopter and its passengers. It should also be appreciated that, in forming a potential source of ignition for flammable gas, the helicopter can pose a risk to the installation itself. It is considered unlikely that routine 'cold flaring' will present any significant risk, but the operation of emergency blow-down systems should be assumed to result in excessive gas concentrations. Installation operators should have in place a management system which ensures that all helicopters in the vicinity of any such releases are immediately advised to stay clear.

NOTE: The installation of 'Status Lights' systems (see Chapter 4, paragraph 4.26) is not considered to be a solution to all potential flight safety issues arising from hydrocarbon gas emissions; these lights are only a visual warning that the helideck is in an unsafe condition for helicopter operations.

3.13 For 'permanent' multiple platform configurations, usually consisting of two or more bridge-linked fixed platforms in close proximity, where there is a physical separation of the helideck from the production and process operation, the environmental effects of hazards emanating from the 'remote' production platform should be considered on helideck operations. This is particularly appropriate for the case of hot or cold gas exhausts where there will always be a wind direction that carries any exhaust plumes from a neighbouring platform (bridge-linked module) in the direction of the helideck.

3.14 For 'temporary' combined operations, where one mobile installation or vessel (e.g. a flotel) is operated in close proximity to a fixed installation, the environmental effects of hazards emanating from one installation (or vessel) on the other installation (or vessel) should be fully considered. This 'assessment' should consider the effect of the turbulent wake from one platform impinging on the helideck of the other, and of any hot or cold gas exhausts from one installation or vessel influencing the approach to the other helideck. On occasions there may be more than two installations and/or vessels in a 'temporary combined' arrangement. Where this is the case, the effect of turbulent wake and hot gas exhausts from each installation or vessel on all helideck operations within the combined arrangement should be considered.

NOTE: Paragraphs 3.13 and 3.14 are primarily concerned with the issue of environmental effects on the helideck design. In respect of permanent multi-platform configurations and 'temporary' combined operations there are a number of other considerations that may need to be addressed. These include, but may not be limited to, the effect of temporary combined operations on helideck obstacle protection criteria. Additional considerations are described in more detail in Chapter 3 paragraphs 3.31 to 3.33 (Temporary Combined Operations) and in paragraphs 3.34 to 3.36 (Multiple Platform Configurations).

Structural design

3.15 The take-off and landing area should be designed for the heaviest and largest helicopter anticipated to use the facility (see Table 1). Helideck structures should be designed in accordance with relevant International Organization for Standardization (ISO) codes for offshore structures and for floating installations. The maximum size and mass of helicopters for which the helideck has been designed should be stated in the Installation Operations Manual and Verification and/or Classification document. For structural design requirements for helicopter landing areas located on vessels (i.e. non-installations), reference may be made to appropriate Class Society rules.

3.16 Optimal operational flexibility may be gained from considering the potential life and usage of the facility along with likely future developments in helicopter design and technology.

3.17 Consideration should also be given in the design to other types of loading such as personnel, other traffic, snow and ice, freight, refuelling equipment, rotor downwash etc. as stated in the relevant ISO codes or Class Society rules. It may be assumed that single main rotor helicopters will land on the wheel or wheels of two landing gear (or both skids if fitted). The resulting loads should be distributed between two main undercarriages. Where advantageous a tyre contact area may be assumed in accordance with the manufacturer's specification. Working stress design or ultimate limit state (ULS) methods may be used for the design of the helideck structure, including girders, trusses, pillars, columns, plating and stiffeners. A serviceability limit check should also be performed to confirm that the maximum deflection of the helideck under maximum load is within code limits. This check is intended to reduce the likelihood of the helideck structure being so damaged during an emergency incident as to prevent other helicopters from landing.

NOTE: Requirements for the structural design of helidecks are comprehensively set out in ISO 19901-3 Petroleum and natural gas industries – Specific requirements for offshore structures, Part 3: Topsides structure (2014).

3.18 Consideration should be given to the possibility of accommodating an unserviceable helicopter in a designated parking or run-off area (where provided) adjacent to the helideck to allow a relief helicopter to land. If this contingency is designed into the construction/operating philosophy of the installation, the helicopter operator should be advised of any weightrestrictions imposed on the relief helicopter by structural integrity considerations. Where a parking or run-off area is provided it is assumed that the structural considerations will at least meet the loads criteria applicable for helicopters at rest (see paragraph 3.21). Parking areas are addressed in more detail in paragraphs 3.59 to 3.62.

3.19 Alternative loading criteria equivalent to those recommended here and in paragraphs 3.20 and 3.21 may be used where aircraft-specific loads have been derived by the aircraft manufacturer from a suitable engineering assessment taking account of the full range of potential landing conditions, including failure of a single engine at a critical point, and the behaviour of the aircraft undercarriage and the response of the helideck structure. The aircraft manufacturer should provide information to interested parties, including the owner or operator of the installation and the helicopter operators to justify use of alternative criteria. The aircraft manufacturer may wish to seek the opinion of the CAA on the basis of the criteria to be used. In consideration of alternative criteria, the CAA is content to assume that a single engine failure represents the worst case in terms of rate of descent on to the helideck amongst likely survivable emergencies.

Loads

Helicopters landing

3.20 The helideck should be designed to withstand all the forces likely to act when a helicopter lands. The loads and load combinations to be considered should include:

1) **Dynamic load due to impact landing.** This should cover both a heavy normal landing and an emergency landing. For the former, an impact load of 1.5 x MTOM of the design helicopter should be used, distributed as described in paragraph 3.17. This should be treated as an imposed load, applied together with the combined effects of 2) to 7) in any position on the landing area so as to produce the most severe load on

each structural element. For an emergency landing, an impact load of 2.5 x MTOM should be applied in any position on the landing area together with the combined effects of 2) to 7) inclusive. It is the emergency landing case that will usually govern the design of the structure.

2) **Sympathetic response of landing platform.** After considering the design of the helideck structure's supporting beams and columns and the characteristics of the designated helicopter, the dynamic load (see 1) above) should be increased by a suitable structural response factor depending upon the natural frequency of the helideck structure. It is recommended that a structural response factor of 1.3 should be used unless further information derived from both the helideck manufacturer and the helicopter manufacturer will allow a lower factor to be calculated. Information required to do this will include the natural periods of vibration of the helideck and the dynamic characteristics of the design helicopter and its landing gear.
3) **Overall superimposed load on the landing platform.** To allow for any appendages that may be present on the deck surface (e.g. helideck net, "H" and circle lighting etc.) in addition to wheel loads, an allowance of 0.5 kilonewtons per square metre (kN/m^2) should be added over the whole area of the helideck.
4) **Lateral load on landing platform supports.** The landing platform and its supports should be designed to resist concentrated horizontal imposed loads equivalent to 0.5 x MTOM of the helicopter, distributed between the undercarriages in proportion to the applied vertical loading in the direction which will produce the most severe loading on the element being considered.
5) **Dead load of structural members.** This is the normal gravity load on the element being considered.
6) **Wind loading.** Wind loading should be allowed for in the design of the platform. The helideck normal restricting wind conditions (i.e. 60 knots equivalent to 31 m/s) should be applied in the direction which, together

with the imposed lateral loading, will produce the most severe loading condition on each structural element.

7) **Inertial actions due to platform motions for floating installations**. The effects of accelerations and dynamic amplification arising from the predicted motions of a floating platform in a storm condition with a 10-year return period should be considered.
8) **Punching shear check.** A check should be made for the punching shear from a wheel of the landing gear with a contact area of 65 x 10^3 mm^2 acting in any probable location. Particular attention to detailing should be taken at the junction of the supports and the platform deck.

Helicopters at rest

3.21 The helideck should be designed to withstand all the applied forces that could result from a helicopter at rest; the following loads should be taken into account:

1) **Imposed load from helicopter at rest.** All areas of the helideck accessible to a helicopter, including any separate parking or run-off area, should be designed to resist an imposed load equal to the MTOM of the design helicopter. This load should be distributed between all the landing gear. It should be applied in any position on the helideck so as to produce the most severe loading on each element considered.
2) **Overall superimposed load.** To allow for personnel, freight, refuelling equipment and other traffic, snow and ice, rotor downwash etc., an allowance of 2.0 kilonewtons per square metre (kN/m^2) should be added to the whole area of the helideck.
3) **Dead load and wind load.** The values for these loads are the same as given in paragraph 3.20 5) and 6) and should be considered to act simultaneously in combination with paragraph 3.21 1) and 2). Consideration should also be given to the additional wind loading from any parked or secured helicopter.
4) **Acceleration forces and other dynamic amplification forces.** The effect of these forces, arising from the predicted motions of mobile

installations and vessels, in the appropriate environmental conditions corresponding to a 10-year return period, should be considered.

Size and obstacle protected surfaces

NOTE: The location of a specific helideck is often a compromise given the competing requirements for space. Helidecks should be at or above the highest point of the main structure. This is a desirable feature but it should be appreciated that if this entails a landing area much in excess of 60 m above sea level, the regularity of helicopter operations may be adversely affected in low cloud base conditions.

3.22 For any particular type of single main rotor helicopter, the helideck should be sufficiently large to contain a circle of diameter D equal to the largest dimension of the helicopter when the rotors are turning. This D-circle should be totally unobstructed (see Table 1 for D values). Due to the actual shape of most offshore helidecks the D-circle will be 'hypothetical' but the helideck shape should be capable of accommodating such a circle within its physical boundaries.

3.23 From any point on the periphery of the above mentioned D-circle an obstacle-free approach and take-off sector should be provided which totally encompasses the landing area (and D-circle) and which extends over a sector of at least 210°. Within this sector obstacle accountability should be considered out to a distance from the periphery of the landing area that will allow for an unobstructed departure path appropriate to the helicopter the helideck is intended to serve. For helicopters operated in Performance Class 1 or 2 the horizontal extent of this distance from the helideck will be based upon the one-engine inoperative capability of the helicopter type to be used. In consideration of the above, only the following items essential for safe helideck operations may exceed the height of the landing area, but should not do so by more than 15 centimetres. For helidecks, where the D-value is 16.00 m or less the height of essential items around the helideck should not exceed 5 cm. Essential items include:

- the guttering (associated with the requirements in paragraph 3.44);
- the lighting required by Chapter 4;
- the foam monitors (where provided); and
- those handrails and other items (e.g. EXIT sign) associated with the landing area which are incapable of complete retraction or lowering for helicopter operations.

3.24 Objects whose function requires that they be located on the surface of the helideck such as landing nets, tie-down points, and "circle" and "H" lighting systems (see Appendix C) should not exceed a height of 25 mm. Such objects should only be present above the surface of the touchdown area provided they do not cause a hazard to helicopter operations. Landing nets should not be fitted on a solid plate helideck where a deck integrated fire-fighting system (DIFFS) is installed.

3.25 The bisector of the 210° Obstacle Free Sector (OFS) should normally pass through the centre of the D-circle. The sector may be 'swung' by up to 15° as illustrated in Figure 1. Acceptance of the 'swung' criteria will normally only be applicable to existing installations.

NOTE: If the 210° OFS is swung, then it would be normal practice to swing the 180° falling 5:1 gradient by a corresponding amount to indicate, and align with, the swung OFS.

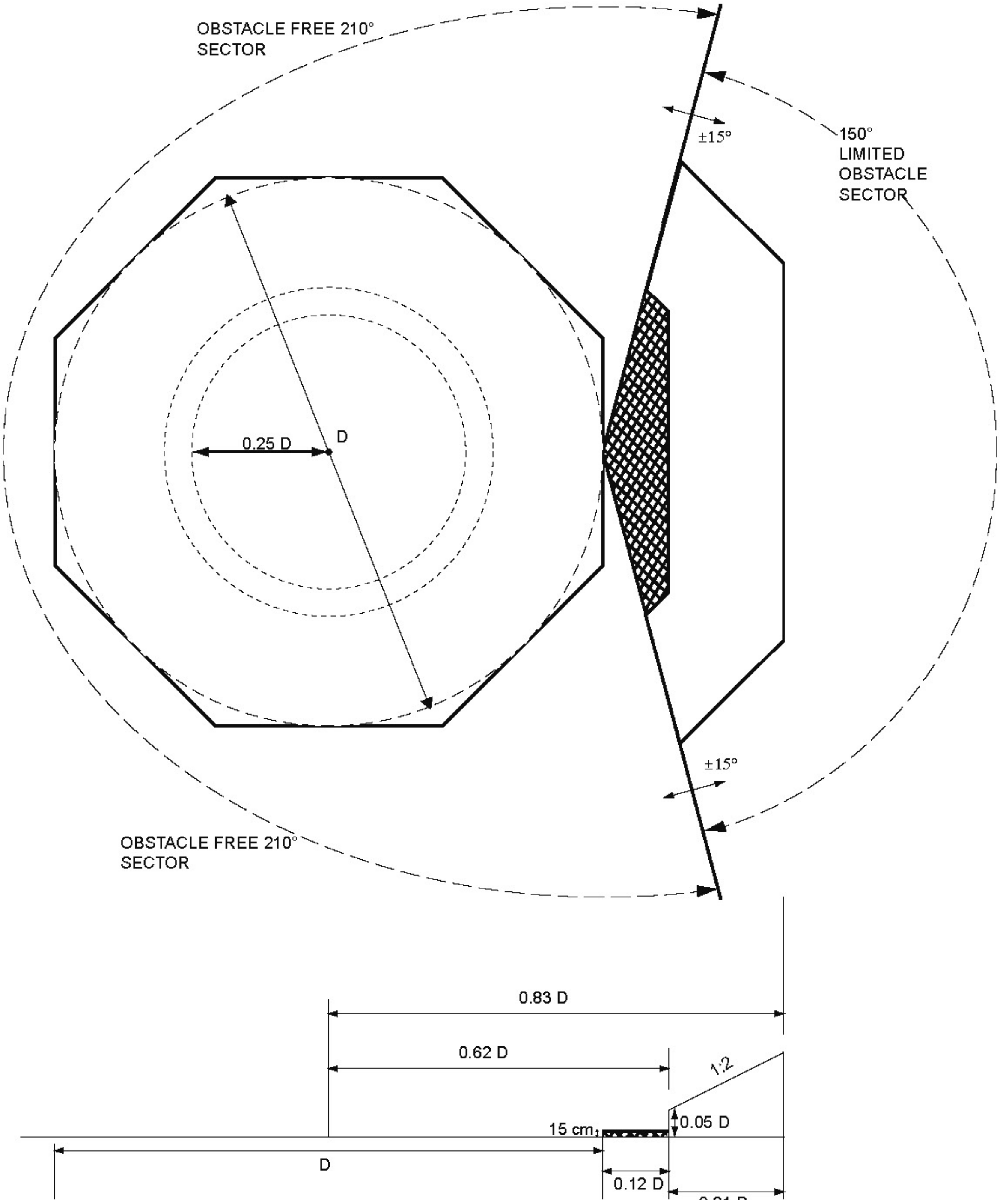
3.26 The diagram at Figure 1 shows the extent of the two segments of the 150° Limited Obstacle Sector (LOS) and how these are measured from the centre of the (hypothetical) D-circle and from the perimeter of the landing area. This diagram assumes, since most helidecks are designed to the minimum requirement of accommodating a 1 D-circle, that the D-circle perimeter and landing area perimeter are coincidental. No objects above 15 cm (or 5 cm where the D-value of the helideck is 16.00 m or less) are permitted in the first (hatched area in Figure 1) segment of the LOS. The first segment extends out to 0.62D from the centre of the D-circle, or 0.12D from the landing area perimeter marking. The second segment of the LOS, in which no obstacles are permitted to penetrate, is a rising 1:2

slope originating at a height of 0.05D above the helideck surface and extending out to 0.83D from the centre of the D-circle (i.e. a further 0.21D from the edge of the first segment of the LOS).

NOTE: The exact point of origin of the LOS is assumed to be at the periphery of the D-circle.

3.27 Where helidecks are able to accommodate a landing area which covers a larger area than the declared D-value; a simple example being a rectangular deck with the minor dimension able to contain the D-circle. In such cases it is important to ensure that the origin of the LOS (and OFS) is at the perimeter of the landing area as marked by the perimeter line. Any landing area perimeter should guarantee the obstacle protection afforded by both segments of the LOS. The respective measurements of 0.12D from the landing area perimeter line plus a further 0.21D are to be applied. On these larger decks there is thus some flexibility in deciding the position of the perimeter line and landing area in order to meet the LOS requirements and when considering the position and height of fixed obstacles. Separating the origin of the LOS from the perimeter of the D-circle in Figure 1 and moving it to the right of the page will demonstrate how this might apply on a rectangular-shaped landing area.

Figure 1: Obstacle limitation (single main rotor and side by side main rotor helicopters) showing position of touchdown/positioning marking circle



NOTE: Where the D-value is 16.00 m or less, objects in the first segment of the LOS are restricted to 5 cm.

NOTE 2: For existing helidecks where the D-value is >16.01 m the obstacle environment should be reviewed to remove, lower or mitigate as far as practical, any essential objects that exceed 15 cm ADL. In any case objects in the 210° OFS and in the 1st segment of the LOS should not exceed 25 cm.

3.28 The extent of the LOS segments will, in all cases, be lines parallel to the landing area perimeter line and follow the boundaries of the landing area perimeter (see Figure 1). Only in cases where the perimeter of the landing area is circular will the extent of the LOS be in the form of arcs to the D-circle. However, taking the example of an octagonal landing area as drawn at Figure 1, it would be possible to replace the angled corners of the two LOS segments with arcs of 0.12D and 0.33D centred on the two adjacent corners of the landing area, thus cutting off the angled corners of the LOS segments. If these arcs are applied they should not extend beyond the two corners of each LOS segment so that minimum clearances of 0.12D and 0.33D from the corners of the landing area are maintained. Similar geometric construction may be made to a square or rectangular landing area but care should be taken to ensure that the LOS protected surfaces minima can be satisfied from all points on the inboard perimeter of the landing area.

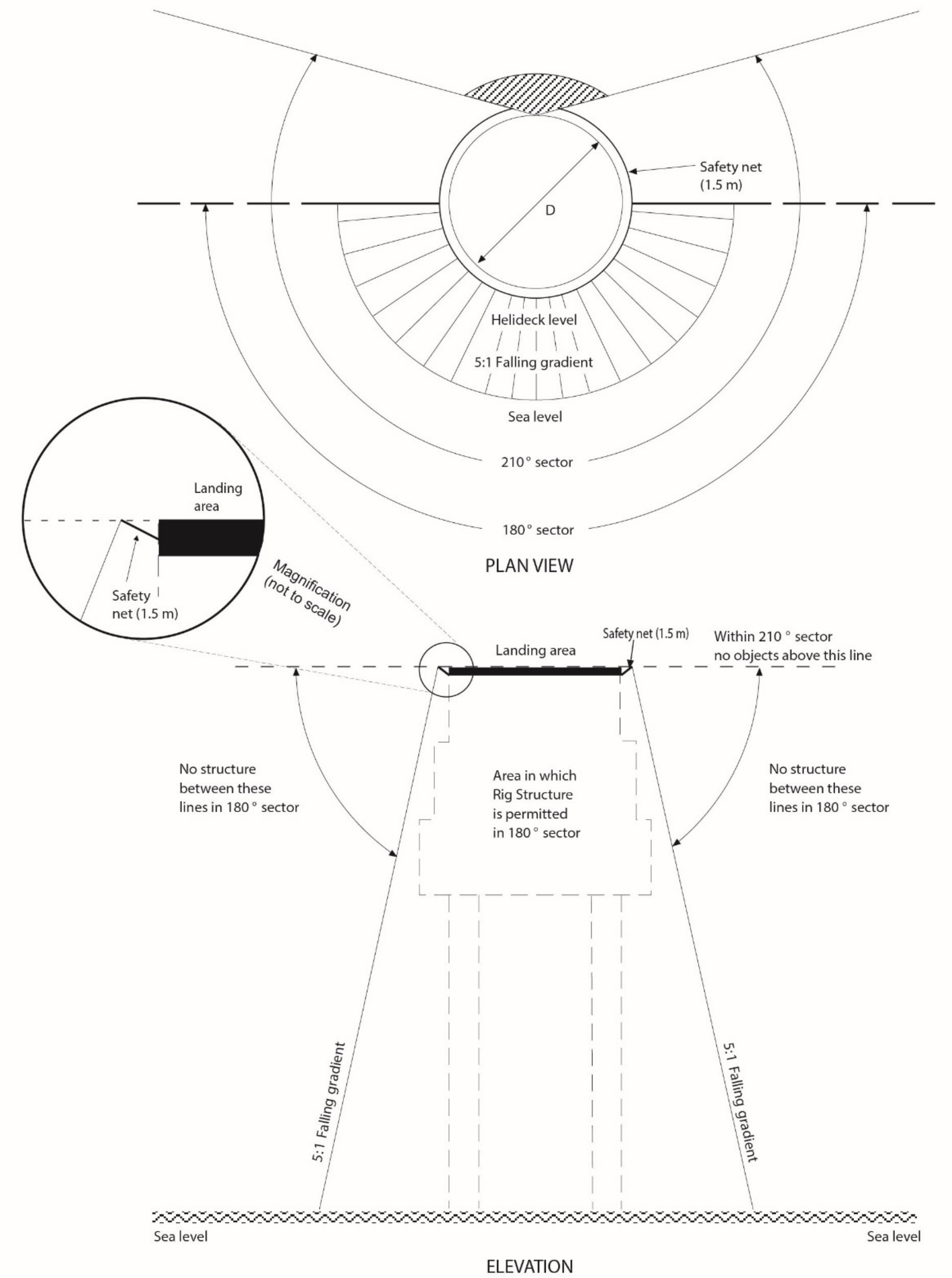
3.29 For new build helideck designs the minimum landing area size should accommodate a circle encompassed by the outer edge of perimeter marking of at least 1D (see paragraph 3.26). However, from time-to-time new helicopter types may be introduced to the UKCS which were not in operational use when an existing helideck was designed. In this case there is a mechanism to review operations by larger (and usually heavier) helicopters than were specified in the original design for the helideck, when subject to a thorough risk assessment. The framework for a risk assessment process for helicopter operations to helidecks on the UKCS, which are sub-1D, is reproduced at Appendix H and may be used by a helicopter operator to present a case for sub-1D operations to the CAA.

3.30 Whilst application of the criteria in paragraph 3.23 will ensure that no unacceptable obstructions exist above the helicopter landing area level over the whole 210° sector, it is necessary to consider the possibility of helicopter loss of height due to a power unit failure during the latter stages of the approach or early stages of take-off. Accordingly, a clear zone should be provided below landing area level on all fixed and mobile installations between the helideck and the sea. The falling 5:1 gradient should be at least 180° with an origin at the centre of the D-circle and ideally it should cover the whole of the 210° OFS. It should extend outwards for a distance that will allow for safe clearance from obstacles below the helideck in the event of an engine failure for the type of helicopter the helideck is intended to serve. (See also Glossary of Terms and Abbreviations.) For helicopters operated in Performance Class 1 or 2 the horizontal extent of this distance from the helideck will be based upon the one-engine inoperative capability of the helicopter type to be used (see Figure 2). All objects that are underneath anticipated final approach and take-off paths should be assessed.

NOTE 1: For practical purposes the falling obstacle limitation surface can be assumed to be defined from points on the outboard edge of the helideck perimeter safety netting supports (not less than 1.5 metres from deck edge). Minor infringements of the surface by foam monitor platforms or access/escape routes may be accepted only if they are essential to the safe operation of the helideck but may also attract helicopter operational limitations.

NOTE 2: Research completed in 1999 (see Appendix B references) demonstrated that, following a single engine failure in a twin engine helicopter after take-off decision point, and assuming avoidance of the deck edge, the resulting trajectory will carry the helicopter clear of any obstruction in the range 2:1 to 3:1. It is therefore only necessary for operators to account for performance in relation to specified 5:1 falling gradient when infringements occur to a falling 3:1 rather than a 5:1 slope.

Figure 2: Obstacle free areas - Below landing area level (for all types of helicopters)



Temporary combined operations

3.31 Temporary Combined Operations are essentially arrangements where two or more offshore installations, whether fixed or floating, are in close proximity 'alongside' or 'pulled away' from one another. They may be in place for a matter of hours, days, months or for up to several years. On occasions, combined operations may include vessels working alongside one or more fixed and/or floating installations. The close proximity of installations and/or vessels one to another is likely to entail that one or more of the landing areas becomes operationally restricted due to obstacle protected surfaces being compromised and/or due to adverse environmental effects.

3.32 So, for example, the installation pictured in the centre of Figure 3 has obstacle protected sectors and surfaces (the extended OFSs as well as the falling gradient) that are severely compromised by the proximity of the other two installations. In these circumstances a landing prohibited marker (a yellow cross on a red background) is placed on the drilling facility (centre) to prevent operations to the helideck. Where temporary combined operations are planned, a helicopter operator assessment should be completed to review the physical, as well as the environmental, impact of the arrangements and to assess whether any flight restrictions or limitations, including prohibitions, should be disseminated to air crews. All helicopter landing areas which are determined to be ‘unavailable’ should display the relevant landing prohibited marker by day while, by day and night, the perimeter lights should be displayed but all other helideck lighting systems (circle/H lighting and/or helideck floodlights) should be extinguished.

3.33 Combined operations usually involve both installations and/or vessels being in close proximity ‘alongside’ one another (as pictured), where the effect of one facility on the obstacle protected surfaces of another is immediately obvious. However, during the life of a combined arrangement there may also be periods when mobile installations and/or vessels are ‘pulled-away’ to a stand-off position, which could entail them being some distance apart. It is necessary for helicopter operators to re-appraise the situation for combined operations now in the ‘stand-off’ configuration as with one or more installations or vessels ‘pulled-away’ there may then be opportunity to relax or remove limitations otherwise imposed for the ‘alongside’ configuration.

Figure 3: A temporary combined operation showing relative position of each helideck 210^0 sector

Multiple platform configurations/location of attended marine vessels

3.34 Where two or more fixed structures are permanently bridge-linked the overall design should ensure that the sectors and surfaces provided for the helicopter landing area(s) are not compromised by other modules which may form part of the multiple platform configurations. It is also important to assess the environmental effect of each module on the flying environment around the helideck.

3.35 Where there is an intention to add new modules to an existing platform arrangement it is important to make an assessment on the potential impact that additional modules may have on helideck operations. This will include an assessment of the sectors and surfaces for the helideck which should not be compromised due to the location of a new module, or modification to an existing module. This will include a detailed analysis of the environmental impact on the flying environment around the helideck (e.g. using CFD).

3.36 Where there is a requirement to position, at sea surface level, offshore support vessels (e.g. a Standby Vessel or tanker) essential to the operation of a fixed or floating offshore installation located within the proximity of the fixed or floating installation's obstacle free sector (OFS), but below helideck level, care should be taken to ensure offshore support vessels are not positioned to compromise the safety of helicopter operations during take-off, departure and approach to landing.

Surface

NOTE: Where the upper surface of the helideck is formed of a grating or includes drain holes, e.g. where a passive fire retarding system is selected (see Chapter 5), the design of the helideck should ensure that the helicopter 'ground effect' air cushion is not reduced.

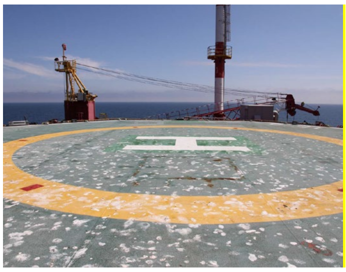
3.37 The landing area should provide a non-slip surface for helicopter operations. The installation operator should ensure that the helideck is kept free from oil, grease, ice, snow, excessive surface water or any other contaminant (particularly guano) that could degrade the surface friction or obscure the helideck lighting or markings. Assurance should be provided to the helicopter operator that procedures are in place for elimination and removal of contaminants prior to helicopter movements.

3.38 With regard to contamination by guano, the protocol detailed in Table 2 below should be applied to ensure that safety is not compromised.

Hazards include:

- Flight safety risk due to obscuration of helideck lighting and/or markings and degradation of surface friction;
- Personnel safety resulting from slip risk and biological hazards.

Table 2: Helideck guano contamination scale

Score	Description		Action / Limitation
1	Markings clearly visible.		Normal operations.
2	Markings beginning to be degraded.		Normal operations - report condition and request cleaning.
3	Noticeable degradation of markings.		Operations to deliver cleaning crew only.

Prevention is usually better than cure and laser-based bird scaring systems have demonstrated that they can be effective. However, these systems use relatively high power lasers (typically Class 3) which are not eye-safe. Where laser bird scaring systems are installed, due consideration should be given to protecting personnel on the installation (e.g. by including a ‘beam break’ interlock on all helideck access stairs to switch the laser off before the eyes can be exposed to the laser) and to the occupants of approaching helicopters (e.g. by connecting the laser system to the helideck status light system such that the status lights are activated whenever the laser is operating).

3.39 The minimum average surface friction values that should be achieved are detailed in Table 3. The average surface friction values should be confirmed using a test method acceptable to the CAA – see paragraphs 3.40 to 3.44.

Table 3: Friction requirements

Section of helideck	Fixed helideck	Moving helideck
Inside TD/PM circle	0.6	0.65
TD/PM circle and H painted markings	0.6	0.65
Outside TD/PM circle and parking areas	0.5	0.5

NOTE: Unless fixed to the sea bed (e.g. a jack-up on station), the helideck on any installation requiring a helideck monitoring system (see paragraph 6.7) should be regarded as a moving helideck.

3.40 For the purposes of helideck surface friction testing, helidecks are divided into the following two types:

- Flat helidecks
- Profiled helidecks

Flat helidecks are provided with a micro-texture finish (e.g. non-slip paint or grit-blasted finish) and should be tested in accordance with paragraph 3.41.

Profiled helidecks are typically constructed from extruded aluminium planks, have a ‘ribbed’ surface and may or may not be provided with a micro-texture finish (e.g. non-slip paint or grit-blasted finish). New profiled helidecks (i.e. helidecks commissioned on or after 01 January 2017) should be tested as described in paragraph 3.42. Legacy profiled helidecks (i.e. helidecks commissioned before 01 January 2017) may be tested as described in paragraph 3.43.

NOTE: For the purposes of this paragraph and paragraphs 3.42 and 3.43, the date of commissioning is the date of the first helideck certificate issued prior to the commencement of routine operations.

3.41 For helidecks with a micro-texture finish (e.g. non-slip paint or grit-blasted finish), the helideck friction test method should normally comprise the following:

- a survey of the entire helideck surface in two orthogonal directions to a resolution of not less than 1 m^2;
- use of a tester employing the braked wheel technique and a tyre made of the same material as helicopter tyres;
- testing in the wet condition using a tester that is capable of controlling the wetness of the deck during testing;
- use of a tester which provides electronic data collection, storage and processing.

An example test protocol based on the use of the Findlay Irvine MicroGT is presented in Appendix G.

The helideck should normally be re-tested annually and after any remedial work has been performed. If the friction values (after scaling, where appropriate) exceed the values given in Table 3 by at least 0.1 in all required areas, then re-testing is not required for two years.

NOTE 1: No two adjacent (side-to-side; corner to corner is acceptable) 1 m squares should achieve less than the average surface friction value specified in paragraph 3.39 above, except within the TD/PM circle where TD/PM circle and ‘H’ lighting is installed.

NOTE 2: Where TD/PM circle and ‘H’ lighting is installed, testing of the TD/PM circle and ‘H’ painted markings is not required, however, non-slip paint should still be used.

3.42 For profiled helidecks commissioned on or after 01 January 2017 a helideck specimen should be submitted to a suitably qualified and independent test facility for testing at full scale. The testing should normally comprise the following:

- use of a representative helicopter wheel and tyre with a tyre contact area of at least 200 cm^2;
- testing at a vertical load to produce a tyre contact pressure of at least 0.95 N/mm^2 and ideally 1 N/mm^2, and also within the normal range of loads and tyre pressures for the aircraft wheel being used for the testing;
- testing in the wet condition;
- testing in all four permutations of wheel and surface profiling directions, i.e. wheel in rolling (R) and non-rolling (N) directions, along, i.e. longitudinal (L), and across, i.e. transverse (T), the ridges of the profiling to give the four test conditions of RL, RT, NL and NT;
- at least three test runs to be performed for each test condition;
- the result for each test run should be the average surface friction value for the run, excluding the initial peak due to static friction;
- the result for each test condition should be the average of the (at least three) test runs for that condition;
- the overall result for the helideck specimen should be the lowest of the results for the four conditions.

NOTE 1: Each test run may be performed using a 'fresh', undamaged section of the test tyre.

NOTE 2: For the area outside the TD/PM Circle, an inadequate surface friction value (i.e. < 0.5) may be rectified by grit blasting or by applying a suitable non-slip paint coating. For the area inside the TD/PM Circle (< 0.6 for fixed helidecks, < 0.65 for moving helidecks), removal of the profiling prior to grit blasting or painting is recommended or, alternatively, the fitment of a helideck net – see paragraph 3.45 below.

NOTE 3: The testing described in this paragraph represents a once-off type approval and no further in-service monitoring or testing is required unless the helideck is provided with a micro-texture finish (e.g. grit blasting or friction paint) in order to meet the minimum surface friction values required. In that case:

- The in-service monitoring/testing protocol specified in paragraph 3.41 should be applied.
- The friction tester to be used should be calibrated using the full-scale test results together with friction tester results for the same helideck test specimen or, at least, a helideck specimen in the same condition as the sample used for the full-scale tests, e.g. a sample from the same plank or the same plank production batch.
- The calibration should comprise multiplying the friction tester readings by the following scaling factor:

$$Scaling\ factor = \frac{RL\ test\ condition\ full\ scale\ results}{L\ average\ friction\ tester\ results}$$

  This assumes that the L test direction (i.e. parallel to the ribs) will yield the lowest friction values. If this is not the case, CAA and/or HCA should be consulted.

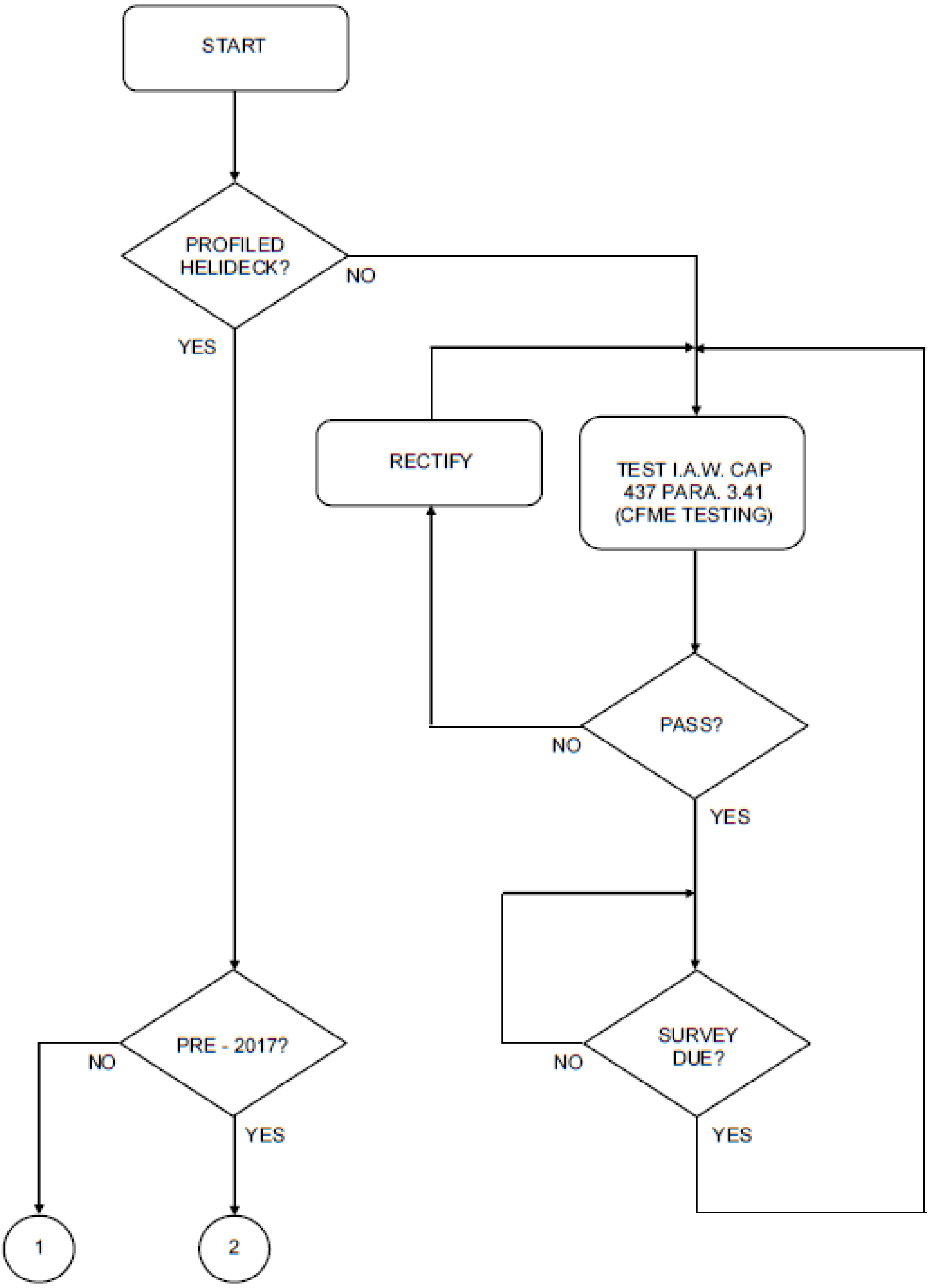
  It is expected that the helideck manufacturer will provide scaling factors for widely used helideck friction testers for their helideck surfaces. If a scaling factor is not available CAA and/or HCA should be consulted.

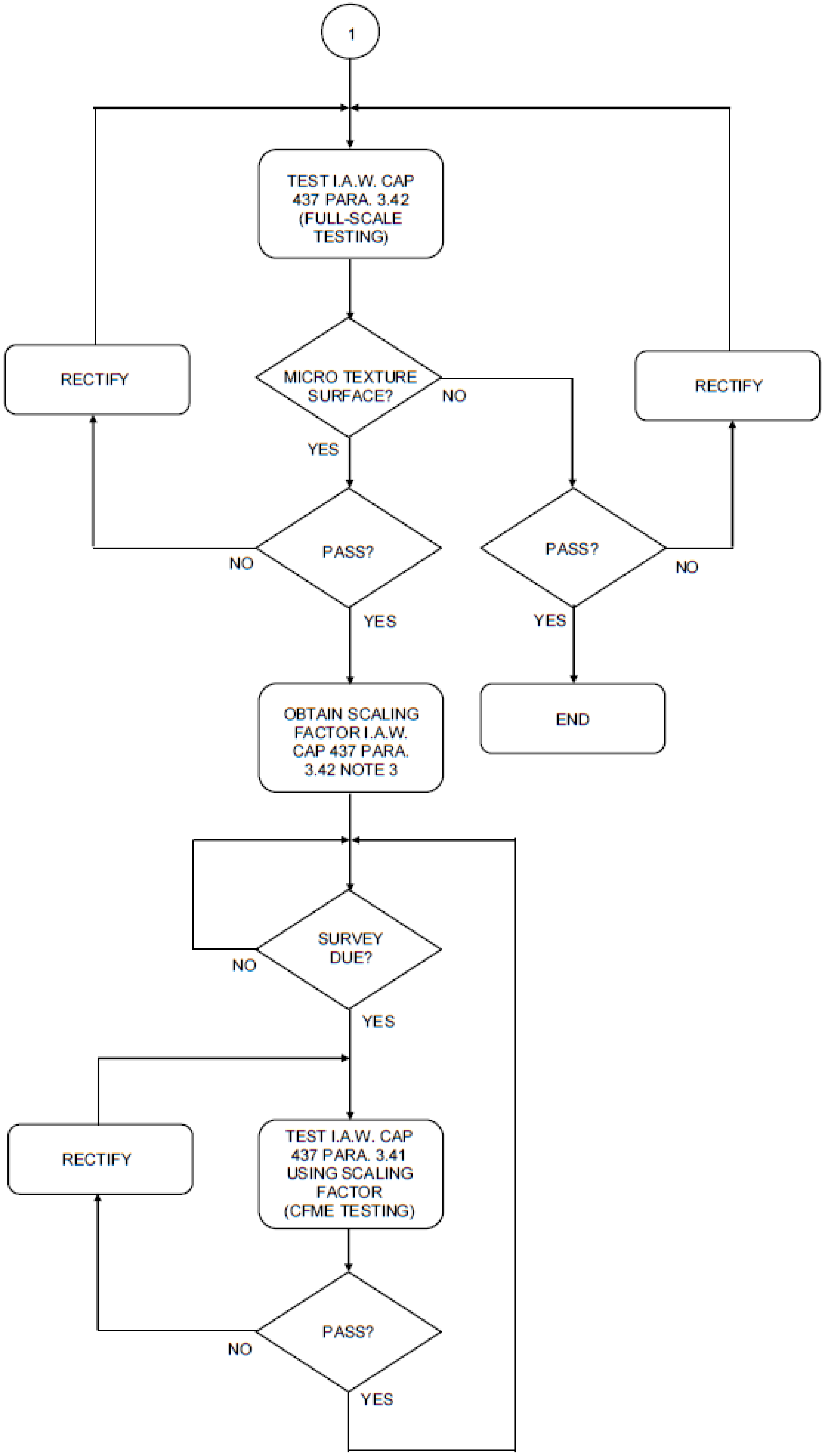
- Testing should be performed in a direction parallel to the ribs of the surface profiling only.

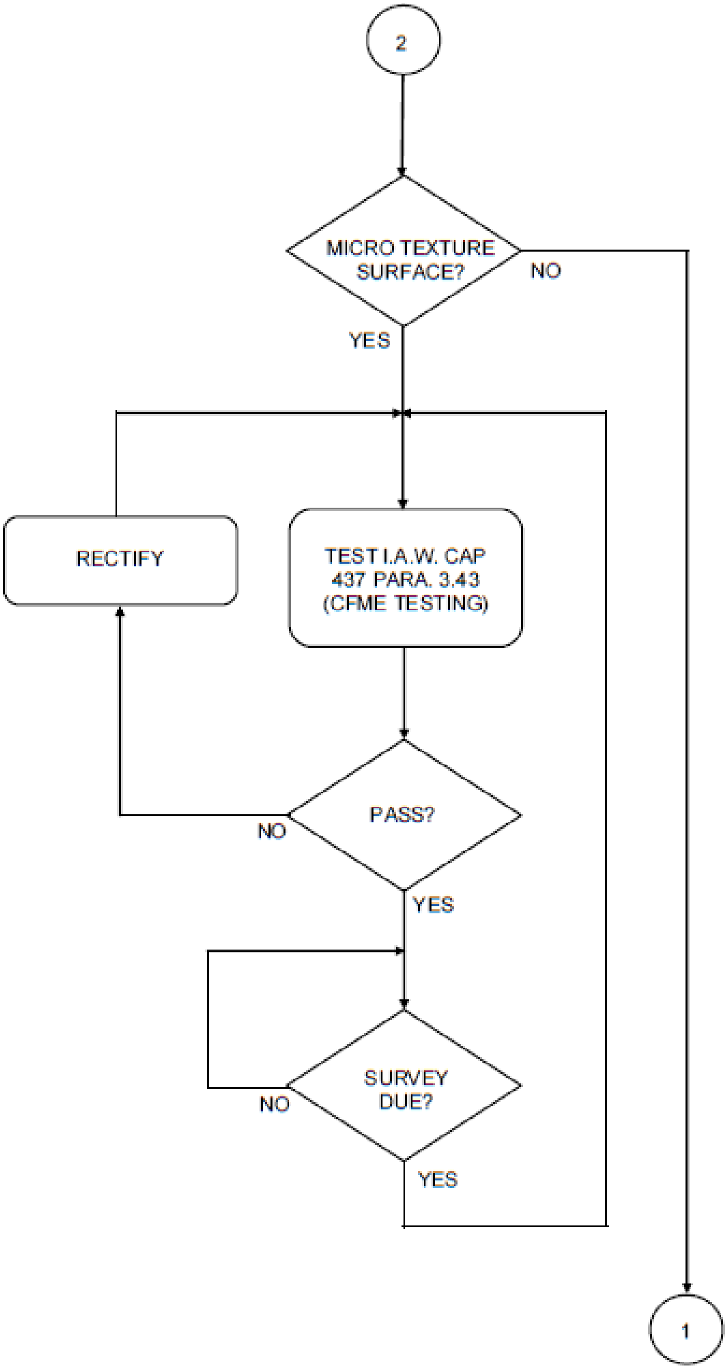
NOTE 4: Providing a lasting non-slip paint finish to the tops of ribs can be challenging. Grit blasted micro-texture finishes are likely to be more effective and more durable than non-slip paint finishes on profiled helideck surfaces.

3.43 For profiled helidecks commissioned before 01 January 2017, full scale testing may be performed but is not required provided that the helideck has been provided with a micro-texture finish (e.g. grit blasting or friction paint). Such helidecks should be subject to in-service monitoring using the protocol specified in paragraph 3.41. Testing should be performed in a direction parallel to the ribs of the surface profiling only. The friction tester readings should not be scaled.

3.44 Helideck friction testing is summarised in the following flow charts.


START
PROFILED HELIDECK?
NO
YES
RECTIFY
TEST I.A.W. CAP 437 PARA. 3.41 (CFME TESTING)
PASS?
NO
YES
SURVEY DUE?
NO
YES
PRE - 2017?
NO
YES
1
2


1
TEST I.A.W. CAP 437 PARA. 3.42 (FULL-SCALE TESTING)
MICRO TEXTURE SURFACE?
NO
YES
RECTIFY
RECTIFY
PASS?
NO
YES
PASS?
NO
YES
OBTAIN SCALING FACTOR I.A.W. CAP 437 PARA. 3.42 NOTE 3
END
SURVEY DUE?
NO
YES
RECTIFY
TEST I.A.W. CAP 437 PARA. 3.41 USING SCALING FACTOR (CFME TESTING)
PASS?
NO
YES



3.45 A helideck net may be used to mitigate for insufficient surface friction provided that an average surface friction of at least 0.5 is achieved across the area inside the TD/PM and outside the TD/PM. This also applies to the paint markings unless TD/PM circle and 'H' lighting is installed . The net should cover the area that encompasses the TD/PM circle only and should be installed and tensioned in accordance with the manufacturer's instructions and should have the following properties:

- the mesh size should be such as to present an area of between 400 and 900 cm^2;
- the net should be secured at intervals approximately 1.5 metres between the lashing points around the landing area perimeter;
- the breaking strain of the rope/webbing from which the net is constructed and the load capacity of the net anchoring points should be at least 8.25 kN;
- the size of the net should such as to ensure coverage of the TD/PM Circle area but should not cover the helideck identification marking (name) or 't' value markings.

NOTE 1: Helideck nets may only be used in conjunction with deck integrated fire-fighting systems on decks with a passive fire-fighting capability.

NOTE 2: Helideck nets are incompatible with helicopters fitted with skid undercarriages and should not be used where the operation of such aircraft is to take place.

NOTE 3: It should be borne in mind when selecting a helideck net that the height of the netting (i.e. the thickness of the installed net including knots) should be in accordance with the requirements specified in paragraph 3.24.

NOTE 4: The helideck net may be any shape but should cover the whole of the TD/PM circle, but not be so large as to obscure other essential markings e.g. helideck name marking, maximum allowable mass marking. The net should be constructed from durable materials not prone to degrade with prolonged exposure to the weather (e.g. UV light), or to the elements (e.g. sea water).

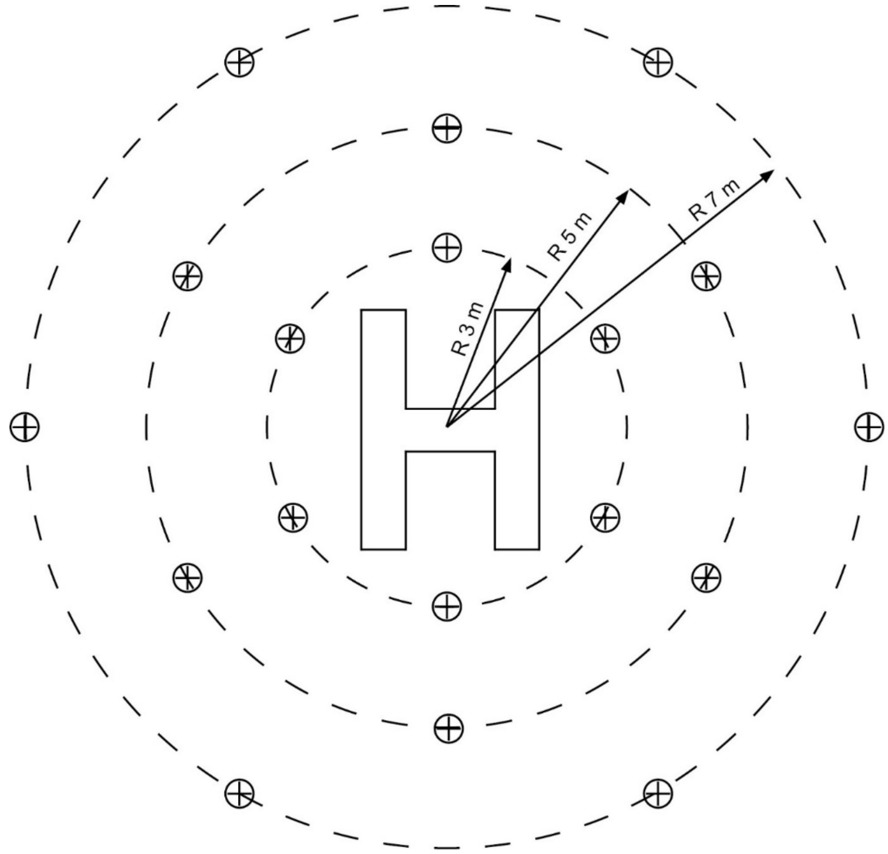
NOTE 5: If a helideck net is to be fitted, measures should be taken to ensure that the performance of TD/PM Circle and 'H' lighting is not impaired. This will be especially evident at low angles of elevation (i.e. less than 6 degrees).

3.46 Every landing area should be equipped with adequate surface drainage arrangements and a free-flowing collection system that will quickly and safely direct any rainwater and/or fuel spillage and/or fire-fighting media away from the helideck surface to a safe place. Helidecks on fixed installations should be cambered (or laid to a fall) to approximately 1:100. Any distortion of the helideck surface on an installation due to, for example, loads from a helicopter at rest should not modify the landing area drainage system to the extent of allowing spilled fuel to remain on the deck. A system of guttering on a new-build or a slightly raised kerb should be provided around the perimeter to prevent spilled fuel from falling on to other parts of the installation and to conduct the spillage to an appropriate drainage system. The capacity of the drainage system should be sufficient to contain the maximum likely spillage of fuel on the helideck. The calculation of the amount of spillage to be contained should be based on an analysis of helicopter type, fuel capacity, typical fuel loads and uplifts. The design of the drainage system should preclude blockage by debris which is best achieved by use of a mesh type filtration system able to strain out smaller items of debris. The helideck area should be properly sealed so that spillage will only route into the drainage system.

Helicopter tie-down points

3.47 Sufficient flush fitting (when not in use) tie-down points should be provided for securing the maximum sized helicopter for which the helideck is designed. They should be so located and be of such strength and construction to secure the helicopter when subjected to weather conditions pertinent to the installation design considerations. They should also take into account, where significant, the inertial forces resulting from the movement of floating units.

Figure 4: Example of suitable tie-down configuration



NOTE 1: The tie-down configuration should be based on the centre of the TD/PM Circle.

NOTE 2: Additional tie-downs will be required in a parking area.

NOTE 3: The outer circle is not required for D-values of less than 22.2 m.

3.48 Tie-down strops held on the installation or vessel should be compatible with the bar diameter of the helideck tie-down points. Tie-down points and strops should be of such strength and construction so as to secure the helicopter when subjected to weather conditions pertinent to the installation design considerations. The maximum bar diameter of the tie-down point should be 22 mm in order to match the strop hook dimension of typical tie-down strops. Advice on recommended safe working load requirements for strop/ring arrangements for specific helicopter types can be obtained from the helicopter operator.

3.49 An example of a suitable tie-down configuration is shown at Figure 4. The agency responsible for the certification of the helideck should be able to provide guidance on the configuration of the tie-down points for specific helicopter types.

Perimeter safety net

3.50 Safety nets for personnel protection should be installed around the landing area except where adequate structural protection against a fall exists. The netting used should be of a flexible nature, with the inboard edge fastened just below the edge of the helicopter landing deck. The net itself should extend at least 1.5 metres, but no more than 2.0 metres, in the horizontal plane and be arranged so that the outboard edge does not exceed the level of the landing area and angled so that it has an upward and outward slope of approximately 10°.

3.51 A safety net designed to meet these criteria should 'contain' personnel falling into it and not act as a trampoline. Where lateral or longitudinal centre bars are provided to strengthen the net structure they should be arranged and constructed to avoid causing serious injury to persons falling on to them. The ideal design should produce a 'hammock' effect which should securely contain a body falling, rolling or jumping into it, without serious injury. When considering the securing of the net to the structure and the materials used, care should be taken that each segment will be fit for purpose. Various wire meshes have been shown to be suitable if properly installed.

NOTE 1: It is not within the scope or purpose of CAP 437 to provide detailed advice for the design, fabrication and testing of helideck perimeter nets. Given the responsibility rests with the duty holder to ensure the net is fit for purpose and is subjected to a satisfactory inspection and testing regime, specific issues are addressed in the OGUK 'Aviation Operations Management Standards and Guidelines'.

NOTE 2: Perimeter nets may incorporate a hinge arrangement to facilitate the removal of sacrificial panels for testing.

NOTE 3: Perimeter nets that extend up to 2.0 m in the horizontal plane, measured from the edge of the landing area, will not normally attract operational limitations.

Access points

3.52 For reasons of safety it is necessary to ensure that embarking and disembarking passengers are not required to pass around the helicopter tail rotor, or around the nose of helicopters having a low profile main rotor, when a 'rotors-running turn-round' is conducted (in accordance with normal offshore operating procedures). Many helicopters have passenger access on one side only and helicopter landing orientation in relation to landing area access points is therefore very important.

3.53 There should be a minimum of two access/egress routes to the helideck. The arrangements should be optimised to ensure that, in the event of an accident or incident on the helideck, personnel will be able to escape upwind of the landing area. Adequacy of the emergency escape arrangements from the helideck should be included in any evacuation, escape and rescue analysis for the installation, and may require a third escape route to be provided.

3.54 The need to preserve, in so far as possible, an unobstructed falling 5:1 gradient (see paragraph 3.30 and Figure 2) and the provision of up to three helideck access/escape routes, with associated platforms, may present a conflict of requirements. A compromise may therefore be required between the size of the platform commensurate with its effectiveness and the need to retain the protection of an unobstructed falling 5:1 gradient. In practice, the 5:1 gradient is taken from the outboard edge of the helideck perimeter safety net supports. Emergency access points which extend outboard from the perimeter safety net constitute a compromise in relation to an unobstructed falling 5:1 gradient which may lead, in some instances, to the imposition of helicopter operating limitations. It is therefore important to construct access point platforms in such a manner as to infringe the falling 5:1 gradient by the smallest possible amount but preferably not at all. Suitable positioning of two major access points clear of the requirements of the protection of the falling 5:1 gradient should be possible. However, the third access referred to at paragraph 3.53 will probably lie within the falling 5:1 sector and where this is the case it should be constructed within the dimensions of the helideck perimeter safety net supports (i.e. contained within a horizontal distance of 1.5 - 2.0 m measured from the edge of the landing area).

3.55 Where foam monitors are co-located with access points care should be taken to ensure that no monitor is so close to an access point as to cause injury to escaping personnel by operation of the monitor in an emergency situation.

3.56 Where handrails associated with helideck access/escape points exceed the height limitations given at paragraph 3.23 they should be retractable, collapsible or removable. When retracted, collapsed or removed the rails should not impede access/egress or lead to gaps which could result in a potential fall from height. Handrails which are retractable, collapsible and removable should be painted in a contrasting colour scheme. Procedures should be in place to retract, collapse or remove them prior to helicopter arrival. Once the helicopter has landed, and the crew have indicated that passenger movement may commence (see Note below), the handrails may be raised and locked in position. The handrails should be retracted, collapsed or removed again prior to the helicopter taking off.

NOTE: The helicopter crew will switch off the anti-collision lights to indicate that the movement of passengers and/or freight may take place (under the control of the HLO). Installation/vessel safety notices placed on approach to the helideck access should advise personnel not to approach the helicopter when the anti-collision lights are on.

Winching (Helicopter hoist) operations

3.57 Except for operations to Wind Turbine Generators (WTGs) – see Chapter 10, paragraph 10.14 – for any other installation or vessel, attended or unattended, fixed or mobile for which helicopters are a normal mode of transport for personnel, a helicopter landing area should always be provided in preference to a winching area. This includes offshore sub-stations (OSS) e.g. Offshore Transformer Modules – OTMs - primarily used in support of wind farm operations.Winching should not be adopted as a normal method of transfer except to WTGs. However, in cases which are defined as “occasional use” (see paragraph 1.8), where heli-hoist operations, rather than landings, are permitted, they should be conducted in accordance with procedures agreed between the helicopter operator and the CAA and contained within the helicopter operator’s Operations Manual. Requirements for winching operations should be discussed with the specific helicopter operator well in advance. Winching area design arrangements are described in more detail in Chapter 10.

Normally Unattended Installations (NUIs)

3.58 The CAA has in the past provided guidance for helicopter operators on the routeing of helicopters intending to land on NUIs. CAA Flight Operations (Helicopters) is able to provide guidance and advice to helicopter operators in consideration of specific safety cases and risk analyses intended to address routeing philosophy.

3.59 Guano and associated bird debris is a major problem for NUIs. Associated problems concern the health hazard on board; degradation of visual aids (markings and lighting) and friction surfaces; and the potential for Foreign Object Debris/Damage (FOD). Helicopter operators should continuously monitor the condition of NUI helidecks and advise the owner/operator before marking and lighting degradation becomes a safety concern. Experience has shown that, unless adequate cleaning operations are undertaken or effective preventative measures are in place, essential visual aids will quickly become obliterated. NUIs should be monitored continuously for signs of degradation of visual cues and flights should not be undertaken to helidecks where essential visual cues for landing are insufficient.

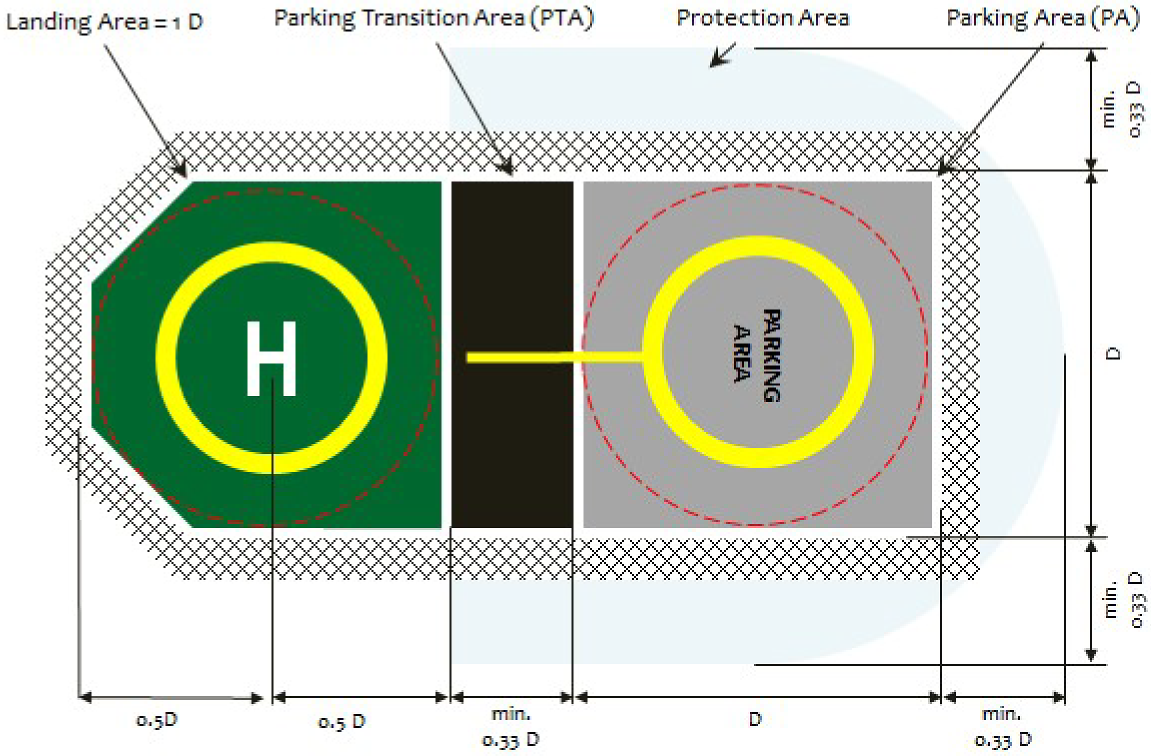
Criteria for parking areas

3.60 The ability to park a helicopter on an offshore installation or vessel and still be able to use the landing area for other helicopter operations provides greater operational flexibility. A parking area, where provided, should be located within the 150 degree limited obstacle sector (LOS) and equipped with markings to provide effective visual cues to assist flight crews positioning helicopters on the parking area.

3.61 It is therefore necessary for a parking area to be clearly distinguishable from the landing area. By day this is achieved by ensuring a good contrast between the surface markings of the landing area and the surface markings of the parking area. For a standard dark green helideck, a parking area painted in a light grey colour utilising a high friction coating, will provide suitable contrast. The friction properties of the parking area should be in accordance with paragraph 3.39 and Table 3.

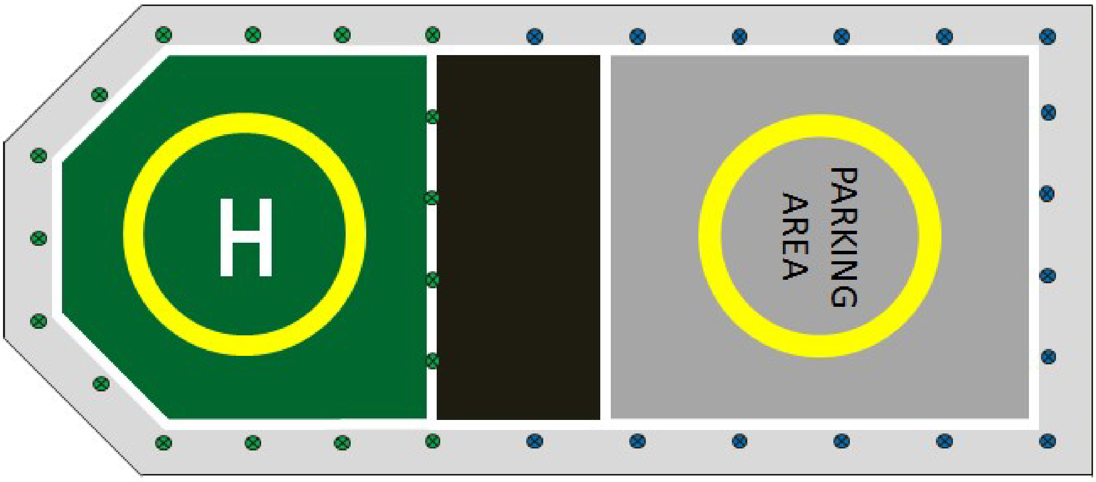
3.62 The dimensions of the parking area should be able to accommodate a circle with a minimum diameter of 1 x D for the design helicopter. A minimum clearance between the edge of the parking area and the edge of the landing area of 1/3 (0.33D) based on the design helicopter should be provided. The 0.33D clearance area represents the parking transition area (PTA) — and should be kept free of obstacles when a helicopter is located in the parking area. A protection area extends around the remaining three sides of the parking area which similarly should be kept free of obstacles when a helicopter is located in the parking area, out to a distance of 0.33D. Figure 5 defines the basic scheme for a 1D landing area with associated 1D parking area. The thickness of the parking area positioning marking circle should be 1m while the yellow lead-in line from the PTA to the parking area should be at-least 0.5m. “PARKING AREA” should be painted inside the yellow circle using characters no less than 1.5m in height.

Figure 5: General arrangement - 1D helicopter landing area with associated 1D parking area separated by a parking transition areas (PTA)



3.63 To provide illumination for the parking area at night, and to ensure a pilot is able to differentiate between the parking area and the landing area, it is recommended that blue parking area perimeter lights are provided; the colour green should be avoided for the parking area and the associated PTA. As the perimeter lights around the parking area do not need to be viewed at range, unlike the landing area perimeter lights, the parking area perimeter lights may be a low intensity light — no less than 5 candelas at any angle of elevation (and subject to a maximum of 60 cds at any angle). A typical parking area lighting scheme is illustrated at Figure 6.

Figure 6: Illustration of landing and parking area deck lighting scheme



NOTE: Consistent with the arrangements for the landing area, provisions should be put in place for parking/parking transition areas to ensure adequate surface drainage arrangements and a skid-resistant surface for helicopters and persons operating on them. When tying down helicopters in the parking area it is prudent to ensure sufficient tie-down points are located about the touchdown/positioning marking circle. A safety device, whether netting or shelving, should be located around the perimeter of the parking area and the parking transition area. Parking areas may be provided with one or more access points to allow personnel to move to and from the parking area without having to pass through the parking transition area to the landing area. Consideration will need to be given to fire-fighting arrangements for the parking area and PTA (see Chapter 5). The structural design requirements applied to a parking area and the parking transition area (PTA) should not be less than the loads for helicopters at rest (see paragraph 3.21).

Chapter 4

Visual aids

General

4.1 The name of the installation should be clearly displayed in such positions on the installation so that it can be readily identified from the air and sea from all normal angles and directions of approach. For identification from the air the helideck name and the side identification panels are used. It is not necessary, nor is it a legal requirement, to complicate recognition processes by inclusion of 'block numbers', company logos, or other designators. In fact, complication of identifiers can be confusing and will unnecessarily, and undesirably, extend the mental process of recognition at the critical time when the pilots' concentration is being fully exercised by the demands of the landing manoeuvre. The names on both identification markings should be identical, simple and unique and facilitate unambiguous communication via radio. The approved radio callsign of the installation should be the same name as painted on the helideck and displayed on the side panel identifier. Where the inclusion of 'block numbers' on side identification panels is deemed to be essential (i.e. for purposes other than recognition), the name of the installation should also be included; e.g. 'NAME. BLOCK NO.' The installation identification panels should be highly visible in all light conditions and from all directions of approach. They should be suitably illuminated at night and in conditions of poor visibility. In order to minimise the possibility of 'wrong rig landings' use of new technology is encouraged so that identification can be confirmed in the early stages of the approach by day and night. Modern technology is capable of meeting this requirement in most ambient lighting conditions. Use of high-intensity Light Emitting Diode (LED) cluster or fibre-optic systems in other applications have been shown to be effective even in severely reduced visibility. Additionally, it is recognised that alternative technologies have been developed consisting of highly visible reflective side signage that has been successfully installed on some installations with the co-operation of the helicopter operator. (HSE Operations Notice 39, re-issued in May 2009 , provides 'Guidance on Identification of Offshore Installations'.)

4.2 Helideck markings (specifically the installation identification marking) and side identification panels are used by pilots to obtain a final pre-landing confirmation that the correct helideck is being approached. It is therefore **VITAL** that the helideck markings and side identification panels are maintained in the best possible condition, regularly re-painted and kept free of all visibility-reducing contaminants. Helideck owners/operators should ensure that specific inspection and re-painting maintenance procedures and schedules for helideck markings and side identification panels take account of the importance of their purpose. Side identification panels should be kept free of any obscuring paraphernalia (draped hoses etc.) and be as high as possible on the structure.

4.3 The installation identification (see paragraphs 4.1 and 4.2) should be marked in white characters on the helideck surface between the origin of the OFS and the TD/PM Circle in symbols not less than 1.2 metres where a helideck is below 16.0m. For all helidecks 16.0m and greater, whether new builds or at the next scheduled repaint, the character height should be increased to 1.5m in white which contrasts with the helideck surface. The name should not be obscured by the deck net (where fitted). For an unpainted aluminium surface the installation identification (in white characters) should be displayed against a black background. Non-slip materials (e.g. paint) should be used for the markings and any background required.

4.4 Helideck perimeter line marking and lighting serves to identify the limits of the Landing Area (see Glossary) for day and night operations respectively.

4.5 A wind direction indicator (windsock/ wind sleeve) should be provided and located so as to indicate the free stream wind conditions at the installation/vessel location. It is often inappropriate to locate the primary windsock (wind sleeve) as close to the helideck as possible where it may compromise obstacle protected surfaces, create its own dominant obstacle or be subjected to the effects of turbulence from structures resulting in an unclear wind indication. The windsock (wind sleeve) should be illuminated for night operations. Some installations may benefit from a second windsock (wind sleeve) to indicate a specific difference between the local wind over the helideck and the free stream wind.

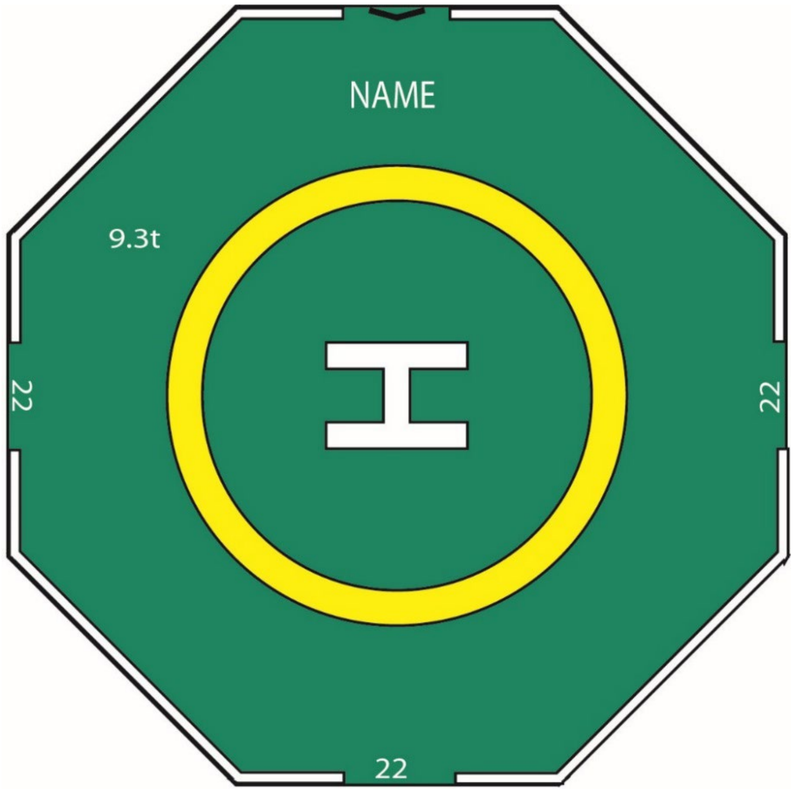
NOTE: Consideration may be given for a hinged windsock pole that can be collapsed in adverse weather conditions to protect the 'sock from risk of damage.

4.6 For character marking dimensions, where character bar width is not specified, use 15% of character height with 10% of character height between characters (extreme right-hand edge of one character to extreme left-hand edge of next character) and approximately 50% of character height between words. An example of an acceptable font type is Clearview Hwy 5-W .

Helideck landing area markings

4.7 The colour of the helideck should be dark green. The perimeter of the landing area should be clearly marked with a white painted line 30 cm wide (see Figure 1). Non-slip materials should be used for applying colour to the helideck surface and for all markings including any associated background required.

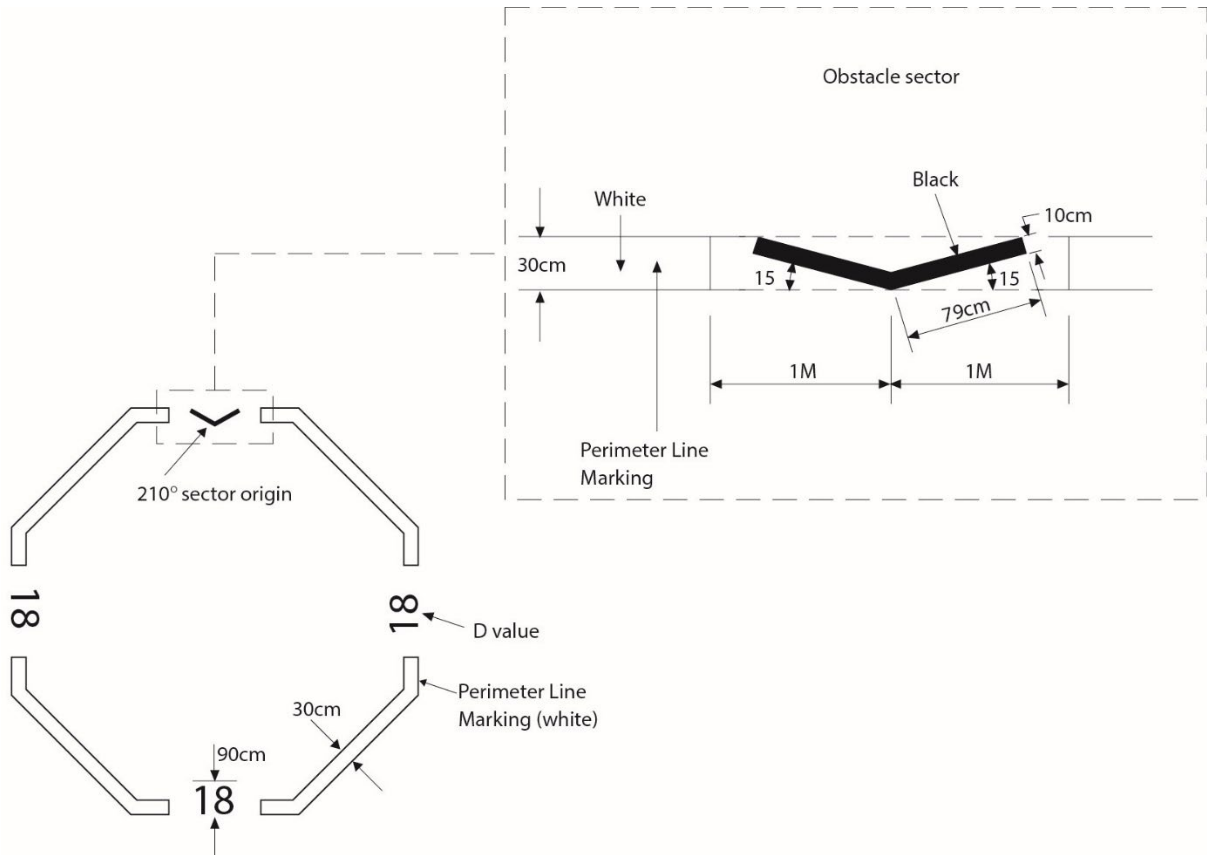
Figure 1: Markings (single main rotor helicopters)



4.8 Aluminium helidecks are in use throughout the offshore industry. Some of these are a natural light grey colour and may present painting difficulties. The natural light grey colour of aluminium may be acceptable in specific helideck applications where these are agreed with the agency responsible for the certification of the helideck. This should be discussed in the early design phase. In such cases the conspicuity of the helideck markings may need to be enhanced by, for example, overlaying white markings on a painted black background. Additionally, conspicuity of the yellow TD/PM Circle may be enhanced by outlining the deck marking with a thin black line (typically 10 cm).

4.9 The origin of the 210° OFS for approach and take-off as specified in Chapter 3 should be marked on the helideck by a black chevron, each leg being 79 cm long and 10 cm wide forming the angle in the manner shown in Figure 2. On minimum sized helidecks where there is no room to place the chevron where indicated, the chevron marking, but not the point of origin, may be displaced towards the D-circle centre. Where the OFS is swung in accordance with the provision of Chapter 3 paragraph 3.25 this should be reflected in the alignment of the chevron. The purpose of the chevron is to provide visual guidance to the HLO so that they can ensure that the 210° OFS is clear of obstructions before giving a helicopter clearance to land. The black chevron may be painted on top of the (continuous) white perimeter line to achieve maximum clarity for the helideck crew.

Figure 2: Helideck D-value and obstacle-free marking



4.10 The actual D-value of the helideck (see Chapter 3, paragraph 3.22 and 3.23) should be painted on the helideck adjacent to, and where practical inboard of, the chevron in alphanumeric symbols 10 cm high. Where, for an existing installation, a helideck has been accepted which does not meet the normal minimum OFS requirements of 210°, the black chevron should represent the angle which has been accepted and this value should be marked inboard of the chevron in a similar manner to the certificated D-value. It is expected that new-builds will always comply in full with the requirement to provide a minimum 210° OFS.

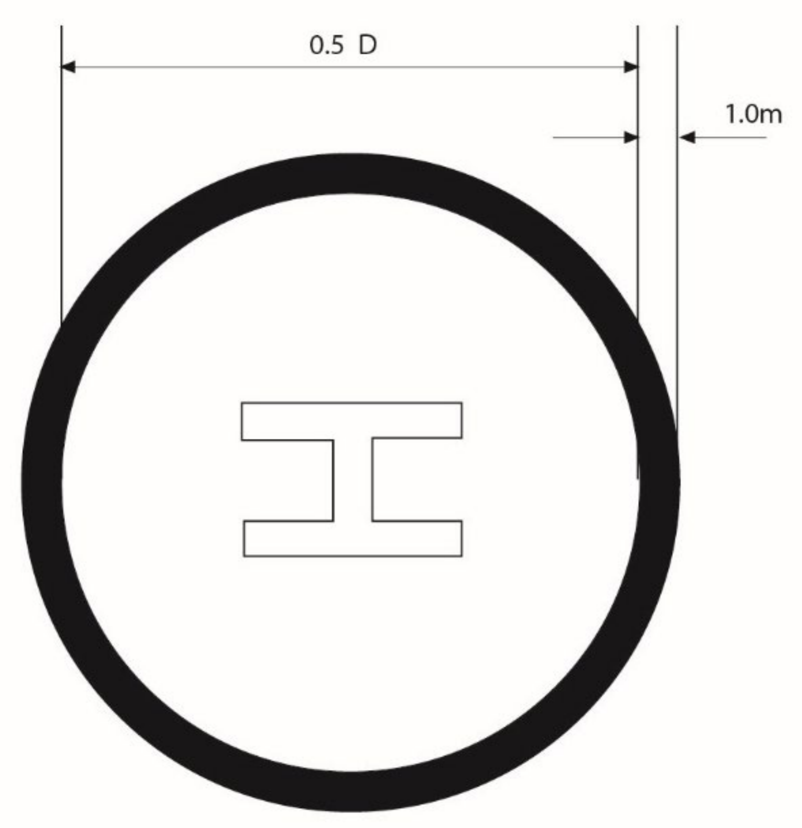
4.11 The helideck D-value should also be marked around the perimeter of the helideck in white characters no less than 90 cm high, in the manner shown in Figures 1 and 2. The D-value should be expressed to the nearest whole number with 0.5 rounded down, e.g. 18.5 marked as 18 (see Chapter 3, Table 1). For an unpainted aluminium surface helideck D-value(s) (in white characters) should be displayed against a black background.

NOTE: Helidecks designed specifically for AS332L2 and EC 225 helicopters, each having a D-value of 19.5 m, should be rounded up to 20 in order to differentiate between helidecks designed specifically for L1 models. For helidecks where the actual D-value is less than 15.00 m, the height of the numbers may be reduced from 90 cm to no less than 60 cm.

4.12 A maximum allowable mass marking should be marked on the helideck in a position which is readable from the preferred final approach direction, i.e. towards the OFS origin. The marking should consist of a two- or three-digit number expressed to one decimal place rounded to the nearest 100 kg and followed by the letter ‘t’ to indicate the allowable helicopter mass in tonnes (1000 kg). The height of the figures should be 90 cm with a line width of approximately 12 cm and should be white i.e. be in a colour which contrasts with the helideck surface. For an unpainted aluminium surface a maximum alllowable mass marking (in white characters) should be displayed against a black background. Where possible the mass marking should be well separated from the installation identification marking (see paragraph 4.3) in order to avoid possible confusion on recognition. Refer also to Figure 1 and Chapter 3, Table 1.

4.13 A Touchdown/Positioning Marking (TD/PM) should be provided (see Figures 1 and 3). The marking should be a yellow circle with an inner diameter of 0.5 of the certificated D-value of the helideck and a line width of 1 metre (for new build helidecks below 16m the line width may be reduced to 0.5m). The centre of the marking should be concentric with the centre of the D-circle.

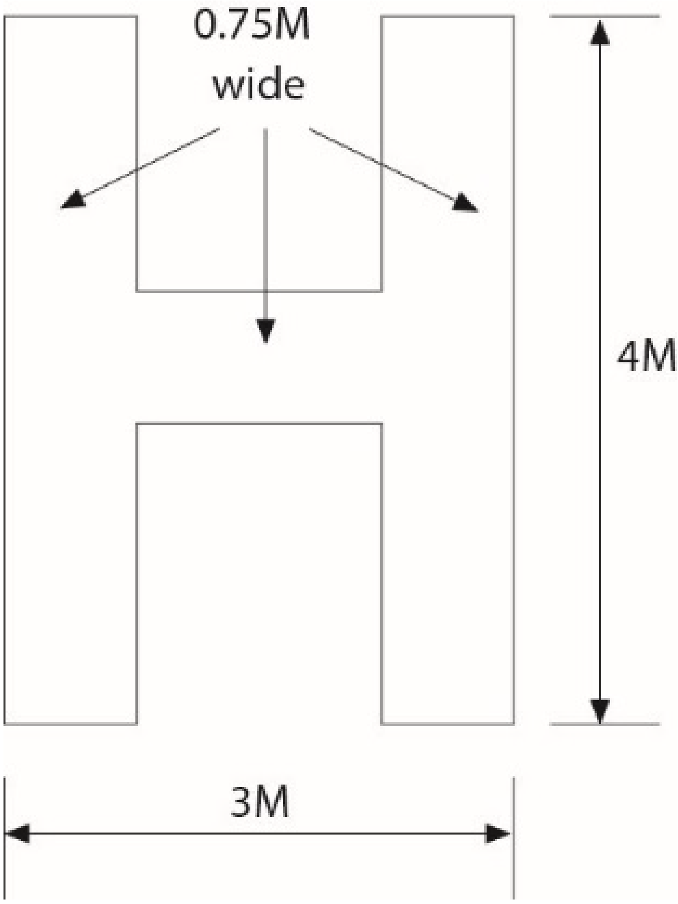
Figure 3: Touchdown/Positioning marking circle (TD/PM circle to be painted yellow



NOTE: On a helideck the centre of the TD/PM Circle will normally be located at the centre of the landing area, except that the marking may be offset away from the origin of the OFS by no more than 0.1D where an aeronautical study indicates such offsetting to be beneficial, provided that the offset marking does not adversely affect the safety of flight operations or ground handling issues.

4.14 A white heliport identification marking 'H' marking should be marked co-located with the TD/PM with the cross bar of the 'H' lying along the bisector of the OFS. Its dimensions are as shown in Figure 4. For new build helidecks having a D-value below 16.0m, the dimensions of the 'H' marking may be reduced to 3m x 2m x 0.5m.

Figure 4: Dimensions of heliport identification marking 'H' ('H' to be painted white)



4.15 Where the OFS has been swung in accordance with Chapter 3 paragraph 3.25 the positioning of the TD/PM and 'H' should comply with the normal unswung criteria. However, the 'H' should be orientated so that the bar is parallel to the bisector of the swung sector.

4.16 Prohibited landing heading sector(s) should be marked where it is necessary to protect the tail of the helicopter from landing or manoeuvring in close proximity to limiting obstructions which, for example, infringe the 150° LOS protected surfaces. When required, prohibited sector(s) are to be shown by red hatching of the TD/PM, with white and red hatching extending from the red hatching out to the edge of the landing area as shown in Figures 5 and 6.

NOTE: When positioning over the TD/PM helicopters should be manoeuvred so as to keep the aircraft nose clear of the hatched prohibited sector(s) at all times.

Figure 5: Specification for the layout of prohibited landing heading segments on helidecks

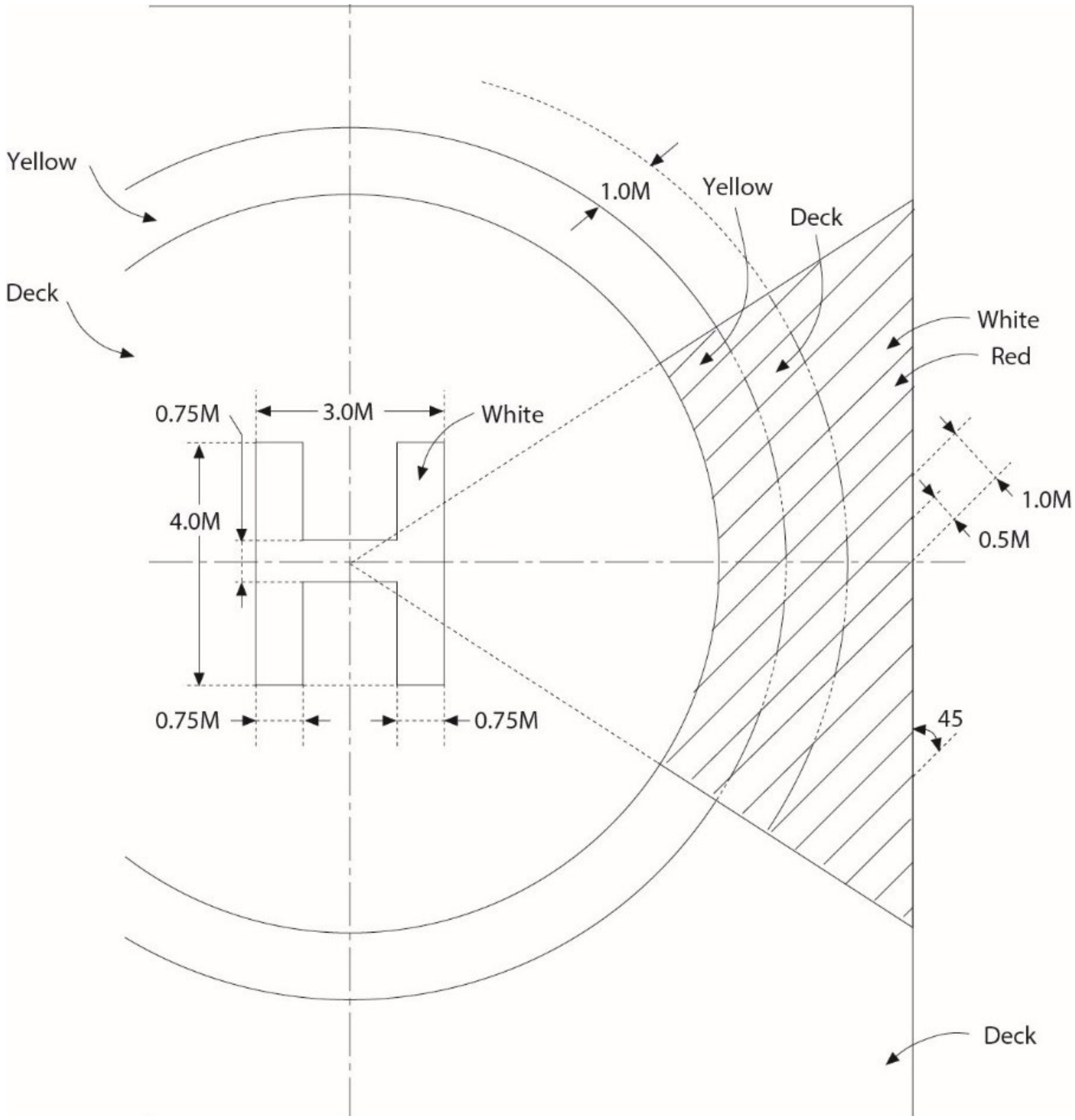
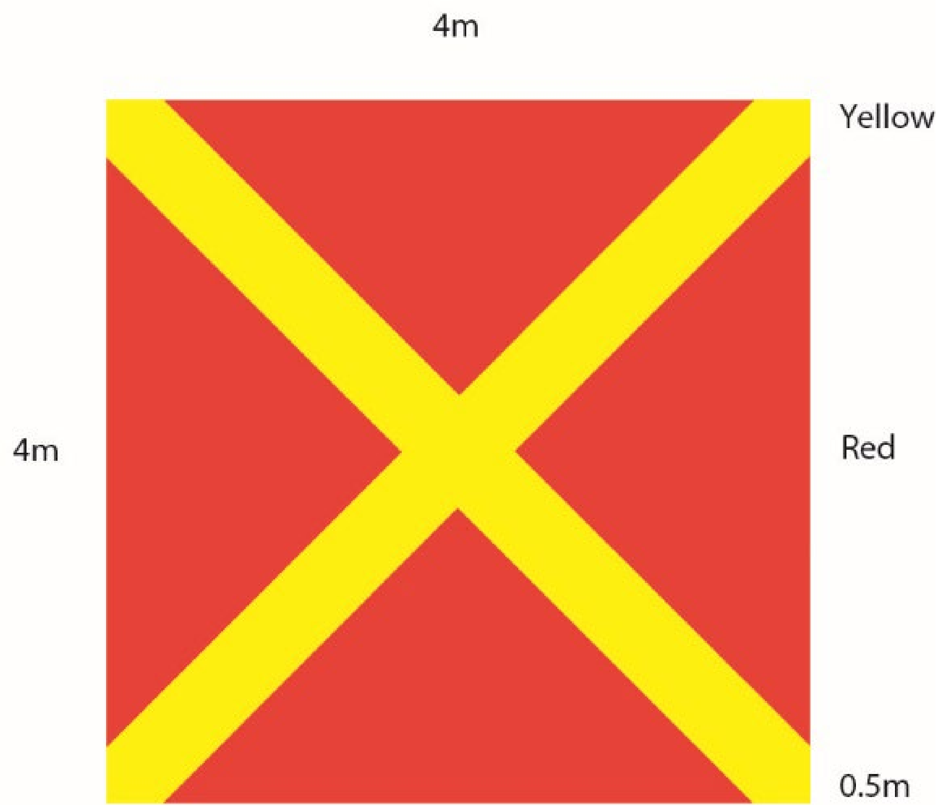


Figure 6: Example of prohibited landing heading marking

NOTE: The position of the 'H' and the orientation of the prohibited landing heading segment will depend on the obstacle.

4.17 For certain operational or technical reasons an installation may have to prohibit helicopter operations. In such circumstances, where the helideck cannot be used, the 'closed' state of the helideck should be indicated by use of the signal shown in Figure 7. This signal is the standard 'landing prohibited' signal given in the Rules of the Air and Air Traffic Control Regulations, except that it has been altered in size to just cover the letter 'H' inside the TD/PM.

Figure 7: Landing on installation/vessel prohibited



NOTE: Signal covers 'H' inside TD/PM.

4.18 Colours should conform with the following BS 381C (1996) standard or the equivalent BS 4800 colour. White should conform to the RAL charts.

- RED
  BS 381C: 537 / RAL 3001 (Signal Red)
  BS 4800: 04.E.53 / RAL 2002 (Poppy)
- YELLOW
  BS 381C: 309 / RAL1018 (Canary Yellow)
  BS 4800: 10.E.53 / RAL1023 (Sunflower Yellow)
- DARK GREEN
  BS 381C: 267 / RAL 6020 (Deep Chrome Green)
  BS 4800: 14.C.39 (Holly Green)
- WHITE
  RAL 9010 (Pure White)
  RAL 9003 (Signal White)

Lighting

NOTE 1: The paragraphs below should be read in conjunction with Appendix C which contains the specification for the full helideck lighting scheme comprising perimeter lights, lit TD/PM Circle and lit heliport identification "H" marking. The specification for each element is fully described in Appendix C with the overall operational requirement detailed in paragraph 1 of the Appendix. The helideck lighting scheme is a requirement for the conduct of night operations and is intended to provide effective visual cues for a pilot throughout the approach and landing manoeuvre at night. Starting with the initial acquisition of the helideck, the lighting needs to enable a pilot to easily locate the position of the helideck on the installation at long range on a well-lit offshore structure. The lighting should then guide the helicopter to a point above the landing area and then provide visual cues to assist with the touchdown. At night, when a helideck is not in use, and to mitigate the possibility of a 'wrong rig landing' on an unsafe helideck, the Lit Touchdown/ Positioning Marking and Lit Heliport Identification Marking should be extinguished. However, green perimeter lights may remain 'on' so that, in an emergency, the outline of the helideck can be distinguished from the air.

NOTE 2: The lighting specification in Appendix C has an in-built assumption that the performance of the helideck lighting system will not be diminished by any other lighting sources on the installation or vessel due to their relative intensity, configuration or colour. Where other non-aeronautical ground lights have the potential to cause confusion or to diminish or prevent the clear interpretation of helideck lighting systems, it will be necessary for an installation or vessel operator to extinguish, screen or otherwise modify these lights to ensure that the effectiveness of the helideck lighting system is not compromised. This will include, but may not be limited to, an assessment of the effect of general installation lighting on the performance of the helideck lighting scheme. The CAA recommends that installation and vessel operators give serious consideration to shielding high intensity light sources (e.g. by fitting screens or louvers) from helicopters approaching and landing and maintaining a good colour contrast between the helideck lighting and surrounding installation lighting. Particular attention should be paid to the areas of the installation adjacent to the helideck.

NOTE 3: The specification contained in Appendix C includes a facility to increase the intensity of some elements of the helideck lighting to compensate for installations or vessels with high levels of background lighting. The setting of the intensity of the helideck lighting should be carried out in conjunction with the helicopter operator as a once-off exercise following installation of the lighting, and subsequently if required following changes to the lighting environment at the installation or vessel. The intensity of the helideck lighting should not be routinely changed, and in any event, should not be altered without the involvement and agreement of the helicopter operator.

Perimeter lighting

4.19 The periphery of the landing area should be delineated by omni-directional green perimeter lights visible from on or above the landing area; however, the pattern formed by the lights should not be visible to the pilot from below the elevation of the landing area. Perimeter lights should be mounted above the level of the helideck but should not exceed the height limitations specified in Appendix C, paragraph C.16. The lights should be equally spaced at intervals of not more than three metres around the perimeter of the landing area, coincident with or adjacent to the white line delineating the perimeter (see paragraph 4.7 above). In the case of square or rectangular decks there should be a minimum of four lights along each side including a light at each corner of the landing area. Recessed helideck perimeter lights may be used at the inboard (150° LOS origin) edge of the landing area where an operational need exists to move large items of equipment to and from the landing area, e.g. where a parking area is provided there may be a need to move the helicopter itself to and from the landing area onto the adjacent parking area. Care should be taken to select recessed helideck perimeter lights that will meet the iso-candela requirements stated in Appendix C, Table 2.

4.20 Where the declared D-value of the helideck is less than the physical helideck area, the perimeter lights should be coincidental with the white perimeter marking and black chevron and delineate the limit of the useable landing area so that, in unusual circumstances where a helicopter touches down inboard of the TD/PM Circle, it can land safely by reference to the perimeter lights on the 150° LOS ‘inboard’ side of the helideck without risk of the main rotor striking obstructions in this sector. By applying the LOS clearances (given in Chapter 3, paragraphs 3.26 to 3.27) from the perimeter marking and coincident lighting, adequate main rotor to obstruction separation should be achieved for the worst-case helicopter intended to operate to the helideck.

Lit TD/PM circle and lit heliport identification 'H' marking and ancillary floodlighting

4.21 In order to aid the visual task of final approach, hover and landing it is important that adequate visual cues be provided. For use at night, this has previously been achieved using floodlighting. However, these systems can adversely affect the visual cueing environment by reducing the conspicuity of helideck perimeter lights during the approach, and by causing glare and loss of pilots' night vision during the hover and landing. Furthermore, floodlighting systems often fail to provide adequate illumination of the centre of the landing area leading to the so-called 'black-hole effect'.

4.22 A lighting scheme comprising a lit TD/PM Circle and a lit heliport identification 'H' marking has therefore been developed and is mandated for operations taking place at night within the UKCS from 1st April 2018 now applied under CAA Safety Directive Number: SD-2022/001 Issued 1 June 2022: Offshore Helicopter Helideck Operations. This scheme, described in detail in Appendix C, has been clearly demonstrated to provide the visual cues required by pilots earlier on in the approach, much more effectively than floodlighting and without the disadvantages associated with floodlights such as glare. If installed, floodlighting systems other than those referred to in paragraph 4.24 below should be switched off during all helicopter movements.

NOTE: The lit TD/PM Circle and a lit heliport identification 'H' marking lighting scheme has been developed to be compatible with helicopters having wheeled undercarriages, this being the prevailing configuration on the UKCS during the development of the specification and at the time of publication. Although the design specifications detailed in Appendix C will ensure the segments and subsections containing lighting elements are compliant with the ICAO maximum obstacle height of 25 mm, compatibility should be considered before operating skidded helicopters to helidecks fitted with this lighting. Due to the potential for raised fittings to induce dynamic rollover of helicopters equipped with skids, it is important that the height of any equipment mounted on the surface of the helideck should be kept as low as possible.

4.23 Although no longer accepted for the provision of primary visual cueing, the CAA has no objection to floodlighting systems being used for the purpose of providing a source of illumination for on-deck operations such as refuelling and passenger handling. Such floodlighting should be switched off during all helicopter movements at the helideck. Where used to assist on-deck operations, particular care should be taken to maintain correct alignment to ensure that floodlights do not cause dazzle or glare to pilots while landed (rotors running) on the helideck. All floodlights should be capable of being switched on and off at the pilot's request. The floodlighting controls should be accessible to, and controlled by, the HLO or Radio Operator.

4.24 Floodlights may still be used for illuminating the installation name and, where applicable, the prohibited landing heading marking(s), on the helideck surface.

4.25 For helidecks located on normally unattended installations (NUIs), it is essential to ensure that the main structure of the platform (or 'legs') are adequately illuminated to improve depth perception and to mitigate the visual illusion that the landing area appears to be 'floating in space'. This is best achieved by providing, in consultation with the helicopter operator(s), floodlighting of the main structure beneath the helideck. Care should be taken to ensure that any potential source of glare from structure lighting is eliminated by directing it away from the approach path of the helicopter, and/or by providing louvres as appropriate.

Helideck status light system

4.26 A visual warning system should be installed if a condition can exist on an installation which may be hazardous for the helicopter or its occupants. The system (Status Lights) should comprise a flashing red light (or lights), visible to the pilot from any direction of approach and on any post-landing heading. The aeronautical meaning of a flashing red light is either “do not land, aerodrome not available for landing” or “move clear of landing area”. The system should be automatically initiated at the appropriate hazard level (e.g. gas release) as well as being capable of manual activation by the HLO. It should be visible at a range in excess of the distance at which the helicopter may be endangered or may be commencing a visual approach. CAA Paper 2008/01 provides a specification for a status light system which is summarised in Appendix J.

4.27 Manual resetting of a status light system may occasionally be required where installed on normally unattended installations (NUIs). In such an event, the duty-holder may present a case-specific risk assessment to the helicopter operator who, if satisfied, may raise a dispensation request to CAA Flight Operations (Helicopters) that, where accepted, would permit flights to installations with operating status lights or to black installations. A CAA Protocol for this process is presented in Appendix I.

UPS requirement

4.28 Installation/vessel emergency power supply design should include the entire landing area lighting system (see Appendix C). Any failures or outages should be reported immediately to the helicopter operator. The lighting should be fed from an Uninterruptable Power Supply (UPS) system. The minimum duration of the Online UPS battery capacity time should be sufficient to cover an approach, landing and take-off, to include on-deck turn-around time; a minimum duration of 30 minutes is recommended.

Obstacles – Marking and lighting

4.29 Fixed obstacles which present a hazard to helicopters should be readily visible from the air. If a paint scheme is necessary to enhance identification by day, alternate black and white, black and yellow, or red and white bands are recommended, not less than 0.5 metres nor more than six metres wide. The use of 'Day-Glo' orange may also be acceptable. The colour should be chosen to contrast with the background to the maximum extent. Paint colours should conform to the references at paragraph 4.18.

4.30 Obstacles to be marked in these contrasting colours include any lattice tower structures and crane booms, in addition to obstacles which are close to the helideck or the LOS boundary. Similarly, parts of the leg or legs of jack-up units adjacent to the landing area which extend, or can extend, above it should also be marked in the same manner. Lattice towers should be painted in their entirety.

4.31 Omnidirectional low intensity steady red obstruction lights conforming to the specifications for low intensity obstacle (Group A) lights described in CAP 168 Licensing of Aerodromes, Chapter 4 and Table 6A.1, having a minimum intensity of 10 candelas for angles of elevation between 0 degrees and 30 degrees should be fitted at suitable locations to provide the helicopter pilot with visual information on the proximity and height of objects which are higher than the landing area and which are close to it or to the LOS boundary. This should apply, in particular, to all crane booms on the installation or vessel. Objects which are more than 15 metres higher than the landing area should be fitted with intermediate low intensity steady red obstruction lights of the same intensity spaced at 10-metre intervals down to the level of the landing area (except where such lights would be obscured by other objects). It is often preferable for some structures such as flare booms and towers to be illuminated by floodlights as an alternative to fitting intermediate steady red lights, provided that the lights are arranged such that they will illuminate the whole of the structure and not dazzle the helicopter pilot. Such arrangements should be discussed with the helicopter operator. Offshore duty holders may, where appropriate, consider alternative equivalent technologies to highlight dominant obstacles in the vicinity of the helideck.

4.32 An omni-directional low intensity steady red obstruction light should be fitted to the highest point of the installation. The light should conform to the specifications for a low intensity obstacle (Group B) light described in CAP 168 Licensing of Aerodromes, Chapter 4 and Table 6A.1, having a minimum intensity of 50 candelas for angles of elevation between 0 and 15 degrees, and a minimum intensity of 200 candelas between 5 and 8 degrees. Where it is not practicable to fit a light to the highest point of the installation (e.g. on top of flare towers) the light should be fitted as near to the extremity as possible.

4.33 In the particular case of jack-up units, it is recommended that when the tops of the legs are the highest points on the installation, they should be fitted with omni-directional low intensity steady red lights of the same intensity and characteristics as described in paragraph 4.32. In addition the leg or legs adjacent to the helideck should be fitted with intermediate low intensity steady red lights of the same intensity and characteristics as described in paragraph 4.31 at 10-metre intervals down to the level of the landing area. As an alternative the legs may be floodlit providing the helicopter pilot is not dazzled.

4.34 Any ancillary structure within one kilometre of the landing area, and which is significantly above helideck height, should be similarly fitted with red lights.

4.35 Red lights should be arranged so that the locations of the objects which they delineate are visible from all directions of approach above the landing area.

4.36 Installation/vessel emergency power supply design should include all forms of obstruction lighting. Any failures or outages should be reported immediately to the helicopter operator and the HCA. The lighting should be fed from a UPS system.

Chapter 5

Helideck rescue and fire-fighting facilities

Introduction

5.1 This Chapter sets out guidance regarding the provision of equipment, extinguishing media, personnel, training, and emergency procedures for offshore helidecks and unless specifically stated it should be assumed that all sections apply to an offshore facility regardless of the manning policy (i.e. whether a permanently attended installation — PAI — or a normally unattended installation — NUI). For editorial convenience, when it fits the context, the generic term “landing area” is used and may be assumed to include both attendance models (PAI and NUI) for fixed helidecks.

5.2 For non-purpose built shipboard heliports on ships constructed before 1 January 2020, RFF arrangements should at-least be in accordance with part C of SOLAS II-2 Helicopter Facilities and for ships constructed on or after 1 January 2020 should at-least meet the relevant provisions of Chapter 17 of the Fire Safety Systems Code. It may therefore be assumed that this chapter does not include RFF arrangements for non-purpose built shipboard heliports or for shipboard winching areas.

5.3 The principal objective of a rescue and fire-fighting response is to save lives. Therefore, the provision of a means of dealing with a helicopter accident or incident occurring at or in the immediate vicinity of the landing area (the response area) assumes primary importance because it is within this area that there are the greatest opportunities for saving lives. This should assume at all times the possibility of, and need for, bringing under control and then extinguishing, a fire which may occur either immediately following a helicopter accident or incident (e.g. post-crash fire) or at any time during rescue operations.

5.4 The most important factors having a bearing on effective rescue in a survivable helicopter accident are the speed of initiating the response and the effectiveness of that response. Requirements to protect accommodation beneath, or in the vicinity of the landing area, a fuel installation (where provided), or the support structure of the landing area are not taken into account in this chapter, nor is any additional considerations that may arise from the presence of a second helicopter located in a parking area (see Chapter 3). In the case of a parking area consideration may be given for providing a passive fire-retarding surface supplemented with hand-held extinguishers.

5.5 Due to the nature of offshore operations, usually taking place over large areas of open sea, an assessment will need to be carried out to determine if specialist rescue services and fire-fighting equipment is needed to mitigate the additional risks and specific hazards of operating over open sea areas. These considerations will form a part of the heliport emergency plan addressed further under paragraph 5.57.

Key design characteristics – Principal agent

5.6 A key aspect in the successful design for providing an efficient, integrated rescue and fire-fighting facility is a complete understanding of the circumstances in which it may be expected to operate. A helicopter accident, which results in a fuel spillage with wreckage and/or fire and smoke, has the capability to render some of the equipment inventory unusable or to preclude the use of some passenger escape routes.

5.7 Delivery of fire-fighting media to the landing area at the appropriate application rate should be achieved in the quickest possible time. The method for delivery of the primary agent is best achieved through a fixed foam application system (FFAS) with an automatic or semi-automatic method for the distribution of extinguishing agent, capable of knocking down and bringing a fire under control in the shortest possible time while protecting the means of escape for personnel to quickly and easily alight clear of the landing area to a place of safety. An FFAS may include, but not necessarily be limited to; a fixed monitor system (FMS) or a deck integrated fire-fighting system (DIFFS). The purpose of this chapter is to discuss in detail the specification for an FMS and, as the alternative means of compliance, the preferred method of delivery widely used in the offshore sector; a DIFFS. However, the critical area calculations illustrated in 5.13 are the recommended minimum objectives for any FFAS. An FMS or DIFFS should therefore be regarded as two different methods by which the uniform distribution of foam, at the required application rate and for the required duration, may be efficiently distributed to the whole of the landing area (an area that is based on the D-circle of the critical (design) helicopter). For an FMS, where, due to their location around the periphery of the helideck, good range of application is essential, foam is initially applied to a localised area as a solid stream (jet) application. A dispersed pattern is capable of being applied through a DIFFS where the requirement is to deliver media at shorter ranges to combine greater coverage and a more effective surface application of primary media. Where a solid plate helideck is provided i.e. a helideck having a surface design set to a fall or camber which allows fuel to drain across the solid surface into a suitable drainage collection system, primary media will always consist of foam (see 5.12 and Note below). However, where the option is taken to install a Passive Fire-Retarding Surface constructed in the form of a perforated surface or grating, which contains numerous holes that allow burning fuel to rapidly drain through the surface of the helideck, the use of water in lieu of foam is accepted. Where seawater is used the critical area calculation applicable for Performance Level C foam may be applied (see 5.13).

NOTE: From time-to-time new technologies may come to market which, providing they are demonstrated by rigorous testing to be at least as effective as the solutions described elsewhere in this chapter, with the approval of the appropriate authority, they may be considered for helideck fire-fighting solutions. For example, Compressed Air Foam Systems (CAFS) may be considered, with foam distributed through a DIFFS. CAFS works by injecting compressed air into foam to generate an effective solution to attack and suppress a helideck fire. This type of foam has a tighter, denser bubble structure than standard foams which allows it to penetrate deeper into the fire before the bubbles are broken down. CAFS will address all sides of the fire triangle by smothering the fire (preventing oxygen from combining with the fuel), by diminishing the heat, using trapped air within the bubble structure, and by disrupting the chemical reaction required for a fire to continue. Hence a reduction in the application rate for a DIFFS using ICAO Performance Level B compressed air foam may be considered— see calculation of application rate at paragraph 5.13.

5.8 Given that the effectiveness of any FFAS is tied to the speed of initiating a response, in addition to the effectiveness of that response, it is recommended that a delay of no more than 15 seconds, measured from the time the system is activated to actual production at the required application rate, should be the objective. The operational objective of an FFAS should ensure that the system is able to bring under control a helideck fire associated with a crashed helicopter within 30 seconds, measured from the time the system is activated and producing foam at the required application rate for the range of weather conditions prevalent for the helicopter operating environment.

NOTE: A fire is deemed to be “under control” at the point when the initial intensity of the fire is reduced by 90%.

5.9 An FFAS should be of adequate performance and be suitably located to ensure an effective application of foam to any part of the landing area, irrespective of the wind strength/direction or accident location when all components of the system are operating in accordance with the manufacturer’s technical specifications for the equipment. However, for a Fixed Monitor System (FMS), consideration should also be given to the loss of a (downwind) foam monitor either due to limiting weather conditions or a crash situation occurring. The design specification for an FMS (usually consisting of 2, 3 or 4 fixed monitors) should ensure the remaining monitors are capable of delivering finished foam to the landing area at, or above, the minimum application rate. For those parts of the landing area or its appendages which, for any reason, may be otherwise inaccessible to an FMS, it is necessary to provide additional hand controlled foam branch pipes as described in paragraph 5.17.

5.10 Consideration should be given to the effects of the weather on static equipment. All equipment forming part of the rescue and fire-fighting response should be designed to withstand protracted exposure to the elements or be protected from them. Where protection is the chosen option, it should not prevent the equipment being brought into use quickly and effectively (see paragraph 5.7 and 5.8 above). The effects of condensation on stored equipment should be considered.

5.11 The minimum capacity of the fixed foam application system will depend on the D-value of the design helicopter, the required foam application rate at the helideck, the discharge rates of installed equipment (e.g. capacity of main fire pump) and the expected duration of application. It is important to ensure that, where installed, the capacity of the main helideck fire pump is sufficient to guarantee that finished foam can be applied at the appropriate induction ratio and application rate, and for the minimum duration, to the whole of the landing area, when all monitors or DIFFS nozzles are being discharged simultaneously.

5.12 The assumed application rate is dependent on the types of foam concentrate in use and the types of foam application equipment selected. For fires involving aviation kerosene, ICAO has produced a performance test which assesses and categorises the foam concentrate. Foam concentrate manufacturers will be able to advise on the performance of their concentrates against these tests. It is recommended that foam concentrates, compatible with seawater and meeting performance level ‘B’ or performance level ‘C’ are used. Level ‘B’ foams should be applied at a minimum application rate of 5.5 litres per square metre per minute. Level ‘C’ foams should be applied at a minimum application rate of 3.75 litres per square metre per minute. Where seawater is used in lieu of foam (see 5.7) the application rate may conform to Performance Level C foam.

NOTE: Compatibility of level C foams when using seawater should be established with the manufacturer.

5.13 **Calculation of Application Rate:** Example based on an S92 (for this illustration assumed to be the design helicopter with a D=20.88):

For an ICAO Performance Level B foam:
Application rate = 5.5 x π x r^2 (5.5 x 3.142 x 10.44 x 10.44) = 1883 litres per minute

For an ICAO Performance Level C foam (or seawater):
Application rate = 3.75 x π x r^2 (3.75 x 3.142 x 10.44 x 10.44) = 1284 litres per minute

For an ICAO Performance Level B compressed air foam:
Application rate = 3.00 x π x r^2 (3.00 x 3.142 x 10.44 x 10.44) = 1028 litres per minute

5.14 Given the often-remote location of helidecks the overall capacity of the foam system should exceed that necessary for initial suppression and extinction of the fire. Five (5) minutes' foam application capability for a solid plate helideck is generally considered to be reasonable. In the case of a passive fire-retarding surface with a water-only DIFFS the discharge duration may be reduced to no less than three (3) minutes.

5.15 **Calculation of Minimum Operational Stocks:** Using the 20.88 metre example as shown in paragraph 5.13 above, a 1% Performance Level B foam solution discharged over five minutes for a solid plate landing area, at the minimum application rate will require 1883 x 1% x 5 = 94 litres of foam concentrate.

A 3% Performance Level C foam solution discharged over five minutes at the minimum application rate will require 1284 x 3% x 5 = 193 litres of foam concentrate

NOTE: Sufficient reserve foam stocks to allow for replenishment resulting from operation of the system during an incident or following training or testing, will also need to be considered.

5.16 Low expansion foam concentrates can generally be applied in either aspirated or non-aspirated form. It should be recognised that whilst non-aspirated foam may provide a quick knockdown of any fuel fire, aspiration, i.e. induction of air into the foam solution discharged by monitor or by hand controlled foam branch (see below), gives enhanced protection after extinguishment. Wherever a non-aspirated FFAS is selected during design, additional hose-lines capable of producing aspirated foam for post-fire security/control should be provided on solid-plate helidecks.

5.17 Not all fires are capable of being accessed by monitors and in some scenarios their use may endanger passengers. Therefore, in addition to foam monitor systems (FMS), there should be the ability to deploy at least two deliveries with hand controlled foam branch pipes for the application of aspirated foam at a minimum rate of 225-250 litres/minute through each hose line. A single hose line, capable of delivering aspirated foam at a minimum application rate of 225-250 litres/minute, may be acceptable where it is demonstrated that the hose line is of sufficient length, and the hydrant system of sufficient operating pressure, to ensure the effective application of foam to any part of the landing area irrespective of wind strength or direction. The hose line(s) provided should be capable of being fitted with a branch pipe able to apply water in the form of a jet or spray pattern for cooling, or for specific fire-fighting tactics.

5.18 As an effective alternative means of compliance to an FMS, offshore helidecks are encouraged to consider the provision of a Deck Integrated Fire Fighting System (DIFFS). These systems typically consist of a series of deck integrated, flush fitted, nozzles which provide both a horizontal and vertical component, designed and tested to deliver an effective spray distribution of foam to the whole of the landing area, and offering protection to the helicopter for a range of weather conditions. This should assume, for the vertical component, a minimum spray height is achieved that corresponds to the lesser of 4m or the wheels-to-rotor height of the design helicopter, measured in calm wind conditions.

Some designs offer a ‘pop-up’ variant, while others provide the same method of dispersion through fixed integrated nozzles known as ‘non-pop up’.

NOTE : DIFFS nozzles may pose a rollover or damage hazard to skid fitted helicopters. These factors may need to be considered when skid fitted helicopters are routinely used.

5.19 A DIFFS on a solid-plate helideck should be capable of supplying performance level B or level C foam solution to bring under control a fire associated with a crashed helicopter within the time constraints stated in paragraph 5.14 achieving an average (theoretical) application rate over the entire landing area (based on the D-circle) of 5.5 litres per square metre per minute for Performance Level B foams and 3.75 litres per square metre per minute for Performance Level C foams, for a duration, which at least meets the minimum requirements stated in paragraph 5.14 above.

NOTE : Helideck nets are considered to be incompatible with a DIFFS installed on a solid-plate helideck due to the likelihood that the presence of the net, fitted to the surface, will have a detrimental impact on the functioning of the DIFFS i.e. the net could foreseeably block, or partially block, one or more of the nozzles during a post-crash fire, at a point when the DIFFS will be operated to control and extinguish the fire. Nets may be permitted where a DIFFS is used in tandem with a passive fire retarding surface.

5.20 Where the FFAS consists of a DIFFS capable of delivering foam and/or seawater in a spray pattern to the whole of the landing area (see paragraph 5.19 to 5.21 and Note below) is selected in lieu of an FMS, full scale testing has confirmed that the provision of additional hand-controlled foam branch pipes may not be essential to address any residual fire situation. Instead any residual fire may be tackled with the use of hand-held extinguishers (see section on Complimentary Media).

5.21 The precise number and lay out of DIFF nozzles will be dependent on the specific landing area design, particularly the dimensions of the landing area. However, nozzles should not be located adjacent to helideck egress points (this may hamper quick access to the helideck by trained rescue crews and/or impede occupants of the helicopter from escaping to a safe place away from the landing area) or on the TD/PM circle or 'H' marking (this will conflict with the installation of the helideck lighting – see Chapter 4 paragraph 4.22). Notwithstanding this, the number and lay out of nozzles should be sufficient to provide an effective spray distribution of foam over the entire landing area with a suitable overlap of the horizontal spray component from each nozzle assuming calm wind conditions. It is recognised in meeting the objective for the average (theoretical) application rate specified in 5.19 above for Performance Level B or Level C foams, there may be some parts of the landing area, particularly where the spray pattern of nozzles significantly over lap, where the average (theoretical) application rate is exceeded in practice. Conversely for other areas the application rate in practice may fall slightly below the average (theoretical) application rate specified in 5.19. This is acceptable provided that the actual application rate achieved for any portion of the landing area does not fall below two-thirds of the application rates specified in 5.19.

NOTE: Where a DIFFS is used in tandem with a passive fire-retarding system demonstrated as capable of removing significant quantities of unburned fuel from the surface of the helideck, in the event of a fuel spill from a ruptured aircraft tank, it is permitted to select a seawater-only DIFFS to deal with any residual fuel burn. A seawater-only DIFFS should meet the same application rate as specified for a Performance Level C foam DIFFS in paragraph 5.19 and duration as specified in 5.14.

5.22 In a similar way to where an FMS is provided (see paragraph 5.8), the performance specification for a DIFFS needs to consider the likelihood that one or more of the DIFF nozzles may be rendered ineffective by the impact of a helicopter on the deck surface. Any local damage to the DIFFS nozzles and distribution system, caused by a helicopter crash, should not hinder the system's overall ability to deal effectively with a fire situation. To this end a DIFFS supplier should be able to verify that a system, where at least one of the nozzles is rendered ineffective, remains fit for purpose, and is able to bring a fire associated with a crashed helicopter "under control" within 30 seconds, measured from the time the system is producing foam at the required application rate.

5.23 A variation on the basic design Level B or Level C foam DIFFS is a DIFFS CAFS (see the Note below 5.7).

5.24 If lifesaving opportunities are to be maximised it is essential that all equipment should be ready for immediate use on, or in the immediate vicinity of, the landing area whenever helicopter operations are being conducted. All equipment should be located at points having immediate access to the landing area. The location of the storage facilities should be clearly indicated.

5.25 Helidecks utilising an automated DIFFS or single point activation fire-fighting systems that would fail if power were lost, should be fed from a UPS system. Where a UPS is provided, it should be periodically tested along with anything that relies on it.

Use and maintenance of foam equipment

5.26 Mixing of different concentrates in the same tank, i.e. different either in make or strength is generally unacceptable. Many different strengths of concentrate are on the market, but the most common concentrates found offshore are 1%, 3% or 6%. Any decision regarding selection should take account of the design characteristics of the foam system. It is important to ensure that foam containers and tanks are correctly labelled.

5.27 Induction equipment ensures that water and foam concentrate are mixed in the correct proportions. Adjustable inductors are not recommended for fixed concentrate systems. However, if installed, settings of adjustable inductors should correspond with the strength of concentrate in use.

5.28 All parts of the foam production system, including the finished foam, should be tested by a competent person on commissioning and annually thereafter. Documented tests, made available to the helideck operator, should assess the performance of the system against original design expectations while ensuring compliance with any relevant pollution regulations.

Complementary media

5.29 While foam is considered the principal agent for dealing with fires involving fuel spillages, the wide variety of fire incidents likely to be encountered during offshore helicopter operations — e.g. engine, avionic bays, transmission areas, hydraulics — may require the provision of more than one type of complementary agent. Dry powder and gaseous agents are generally considered acceptable for this task. The complementary agents selected should comply with the appropriate specifications of the International Organisation for Standardisation (ISO). Systems should be capable of delivering the agents through equipment which will ensure its effective application.

NOTE: Halon extinguishing agents are no longer used offshore. Gaseous agents, including CO_2, have replaced them. The effectiveness of CO_2 is accepted as being half that of Halon.

5.30 Dry chemical powder is recommended as the primary complementary agent. For helidecks up to and including 16.0m the minimum total capacity should be 23kg delivered from one or two extinguishers. For helidecks above 16.0m and up to 24.0m, the minimum total capacity should be 45kg delivered from one or two extinguishers. For helidecks above 24.0m the minimum total capacity should be 90kg delivered from two, three or four extinguishers. The dry powder system should have the capability to deliver the agent anywhere on the landing area and the discharge rate of the agent should be selected for optimum effectiveness of the agent. Containers of sufficient capacity to allow continuous and sufficient application of the agent should be provided.

5.31 A quantity of gaseous agent is recommended in addition to the use of dry powder as a secondary complementary agent. A quantity of gaseous agent should be provided with a suitable applicator for use on engine fires. The appropriate minimum quantity delivered from one or two extinguishers is 9kg for helidecks up to and including 16.0m, 18kg for helidecks above 16.0m and up to 24.0m, and 36kg for helidecks above 24.0m. The discharge rate should be selected for optimum effectiveness of the agent. Due regard should be given to the requirement to deliver gaseous agents to the seat of the fire at the recommended discharge rate. Due to the windy conditions prevalent in the UK offshore sector, complementary agents may be adversely affected during application and training evolutions should take this into account.

5.32 Offshore helicopters have integral engine fire protection systems (predominantly Halon) and it is therefore considered that provision of foam as the principal agent plus suitable water/foam branch lines plus sufficient levels of dry powder with a quantity of secondary gaseous agent will form the core of the fire extinguishing system. It should be borne in mind that none of the complementary agents listed will offer any post-fire security/control.

5.33 All applicators are to be fitted with a mechanism which allows them to be hand controlled.

5.34 Dry chemical powder should be of the 'foam compatible' type capable of dealing with Class B fire for liquid hydrocarbons.

5.35 The complementary agents should be sited so that they are readily available for use.

5.36 Reserve stocks of complementary media to allow for replenishment due to activation of the system during an incident, or following training or testing, should be held.

5.37 Complementary agents should be subject to annual visual inspection by a competent person and pressure testing in accordance with manufacturers' recommendations.

Normally unattended installations

5.38 In the case of normally unattended installations (NUIs), where RFF equipment will not be operated during unattended helicopter movements, the application of foam through a fixed monitor system is not recommended. For installations which are at times unattended, the effective delivery of foam to the whole of the landing area is best achieved by means of a fully-automated DIFFS. See paragraphs 5.19 to 5.21 for specification which, where a tank is used for the storage of water, may utilise potable water in lieu of seawater.

5.39 For NUIs, other 'combination solutions' where these can be demonstrated to be effective in dealing with a running fuel fire, may be considered. This could permit, for example, the selection of a potable-water DIFFS used in tandem with a passive fire-retarding system capable of removing significant quantities of unburned fuel from the surface of the landing area in the event of a fuel spill from a ruptured aircraft tank. In this case the minimum discharge duration should meet the appropriate requirements specified in paragraph 5.14 i.e. 3 minutes.

5.40 DIFFS on NUIs should be integrated with platform safety systems such that DIFFS nozzles are activated automatically in the event of an impact of a helicopter where a post-crash fire (PCF) results. The overall design of a DIFFS should incorporate a method of fire detection and have a manual override function, both on the NUI and on a remote attended installation and/or from the beach, which allows it to be shut-off in the unlikely event of spurious activation or once the fire has been fully extinguished . Like a DIFFS provided for a PAI, a DIFFS on an NUI needs to consider the eventuality that one or more nozzles may be rendered ineffective by, for example, a crash. The basic performance assumptions stated in paragraphs 5.19 to 5.21 should also apply for a DIFFS located on an NUI.

The management of extinguishing media stocks

5.41 Consignments of extinguishing media should be used in delivery order to prevent deterioration in quality by prolonged storage.

5.42 The mixing of different types of foam concentrate may cause serious sludging and possible malfunctioning of foam production systems. Unless evidence is given to the contrary it should be assumed that different types are incompatible. In the event of mixing it is essential that the tank(s), pipe work and pump (if fitted) are thoroughly cleaned and flushed prior to the new concentrate being introduced.

5.43 Consideration should be given to the provision of reserve stocks for use in training, testing and recovery from emergency use.

Rescue equipment

5.44 In some circumstances, lives may be lost if simple ancillary rescue equipment is not readily available.

5.45 The provision of minimum equipment is recommended as listed in Table 1. Sizes of equipment are not detailed in Table 1 but should be appropriate for the types of helicopter expected to use the facility.

5.46 A responsible person should be appointed to ensure that a planned maintenance routine is in place to ensure the rescue equipment is checked and maintained regularly.

5.47 Rescue equipment should be stored in clearly marked and secure watertight cabinets or chests. An inventory checklist of equipment should be held inside each equipment cabinet/chest.

Table 1: Rescue equipment – crash box with breakable tie on the lid

Adjustable wrench	1
Rescue axe, large (non-wedge or aircraft type)	1
Cutters, bolt	1
Crowbar, large	1
Hook, grab or salving	1
Hacksaw (heavy duty) and six spare blades	1
Blanket, fire resistant	1
Ladder (two-piece)*	1
Life line (50 mm circumference x 15 m in length) plus rescue harness	1
Pliers, side cutting (tin snips)	1
Set of assorted screwdrivers	1
Harness knife and sheath or harness cutters**	**
Man-Made Mineral Fibre (MMMF) Filter masks**+	**
Gloves, fire resistant**	**

* For access to casualties in an aircraft on its side.

** This equipment is required for each helideck crew member.

+ Helicopters being operated in the UKCS incorporate composite materials in their construction. When dealing with incidents involving MMMF, filter masks are strongly recommended. The EN Standard Respiratory Protective Equipment Masks for personnel dealing with MMMF incidents are: EN405:2001 + A1:2009 or EN149:2001.

Consideration should be given to providing a stretcher / first aid kit in the inventory of rescue equipment. To ensure suitability for purpose, rescue equipment that meets relevant EU or national standards should be provided.

Personnel levels

5.48 The facility should have sufficient trained fire-fighting personnel who are immediately available during rotors turning operations. A determination of what constitutes “sufficient resources” may be made on a case-by-case basis using a task resource analysis. When conducting an assessment it is recommended that at-least the following should be taken into account:

- The types of helicopters using the helideck including maximum passenger seating configuration, composition, fuel loads (and whether fuel can be uplifted on site).
- The expectations for the rescue of helicopter occupants i.e. requires an assisted rescue model
- Design and complexity of the fire-fighting arrangements i.e. operation of all equipment to address worse case post-crash fire with rescue of occupants
- Availability of additional emergency support personnel to assist dedicated helideck personnel

5.49 Dedicated helideck personnel should be deployed in such a way as to allow the appropriate fire-fighting and rescue systems to be operated efficiently and to maximum advantage so that any helideck incident can be managed effectively. The Helicopter Landing Officer (HLO) should be readily identifiable to the helicopter crew as the person in charge of operations. The preferred method of identification is a brightly coloured ‘HLO’ tabard.

Personal Protective Equipment (PPE)

5.50 All responding rescue and fire-fighting personnel should be provided with appropriate Personal Protective Equipment (PPE) and Respiratory Protective Equipment (RPE) to allow them to carry out their duties in an effective manner.

5.51 Sufficient personnel to operate the RFF equipment effectively should be dressed in protective clothing prior to helicopter movements taking place. Equipment should only be used by personnel who have received adequate information, instruction and training. PPE should be accompanied by suitable safety measures e.g. protective devices, markings and warnings. The specifications for PPE should meet one of the following standards (note these standards are updated from time-to-time):

	EN	BS
Helmet with visor	EN 443	BS EN 443
Gloves	EN 659	BS EN 659
Boots (footwear)	EN ISO 20345	EN ISO 20345
Tunic and Trousers	EN 469	BS EN ISO 14116
Flash-Hood	EN 13911	BS EN 13911

5.52 A responsible person(s) should be appointed to ensure that all PPE is installed, stored, used, checked and maintained in accordance with the manufacturer's instructions through a planned maintenance routine. Facilities should be provided for the cleaning, drying and storage of PPE when crews are off duty. Facilities should be well-ventilated and secure.

5.53 In addition equipment should only be used by personnel who have received adequate information, instruction and training. PPE should be accompanied by suitable safety measures e.g. protective devices, markings and warnings. Appropriate PPE is included in Table 1 below. Specific outcomes from the task-resource analysis, highlighted in paragraph 5.48, may determine a requirement for additional PPE, or that, given the specific rescue model employed, certain items may not be required.

Training

5.54 If they are to effectively utilise the equipment provided, all personnel assigned to RFF duties on the landing area should be fully trained to carry out their duties to ensure competence in role and task. It is recommended that personnel attend an established helicopter fire-fighting course.

5.55 In addition, regular recurrent training in the use of all RFF equipment, helicopter type familiarisation and rescue tactics and techniques should be carried out. Correct selection and use of principal and complementary media for specific types of incident should form an integral part of personnel training.

Emergency procedures

5.56 The heliport emergency plan should specify the actions to be taken in the event of an emergency involving a helicopter on or near the installation or vessel. The heliport emergency plan sets out the procedures for co-ordinating the response of agencies or services that could be of assistance in responding to an emergency at an offshore helideck. Examples of emergencies include crashes on or off the helideck, medical emergencies, dangerous goods occurrences, fires and natural disasters.

5.57 Details of the scope and content for Heliport Emergency Planning are addressed in detail in ICAO Annex 14 Volume II, Chapter 6, Section 6.1. This is reproduced, in the context of offshore operations, below:

- A helideck emergency plan should be established commensurate with the helicopter operations and other activities conducted at the helideck.
- The plan should identify agencies which could be of assistance in responding to an emergency at the helideck or in its vicinity.
- The helideck emergency plan should provide for the coordination of the actions to be taken in the event of an emergency occurring at a helideck or in its vicinity.

- With the approach/departure path at the helideck located over water, the plan should identify which agency is responsible for coordinating rescue in the event of a helicopter ditching and indicate how to contact that agency.
- The plan should include, as a minimum, the following information:
- the types of emergencies planned for;
- how to initiate the plan for each emergency specified;
- the name of agencies on and off the helideck to contact for each type of emergency with telephone numbers or other contact information;
- the role of each agency for each type of emergency;
- a list of pertinent on-helideck services available with telephone numbers or other contact information;
- copies of any written agreements with other agencies for mutual aid and the provision of emergency services; and
- a grid map of the helideck and its immediate vicinity.
- All agencies identified in the plan should be consulted about their role in the plan.
- The plan should be reviewed and the information in it updated at least yearly or, if deemed necessary, after an actual emergency, to correct any deficiency found during an actual emergency.
- A test of the emergency plan should be carried out at least once every three years.

Chapter 6

Miscellaneous operational standards

Landing area height above water level

6.1 In consideration of the effects upon aircraft performance in the event of an engine failure (see Chapter 2) the height of the landing area above water level will be taken into account when deciding on any operational limitations to be applied to specific helidecks. Landing area height above water level is to be included in the information supplied on the helideck template for the purpose of authorising the use of the helideck (see Appendix A).

Wind direction (vessels)

6.2 The ability of a vessel to manoeuvre may be helpful in providing an acceptable wind direction in relation to the helideck location and information provided should include whether the installation or vessel is normally fixed at anchor, single point moored, or semi- or fully manoeuvrable.

Helideck movement

6.3 Floating installations and vessels experience dynamic motions due to wave action which represent a potential hazard to helicopter operations. Operational limitations are therefore set by the helicopter operators which are promulgated in the HLL and incorporated in their Operations Manuals. Helideck downtime due to excessive deck motion can be minimised by careful consideration of the location of the helideck on the installation or vessel at the design stage. Guidance on helideck location and how to assess the impact of the resulting helideck motion on operability is presented in CAA Paper 2008/03 ‘Helideck Design Considerations –

Environmental Effects' which is available on the Publications section of the CAA website at www.caa.co.uk. It is strongly recommended that mobile installation and vessel designers consult CAA Paper 2008/03 at the earliest possible stage of the design process.

6.4 In the interests of safety, the helicopter pilots need to know the magnitude and rate of movement of the helideck surface. The helicopter operator's Operations Manual limitations specify the movement of the helideck in terms of pitch, roll, inclination, Significant Heave Rate (SHR) and Motion Severity Index (MSI)/Wind Severity Index (WSI). It is necessary for details of these motions to be measured by the vessel's Helideck Monitoring System (HMS) and reported as part of the overall Offshore Weather Report (see Appendix E) prior to, and during, all helicopter movements. A helideck motion status indication should be presented on the HMS display and directly to the helicopter pilots via helideck mounted HMS repeater lights to indicate whether the deck is 'in limits' for approach to land as follows:

- Steady BLUE = safe to land (pitch, roll, inclination, SHR and MSI/WSI all within limits).
- Steady AMBER = land with caution (MSI/WSI **only** out of limits). Consider employing revised helideck handling procedures (see NOTE below).
- Steady RED = **do not land** (pitch, roll, inclination or SHR out of limits).

NOTE: Where a helideck status light system is installed (see Chapter 4 paragraph 4.26) the HMS repeater lights should be automatically switched off when the status lights have been activated to avoid the possibility of conflicting and/or confusing signals to the helicopter pilots.

6.5 Pitch and roll reports to helicopters should include values, in degrees, about both axes of the true vertical datum (i.e. relative to the true horizon). It is important that reported values are only related to the true vertical and do not relate to any 'false' datum (i.e. a 'list') created, for example, by anchor patterns or displacement. Pitch should be expressed in terms of 'up' and 'down'; roll should be expressed in terms of 'left' and 'right'; helideck inclination is the angle measured in degrees between the absolute horizon and the plane of the helideck. The pitch, roll and inclination values reported to the helicopter should be the maximum values measured during the previous 20 minutes and should be reported to one decimal place. The helideck status becomes steady RED if either the pitch or roll limit or both are exceeded.

6.6 The SHR value, being twice the Root Mean Square (RMS) heave rate measured over the previous 20-minute period, should be reported in metres per second to one decimal place. Due to the nature of the SHR signal, the following trigger logic should be applied to the SHR input to the helideck motion status:

- The helideck motion status becomes steady RED if:
  - the SHR limit is exceeded; **and**
  - all of the records in the previous 2 minutes have also exceeded the SHR limit (or equivalently, the minimum SHR in the previous 2 minutes exceeds the SHR limit).
- Once the deck motion status is steady RED, it becomes steady BLUE again only if:
  - the SHR falls below 95% of the SHR limit, **and**
  - the mean of the records in the previous 10 minutes is below the SHR limit.

6.7 In principle, MSI/WSI limits are specific to individual helicopter types. However, no individual limits are available and a single generic limit has been produced which is contained in the HMS standard (see Paragraph 6.10) and the HLL Part C. For simplicity, the status of the helideck relative to the MSI/WSI limit is reported via the helideck status indication on the HMS pre landing display which becomes steady AMBER if the MSI/WSI limit is exceeded.

NOTE: The following should be considered when operating on an offshore installation in steady AMBER conditions, in order to minimise time to close-up and depart if conditions deteriorate and to maximise aircraft weight:

- At touchdown, take particular care to align the aircraft as closely as possible with the wind (ideally within ± 10°) at wind speeds greater than 15 kts.
- Both pilots to remain in the cockpit during embarking / disembarking of passengers and bags, and the loading of bags and freight. The flight crew should instruct the HLO to permit only one of these activities to take place at a time.
- Embarking and disembarking passengers should be swapped in small numbers.
- Avoid refuelling.
- One pilot may leave the aircraft to confirm its security, once all activities have been completed.

6.8 In addition to helideck motion, vessel heading relative to the heading of the helicopter during the final approach and landing is also important on some types of vessels. This can affect the visual cues that will be available to the pilot on landing, and the availability of an obstacle clear area behind the helicopter.

6.9 Once the helicopter has landed it remains vulnerable to environmental conditions, the most significant of which is the relative wind direction (RWD). The pilot will report the heading of the helicopter to the vessel after landing which is input to the HMS. The HMS then switches to 'on-deck' mode and calculates and monitors the relative to the generic RWD limit contained in the HMS standard (see Paragraph 6.10). The RWD status is reported via the helideck status indication on the HMS on deck display as follows:

- Flashing (slow) BLUE = HMS in 'on-deck' mode, RWD is within limits).

- Flashing (fast) AMBER = RWD limit approaching (within 5° and/or 5 kts of the limit), investigate cause and plan mitigating actions (see NOTE below).
- Flashing (fast) RED = RWD limit exceeded, perform planned mitigating actions.

NOTE: If a flashing AMBER RWD warning occurs at any time after touchdown, the RO should investigate the cause:

- If due to vessel heading change, RO to take action to correct vessel heading and/or pilot to decide what mitigating action is required.
- If due to wind direction change, RO to advise changes in trend, and pilot to decide what mitigating action is required.

If the RWD continues to increase and the deck motion lights flash RED, consideration should be given to performing a take-off and reposition, oriented into wind. If the lights flash RED or the aircraft commander is at all concerned about the stability of the helicopter, all helideck operations should cease and preparations should be made for a safe and timely departure.

Normal take-off procedures should be followed if a re-orientation into wind is required following landing.

6.10 It is strongly recommended that all moving helidecks are equipped with electronic motion-sensing systems (i.e. HMS) which are necessary to provide the functionality described above to an appropriate level of accuracy and integrity. A suitable HMS standard is published by the Helideck Certification Agency (see www.helidecks.org). The specification for the HMS repeater lights is presented in Appendix J and is also included in Rev.9b of the HMS standard.

6.11 HMS complying with Rev. 9 or later of the HMS standard were mandated for operations on the UKCS from 1st April 2021 now applied under CAA Safety Directive Number: SD-2022/001 Issued 1 June 2022: Offshore Helicopter Helideck Operations. HMS should comply with Rev. 9c of the HMS standard from 1st October 2024. In the event that an HMS is not available or the HMS installed is inoperative or non-compliant, the stable helideck conditions detailed in the HLL Part C should be applied to helicopter operations, i.e. maximum pitch and roll 1°, maximum SHR 0.4 metres per second.

6.12 The HMS should be powered from an uninterruptable power supply (UPS – see Chapter 4 paragraph 4.28).

Helideck motion reporting

6.13 Information on helideck movement should be passed to the helicopter in an unambiguous format using a standard radio message and should include helideck pitch, roll, inclination and helideck status (i.e BLUE, AMBER or RED). This will, in most cases, be sufficient to enable the helicopter flight crew to make safety decisions. Should the helicopter flight crew require other motion information or amplification of the standard message, the crew will request it (for example, yaw and heading information). For further guidance refer to CAP 413 Radiotelephony Manual.

6.14 The following provides a representative example of the correct message format in respect of pitch, roll and heave rate:

- **Situation:** The maximum vessel movement (over the preceding 20-minute period) about the pitch axis is 2.1° up and 2.3° down. The maximum vessel movement (over the preceding 20-minute period) about the roll axis is 1.6° to left and 3.6° to right (i.e. this vessel may have a permanent list of 1° to right and is rolling a further 2.6° either side of this ‘false’ datum). The SHR recorded over the preceding 20-minute period is 1.1 metres per second. The maximum helideck inclination is 2.8°.
- **Report:** “Pitch 2.1° up and 2.3° down; roll 1.6° left and 3.6° right; Significant Heave Rate 1.1 metres per second; maximum helideck inclination 2.8°”.

NOTE: Where there is a list or trim such that the vessel movement is all to one side of the respective datum, the pitch and roll should be reported ‘as seen’. For example, if the maximum vessel movement (over the preceding 20-minute period) is 1° down and 2.5° down about the pitch axis and 0.5° right and 2.8° right about the roll axis, the report should be “Pitch 1° down and 2.5° down; roll 0.5° right and 2.8° right.”

Meteorological information

(Relevant references are listed in Appendix B.)

(Additional guidance is listed in Appendix E.)

6.15 Accurate, timely and complete meteorological observations are necessary to support safe and efficient helicopter operations.

Meteorological observations

6.16 In addition to the data covered by paragraph 6.4, it is strongly recommended that installations are provided with an automated means of ascertaining the following meteorological information at all times:

- wind speed and direction (including variations in direction);
- air temperature and dew point temperature;
- QNH and, where applicable, QFE;
- cloud amount and height of base (Above Mean Sea Level (AMSL));
- visibility; and
- present weather.

NOTE 1: Where an attended installation is within 10NM of another attended installation that is equipped with an automated means of ascertaining the cloud amount and height of base, visibility and present weather, and which also makes this information routinely available to other installations, the output from the sensors may be used by the other installation's Met Observer as the basis for a report providing that the information has been manually checked and qualified before it is issued.

NOTE 2: Appropriate consideration and provision for service continuity of automated observing equipment should be made, including any necessary support facilities, such as contingency equipment and power.

NOTE 3: Contingency meteorological observing equipment providing manual measurements of air and dew point temperatures, wind speed and direction and pressure is recommended to be provided in case of the failure or unavailability of the automated sensors.

Assessment of wind speed and direction

6.17 For recording purposes a primary anemometer positioned in an unrestricted air flow is required. If the location of the primary anemometer is obstructed then a second anemometer should be fitted at a location in an unrestricted airflow to cover any compass point that may be obstructed from the primary wind sensor. For further details regarding the siting of anemometer see Appendix E, Paragraph E.33. An indication of wind speed and direction should also be provided visually to the pilot by the provision of a wind sock (wind sleeve) coloured so as to give maximum contrast with the background (see also Chapter 4, paragraph 4.5).

NOTE: A second wind sock (wind sleeve), located at a suitable height and position, can give useful information on wind velocity at hover height over the helideck in the event of turbulent or disturbed air flows over the deck.

Reporting of meteorological information

6.18 Up-to-date, accurate meteorological information is used by helicopter operators for flight planning purposes and by crews to facilitate the safe operation of helicopters in the take-off and landing phases of flight. Reports should be provided by the Met Observer (or at NUI's, the automated equipment) located at the installation concerned and not by Met Observers or automated equipment located on neighbouring installations or from standby boats in the vicinity.

Pre-flight weather reports

6.19 The latest weather report from each installation should be made available to the helicopter operator one hour before take-off. These reports should contain:

- the name, ICAO Location Indicator (if applicable) and location of the installation (latitude and longitude in degrees and decimal minutes);
- the date and time the observation was made;
- wind speed and direction;
- visibility;
- present weather (including presence of lightning);
- cloud amount and height of base;
- temperature and dew point;
- QNH and QFE; and
- details of unserviceable Met sensors (including the original date that the sensor became unserviceable).

Additional information should be provided from mobile installations and vessels as follows:

- Max. pitch and max. roll;
- Max. helideck inclination; and
- Significant Heave Rate;
- Helideck status, i.e. blue, amber or red (See Paragraph 6.4)

Where measured, the following information should also be included in the weather report:

- significant wave height.

NOTE: Additional non-meteorological information may be required to be provided, e.g. fuelling installation, radio frequencies or passenger numbers.

Radio messages

6.20 A standard radio message should be passed to the helicopter operator which contains information on the helideck weather in a clear and unambiguous format. When passing weather information to flight crews it is recommended that the information be consistently sent in a standard order as detailed in CAP 413 'Radiotelephony Manual' and in the OGUK 'Guidelines for the Management of Aviation Operations'. This message will usually be sufficient to enable the helicopter crew to make informed safety decisions. Should the helicopter crew require other weather information or amplification of the standard message they will request it.

Collection and retention of meteorological information

6.21 Records of all meteorological reports that are issued are required to be retained for a period of at least 30 days.

Real-time web-based systems

6.22 All meteorological information produced by offshore installations (whether they are operating for the Oil and Gas or Renewable Energy sectors) should be made readily available (via a real time web-based system) so that helicopter operators, installation duty holders and others can access the latest information in one place and in real time, thereby enhancing users' situational awareness of weather conditions across the North Sea.

Oil and Gas Sector

All installations should supply meteorological information to the Offshore Energies UK 's “Offshore Helicopter Weather Network” (OHWN). OEUK OHWN is a web-based system that provides an efficient and consistent method of submitting weather reports and information from automated sensors to the helicopter operators. OEUK OHWN also performs some verification of information submitted via the system which reduces the risk of data entry errors.

Renewables Sector

In order that helicopter operators and others can access the latest information **in one place** it is strongly recommended that all installations should supply meteorological information to the Offshore Energies UK 's “Offshore Helicopter Weather Network” (OHWN).

AUTO METARS

Where appropriate, AUTO METARS may be generated from automated meteorological reports which, provided all the required parameters are being generated, may be made available on the Aeronautical Fixed Service (AFS) channels, including the Aeronautical Fixed Telecommunications Network (AFTN).

NOTE 1: Following consultation in 2008 it was agreed by Oil & Gas UK (now Offshore Energies UK) and Oil and Gas Producers groups that 14 installations would provide half hourly AUTO METAR reports on a 24 hour basis to be distributed on the AFTN. The installations were selected as they had all the required sensors and were located in positions such that AUTO METARs would provide wider weather situational awareness across the North Sea domain. Of the original 14 installations the following 12 installations are providing AUTO METARs in 2022.

Installation	ICAO Location Indicator
Andrew	EGRO
Bruce	EGRK
Clair	EGRF
Cleeton	EGRT
Cormorant Alpha	EGRG
ETAP CPF (Marnock)	EGRS
Fulmar Alpha	EGRN
Harding	EGRL
Magnus	EGRE
Mungo	EGRP
Ravenspurn N	EGRV
West Sole	EGRW

NOTE 2: If one of the installations specified above stops producing AUTO METARs, for example if it is de-commissioned, the impact to weather situational

awareness should be assessed and AUTO METAR production at another installation in a suitable position should be established as applicable.

Meteorological observer training

6.23 Personnel who carry out meteorological observations on offshore installations should undergo formal meteorological observer training and be certificated by a CAA approved training organisation for this role. Observers should complete refresher training provided by a CAA approved training organisation every two years to ensure they remain familiar with any changes to meteorological observing practices and procedures.

6.24 Information on CAA approved training organisations and recognised training courses for offshore meteorological observers are published and updated each year in the UK AIP, GEN 3.5.

6.25 Training on the use of contingency meteorological equipment and procedures should be provided to enable a suitable level of accuracy and regularity of observations to be maintained in case of the failure or unavailability of automated sensors.

Calibration of meteorological equipment sensors

6.26 Calibration of primary and contingency meteorological equipment sensors used to provide the data listed in paragraph 6.16 should be periodically carried out in accordance with the manufacturers' recommendations in order to demonstrate continuing adequacy for purpose. Procedures for calibration of meteorological equipment should be documented in the offshore duty holder's/vessel operators management system (as applicable).

Location in respect to other landing areas in the vicinity

6.27 Mobile installations and support vessels with helidecks may be positioned adjacent to other installations so that mutual interference/overlap of obstacle protected surfaces occur. Also on some installations there may be more than one helideck which may result in a confliction of obstacle protected surfaces.

6.28 Where there is confliction as mentioned above, within the OFS and/or falling gradient out to a distance that will allow for both an unobstructed departure path and safe clearance for obstacles below the helideck in the event of an engine failure for the type of helicopter the helideck is intended to serve (see also Glossary of Terms. Note: for helicopters operated in Performance Class 1 or 2 the horizontal extent of this distance from the helideck will be based upon the one-engine inoperative capability of the helicopter type to be used), simultaneous operation of two helicopter landing areas is not to take place without prior consultation with the helicopter operator. It is possible, depending upon the distance between landing areas and the operational conditions which may pertain, that simultaneous operations can be permitted but suitable arrangements for notification of helicopter crews and other safety precautions will need to be established. In this context, 'flotels' will be regarded in the same way as any other mobile installation which may cause mutual interference with the parent installation approach and take-off sector. For a detailed treatment of this subject readers are recommended to refer to the OGUK 'Guidelines for the Management of Aviation Operations'. See also Chapter 3 which addresses issues from the perspective of the impact of environmental effects on helideck operations.

Control of crane movement in the vicinity of landing areas

6.29 Cranes can adversely distract pilots' attention during helicopter approach and take-off from the helideck as well as infringe fixed obstacle protected surfaces. Therefore it is essential that when helicopter movements take place (±10 minutes) crane work ceases and jibs, ‘A’ frames, etc. are positioned clear of the obstacle protected surfaces and flight paths. When a crane is in an awkward/unusual position the aircrew should ask for it to be stowed - even if this delays the flight.

6.30 The HLO should be responsible for the control of cranes in preparation for and during helicopter operations.

General precautions

6.31 Whenever a helicopter is stationary on board an offshore installation with its rotors turning, except in case of emergency, no person should enter upon or move about the helicopter landing area otherwise than within view of a helicopter flight crew member or the HLO and at a safe distance from its engine exhausts and tail rotor. It may also be dangerous to pass under the main rotor disc in front of helicopters which have a low main rotor profile.

6.32 The practical implementation of paragraph 6.31 is best served through consultation with the helicopter operator for a clear understanding of the approach paths approved for personnel and danger areas associated with a rotors-running helicopter. These areas are type-specific but, in general, the approved routes to and from the helicopter are at the 2–4 o’clock and 8–10 o’clock positions. Avoidance of the 12 o’clock (low rotor profile helicopters) and 6 o’clock (tail rotor danger areas) positions should be maintained.

6.33 Personnel should not approach the helicopter while the helicopter anti-collision (rotating/flashing) beacons are operating. In the offshore environment, the helideck should be kept clear of all personnel while anti-collision lights are on.

Installation/Vessel helideck operations manual and general requirements

6.34 The maximum helicopter mass and D-value for which the deck has been designed and the maximum size and MTOM of helicopter for which the installation is certified should be included in the Operations Manual. The extent of the obstacle-free area should also be stated and reference made to any helideck operating limitation imposed by helicopter operators as a result of any non-compliance. Non-compliances should also be listed.

Helicopter operations support equipment

6.35 Provision should be made for equipment needed for use in connection with helicopter operations including:

- chocks and tie-down strops/ropes (strops are preferable);
- heavy-duty, calibrated, accurate scales for passenger baggage and freight weighing;
- a suitable power source for starting helicopters if helicopter shut-down is seen as an operational requirement;
- spill kit; and
- equipment for clearing the helicopter landing area of snow and ice and other contaminants.

6.36 Chocks should be compatible with helicopter undercarriage/wheel configurations. Helicopter operating experience offshore has shown that the most effective chock for use on helidecks is the ‘NATO sandbag’ type. Alternatively, ‘rubber triangular’ or ‘single piece fore and aft’ type chocks may be used as long as they are suited to all helicopters likely to operate to the helideck. The ‘rubber triangular’ chock is generally only effective on decks without nets.

6.37 For securing helicopters to the helideck it is recommended that adjustable tie-down strops are used in preference to ropes. Specifications for tie-downs should be agreed with the helicopter operators.

Aeronautical communications and navigation facilities

6.38 Detailed guidance on the provision and operation of aeronautical communications and navigation facilities associated with offshore helicopter landing areas is given in the OGUK publications 'Guidelines for the Management of Aviation Operations' and 'Guidelines for Safety Related Telecommunications Systems On Fixed Offshore Installations'.

6.39 Offshore Radio Operators, HLOs, Helideck Assistants and other persons who operate VHF aeronautical radio equipment are required to hold a UK CAA Offshore Aeronautical Radio Station Operator's Certificate of Competence (ROCC). Further information can be found firstly on the CAA website 'Radio Operator's Certificate of Competence' and additionally in CAP 452 'Aeronautical Radio Station Operator's Guide' and CAP 413 'Radiotelephony Manual' .

NOTE: Provided the radio does not have a transmit function, users will not be required to hold a ROCC for listening purposes only.

6.40 Offshore fixed installations, mobile installations and vessels which have aeronautical radio equipment and/or aeronautical Non-Directional Radio Beacons (NDBs) installed on them and are operating in UK Internal Waters, UK Territorial Waters or within the limits of the UKCS are required to hold a valid Wireless Telegraphy (WT) Act licence and Air Navigation Order (ANO) approval. It should be noted, however, that the provision of an NDB on fixed installations, mobile installations and vessels is not mandatory and use should be discussed with the provider of helicopter services to ascertain their needs.

Ofcom form OfW586a 'Aeronautical radio ground station licence application form' may be used to apply for both the WT Act licence and ANO approval and can be found at https://www.ofcom.org.uk/manage-your-licence/radiocommunication-licences/aeronautical-licensing. The completed application should be submitted to spectrum.licensing@ofcom.org.uk. Operators wishing to establish an aeronautical radio station/beacon are required to obtain regulatory approval from the Civil Aviation Authority prior to operating the radio station/beacon. It is important that any changes in operation, ownership or radio station/beacon equipment are also notified using form OfW586a. It should be noted that coordination with other European states may be necessary before a frequency can be assigned and therefore applications should be made as early as possible.

NOTE: Offshore fixed installations are assigned a traffic and logistics VHF channel, or a single channel to be used for both traffic and logistics services. For mobile vessels the radio channels are assigned using an area system based on blocks. Details of this system are published in UK AIP ENR 1.6 ATS Surveillance Services and Procedures, section 4.5.5 (RFT and NDB frequencies used on Off-shore installations) in combination with charts ENR 6-28, ENR 6-29 or ENR 6-30.

6.41 Aeronautical radio equipment should be powered from a UPS system.

6.42 Simultaneous operation of the Traffic and LOG frequencies may be required, therefore installations are required to carry radio facilities to support this.

Chapter 7

Helicopter fuelling facilities – Systems design and construction

General

7.1 The contents of this chapter are intended to give general advice / best practice for the design and construction requirements for helicopter fuelling systems intended for use on fixed offshore installations, Mobile Offshore Units and Vessels. The information has been compiled by OEUK in consultation with the UK offshore oil and gas industry and specialist fuelling companies. Additionally, as a reference document for best practice, the information provided herein should act as guidance for the continued improvement of legacy offshore helicopter fuelling systems. As refuelling equipment technology and design improves, when the risks associated with offshore helicopter fuelling can be further reduced by implementing improvements and / or alternate technical solutions, this should be carried out whenever practicable. Works undertaken on legacy refuelling systems that are subject to repair and / or refurbishment should, where practicable and economically viable, comply with these standards and guidelines.

7.2 The OEM of new-build refuelling systems should ensure that design is in accordance with aviation fuel industry standards, and is specific to the grade of fuel to be used. A Statement of Compliance should be issued to certify that the system conforms to CAP 437 design requirements as well as any other relevant standards specific to the design. When installed on a Mobile Offshore Unit or Vessel, in addition to meeting the requirements of Chapters 7 & 8 of CAP 437, it may also be necessary to demonstrate compliance with specific rules of the class society (e.g. ABS, Bureau Veritas, DNV, Lloyds Register, etc.).

7.3 The Civil Aviation Authority recognises that the Joint Inspection Group (JIG) in association with the Energy Institute (EI) is a world-leading organisation in development of standards governing the aviation fuel supply chain. Although JIG Standard 1, 2 & 4 and EI/JIG Standard 1530, do not directly relate to offshore refuelling scenarios, this chapter has been prepared with the relevant content of these standards in mind. Where the reader is referred to other standards or alternative guidance, the reference documents used should always be checked by the reader to ensure they are up-to-date and reflect current best practice.

Product identification

7.4 It is essential to ensure at all times that aviation fuel delivered to helicopters from offshore installations and vessels is of the highest quality. A major contributor toward ensuring that fuel quality is maintained and contamination is prevented is to provide clear and unambiguous product identification on all system components and pipelines denoting the fuel type (e.g. Jet A-1) following the standard aviation convention for markings and colour code. Details can be found in EI Standard 1542 'Identification markings for dedicated aviation fuel manufacturing and distribution facilities, airport storage and mobile fuelling equipment' (latest edition). The correct identification markings should initially be applied during system manufacture and routinely checked for clarity during subsequent maintenance inspections.

Fuelling system categories

7.5 It should be noted that an offshore fuelling system may vary according to the particular application for which it was designed. Nevertheless the elements of all offshore fuelling systems are basically the same and refuelling systems will generally fall into one of two categories:

'Transportable Tank System' consisting of:

- a transit tank laydown area and owned or rented transit tanks,
- a fuel delivery pumping system, and
- a dispensing system.

NOTE: The terms 'Transportable Tank' and 'Transit Tank' are synonymous and both terms are used throughout this document.

'Static Storage Tank System' consisting of:

- a transit tank laydown area and owned or rented transit tanks,
- static storage facilities and, if installed, a sample reclaim tank (see note),
- fuel delivery and fuel transfer pumping systems or a combined delivery and transfer pumping system, and
- a dispensing system.

NOTE: On legacy Transportable Tank Systems where built-in static storage tanks are not provided, delivery of fuel is direct to the aircraft from transit tanks. In this case, in order to prevent un-quantified mixing of fuel batches within transit tanks where fuel density requires to be tightly controlled, sample reclaim tanks should not be used.

General design considerations

7.6 When preparing a layout design for aviation fuelling systems on offshore installations and vessels it is important to make provisions for suitable segregation and bunding of the areas set aside for the tankage, pumping and dispensing systems. Facilities for containing possible fuel leakage until waste fuel can be properly disposed of should be given full and proper consideration.

7.7 Although Jet A-1 is a flammable hydrocarbon, it is a relatively safe fuel in comparison to other shorter-chain hydrocarbons, having a flash point of at least 38˚C, and is designed to ignite in an atomised form as it is injected into an aircraft engine. It is not designed to burn in liquid form at temperatures below its flashpoint. Additionally, ignition sources are generally well controlled in an offshore operating environment, however, the movement of fuel through system components may generate electrostatic charges. Grounding of electrostatic charges may generate a spark / source of ignition. System design should therefore take into consideration engineering controls to prevent fuel from being exposed to conditions similar to ideal ignition conditions as the presence of Jet A-1 in an offshore environment constitutes a major safety hazard. Considerations should include but not be limited to:

- Proximity to heat sources may necessitate consideration of heat shielding.
- Earth bonding is a requirement throughout the system, including; tank earthing leads and clamps, system pipework and equipment bonding, aircraft primary bonding lead and pressure refuelling coupling / gravity nozzle secondary bonding leads.
- Protection of system components from over-pressurisation due to thermal expansion should be considered, especially in sections of the system where components can be isolated from the mandatory EI 1596 filter vessel thermal expansion relief valve by closure of isolation valves.
- Provision of fire control should be given full and proper consideration.
- Adequate protection should be provided from potential dropped objects (e.g. due to crane operations) which could cause uncontrolled release of fuel under pressure if damage were to occur, or the potential effects should be mitigated.

7.8 Systems should be designed with full and proper consideration given to safeguard against the possibilities of accidental or malicious introduction of contaminants to the fuel at any stage. Considerations should include but not be limited to:

- Shielding from rainwater, snow, windborne debris and other environmental factors where possible, especially around openings and access points.
- Shielding from accidental deluge release or other fire protection measures where possible, especially around openings and access points.
- Any openings or access points such as inspection hatches, dip valves, etc, which provide access to fuel or equipment which fuel passes through, especially fittings mounted on tops of static storage, transit or product recovery tanks that are easily opened, should have the capability of being locked or having a frangible seal installed to verify contents have not been tampered with.

System component design requirements

Static storage tanks

7.9 All new build Offshore Static Storage Tank Fuelling Systems should provide static storage tanks constructed to suitable standards. Acceptable standards include ASME VIII, PED 2014/68/EU and BS EN 13445. The tank should be cylindrical and mounted with an obstacle free centreline slope to a small cone-shaped or dished positive drainage sump or low point. This slope should be at least 1 in 30, although 1 in 25 is preferred. Where tanks are fitted with baffles, they should have drainage channels at the centreline.

7.10 Tanks may be constructed from stainless steel or mild steel. If mild steel is used, then the tanks should be lined internally with a suitable white or light-coloured, fuel-resistant epoxy lining, conforming to the requirements of the latest editions of EI Standard 1541, ‘Requirements for internal protective coating systems used in aviation fuel handling systems’ or Def Stan 80-097 ‘Paint, System, for the Interior of Bulk Fuel Tanks and Fittings, Multi-Pack’. External surfaces should be lined with a suitable paint system to resist the marine operating environment and fuel spillage.

7.11 Tanks should be clearly and permanently marked on their identification plate with the tank's actual capacity, working capacity and tank serial number.

7.12 Static storage tanks should be equipped with the following:

7.12.1. **Manhole:** A 600 mm (24") or greater diameter manhole which should normally be hinged to assist easy opening.

7.12.2. **Inspection Hatch:** A 150 mm (6") inspection hatch to allow for a visual inspection of the low end of the tank or for taking mid level and high level samples (e.g. using a sample flask) in order to investigate fuel contamination issues.

7.12.3. **Contents measuring device:** A suitable dipstick or dip-tape should be provided to be used in conjunction with a millimetre dip conversion chart specific to the tank, with a means of access to the tank interior. A sight glass or contents gauge may also be provided to determine the tank contents. Additionally, tanks may be fitted with low and high level transmitters interfaced with the control system to safeguard against pump cavitation and to prevent overfilling.

NOTE: A dipstick or an electronic tank contents monitoring system is required to accurately determine the tank contents and the amount of usable fuel remaining in the tank. This will not be achieved using a level gauge and thus, it will increase the risk of entrained air being delivered into the aircraft fuel tanks.

7.12.4. **Overfill Protection:** A means of preventing or reducing the possibility of tank overfill should be incorporated, utilising a tank contents monitoring system or a high-level float to activate pump-shut down, inlet valve closure or some other physical means of preventing more fuel from entering the tank.

7.12.5. **Vent:** A free vent or a pressure / vacuum relief valve should be fitted. Type and pressure settings should be in accordance with the tank manufacturer's recommendations based on design pressure calculations for the vessel. Vents or relief valves should be designed and mounted in such a way as to prevent water ingress.

7.12.6. **Outlet and fill connections:** Separate outlet and fill connections with the fill point arranged so that there is no free-fall of product at any stage of the tank filling. This is to prevent splash filling which may cause fuel atomisation resulting in conditions suitable for fuel ignition. The draw-off point for the tank should be designed such that there is at least 150 mm (6”) of ‘dead-stock’ fuel when the tank breaks suction. This can be achieved by either positioning the draw-off point higher than the lowest point of the tank or preferably by use of a floating suction arm.

7.12.7. **Sample connection:** A stainless steel sample point should be fitted to the sump at the lowest point of the tank. The sample line should be double valved with the downstream valve being a full bore ball valve to prevent trapping of sediment and to allow samples to be taken under full flow conditions in a controlled manner. Where practicable, the downstream valve should have spring return operation as a safety feature. Sample lines should be a minimum of 19 mm (¾”) nominal bore but preferably 25 mm (1”) nominal bore. It should terminate with a captive dust cap at a location conducive to sampling operations and positioned such as to allow sufficient access, space and height to accommodate at least a standard 3-litre sample jar, but preferably able to accommodate a 10-litre stainless steel sampling bucket.

7.12.8. **Floating suction:** When floating suction is embodied then a mean of checking correct function / buoyancy should be installed. Floating suction offers some advantages over other outlet types, including shorter fuel settling times after replenishment, and is therefore strongly recommended. However, the size and shape of the tank should also be considered to determine suitability for incorporating into a fixed or mobile installation design along with the capacity required to service the intended offshore helicopter operations.

7.12.9. **Remotely operated closure valves:** Remotely operated quick closure valves for fill and discharge points should be fitted. These may be integral to the tank, such as an actuated foot valve arrangement, or may be mounted to the tank nozzles. These valves should be capable of operation from both the helideck and from another point which is at a safe distance from the tank.

7.12.10. **Tank shell outer surface finish:** The static storage tank shell should be suitably primed and then finished in safety yellow (BS 4800, Type 08.E.51). Where the tank shell is fabricated from stainless steel it may remain unpainted. Safety yellow is not mandatory but has been generally accepted for helifuel tanks. All component parts should be properly bonded for earth continuity before being painted. Whether the tank barrel is painted yellow or otherwise, Jet A-1 static storage tanks should be correctly identified by placing clear product identification markings on all sides, particularly above the tank outlet and fill connections.

7.12.11. **Tank shell inner surface finish:** The internal finish should be sufficiently smooth to ensure that liquid run-off is clean and allow the tank to be wiped down during internal inspections without dragging threads or lint from the cleaning cloth. Weld roots should be laid or ground flush with the bottom centreline of the tank to prevent water or contaminant traps.

Sample / Product reclaim tank

7.13 If the fuelling system includes a static storage tank, water-free and sediment-free fuel samples can be disposed of into a dedicated reclaim tank (if installed). The sample reclaim tank, also referred to as a PRT (product reclaim tank) should be equipped with a removable 100 mesh strainer at the fill point, a lockable sealing lid, a conical or dished base (slope of 1 in 20 is recommended) with a sample point at the sump and a return line (fitted with a check valve) to re-introduce reclaimed fuel to the storage tank via filtration. Reclaim filtration may utilise a filter vessel or vessels used for fuel transfer / bunkering or may be a single purpose fuel reclaim vessel. Reclaim filter vessels should be of an approved type for Jet A-1 fuel filtration as detailed in paragraphs 7.15.5 to 7.15.8. In addition, sample reclaim tanks should include the following:

- Means for access and visual inspection.
- Means to prevent spillage / overfill.
- Means for venting.
- Suitable secondary containment as applicable.
- Suitable identification to denote its use (e.g. ‘Jet A-1 Recovery Tank Intended for Aviation Use’).
- Tank should have sloped bottom to a positive sump with a drain for sampling contents prior to decant.
- Pump pick-up should be designed such that a quantity of dead-stock remains in the sample reclaim tank upon breaking suction during sample reclamation which should then be removed through the drain point and disposed of. Quantity of dead-stock may vary dependent on tank design, but should not be less than 10 litres.
- All tank appurtenances, access entrances, vents, inspection ports, etc. should be accessible, and designed to prevent the ingress of contaminants.

7.14 Where the system does not include a functioning static storage tank and fuelling is direct from transit tanks, if a sample reclaim tank has been installed fuel samples may be drained to it. However, the reclaim tank contents should only be decanted directly from the sample point into drums or other suitable receptacles and then properly disposed of.

Delivery system

7.15 The delivery system to pump fuel from static storage tanks or transit tanks to the aircraft should include the following components:

7.15.1. **Suction hose and hose unit:** In order to connect transit tanks to the pumping system pipework, a flexible suction hose with 2½” self-sealing hose unit requires to be fitted. In order to reduce yellow metal contact with fuel, stainless steel hose units should ideally be used, however, aluminium is currently acceptable. The hose unit should be fitted with a captive dust plug. The suction hose should be an approved, smooth bore, semi-conducting type to EN ISO 1825 Type C, Grade 2, and should be as a minimum, 50 mm (2”) nominal bore fitted with reusable safety clamp adaptors. Dependent on pump suction characteristics, it may be necessary to use one of the hose variants with an integral reinforcing helix. Historically, single or double braided stainless steel annular convoluted B-Flex hoses have been in use, however, the annular convoluted design has been found to act as a contaminant trap. Although still acceptable for use at present, where practicable to do so (e.g. when a hose requires to be renewed due to damage or leakage) B-Flex hoses should be replaced with smooth bore EN ISO 1825 aviation approved equivalents. For static storage tanks, connection to the pumping system should be stainless steel pipework.

7.15.2. **Pumps:** Where practicable, systems should be designed to incorporate a twin pump skid in order to provide redundancy should one pump fail in service. The pumps should be manufactured from materials compatible with aviation fuel service and be electrically, hydraulically or pneumatically driven, centrifugal or positive displacement types with a head and flow rate suited to the particular installation. The pump(s) should be able to deliver up to 225 litres (50 imperial gallons) per minute under normal flow conditions. Pump discharge pressure should be set to overcome head loss and equipment pressure drops such that pressure measured at the dispensing cabinet against a closed head does not exceed 50 psi (3.45 bar). This may be achieved by use of an internal or external pressure adjustable pump bypass valve or direct acting nozzle inline pressure reducing valve. In order to provide protection, a pump inlet Y-strainer with 60 mesh (250 micron or finer) screen should be fitted. The strainer should be orientated in the vertical plane with the basket pointing downwards so that contaminants settle out of the fuel path. Pot type strainers should not be used as removal of accumulated contaminants is difficult. A remote start/stop control should be provided at the helideck close to the hose storage location (in a position where the operator is able to view the whole fuelling operation). Additionally, there should be a local emergency stop control adjacent to the pump(s).

NOTE: Hand pumps for delivery of fuel to an aircraft should not be incorporated in refuelling system designs and should be removed from legacy systems where fitted. Lack of use over long periods of time may result in deterioration of the hand pumps' internal components, causing them to become a potential source of system contamination. However, hand pumps may be used to transfer fuel samples to and from closed circuit samplers and as such, should be manufactured from stainless steel.

7.15.3. **Pump safety systems:** The pumping system should be equipped with an automatically switched, flashing pump-running warning beacon that is visible from the helideck to clearly show that the fuel delivery pumps are running. The flashing beacon should be coloured amber to distinguish it from other helideck lighting and to ensure it is visible against the general installation lighting. There may need to be exceptions where other existing lighting in the vicinity is also amber (such as GPA beacons). However, the colour red should not be used as this is designated specifically for helideck wave-off lighting.

7.15.4. **Flow meter:** The flow meter should ideally be manufactured from stainless steel. Aluminium meters are an acceptable alternative but cast iron meters should not be used. Ideally they should be of the positive displacement type due to a greater degree of accuracy attainable, however, other types may be considered where they can be setup to guarantee acceptable accuracy levels for the intended duty; meters should be appropriately sized to suit the system flow rate and should be fitted with a read-out in litres.

System designs should take fully into consideration flow meter manufacturers' recommendations including the installation of strainers and air eliminators when appropriate, especially when placed before filtration. Flow meters should be positioned before filtration where possible due to the risk of system contamination from potential breakdown or wear of moving parts inside the flow meter body. Where system design incorporates a single filter water separator vessel located at the dispensing cabinet, fuel should be routed through the flow meter first, however, if this cannot be achieved due to space restrictions or if the filter water separator cannot be located at the dispensing cabinet, then refuelling nozzle strainer checks and hose end samples should be carefully monitored to detect early signs of meter wear or damage in the form of accumulation of particulate contamination.

In the case of legacy systems with flow meters installed after all filtration, consideration should be given to relocating the flow meter, where it is practicable to do so. Where this is not possible, then refuelling nozzle strainer checks and hose end samples should be carefully monitored to detect early signs of meter wear or damage in the form of accumulation of particulate contamination. Legacy meters of cast iron or carbon steel construction should be replaced with stainless steel or aluminium equivalents to prevent potential internal corrosion issues from occurring but where it is not practicably possible to do so, then nozzle strainer checks and hose end samples should also be carefully monitored to detect early signs of meter internal corrosion.

7.15.5. **Filtration (General)**

7.15.5.1. All previous editions of CAP 437 have specified that offshore refuelling system filtration should consist of a filter water separator vessel and a fuel filter monitor vessel, or should combine the two within a single vessel, however, following several serious aircraft incidents over a number of years, including loss of engine power control, it has been confirmed that monitor elements are no longer suitable for use with Jet A-1 aviation fuel due to monitor element technology containing Super-Absorbent Polymer (SAP) which has been found to migrate to aircraft fuel systems in certain circumstances during fuelling. ‘JIG Bulletin 105’, ‘JIG Bulletin 130’, ‘JIG Bulletin 132’ and ‘IATA Super-Absorbent Polymer (SAP) Special Interest Group – Data summary and proposed roadmap’ provide additional information on this subject matter.

7.15.5.2. Use of monitor elements should cease as soon as practicably possible but should not extend beyond 1st July 2023 at which point all reference to use of monitor elements will be withdrawn from JIG standards. The Energy Institute has already withdrawn standard EI 1583 governing test and operating criteria for these elements. It should be noted that continued use of monitor elements is carried out entirely at the risk of the operating company.

7.15.5.3. EI/JIG has introduced new standards for alternative filtration and contaminant detection technology as proposed replacements for monitor elements. These are:

- EI 1588 – Laboratory tests and minimum performance levels for aviation fuel water barrier filters
- EI 1598 – Design, functional requirements and laboratory testing protocols for electronic sensors to monitor free water and/or particulate matter in aviation fuel
- EI 1599 – Laboratory tests and minimum performance levels for aviation fuel dirt defence filters

NOTE: EI 1599 Dirt Defence filters have no water stopping or removal capability and EI 1598 Electronic Water Sensors offer no filtration capability to prevent migration of particulate therefore both solutions should be used together if attempting to replicate monitor element functionality.

7.15.5.4. Where system filtration has previously consisted of two different types of filtration, the minimum standard for new-build and legacy systems will now rely on filter water separator vessels as the sole means of primary filtration. New-build system design should not incorporate combined three-stage filter vessels. Systems should be equipped with a filter water separator vessel located either at the tank laydown and pump skid or at the dispensing cabinet. Although secondary filtration (and / or contaminant detection technology) is not necessary, it may be used in addition to filter water separators where it is deemed beneficial or best practice. This may apply in situations where there is perceived to be an increased likelihood of contaminant presence due to specific system layout or operating conditions. Alternative technology meeting the above EI standards may be used as and when element configurations have undergone Joint Industry Filtration Field Trial evaluation which has resulted in recommendation for adoption into JIG standards under defined operating procedures upon completion of evaluation.

7.15.5.5. For legacy systems, offshore operators or duty holders in conjunction with their contracted fuel inspection companies should have a transition plan in place to ensure that changes are implemented by or before the above deadline. In order to remove monitor elements from legacy refuelling systems, monitor vessels may be removed completely and replaced with spools. Alternatively, vessels may be left in place with:

- elements removed (if vessels are not fitted with element interlock safety valves).
- through-flow ‘dummy’ elements installed (if vessels are fitted with element interlock safety valves which require elements to be present to allow fuel to flow).
- elements meeting the above or future approved EI standards installed (if vessels are fitted with element interlock safety valves which require elements to be present to allow fuel to flow and there is perceived to be a need for additional fuel filtration).

Where elements are removed or through-flow ‘dummy’ elements are installed to allow fuel to pass through a vessel unhindered, the corresponding differential pressure gauge should be removed or isolated and marked as out of service. This also applies to legacy three-stage filter vessels. By removal of monitor elements or installation of through-flow 'dummy' elements from three-stage vessels, the vessel is effectively converted to a filter water separator vessel and as such should meet the requirements of paragraph 7.15.6.

Where filter vessels are modified, corresponding vessel operating plates should be modified or replaced to correctly indicate element arrangement.

7.15.5.6. Vessels should comply with the requirements of EI 1596 'Design and construction of aviation fuel filter vessels' (latest edition) which gives guidance on design details such as minimum element spacing, preclusion of flat bases and minimum slopes to ensure adequate drainage of accumulated water, etc. Specific requirements relating to each filter type are further detailed in paragraphs 7.15.6 to 7.15.8.

7.15.6. **Filter water separator**

7.15.6.1. Filter water separators should be sized to suit the discharge rate and pressure of the delivery system and be fitted with an automatic air eliminator and pressure relief valve. Filter element configuration within the vessel should comply with EI 1581 'Specification and qualification procedures for aviation jet fuel filter/separators' (latest edition).

7.15.6.2. A direct read differential pressure gauge (e.g. Gammon Model GTP-534 series or equivalent) with calibrated reading should be fitted in order to provide a means of monitoring element condition during operation. Where filter water separators are located at a distance from the dispensing cabinet / helideck, differential pressure gauges with peak hold function should be considered.

7.15.6.3. Filter units should be fitted with a sample line at the lowest point of the vessel to enable contaminants, including coalesced water, to be drained from the unit and to prove cleanliness of the fuel. The connection for the sample line should therefore be after the first stage of filtration (coalescer elements) and before the second stage of filtration (separator element). Vessels may be fitted with additional drain points, but these should generally not be used as sample points in daily use. The sample line should be double valved, with the downstream valve being a full bore ball valve to prevent trapping of sediment and to allow samples to be taken under full flow conditions in a controlled manner. Where practicable, the downstream valve should have spring return operation as a safety feature. The stainless steel sample line should terminate with a captive dust cap. Sample lines on filter units should be a minimum of 12 mm (½") nominal bore but, in general, the larger the diameter of the sample line, the better.

7.15.6.4. Where practicable to do so, legacy filter vessels/systems should be upgraded to meet the requirements of EI 1581 (latest edition).

7.15.6.5. All filter vessels should be marked with a placard / label indicating month and year of last filter change.

7.15.7. Dirt defence filter

7.15.7.1. A dirt defence filter vessel should be sized to suit the discharge rate and pressure of the delivery system and be fitted with an automatic air eliminator and pressure relief valve. Dirt defence elements should be EI 1599 'Laboratory tests and minimum performance levels for aviation fuel dirt defence filters' (latest edition) approved and be designed to remove solid particulates from delivered fuel. All filter element configurations should be evaluated by Joint Industry Filtration Field Trial and recommended for adoption into JIG standards under defined operating procedures upon completion of evaluation.

7.15.7.2. A direct read differential pressure gauge (e.g. Gammon Model GTP-534 series or equivalent) with calibrated reading should be fitted in order to provide a means of monitoring element condition during operation.

7.15.7.3. Filter units should be fitted with a stainless steel sample line at the lowest point of the vessel's pre-filtration chamber to enable contaminants to be drained from the unit and to prove cleanliness of the fuel. The sample line should be double valved with the downstream valve being a full bore ball valve to prevent trapping of sediment and to allow samples to be taken under full flow conditions in a controlled manner. Where practicable, the downstream valve should have spring return operation as a safety feature. The sample line should terminate with a captive dust cap. Sample lines on filter units should be a minimum of 12 mm (½") nominal bore but, in general, the larger the diameter of the sample line, the better.

7.15.8. **Water barrier filter**

7.15.8.1. A water barrier filter vessel should be sized to suit the discharge rate and pressure of the delivery system and be fitted with an automatic air eliminator and pressure relief valve. Water barrier elements should be EI 1588 'Laboratory tests and minimum performance levels for aviation fuel water barrier filters' (latest edition) approved and be designed to remove solid particulates, emulsified water and water slugs from delivered fuel. All filter element configurations should be evaluated by Joint Industry Filtration Field Trial and recommended for adoption into JIG standards under defined operating procedures upon completion of evaluation.

7.15.8.2. A direct read differential pressure gauge (e.g. Gammon Model GTP-534 series or equivalent) with calibrated reading should be fitted in order to provide a means of monitoring element condition during operation.

7.15.8.3. Filter units should be fitted with a stainless steel sample line at the lowest point of the vessel's pre-filtration chamber to enable contaminants to be drained from the unit and to prove cleanliness of the fuel. The sample line should be double valved with the downstream valve being a full bore ball valve to prevent trapping of sediment and to allow samples to be taken under full flow conditions in a controlled manner. Where practicable, the downstream valve should have spring return operation as a safety feature. The sample line should terminate with a captive dust cap. Sample lines on filter units should be a minimum of 12 mm (½") nominal bore but, in general, the larger the diameter of the sample line, the better.

7.15.9. **Electronic water sensor:** Electronic water sensors conforming to EI 1598 ‘Design, functional requirements and laboratory testing protocols for electronic sensors to monitor free water and/or particulate matter in aviation fuel’ (latest edition) may be used to monitor fuel in the delivery system for presence of suspended and free water, however, careful consideration should be given to suitability for offshore use due to regular loop testing and onshore calibration requirements.

7.15.10. **Closed circuit sampler:** Fitment of a closed circuit sampler is recommended where sampling is made difficult due to the exposure of manual sample point connections to airborne contaminants such as blown debris or rainfall. A closed circuit sampler should be fitted in addition to, not instead of, manual sample points as a tee-off from the sample line as near to the upstream side of the manual ball valve as possible and can be used for sampling tanks, filter vessels or even pressure refuelling couplings with the right connections fitted. Multiple samplers may be installed, or one sampler can be used for sampling multiple pieces of equipment depending on system layout and if appropriately manifolded.

Where a closed circuit sampler is fitted to static storage tank sample points, the system should be designed such that the top of the closed circuit sampler sits at a lower elevation than the bottom of the tank in order to ensure there is sufficient head of pressure above the sampler to draw samples at full flush. Alternatively, if there will be insufficient flow of fuel through the sample line due to insufficient elevation differential, a lift pump may be fitted to the tank sample line to achieve the necessary flow for entrainment of settled-out contaminants.

Routing of piping or instrumentation tubing from sample lines to the closed circuit sampler should keep vertical rises and dog legs to a minimum in order to aid free movement of any contaminants which may be present in the fuel being sampled. As the nominal bore of the entry point connection to closed circuit samplers is generally small (⅜”), piping or instrumentation tubing size is not restricted to the stipulations laid out for tank and filter vessel sample lines and smaller bore instrumentation may be used, although it is recommended that no smaller than 12 mm (½”) OD tubing with a nominal bore around 10 mm (⅜”) be used.

7.15.11. **Hose reel assembly:** A robust delivery hose reel should be fitted within the dispensing cabinet to allow correct stowage and protection of the fuel delivery hose. It should be sized to accommodate the length and diameter of hose fitted to the system ensuring that the minimum bend radius of the hose is considered. It is recommended that the reel is of stainless steel construction, however, painted mild steel and aluminium are also acceptable on condition that all wetted metal parts are stainless steel so as not to expose the fuel to potential contamination. It is recommended that a powered rewind mechanism is fitted to overcome potential manual handling issues when rewinding the hose. However, a manual rewind facility should also be fitted in case of motor failure. Power rewind reels should be equipped with some form of slip drive (e.g. a slip motor, dead-man’s switch or dead-man’s pneumatic valve) to protect against entanglement when rewinding the hose.

7.15.12. **Fuel delivery hose:** The fuel delivery hose should be an approved semi-conducting type to EN ISO 1825 Type C, Grade 2, 38 mm (1½”) nominal bore fitted with reusable safety clamp adaptors; hoses of larger diameter may be required if a higher flow rate is specified. The selected length of refuelling hose provided should be consistent with safely reaching the helicopter refuelling points when the aircraft is correctly positioned on the helideck.

7.15.13. **Primary bonding lead:** To ensure that no difference in electrical potential exists between the aircraft, fuelling equipment and pressure refuelling coupling / gravity nozzle, a stranded single core bonding lead, with high visibility coating should be provided to bond the helicopter airframe to the refuelling installation structure before any fuelling commences. The lead should be connected to a manual or spring-rewind reel which is earth-bonded, common to the system pipework, and the lead should be fitted with a correct jack plug adaptor to attach to the approved aircraft earth bonding point. It is important that only approved earth bonding connection points are used for attaching the primary bonding lead to. The location and type of approved points will vary depending on aircraft make and model. The body of the jack plug should be of bare conductive metal construction to allow the secondary bonding lead clip (i.e. pressure refuelling coupling or gravity nozzle ground wire clip) to be attached to it when it is plugged into the aircraft. To minimise the potential of water ingress and poor continuity, no breakout point should be fitted between the reel and the jack plug. The electrical resistance between the jack plug and the system pipework should not be more than 25 ohms. The selected length of primary bonding lead provided should be consistent with safely reaching the approved helicopter earthing points when the aircraft is correctly positioned on the helideck. The system should be robustly designed to prevent inadvertent disconnection during operation.

NOTE: The flight crew / HLO remain responsible for ensuring that the primary bonding lead has been disconnected from the aircraft and is properly stowed prior to clearance for flight (see also Chapter 8, paragraphs 8.59.10 and 8.59.11).

7.15.14. **Fuelling nozzle:** Fuel delivery to the aircraft may be either by gravity (overwing) or pressure (underwing) refuelling. It is operationally advantageous to have the ability to refuel by either means to suit the aircraft type using the helideck:

7.15.14.1. **Gravity refuelling nozzle:** The nozzle should be 38 mm (1½”) spout diameter fitted with 100 mesh strainer. Suitable types include the EMCO G180-GRTB and Elaflex ZVF 50 JET.3 refuelling nozzle or equivalent. Gravity nozzles should be equipped with a secondary bonding lead.

7.15.14.2. **Pressure refuelling coupling:** For pressure refuelling the coupling should be 63.5 mm (2½”) with 100 mesh strainer and quick disconnect. Suitable types include Carter, Avery Hardoll, Cla-Val and Meggitt couplings. Couplings should be fitted with a regulator / surge control device with a maximum spring rating of 241.3 kPa (35 psi) and should also be equipped with a secondary bonding lead. A means of being able to draw fuel samples from the coupling should be provided, either using a sample point fitting screwed into one of the nozzle test-ports (such as a Gammon Jet-Test sampler or equivalent) or by attaching the coupling’s nozzle-end to a manual sample point adaptor or a closed circuit sampler connection.

NOTE: Although a correctly functioning pressure refuelling coupling surge controller will restrict delivery pressure to the aircraft fuel system to the setting of the surge controller’s internal spring, it is not recommended that this be relied upon as the sole means of system pressure regulation.

7.15.14.3. **Hose-end adaptor:** To be able to readily change between pressure and gravity refuelling in order to meet different aircraft type requirements, a self-sealing hose-end adaptor can be fitted to the hose-end and matching actuators fitted to the different nozzles. Suitable types include the Gammon GTP-919. Alternatively, a short length of hose fitted with an aircraft adaptor on one end (to fit to the pressure refuelling coupling) and with the gravity nozzle attached to the other end can be used as required. This arrangement gives the flexibility to provide direct pressure refuelling or, with the extension hose attached, a means of providing gravity refuelling.

7.15.15. **Interconnecting pipework:** Interconnecting pipework (e.g. between refuelling system pump skid and dispensing cabinet) is generally the responsibility of the installation contractor and should be designed and fabricated to suit the duty flow rate requirements of the system; 2” nominal bore piping is most typically used, however, 3” nominal bore may be required to reduce pressure losses dependent on pipe-run length.

Piping material should be 316L or equivalent grade stainless steel as a minimum standard. Higher grades may be selected depending on operating parameters.

Pipework should be fabricated using butt weld / weld neck fittings and full penetration welding. Socket weld fittings should not be used as this can cause dirt traps. Slip on weld flanges are acceptable where an internal fillet weld can be laid. Pipe-run design should aim to minimise the number of doglegs and low points which could act as accumulation points for contaminants; low points should be fitted with drainage connections.

Piping should either remain unpainted or be primed and finished with a suitable paint system to resist the marine operating environment. It is best practice to fit flange to flange earth bonding straps across every flanged connection where there is a flow of fuel in order to dissipate electrostatic charge generated by the movement of fuel, however, as a minimum, earth bonding straps should be fitted when a paint lining is applied ensuring paint is bared back on both sides of one flange bolt hole to allow a metal to metal contact.

Flange fixings should be stainless steel, with specifications being dictated by pressure calculations. In special circumstances, it may be necessary to use carbon steel fixings, and in this case, it will also be a mandatory requirement to fit flange earth straps as the carbon steel fixings should be installed with insulation kits (e.g. Maloney kits) to prevent dissimilar metal corrosion and surface pitting of the flanges (e.g. galvanic corrosion). Earth straps will be required to contact the flange surface and insulation kits should be fitted through the earth straps.

Gasket material should be selected to meet piping specification requirement but with the caveat in place that system cleanliness should not be compromised. Plain graphite gaskets should under no circumstances be used due to the flake nature of graphite. Likewise, plain CNAF gaskets have been found to shed fibres. Composite material gaskets such as PTFE impregnated CNAF where fibre shed is not an issue are more suitable. If piping specification does require graphite gaskets be used, only gaskets where the graphite is not in contact with the fuel will be acceptable, such as certain types of spiral wound gasket.

7.15.16. **Weather protection:** The delivery system, including hoses and nozzles, should be equipped with adequate weather protection to prevent deterioration of hoses and ingress of dust and water into the refuelling nozzles.

Transfer system

7.16 Where a static storage tank or tanks are fitted and in use, depending on system layout, it may be possible to utilise the delivery system equipment to transfer fuel from transit tanks into the storage tanks, but if not, additional equipment may be required for fuel transfer. This generally consists of:

7.16.1. **Transfer pump(s):** Where practicable, systems should be designed to incorporate a twin pump skid in order to provide redundancy should one pump fail in-service. This may not always be possible due to space restrictions. The pumps should be manufactured from materials compatible with aviation fuel service and be electrically, hydraulically or pneumatically driven, centrifugal or positive displacement types with a head and flow rate suited to the particular installation. There is no set transfer flow rate requirement however, pumps should not be able to deliver more than the rated flow of the transfer filter vessel. Operation of pumps should be controlled through a local control station. There should be a local emergency stop control adjacent to the pumps.

7.16.2. **Transfer flow meter:** There is no requirement to have a transfer flow meter fitted if fuel quantities transferred can be quantified by other means (e.g. tank calibration chart, accurate level gauge or known ‘supplied quantity’ and ‘break suction’ quantities). If a flow meter is fitted, it should meet the same criteria as described for delivery system flow meters in paragraphs 7.15.4, being positioned before the transfer filter due to the risk of system contamination from potential breakdown or wear of moving parts inside the flow meter body.

7.16.3. **Transfer filtration:** Transfer filtration should either consist of a filter water separator, dirt defence filter or water barrier filter. Vessels should meet the same criteria as described for delivery system filter vessels in paragraphs 7.15.5 to 7.15.8.

Transportable tanks

7.17 Transportable tanks should be constructed to satisfy the requirements of Intergovernmental Marine Consultative Organisation (IMCO), International Maritime Dangerous Goods (IMDG) Codes and the latest EU regulations. Current inspection and repair codes of practice include ISO 10855.

7.18 Tanks may be constructed from stainless steel or mild steel. If mild steel is used, then the tanks should be lined internally with a suitable white or light-coloured fuel-resistant epoxy lining, conforming to the requirements of the latest editions of EI Standard 1541, ‘Requirements for internal protective coating systems used in aviation fuel handling systems’ or Def Stan 80-097 ‘Paint, System, for the Interior of Bulk Fuel Tanks and Fittings, Multi-Pack’. External surfaces should be lined with a suitable paint system to resist the marine operating environment and fuel spillage.

7.19 The tanks should be encased in a robust steel cage with four main lifting eyes designed and certified to a recognised offshore container standard such as DNV 2.7-1, ABS Guide for Certification of Offshore Containers or ISO 10855. (It should be noted that use of BS 7072 framed tanks has been prohibited since 1st January 2015 in the UKCS). Where possible, stainless steel fasteners in conjunction with stainless steel fittings should be used. The tank frame (cage) should incorporate cross-members to provide an integral 'ladder' access to the tank top. When horizontal vessels are mounted in the transit frame there should be a tank centre line slope towards a low point. Vertical vessels should have dished ends providing adequate drainage towards the tank low point. This slope should be at least 1 in 30, although 1 in 25 is preferred.

7.20 Tanks should be clearly and permanently marked on the identification plate with the tank capacity, IMDG 'T' classification number and tank serial number. Tanks should also be clearly marked with the date of the last lifting gear inspection and initial and most recent IMDG pressure test.

7.21 Tanks should be equipped with the following:

7.21.1. **Manhole:** A 450 mm (18") or greater manhole to allow physical access to the interior of the tank.

7.21.2. **Inspection hatch:** If the manhole position and/or cover type is unsuitable for inspecting the lower end of the tank, a 150 mm (6") hatch should be fitted to enable inspection.

7.21.3. **Dipstick connection:** A suitable access point to allow a dipstick to be used in order to determine the tank contents. A captive dipstick may also be attached to the tank frame or held within the tank vessel.

NOTE: A millimetre dipstick and calibration chart suited to each individual style of tank is required to accurately determine the tank contents at the point of filling and return to shore for Customs & Excise purposes. As access to the top of transportable tanks whilst offshore is largely restricted due to 'Working at Height' hazards, fuel stock can most accurately be determined by completion of accurate fuel quality control documentation; fuel usage should be recorded daily to accurately determine the amount of usable fuel remaining in the tank. This will not be achieved using a level gauge (even most integral (captive) dipsticks are only ±5% accurate) and thus, it will increase the risk of entrained air being delivered into the aircraft fuel tanks.

7.21.4. **Pressure / Vacuum relief:** A stainless steel 63.5 mm (2½”) pressure / vacuum relief valve fitted with weatherproof anti-flash cowl. The valve settings will depend on the type of tank in use and manufacturers’ recommendations should be followed.

7.21.5. **Sample connection:** A stainless steel sample point, fitted at the lowest point of the tank. A foot-valve should be fitted in the sample line, complete with an extension pipe terminating with a full bore ball valve with a captive dust cap. Sample lines should be a minimum of 19 mm (¾”) nominal bore. In order to allow flushing of the tank, the sample point should be designed with sufficient access, space and height to accommodate a 10-litre stainless steel bucket.

NOTE: Previous editions of CAP 437 only required sample line clearance to accommodate a 3-litre glass sample jar. Legacy transportable tanks may remain in use, even though it is recognised that modification to accommodate clearance for a bucket is unlikely to be practicably possible. Swan neck flushing adaptors may be used to allow for flushing into a bucket.

7.21.6. **Fill / Discharge connection:** The fill / discharge connection should be a flanged fitting with a 76 mm (3”) internal foot valve terminating to a 63.5 mm (2½”) self-sealing coupler complete with captive dust cap. The draw point for the tank outlet should be at least 150 mm (6”) higher than the lowest point of the inside of the tank.

7.21.7. **Document container:** A suitably robust container should be positioned close to the fill / discharge point to hold the tank and fuel certification documents.

7.21.8. **Tank shell and frame external surface finishes:** The tank shell and frame should be suitably primed and then finished in safety yellow (BS

4800, Type 08.E.51). Where the shell is fabricated from stainless steel it may remain unpainted. Safety yellow is not mandatory but has been generally accepted for helifuel tanks. All component parts, e.g. tank, frame etc., should be properly bonded for earth continuity before being painted and the tank should be fitted with an unpainted bonding pin or plate made from brass or stainless steel. Whether the tank shell is painted yellow or otherwise, Jet A-1 Transit Tanks should be correctly identified by placing clear product identification markings on all sides, particularly above the tank fill and discharge connection.

7.21.9. **Tank shell internal finish:** The internal finish should be sufficiently smooth to ensure that liquid run-off is clean and allow the tank to be wiped down during internal inspections without dragging threads or lint from the cleaning cloth. Weld roots should be laid or ground flush with the bottom centre-line of the tank to prevent water or contaminant traps.

Chapter 8

Helicopter fuelling facilities – Maintenance and fuelling procedures

General

8.1 This chapter provides general advice and best practice on the necessary requirements for fuelling system maintenance and the fuelling of helicopters on offshore installations and vessels. It includes recommended procedures for the onshore filling of transit tanks, the transfer of fuel from transit tanks to static storage, the refuelling of aircraft from both transportable and static storage tank systems, static storage tank draining and long term fuel storage.

8.2 The management of helicopter fuelling facilities and the associated operations should be formally hazard / risk assessed as part of the organizations Safety Case or Safety Management System. Additionally, safety controls for fuelling facilities and fuel handling, identified through the hazard / risk assessment processes, should be included in the facilities / operators internal Quality Assurance (QA) program.

8.3 Fuel storage, handling and quality control are key elements for ensuring, at all times, the safety of aircraft in flight. For this reason, platform / vessel personnel assigned supervisory and operating responsibilities should be certified as properly trained and competent to undertake daily and weekly system maintenance tasks, fuel sampling and fuelling of aircraft. It is recommended that personnel attend an established helicopter refuelling course. In addition to initial training, individuals should be regularly assessed, by an independent assessor, as competent for these specialist activities as detailed in the OPITO Standard Code 9255 – Helicopter Refuelling Training and Standard Code 9256 – Helicopter Refuelling Workplace Competence Assessment.

8.4 Management and handling of the Jet A-1 fuel supply chain outwith the scope of regular platform / vessel personnel duties is equally critical to safe operations and requires that all companies undertaking fuel supply chain activities have a Workplace Competency Management System (CMS) in place to ensure **all** personnel are fully trained and regularly assessed as competent for these specialist activities. Assessment and verification should be carried out by OPITO trained assessors and verifiers working to an OPITO competency framework or equivalent.

8.5 This chapter has been prepared by OEUK, in consultation with the offshore oil and gas industry and aviation specialists. Additional detailed technical information and codes of practice can be obtained from EI/JIG (Energy Institute and Joint Inspection Group) aviation fuelling standards. Although JIG Standard 1, 2 & 4 and EI/JIG Standard 1530, do not directly relate to offshore refuelling scenarios, this chapter has been prepared with the relevant content of these standards in mind. Where the reader is referred to other standards or alternative guidance, the reference documents used should always be checked by the reader to ensure they are up-to-date and reflect current best practice.

8.6 Alternative procedures from other recognised national sources may be used where duty holders can satisfy themselves that the alternative is adequate for the purpose, and achieves equivalence, considering particularly the hostile conditions to which the fuelling systems may be subjected and the vital and overriding importance of a supply of clean fuel.

Fuel quality sampling and sample retention

8.7 Throughout the critical processes of aviation fuel system maintenance and fuelling operations, routine fuel sampling is required to ensure that delivered fuel is scrupulously clean and free from any contamination that may enter the aircraft fuel tanks which could ultimately result in engine malfunctions. Different types of fuel sampling and testing are carried out at different points throughout the fuel supply chain, however the main type of sampling and testing carried out in the offshore operating environment falls within the category of 'Field Tests' and consists of a 'Visual Appearance Check' and 'Chemical Water Detection'. The requirement to be able to see small quantities of solid contaminants, free water or suspended water within a fuel sample, to be able to identify fuel colour and to visually detect colour change on a chemical water detector capsule should be taken into account when selecting personnel for this task.

Fuel sample containers

8.8 Only scrupulously clean, standard 3-litre clear glass sampling jars should be used for taking fuel samples unless using a closed circuit sampler. It is strongly recommended that they are also used for short term initial storage (maximum 48 hour retention period). Fuel samples drawn from transit / static storage tanks and the fuel delivery system during daily and weekly tests should be retained for specified periods as detailed in paragraph 8.17 and its corresponding table. The sample containers should be kept locked in a secure, suitably constructed light-excluding store and kept away from sunlight until they are disposed of (aviation fuel is affected by UV light).

8.9 It is recommended that for on-board short term retention, fuel samples are not kept in 5-litre International Air Transport Association (IATA) lacquer-lined sample cans because their design prevents scrupulous cleaning and visual confirmation of removal of all sources of contamination (e.g. trace sediments) prior to re-use. Sediments trapped in IATA cans are likely to result in highly inaccurate representations of drawn fuel samples when submitted for laboratory analysis, in the event of an aircraft incident where fuel is a suspected causal factor. When retained fuel samples are requested for analysis as evidence, specialist advice and equipment should be sought from the contracted Refuelling System Service Provider to allow samples to be transported to laboratory facilities in accordance with ASTM D4306.

8.10 To prevent sample contamination, sampling jars and all supplementary items should be scrupulously cleaned before each use using low lint cloth and rinsed at least 3 times with the aviation fuel to be sampled. Supplementary items such as buckets and funnels, fitted with earth cable and clamp, should be manufactured from stainless steel.

NOTE: In this context, lint is defined as 'short, fine fibres which separate from the surface of cloth'.

Fuel sampling – General

8.11 Prior to carrying out a visual appearance check, flushing of each sample point should be carried out to ensure that any accumulation of condensed or coalesced water is removed and to ensure that the sample drawn thereafter is a true representation of the fuel within the tank, filter vessel or nozzle being sampled. The quantity of fuel to be flushed may vary depending on the shape and size of the system component being sampled and the volume of fuel held in the sump and/or sample line. Flushing should be carried out at full flow or as near to full flow as is practically possible. Flushing should be carried out into a clean receptacle to allow the flushings to be visually checked for contaminants. Presence or absence of contamiants should be recorded along with the volume of flushings taken prior to achieving a clean, water-free sample.

8.12 Acceptable fuel samples taken from any aviation fuelling system sample point should be the correct colour, clear, bright and free from solid matter and free water before the system is deemed fit for use. They should also be checked for suspended water by using a syringe and chemical water detector capsule. If a sample does not meet the quality criteria as laid out below, the sample should be disposed of, sampling equipment should be cleaned and rinsed and the flushing and sampling process repeated until an acceptable result is achieved. However, sampling should not be repeated indefinitely but should take into consideration whether or not sample quality is improving over subsequent attempts as well as the nature of contamination. If consistently unacceptable samples are obtained with little or no improvement (after more than 3 times), it may become necessary to contact the Refuelling System Service Provider responsible for certification of the fuelling system or the Fuel Supplier for advice.

8.13 Samples should always be drawn at full flow (or as close to full flow as is reasonably practicable without causing spillage) to achieve the necessary velocity for entrainment of settled-out contaminants. Filter vessel and hose end samples or samples taken from any other pressurisable part of the system should be taken with the pump running for the duration of the sample being drawn. When sampling from a sample point which cannot be pressurised such as transit, static storage or product reclaim tanks, head of pressure should be used to achieve necessary flow unless a lift pump is fitted to the sample line. Where a manually operated lift pump is fitted, it should be operated with sufficient force / speed to obtain a reasonable flow of fuel for entrainment of settled-out contaminants.

8.14 Chemical water detector capsules should be kept tightly sealed in their container when not in use. Capsule tubes are marked with the relevant expiry date and capsules should be used before the end of the month shown on the container. Capsules should not be re-used.

NOTE: The use of water-finding paper or paste is no longer recommended. These methods do not meet the minimum standards for detecting water content at the fuel delivery point of 30 ppm (see IATA Guidance Material for Aviation Fuel Specifications).

Sampling using manual sample points

8.15 Checking for fuel quality using a manual sample point and 3-litre glass jar should be carried out whilst making observations in the following manner:

8.15.1. Carry out flushing of the sample point and cleaning and rinsing of the sampling equipment as detailed in paragraph 8.11. Record quantities and findings.

8.15.2. Samples should be drawn into scrupulously clean, clear glass sample jars at full flow (or as close to full flow as is reasonably practicable without causing spillage). The jar lid should be fitted as soon as possible to reduce the likelihood of airborne contamination of the sample.

8.15.3. The fuel sample should be visually checked to ensure it is of the correct colour, clear, bright and free from solid matter, free water and suspended water. (Jet A-1 may vary from colourless to straw colour.)

8.15.4. Free water will appear as droplets on the sides, or bulk water on the bottom, of the sample jar. If there is any evidence of free water the sample should be rejected.

8.15.5. Suspended water will appear as a cloud or haze, however, small air bubbles may also appear as a haze. Air bubbles can appear in fuel samples from filter vessels for 2 to 3 days following a filter change. If there is any sign of a haze, the sample should be left for 60 seconds to determine whether or not this indicates presence of air or water; air bubbles will settle out upwards whilst water will either remain, or will settle to the bottom of the jar where the droplets can form together to create free water. If the evidence points towards suspended water, the sample should be rejected. If in doubt, a chemical water detector capsule test will determine the correct outcome.

8.15.6. Solid matter or sediment is usually made up of small amounts of dust, rust, scale etc. suspended in the fuel or settled out on the jar bottom. When testing for solid contaminants, swirl the sample to form a vortex; any solids present will concentrate at the centre of the vortex making it more readily visible. ‘Trace’ amounts of sediment are acceptable. If more than a ‘trace’ of solid matter is detected, the sample should be rejected. DefStan 91-091 defines the acceptable limits of solid matter in Jet A-1 as 1.0 mg/l at point of manufacture, however, as guidance in the context of a visual appearance check as part of a field test, a ‘trace’ of solid matter can be defined as, 2 to 3 particles of debris not exceeding 0.5 mm diameter.

8.15.7. Testing for suspended water should be carried out using a syringe and chemical water detector capsule (e.g. Shell type or an approved alternative). Fit a capsule to the syringe, immerse in the fuel sample and immediately draw a 5 ml fuel sample into the syringe. If the capsule is withdrawn from the fuel and there is less than 5 ml in the syringe, the capsule should be discarded, and the test repeated using a new capsule. Examine the capsule for any colour change. If there is any colour change the fuel should be rejected.

NOTE 1: Empty syringe contents slowly with the tip immersed back in the fuel sample. Do not spray the 5ml syringe contents into the atmosphere because this creates a hazardous Jet A-1 explosive mixture.

NOTE 2: The same sampling criteria as set out in 8.12 above should be applied. If consistently unacceptable samples are obtained with little or no improvement, it may become necessary to contact the Refuelling System Service Provider responsible for certification of the fuelling system.

Sampling using a closed circuit sampler

8.16 Checking for fuel quality using a closed circuit sampler is similar to sampling carried out as described in paragraph 8.12 and the same pass / fail criteria applies to samples, however, the order in which checks are carried out does vary. Carry out sampling and make observations in the following manner:

8.16.1. Carry out flushing, cleaning and rinsing of the closed circuit sampler as detailed in paragraph 8.11. Record quantities and findings.

8.16.2. Samples should be drawn into the closed circuit sampler at full flow (or as close to full flow as is reasonably practicable without causing spillage out of the lid). The sampler lid should be closed, however, the lid does not form a pressure tight seal.

8.16.3. As the fuel enters the jar off-centre, it immediately creates a vortex, therefore any solid contaminants and any free water present will concentrate at the centre of the vortex making it more readily visible. Vortex checks should therefore be carried out first.

8.16.4. The fuel should then be allowed to settle until the vortex slows or stops. This will allow colour, appearance and suspended water checks to be carried out.

8.16.5. Testing for suspended water should be carried out as the final test using a syringe and chemical water detector capsule (e.g. Shell type or an approved alternative). Some closed circuit samplers come equipped with a water detector port on the inlet line, whilst others require the test to be carried out by opening the sampler lid.

Fuel sample retention

8.17 The purpose of retaining selected fuel samples during the handling processes is to provide proof of fuel quality when delivered to an aircraft.

In the event of an aircraft incident where fuel may be considered to be a causal factor, retained fuel samples will subsequently be requested by the investigating authority to support technical investigations.

The following table summarises the minimum recommended fuel sampling and retention requirements for offshore refuelling operations.

	Sample	**Reason for sampling and when taken**	**Sample retention period**
1	Transit tanks	Filling onshore	Until transit tank is returned onshore
2	Transit tanks	Within 24 hours of placement in a bunded storage area and weekly thereafter until tank becomes next on-line	24 hours

	Sample	Reason for sampling and when taken	Sample retention period
3	Transfer filters	Prior to fuel transfer or weekly, whichever occurs first	When an acceptable clean fuel sample has been obtained, samples can be discarded
4	Transit tanks	Prior to decanting to bulk storage tank or daily when on-line or next in-line	24 hours
5	Static storage tank	Daily - prior to system use	48 hours
6	Delivery filter vessels* (See Note below)	Daily - prior to system use	When an acceptable clean fuel sample has been obtained, samples can be discarded
7	Delivery hose end (pressure refuelling coupling / gravity nozzle)	Daily - prior to system use	When an acceptable clean fuel sample has been obtained, samples can be discarded or retained as a pre-refuel sample
8	Delivery hose end (pressure refuelling coupling / gravity nozzle)	Before aircraft refuelling, this sample is to be checked by the pilot	When an acceptable clean fuel sample has been obtained and the flight crew have seen the evidence (vortex / particle check and water test), samples can be discarded
9	Delivery hose end (pressure refuelling coupling / gravity nozzle)	Immediately after aircraft refuelling, this sample is to be checked by the pilot	24 hours. However, if the same aircraft is refuelled again on the same day, the previous sample may be discarded and the new one retained
10	Tanks and delivery system	After heavy rainfall, storms, if subject to water/foam** deluge on activation of the fire protection system or after snow on tanks is thawing	When taken, these samples replace the ones taken for 4 and 5 above

***NOTE:** Delivery filter vessel daily fuel sampling applies to primary filter water separator vessels and optional secondary dirt defence or water barrier filter vessels as well as any decommissioned monitor vessel which remain in the fuel path. Although decommissioned monitor vessels do not contain elements which may cause contaminants to be gathered, they do contain low point traps and as such, daily sampling is still a requirement.

****NOTE:** In the event that water is found in any initial flushing following foam deluge release, fuel requires to be quarantined and samples submitted for laboratory analysis to confirm fuel remains within specification prior to release for use.

8.18 Fuel Sample Labelling – The following information should be clearly marked on the retained fuel samples:

- Transit / Static tanks: Tank No. / Date / Time
- Post refuel sample: A/C Reg. / Date / Time

Decanting from sample reclaim tanks

8.19 Before transfer of fuel takes place from a sample reclaim tank to bulk storage, the reclaim tank should be flushed and sampled to drain out any accumulated contaminants and ensure the remaining fuel is in good condition.

Any samples taken prior to transfer should not be returned until transfer from the sample reclaim tank to the bulk tank and subsequent cleaning has been completed. After each transfer, the residual fuel below the break-suction point should be fully drained and disposed of to allow the inside of the reclaim tank to be cleaned using low lint cloths.

The transfer filter vessel should also be flushed and sampled under pump pressure before the storage tank inlet valve is opened, to ensure that no contamination is present in the filter vessel. Any contaminated samples should be disposed of into a suitable container.

Maintenance schedules

General

8.20 Different elements and components of the helicopter fuelling systems require maintenance at different times, ranging from daily checks of the delivery system up to three yearly checks on static storage tanks.

8.21 Particularly in the UK, responsible bodies within the offshore oil and gas and aviation industries have developed maintenance regimes and inspection cycles to suit their specific operations. There may therefore appear to be anomalies between different source guidance on filter element replacement periodicity, hose inspection and replacement periodicity, static storage tank inspection periodicity and bonding lead continuity checks.

8.22 The various components of fuelling systems are listed with their recommended servicing requirements in the following paragraphs and tables.

Transit tank inspections

8.23 All transit tanks should be subject to a ‘trip inspection’ each time the tank is filled and, in addition, their condition should be re-checked weekly. Six-monthly and twelve-monthly inspections should be carried out on all lined carbon steel tanks. For stainless steel tanks, the inspections can be combined at twelve month intervals.

8.24 **Trip inspection:** Each time a transit tank is offered for refilling onshore the following items should be checked:

	Items	Activity
1	Tank shell	Visual check for condition. Has the shell suffered any damage since its previous filling?
2	Filling / discharge and sampling points	Visual check for condition, leakage and caps in place.

3	Lifting frame, lugs and four-point sling	Visual check for signs of damage.
4	Tank top fittings	Check for condition, caps in place, dirt free and watertight.
5	Tank identification	Check that serial number, capacity and contents and hazard identification labels are properly displayed.
6	Tank certificate	Ensure internal cleanliness certificate is valid and located in the document container. Ensure lifting equipment and IMDG pressure testing certification is in date and tank data plates are hard stamped accordingly.

8.25 **'On receipt' inspection:** On receipt of a tank offshore, the following checks should be carried out as the responsibility of the HLO, although tasks may be delegated.

	Items	Activity
1	Customs seals	Check that Customs seals are intact on all points of entry to, or exit from, the tank interior. Are there any signs that the contents have been tampered with?
2	Tank shell	Check for any evidence of damage, i.e. dents or deep scoring. Report any damage as dents may mean damage to the internal paint lining of carbon steel tanks.
3	Tank fill/discharge and sample valves	Check for damage, pay particular attention to flanges and threaded connections for any signs of fuel leakage. Check dust caps or plugs are in place.
4	Tank lifting gear	Check lifting lugs, slings and shackles for signs of damage, check split pins are in place.
5	Tank top fittings	Check all fittings are in place, clean and all dust caps are fitted. Check valves are closed and inspection hatches tightened down.
6	Tank labels & documentation	Check that tank identification and serial number (if different) are clearly visible as well as tank capacity. Check that 'Jet A-

	Items	Activity
		1', 'Flammable UN 1863' and 'Marine Pollutant' stickers are in place and that the tank capacity is visible. Check for presence and completeness of Fuel Release Certificate which should indicate: • Correct fuel grade, i.e. Jet A-1 • Quantity delivered • Fuel supply batch number • Date of filling • Certified free from solid contaminants and water • Signature of authorised product inspector.
7	Fuel flushing and sampling	Flushing and sampling should be carried out following appropriate settling time as detailed in paragraphs 8.11 to 8.18 and 8.46.

8.26 **Weekly inspection:** Each transit tank whether it is full or empty, onshore or offshore, should be given a weekly inspection similar to the 'On Receipt' inspection as above to ensure that the tank remains serviceable and fit for purpose. The weekly inspection should primarily be for damage and leakage; it may not be possible to check Customs seals integrity if the tank is in use and documentation may have been moved to retained fuel QC records. The completion of this check should be signed for on the 'Daily & Weekly Maintenance Checks' form (see paragraph 8.60).

8.27 **Six-monthly and twelve-monthly inspection:** The six-monthly and twelve-monthly inspections should be carried out onshore by a specialist organisation. The scope of the two inspections is identical and should include:

	Items	Activity
1	Tank identification plate	Check details.
2	Tank shell	Visual check for damage.
3	Paint condition (external)	Check for deterioration.

	Items	Activity
4	Epoxy lining condition (internal)	Check for deterioration, lifting, etc particularly around seams if applicable. Acetone test should be carried out on any lining repairs.
5	Tank fittings (internal)	Check condition.
6	Tank fittings (external)	Check condition.
7	Access manhole	Check security.
8	Pressure and vacuum relief valves	Check condition and presence of fire-screen gauze; in particular check for leaks.
9	Dipstick assembly	Check constraint, markings and cover/cap for security (where fitted).
10	Bursting disc	Modern tanks are not fitted with busting discs. Tanks found to have a bursting disc should be modified to incorporate a relief valve.
11	Inspection hatch assembly	Check lid, seal and swing-bolt condition and security.
12	Bonding	Measure electrical bonding resistance between transit tank frame and shell (maximum permissible reading of 10 ohms in accordance with IMDG).
13	General	Examination and test procedures to conform to current rules and industry standards.

8.28 **Re-certification:** It is a legal requirement that ‘single product’ transit tanks are re-certified at least every 5 years by an authorised specialist, normally the tank owner or fleet management company functioning under an approved verification scheme. There should also be an intermediate check carried out every 2½ years. These checks should include re-certification of the pressure / vacuum relief valve. The date of the re-certification should be stamped on the tank inspection plate.

Static storage tank internal inspection

8.29 Static storage tanks are subject to an annual or biennial internal inspection (depending on the type of tank) by the Refuelling System Service Provider. If the storage tank is mild steel with an epoxy lining then it should be inspected at least once per year. If the tank is stainless steel then a two-year interval between inspections is acceptable, however, where a track record of minimal findings during internal inspections can be evidenced, inspection intervals may be extended to three years for both mild and stainless steel tanks at the discretion of the Refuelling System Service Provider responsible for certification of the system. If excessive accumulation of contaminants or degradation of internal surfaces is found following extension to a three-yearly frequency, the inspection frequency should be reverted to biennial or annual as required.

When due for inspection the tank should be drained, isolated and vented with the manhole access cover removed.

The inspection should include the following internal and external checks:

	Items	**Activity**
1	Visual inspection of internal condition	Assess and record condition of the inside of the tank upon initial entry, recording nature and extent of contaminants, staining and discolouration.
2	Cleanliness	Clean tank bottom as required.
3	Tank internal fittings	Check condition.
4	Lining material (if applicable)	Acetone test (note this check need only be carried out on new or repaired linings).
5	Paint condition	Check for deterioration, particularly around seams.
6	Access to tank top fittings	Check condition of access ladder / platform.
7	Inspection hatch	Check lid, seal and swing-bolt condition and security.

	Items	Activity
8	Access manhole cover	Check lid, seal and swing-bolt condition and refit cover securely.
9	Pressure and vacuum relief valve	Check condition and presence of fire-screen gauze, in particular check for leaks.
10	Floating suction	Check condition, continuity of bonding and operation. Ensure float is empty.
11	Valves	Check condition, operation and suitability of materials of construction.
12	Sump / drain line	Check condition, operation and suitability of materials of construction.
13	Grade identification	Ensure regulation Jet A-1 markings are applied and clearly visible.
14	Contents gauge	Check condition and operation.
15	Bonding	Measure electrical bonding resistance between tank and system pipework (maximum permissible reading of 25 ohms).

8.30 Static storage tanks are also subject to more frequent external checks. These are detailed within ‘Refuelling system checks – Operator’ and ‘Refuelling system inspection – Authorised Service Engineer’ sections below.

Refuelling system – General

8.31 The refuelling system should be subject to daily and weekly checks by competent offshore fuelling personnel to ensure sustained operability and satisfactory fuel quality.

8.32 The refuelling system should normally be inspected every three months by an authorised Service Engineer on behalf of a Refuelling System Service Provider, contracted by the offshore asset owner or duty holder to inspect and certify the system is fit for uplifting fuel by the helicopter operator.

NOTE 1: Inspection in this context is **not** to be confused with Auditing. It is physical intervention / trades supervision by a fully trained and competent engineer for determining condition and replacement of key system components, prior to certifying the system is fit for purpose.

NOTE 2: An authorised Service Engineer is defined as an individual that is independent from the business unit procuring the inspection service, who's employing company can demonstrate that the individual is technically qualified, competent and has relevant experience on the offshore refuelling systems, components and equipment subjected to examination and verification.

NOTE 3: On some installations, duty holders may require specific work activities to be undertaken by an on-board maintenance team member (e.g. an electrician or mechanic) as part of the maintenance management plan. In such cases, the work undertaken by the duty holder should not include activities for breaking into system fuel containment, without receipt of written approval from the authorised / certifying Refuelling System Service Provider. Any work done may additionally require inspection and verification following completion.

8.33 The function of refuelling system inspection is twofold; firstly, it allows necessary scheduled invasive and specialist work-scopes to be carried out by an approved Service Engineer, and secondly, it provides system certification on completion of a successful inspection.

8.34 No system should exceed four months between successive inspections and certification may be withdrawn if the system is not maintained in accordance with the requirements noted below.

Refuelling system checks – Operator

8.35 **Daily checks:** The following checks should be carried out each day and is the responsibility of the HLO, although tasks may be delegated to another competent person.

	Items	Activity
1	Transit tank / storage tank	Flush and sample each compartment of the transit tank / storage tank (as applicable), check for quality and retain as detailed in paragraphs 8.11 to 8.12 and 8.15 to 8.18.
2	Delivery filter vessel(s)	Flush and sample filter vessel sump / sample line and check for quality as detailed in paragraph 8.11 to 8.12 and 8.15 to 8.17. **NOTE 1:** Delivery filter vessel daily fuel sampling applies to primary filter water separator vessels and optional secondary dirt defence or water barrier filter vessels as well as any decommissioned monitor vessel which remain in the fuel path. Although decommissioned monitor vessels do not contain elements which may cause contaminants to be gathered, they do contain low point traps and as such, daily sampling is still a requirement. **NOTE 2:** This check excludes the transfer filter which should be flushed and sampled weekly or prior to use, whichever is the sooner. This can only be carried out when fuel is being transferred.
3	Delivery hose end (pressure refuelling coupling / gravity nozzle)	Flush and sample from the hose end and check for quality as detailed in paragraphs 8.11 to 8.12 and 8.15 to 8.18. The sample may be retained as a pre-refuel sample as detailed in paragraph 8.17.
4	General system checks	Check for signs of leakage from the system. Ensure that all dispensing equipment is stowed inside the dispensing cabinet with the door closed for protection from the elements when not in use.
5	Complete documentation	Daily checks should be recorded on the 'Daily & Weekly Maintenance Checks' and 'Daily System Fuel Sampling' QC documentation.

8.36 **Weekly checks:** In addition to the daily checks specified in paragraph 8.35 above the following checks should be carried out each week and is the responsibility of the HLO, although tasks may be delegated to another competent person.

	Items	Activity
1	Transit tanks	Carry out weekly tank checks as detailed in paragraph 8.26
2	Suction hose and hose coupling	*For EN ISO 1825 rubber hoses:* ▪ Lay out straight then form a loop to examine the hose along its length by rolling the loop, allowing full circumference inspection. Check for damage i.e. 'soft spots', bulges, blistering, cuts, abrasions, kinks or crushing. Light surface damage is acceptable, however, no white canvas braiding should be visible through the skin of the hose. ▪ Check hose end clamps for security. *For B-Flex annular convoluted hoses:* ▪ Check hose has not been coiled too tightly. ▪ Check condition of outer protective cover where fitted. ▪ Feel along hose length checking for crush damage. *General checks:* ▪ Check complete assembly for any indication of leakage. ▪ Check correct operation of hose coupling. ▪ Check captive dust plug is present.
3	Static storage tanks	Check floating suction assembly for buoyancy and freedom of movement. Check all tank top fittings are in place, clean and all dust caps are fitted. Check that valves are closed and inspection hatches tightened down. Check silica gel air vent dryers for condition (where fitted) and replace crystals as required.

	Items	Activity
4	Pump skid / cabinet	Check pump bearings are adequately greased. *For air motor driven systems:* ▪ Ensure air-line lubricators are adequately topped up with suitable oil and drain air-line water traps. *For electric motor driven systems:* ▪ Check pump drive gearbox oil level and top up as required.
5	Sample reclaim tank	Check level of fuel in reclaim tank. If fuel requires to be reclaimed, flush, sample, reclaim to bulk storage, drain dead stock off to waste and clean reclaim tank internally. Inspect and clean strainer as necessary.
6	Differential pressure gauges	*For delivery filter vessels:* ▪ Obtain weekly differential pressure readings for each vessel during refuelling under full flow conditions. If no refuel has taken place during any given week, a sufficient quantity of fuel should be run off into a drum at full flow to allow readings to be taken. Readings should be recorded on the 'Differential Pressure Record' QC documentation sheet. *For transfer filter vessels:* ▪ Obtain weekly differential pressure readings for each vessel during static storage tank replenishment under full flow conditions. If no replenishment has taken place during any given week no further action is necessary, and readings can be taken during the next replenishment. Readings should be recorded on the 'Differential Pressure Record' QC documentation sheet.
7	Dispensing cabinet pressure gauge	Check for correct operation of the dispensing system fuel pressure gauge.

	Items	Activity
8	Hose reel	Check rewind gears are adequately greased – apply grease as required. Ensure air-line lubricators for air driven rewind motors are adequately topped up with suitable oil and drain air-line water traps (as appropriate).
9	Fuel delivery hose	Unwind the hose from the reel onto the helideck and lay out as straight as possible, or in a wide arc if space does not permit. Subject to pump pressure then form a loop to examine the hose along its length by rolling the loop, allowing full circumference inspection. Check for damage i.e. 'soft spots', bulges, blistering, cuts, abrasions, kinks or crushing. Light surface damage is acceptable, however, no white canvas braiding should be visible through the skin of the hose. Particular attention should be paid to those sections of the hose within approximately 45 cm (18'') of couplings since they are especially prone to deterioration. Check hose end clamps for security. Rewind hose back onto the reel. Test results to be recorded on the 'Hose Inspection & Test Record' QC documentation sheet.
10	Fuel delivery pressure refuelling coupling / gravity nozzle	Inspect for general condition, cleanliness and correct operation to ensure correct lock off and no leakages. Remove, inspect and clean cone strainers as necessary. If significant quantities of contaminants are found, refuelling operations should cease until the reason can be established and remedial action taken. Re-install or renew strainers as required, taking care to locate the seals correctly. Ensure dust caps are present and secure. **NOTE:** Only lubricate pressure refuelling coupling or gravity nozzle parts with manufacturer approved lubricant.

	Items	Activity
11	Spill pot	Accumulated fuel should be drained from the spill pot and disposed of.
12	Earth bonding / EPU	*Check for general condition, security and electrical continuity (maximum permissible reading of 25 ohms) on the following earth bonding equipment:* ▪ Tank earth leads and clamps. ▪ Pressure refuelling coupling / gravity nozzle secondary bonding lead, jack plug and clips. ▪ Primary aircraft bonding / EPU lead, and jack plug. *Carry out checks for correct function of the following:* ▪ Primary aircraft bonding / EPU reel automatic or manual rewind mechanism.
13	General system checks	The system should be checked for leaks and general appearance. Painted components should be visually inspected to determine condition of paint linings. Localised repairs should be carried out where fuel quality and system integrity will not be compromised. Ensure good housekeeping is maintained. Blocked drains, standing water and accumulation of rubbish, such as used water detector capsules should be addressed by the HLO or delegate as soon as is achievable.
14	Documentation	Completion of aforementioned checks should be recorded within system QC Documentation.

Refuelling system inspection – Authorised Service Engineer

8.37 **Three-monthly inspection:** A three-monthly inspection is the foundation on which the more in-depth six-monthly and annual inspection work scopes are based. Three-monthly inspection work scopes should only be carried out by an authorised Service Engineer on behalf of a Refuelling System Service Provider and will vary dependent on the particular installation and fuel system set up.

The following checklist is included as a general guide only but should cover most equipment scenarios. Additional items may be included when considered appropriate.

	Items	**Activity**
1	Transit tanks	Carry out weekly tank checks as detailed in paragraph 8.26
2	Suction hose and hose coupling	*For EN ISO 1825 rubber hoses:* ▪ Lay out straight then form a loop to examine the hose along its length by rolling the loop, allowing full circumference inspection. Check for damage i.e. ‘soft spots’, bulges, blistering, cuts, abrasions, kinks or crushing. Light surface damage is acceptable, however, no white canvas braiding should be visible through the skin of the hose. ▪ Check hose end clamps for security. *For B-Flex annular convoluted hoses:* ▪ Check hose has not been coiled too tightly. ▪ Check condition of outer protective cover where fitted. ▪ Feel along hose length checking for crush damage. *General checks:* ▪ Check complete assembly for any indication of leakage. ▪ Check correct operation of hose coupling. ▪ Check captive dust plug is present.
3	Static storage tanks	Check floating suction assembly for buoyancy and freedom of movement. Check all tank top fittings are in place, clean and all dust caps are fitted. Check that valves are closed and inspection hatches tightened down. Check silica gel air vent dryers for condition (where fitted) and replace crystals as required.

	Items	Activity
4	Pump skid / cabinet	Remove, clean and inspect Y-strainer baskets. Where a track record of minimal findings during previous inspections can be evidenced, inspection intervals may be extended to six months at the discretion of the Refuelling System Service Provider. If an excessive accumulation of contaminants is found following extension to a six-monthly frequency, the inspection frequency should be reverted to three-monthly as required. Check pump bearings are adequately greased. *For air motor driven systems:* ▪ Ensure air-line lubricators are adequately topped up with suitable oil and drain air-line water traps. ▪ Check air-line lubricator drip feed rate is set correctly. *For electric motor driven systems:* ▪ Check pump drive gearbox oil level and top up as required.
5	Sample reclaim tank	If fuel requires to be reclaimed, flush, sample, reclaim to bulk storage, drain dead stock off to waste and clean reclaim tank internally. Inspect and clean strainer as necessary.
6	All filtration units (e.g. transfer and delivery filter vessels)	Check vessels for condition, security of fittings, evidence of leakage and correct product identification labels. Flush and sample each filtration unit and perform fuel quality checks as detailed in paragraphs 8.11 to 8.12 and 8.15 to 8.16. Record results on 'Daily System Fuel Sampling' QC documentation. If consistently unacceptable samples are evident during the three-monthly check it could indicate one of a number of causes, including the presence of bacteriological growth in the vessel and more in-depth investigation may be required: ▪ Open the filter vessel and inspect for correct seating and security of elements, surfactants, bacteriological

	Items	Activity
		presence, mechanical damage and condition of lining (as applicable). ▪ Clean out any sediment and carry out a water test on the water separator element (as applicable). ▪ Inspect all elements and renew as necessary. ▪ Reassemble and repeat testing.
7	Differential pressure gauges	Check condition and security of gauges. Check for correct operation during functional testing and check for full scale deflection and return to 'zero' where gauges are fitted with test valves. *For delivery filter vessels:* ▪ Obtain differential pressure readings for each vessel during refuelling or operational performance test flushing under full flow conditions. Readings should be recorded on the corresponding 'Differential Pressure Record' QC documentation sheet. *For transfer filter vessels:* ▪ Obtain differential pressure readings for each vessel during static storage tank replenishment under full flow conditions. If no replenishment can be carried out during the inspection, readings should be taken by recirculating fuel if system configuration allows this, otherwise no further action is necessary. Readings should be recorded on the corresponding 'Differential Pressure Record' QC documentation sheet.
8	Automatic air eliminators	Prime and check for correct operation of all installed air eliminators. If a manual air vent valve is fitted, replace it with an automatic type.
9	System pressure relief valves	Visually check for condition and note certification frequency and due dates on the system inspection report.

	Items	Activity
10	Electronic water sensor	Carry out loop testing using EWS manufacturer's loop tester equipment in line with manufacturer's testing requirements.
11	Dispensing cabinet pressure gauge	Check for correct operation of the dispensing system fuel pressure gauge.
12	Hose reel	Ensure reel rewind mechanism operates correctly by testing operation using powered and manual rewinds (as appropriate). Check bearings and rewind gears are adequately greased – apply grease as required. Ensure air-line lubricators for air driven rewind motors are adequately topped up with suitable oil and drain air-line water traps (as appropriate). Check air-line lubricator drip feed rate is set correctly (as appropriate). Inspect inlet swivel and swan neck hose connection for condition.
13	Fuel delivery hose	Unwind the hose from the reel onto the helideck and lay out as straight as possible, or in a wide arc if space does not permit. Subject to pump pressure then form a loop to examine the hose along its length by rolling the loop, allowing full circumference inspection. Check for damage i.e. 'soft spots', bulges, blistering, cuts, abrasions, kinks or crushing. Light surface damage is acceptable; however, no white canvas braiding should be visible through the skin of the hose. Particular attention should be paid to those sections of the hose within approximately 45 cm (18'') of couplings since they are especially prone to deterioration. Check hose end clamps for security. Rewind hose back onto the reel. Test results to be recorded on the 'Hose Inspection & Test Record' QC documentation sheet.
14	Fuel delivery pressure	Inspect for general condition, cleanliness and correct operation to ensure correct lock off and no leakages.

	Items	Activity
	refuelling coupling / gravity nozzle	Remove, inspect and clean cone strainers as necessary. If significant quantities of contaminants are found, refuelling operations should cease until the reason can be established and remedial action taken. Re-install or renew strainers as required, taking care to locate the seals correctly. Ensure dust caps are present and secure. **NOTE:** Only lubricate pressure refuelling coupling or gravity nozzle parts with manufacturer approved lubricant.
15	Spill pot	Accumulated fuel should be drained from the spill pot and disposed of.
16	Earth bonding / EPU	*Check for general condition, security and electrical continuity (maximum permissible reading of 25 ohms) on the following earth bonding equipment:* ▪ Tank earth leads and clamps. ▪ Pressure refuelling coupling / gravity nozzle secondary bonding lead, jack plug and clips. ▪ Primary aircraft bonding / EPU lead and jack plug. *Carry out checks for correct function of the following:* ▪ Primary aircraft bonding / EPU reel automatic or manual rewind mechanism.
17	General system checks	The system should be checked for leaks and general appearance. Painted components should be visually inspected to determine condition of paint linings. Localised repairs should be carried out where fuel quality and system integrity will not be compromised. Ensure good housekeeping is maintained. Blocked drains, standing water and accumulation of rubbish such as used water detector capsules should be addressed by the HLO or delegate as soon as is achievable.

	Items	Activity
18	Documentation	Completion of aforementioned checks should be recorded within system QC documentation.

8.38 **Six-monthly inspection:** Six-monthly inspections should only be carried out by an authorised Service Engineer on behalf of a Refuelling System Service Provider. The content of a six-monthly inspection should include all of the three-monthly inspection checks detailed in paragraph 8.37 above and, in addition, should include the following items:

	Items	Activity
1	Pump skid / cabinet	Check coupling between motor and pump for wear and signs of misalignment. Refer to refuel system supplier / pump manufacturer's recommended maintenance schedule for additional items. *For electric motor driven systems:* ▪ All electrical circuits to be checked by a qualified electrician.
2	Interconnecting pipework	Check for clear fuel grade identification labelling in accordance with EI 1542.
3	Flow Meter	Lubricate the meter register head, drive and calibration gears with petroleum jelly. Remove, inspect and clean strainer basket as necessary. If significant quantities of contaminants are found, the reason should be established, and remedial action taken. Re-install or renew strainer as required, taking care to locate the seals correctly. **NOTE:** Inspection of flow meter strainers which are fitted immediately after filter vessels can be deferred to annual inspection frequency to correspond with filter vessel drain-down and inspection.
4	Hose reel	Check tension on chain drive and adjust as necessary.

	Items	Activity
5	Documentation	Completion of aforementioned checks should be recorded within the QC documentation.

8.39 **Annual inspection:** Annual inspections should only be carried out by an authorised Service Engineer on behalf of a Refuelling System Service Provider. The content of the annual inspection includes all the items in both the three-monthly and six-monthly inspections and the following additional items:

	Items	Activity
1	All filtration units (e.g. transfer and delivery filter vessels)	Drain down and open filter vessels. Inspect for correct seating and security of elements. Remove, inspect then discard existing disposable type elements. Remove, inspect and carry out water test on separator element if fitted. Satisfactorily inspected and tested separator elements should then be bagged for re-fitment on completion of cleaning. Clean vessel internal surfaces, base plates and manifolds. For lined vessels, check all areas of lining for signs of deterioration. Carry out lining repairs as necessary. Conduct acetone, dry film thickness and / or pin hole detection test on vessel interior linings if applicable. **NOTE:** These need only be carried out to check for correct curing when lining is new or has been repaired. Fit new disposable elements. Fit tested separator element or renew as required (if fitted). Fit new head gasket / seal as required, close up the vessel and tighten the head securing bolts. Closure seals should be subjected to a maximum of three compressions before replacement.

		Mark the filter body with the dates of the filter element change.
2	Electronic water sensor	Disconnect and remove the EWS unit and send to the manufacturer for calibration. Fit a pre-calibrated change-out unit if available to return the system to operational status. **NOTE:** Initial calibration validity is 2 years from installation. Annual calibration is only required after the first 2 years in service, however, this frequency should be checked with the equipment manufacturer.

8.40 **Bi-enniel maintenance requirements:** Bi-enniel maintenance should only be carried out by an authorised Service Engineer on behalf of a Refuelling System Service Provider and should be in addition to all the items in the three-monthly, six-monthly and annual inspections:

	Items	Activity
1	Delivery hose	Delivery hoses should be pressure tested and recertified (ISO 1825) every two years. However, for operational expediency, duty holders may elect to replace the hose at the prescribed interval or earlier if any defects are found which cannot be repaired. In the absence of facilities for offshore testing, a removed hose should be tested and re-certified onshore. The hose will have a ten-year life from date of manufacture.
2	Electronic water sensor	After the first two years in service, disconnect and remove the EWS unit and send to the manufacturer for calibration. Fit a pre-calibrated change-out unit if available to return the system to operational status. **NOTE:** Initial calibration validity is 2 years from installation. Bi-enniel maintenance of the EWS is no longer applicable thereafter, however, this frequency should be checked with the equipment manufacturer.

Miscellaneous inspection frequency

8.41 Inspection of some items of equipment within the fuelling system fall out-with standard frequencies. This may be because of individual component manufacturer's recommendations or over-riding platform or vessel standards as examples. Generally, where there is a conflict in inspection frequency, it is preferred that the more stringent standard is adopted. The inspection scopes listed below should be carried out by an authorised Service Engineer on behalf of a Refuelling System Service Provider:

	Items	Activity
1	Static storage tanks	Internal inspection of static storage tanks has varying frequency of between 1, 2 or 3 years, based on material of construction as well as previous internal inspection track record. This is detailed within 'Static storage tank internal inspection' section, paragraph 8.29 above.
2	Pressure relief valves	Change-out or recertification frequency for relief valves fitted to filter vessels, static storage tanks, pipework or other equipment is often dictated by installation specific standards. Relief valves fitted to transit tanks are always managed under IMDG test requirements, i.e. 2½ year frequency. Relief valves may be included in a general installation relief valve register but should only be changed out by an authorised Service Engineer on behalf of a Refuelling System Service Provider. Wherever possible relief valve change-out should be aligned with scheduled invasive work on the equipment to which it is fitted (e.g. filter change or static storage tank internal inspection).
3	Flow meter	Flow meters may be included in a general installation instrumentation register but should only be changed out by an authorised Service Engineer on behalf of a Refuelling System Service Provider. The flow meter calibration frequency should be in accordance with the manufacturer recommendations. This may be based on elapsed time or throughput.

	Items	Activity
		If there is evidence of inaccuracy such as metered quantities not aligning with aircraft instrument readings, investigation and / or rectification / calibration may need to be completed out-with the manufacturer recommendations. Calibration frequency should not extend beyond 5 years.
4	Gauges and instrumentation	Pressure and differential pressure gauge calibration or replacement frequencies may be based on gauge type, criticality, manufacturer or operator requirements. As a minimum, dispensing cabinet fuel pressure gauges and filter differential pressure gauge should be calibrated annually due to their criticality to monitoring the system for safe operation during refuelling. **NOTE:** Some differential pressure gauges are designed and equipped with a self-calibrating function. Due to the simplicity of this design, calibration of these gauges can be carried out on a three-monthly basis.
5	Fuel delivery pressure refuelling coupling / gravity nozzle	Offshore operators or duty holders should decide on a maintenance strategy for in-use pressure refuelling couplings and gravity nozzles, adopting either a set frequency maintenance schedule, (e.g. 2 yearly) or condition monitoring to dictate when they should be sent ashore for inspection, maintenance and testing. A period of 4 years in-use should not be exceeded irrespective of which philosophy is adopted. Shelf life of spare couplings and nozzles held in controlled storage conditions should also be considered and may vary dependent on the types held due to differing manufacturer recommendations.

System breakdown

8.42 In the event of a system breakdown, as a general rule, before carrying out ‘in-house’ repairs on fuelling system equipment, the HLO or his delegate should consult with the issuer of the current system certification to discuss the symptoms of the problem and to seek advice and permission before carrying out any work in order to maintain certification of the system. Some work scopes will be permissible following a brief discussion, others will be permissible if carried out by following written instructions or procedures and still others will not be permissible as an in-house repair at all, requiring the mobilisation of an authorised Service Engineer on behalf of a Refuelling System Service Provider.

8.43 In general terms, rectification work which does not have a direct effect on fuel quality and is not classed as invasive to the fuel side of the system may be undertaken by the HLO or his delegate following confirmation from the system certification issuer. Some examples of this would be:

- External paint lining repairs,
- Pneumatic and electrical controls and circuits and earth bonding,
- Motor and gearbox work,
- Structural work (roller doors, pipe support brackets, equipment mounting brackets).

8.44 Rectification work that has a direct effect or the potential to have a direct effect on fuel quality and other invasive work should not be attempted by the HLO or his delegate unless given specific written permission to do so by the system certification issuer. Some examples of this would be:

- Filter changes or filter contamination investigative work,
- Pump replacement,
- Relief valve change-out or recertification,
- Hose change-out,
- Static storage tank entry.

Exceptions to this might be where a pump is to be removed for maintenance, but will not be reinstated until a Service Engineer is mobilised or where a static storage tank is to be decommissioned. Individual scenarios should be reviewed and the safest course of action determined by the system certification issuer.

Fuel movement operations

Filling of transit tanks

8.45 Filling of transit tanks at onshore locations should be carried out under a system of controls and processes designed to ensure that the fuel delivered meets the requirements of Def Stan 91-091.

Receipt of transit tanks offshore

8.46 Transit tanks transported offshore are often exposed to sea spray and harsh weather conditions on supply vessels and this could potentially cause ingress of water into the fuel. As deck space and capacity for fuel holding available on board an offshore installation or vessel may be limited, it is strongly recommended that under normal circumstances, tank inspection, fuel flushing and sampling is carried out as soon as the appropriate settling time has elapsed or at least within 24 hours of the tank being placed into a bunded storage area on board. In this way, any operational condition or fuel quality issues can be identified and rectified as early as possible. Settling times are one hour per foot depth of fuel in the tank.

NOTE: In some circumstances, it may not be appropriate to sample transit tanks within 24 hours of laydown, for example, during adverse weather or on occasions where additional settling time is required to allow condensation and low point accumulation of water. If initial flushing and sampling reveals consistently wet fuel, it may be necessary to contact the Refuelling System Service Provider or Fuel Supplier who can advise whether it is appropriate to return the tank, continue flushing and sampling or allow additional settling time, dependent on findings as detailed in paragraph 8.12.

8.47 The following procedure should then be followed:

8.47.1. Carry out an 'On receipt' inspection as detailed in paragraph 8.25 above.

8.47.2. Flush and sample the transit tank and dispose of waste fuel until the sample appears free from contaminants as indicated in paragraph 8.11 to 8.18.

Decanting from transit tanks to static storage

8.48 Before commencing any transfer of fuel it is necessary to check the static storage tank fuel level using a dipstick, dip tape or level gauge to ensure that the contents of the transit tank can be accommodated.

The transit tank should have had sufficient time to settle once positioned correctly for the transfer operation. Settling times are one hour per foot depth of fuel in the tank.

The following procedure should then be followed:

8.48.1. Connect an earth bonding lead to the transit tank.

8.48.2. Carry out checks for fuel quality as described in paragraph 8.11 to 8.16.

8.48.3. Once a satisfactory sample has been obtained, the suction hose should be connected to the transit tank discharge point and the tank foot valve should be opened.

8.48.4. With the system valves set up to supply fuel from the transit tank to the transfer pump and on to the transfer filter vessel, the transfer pump should be run in order to flush and obtain a sample from the transfer filter vessel under pump pressure until a satisfactory result is obtained. Stop the pump between samples if multiple samples require to be taken.

8.48.5. Re-start the transfer pump and open the static storage tank inlet valve to start the fuel flow. Once fuel transfer has commenced, check the coupling connections for any signs of leakage and continue to monitor the fuel flow whilst transfer is taking place.

8.48.6. When sufficient fuel has been transferred, shut off the valves and stop the transfer pump.

8.48.7. Disconnect the transfer hose followed by the earth bonding lead and replace any dust caps that were removed at commencement of the operation.

8.48.8. Record fuel quality checks and the transfer of the transit tank contents into the storage tanks and retain the fuel release certificate on board the installation / vessel.

8.48.9. After transfer of fuel into the bulk storage tank and before it is released for use, ensure that the fuel is allowed to settle. Where possible, minimum settling time should be a period in hours equal to or greater than the depth of fuel measured in feet. Where it is not possible to measure fuel depth, the maximum depth of the tank should be used. When operational requirements dictate that refuelling requires to be carried out before fuel has fully settled, this is permissible after a minimum of 1 hour settling time on condition that the storage tank is fitted with floating suction and a floating suction buoyancy check is carried out before refuelling.

8.48.10. For systems which are set up to gravity decant fuel from transit to static storage tanks, the process should be identical with the exception of having to operate a pump, i.e. after tank flushing and sampling, connect the suction hose and open valves to allow transfer filter flushing and sampling under head of pressure of the tank. Once a satisfactory sample is obtained, open the static storage tank inlet valves to commence decant.

Set-up for fuelling direct from transit tanks

8.49 Many offshore helicopter fuelling systems are designed to supply aviation fuel direct from the transit tanks into the delivery system.

In this case the following procedure should be followed:

8.49.1. Once the transit tank is located in the tank laydown area and before it is released for use, ensure that the fuel is allowed sufficient time to settle. Settling time is one hour per foot depth of fuel in the tank.

8.49.2. Connect an earth bonding lead to the transit tank.

8.49.3. Flush and sample the transit tank and dispose of waste fuel until the samples appear free from contaminants.

8.49.4. Carry out checks for fuel quality as described in paragraph 8.11 to 8.18.

8.49.5. Once a satisfactory sample has been obtained, the suction hose should be connected to the transit tank discharge point and the tank foot valve should be opened.

8.49.6. With the system valves set up to supply fuel from the transit tank to the delivery pump and on to the delivery filter vessels, the delivery pump should be run in order to flush and obtain a sample from the delivery filter water separator and any secondary filtration vessels fitted, followed by the hose end until a satisfactory result is obtained from each. Stop the pump between samples. Record fuel quality checks, sample quantities taken and retain the fuel release certificate on board the installation / vessel.

8.49.7. The system is now ready for fuelling an aircraft.

Set-up for fuelling from static storage tanks

8.50 The process for refuelling from static storage tanks should be identical to that of refuelling from transit tanks with the exception of setting up system valves to route fuel from the static storage tank to the delivery pumps.

Static storage tank draining

8.51 In order to carry out static storage tank internal inspection, the tank should be empty. It is not always possible to co-ordinate so that stock is run down in time for a scheduled inspection visit and there is always a quantity of dead-stock fuel to drain even when the tank has broken suction. In order to ensure fuel movements from the static storage tanks are controlled so as to maintain fuel traceability and to prevent potential fuel contamination, a list of scenarios are noted below for guidance.

8.52 Some basic principles apply:

- Static storage tanks contain a composite of multiple batches of fuel. Although the fuel pumped into these tanks is of known batch, density and quality, as there are no facilities to measure density once fuel is transferred nor to create composite batch numbers, any fuel held in a static storage tank cannot be returned onshore for re-use without incurring significant costs for Certificate of Analysis (CoA) testing which may make returns in transportable tank size quantities economically unviable.
- Transit tanks are used to transport traceable fuel of a known density of which residues are checked on return to the point of filling, therefore, any fuel added to these residues will mean that all fuel in that tank cannot be returned onshore for re-use without incurring significant costs for Certificate of Analysis (CoA) testing which may make returns in transportable tank size quantities economically unviable.
- Fuel transferred between tanks using the offshore refuelling system will reduce the likelihood of contaminants being introduced during the transfer process.
- Any fuel removed from a tank sample line should be disposed of unless it is removed into a sample jar or closed circuit sampler and quality control checks are carried out and found to be acceptable. In this case, the sample can be returned to the sample recovery tank (if fitted) and reintroduced to a static storage tank once maintenance has been completed. All fuel removed from a sample line by other means (e.g. a sump drain pump) where fuel quality cannot be checked and controlled should be disposed of.

8.53 Emptying a static storage tank to 'break suction' point:

8.53.1. Depending on system set up, it may be possible where there is more than one static storage tank to transfer fuel from the tank to be inspected into another storage tank by orientating the valves to draw from one tank and pump through the transfer vessel into the other tank.

8.53.2. If fuel cannot be transferred from one storage tank to another and it is possible to locate a transportable tank on the helideck or within reach of the fuel delivery hose, fuel can be pumped to a transportable tank using a crossover connection to connect the delivery system to the tank fill connection as if refuelling an aircraft. The tank should be earth bonded prior to pumping fuel into it. This fuel can then be flushed, sampled and transferred back to a static storage tank once maintenance has been completed, however, fuel residues after breaking suction on the transportable tank cannot be returned onshore for re-use without undergoing CoA testing which may be economically unviable for small quantities of fuel. Residues can either be returned onshore for disposal in the tank, or transferred into a drum or hazardous drain, however, the tank should be adequately labelled as containing scrap fuel and manifested as such. Additionally, the tank supplier should be informed that the tank has contained mixed density fuel and should be cleaned and conditioned once returned onshore.

8.53.3. If fuel cannot be handled as described above in order to control its quality for re-use, then all fuel in the static storage tank should be decanted to waste. This can be accomplished using the fuel delivery system to pump into a waste fuel tank, drums or hazardous drains until the tank breaks suction. Alternatively, a tank could be drained by fitting a sump drain pump to the sample line before breaking suction as described below.

8.54 Emptying static storage tank dead-stock:

8.54.1. Dead-stock can be sampled and if satisfactory, decanted into the sample recovery tank (if fitted) and reintroduced to a static storage tank once maintenance has been completed, however, this is a long and laborious process and sample recovery tanks will often not have sufficient capacity to contain all dead-stock.

8.54.2. A sump drain pump (e.g. a 1” air driven diaphragm pump) can be connected to the static storage sample line end connection and run to suck all fuel out until the tank is empty. This fuel can be pumped to a waste fuel tank, drums or hazardous drains.

Long term storage of aviation fuel & system inactivity

8.55 The long term storage of aviation fuel offshore should be discouraged. Should fuel stocks remain unused offshore for an extended period (i.e. 180 days after the last fuel test date) then, prior to use, samples should be drawn from the tank and sent onshore for laboratory testing to ensure fuel quality. Fuel held in transit tanks may be returned to an onshore fuel depot for further action.

8.56 Systems which are inactive for prolonged periods should not be used for refuelling. Quarterly system cetification is conditional on daily sampling and routine maintenance checks being carried out between inspections, therefore failure to comply with these requirements dictates that a system be inspected and certified prior to re-commencement of refuelling operations. Length of inactivity, along with other factors such as system layout and quality of samples obtained will determine the steps necessary for re-certification, and each case will require to be assessed on its own merits by the Refuelling System Service Provider prior to issue / renewal of certification.

In systems where the fuel within components and interconnecting pipework is more than 1 month old due to lack of sampling and weekly performance test flushing, the system should be flushed using at least twice the total system volume (excluding tank volumes) in order to displace stagnant fuel. This may also be required for shorter periods of inactivity, dependent on the findings during system assessment.

Planned periods of inactivity should be discussed with the contracted Refuelling System Service Providerin order to determine the most appropriate method of system preservation.

Aircraft refuelling

8.57 Refuelling during thunderstorms and significant lightning activity poses significant risks and should therefore be avoided.

8.58 Always ensure before starting any refuel that the fuel in the static storage tank or transit tank is properly settled. Refer to paragraphs 8.48 and 8.48.9 for correct settling times.

8.59 Before the commencement of any helicopter refuel, the HLO should be notified. Unless for specific safety reasons (see paragraph 8.59.13), passengers should normally be disembarked from the helicopter and should be clear of the helideck before refuelling commences. The helideck fire team should be in attendance at all times during any refuelling operation. The following procedure should then apply:

8.59.1. When the aircraft captain is ready and it has been ascertained how much fuel is required and that the grade of fuel is correct for the particular aircraft, a flight crew member (e.g. non-handling pilot) should check and acknowledge that the daily fuel sample visual appearance check and chemical water detector test is acceptable. Morning samples are generally accepted, but a fresh sample may be requested by the pilot if any discrepancy is noted.

8.59.2. Take the primary bonding lead and attach it to the approved aircraft bonding point. Next, take the delivery hose to the aircraft refuelling point.

8.59.3. If pressure refuelling, connect the secondary bonding lead to the approved aircraft bonding point to bond the pressure refuelling coupling to the aircraft, then connect the pressure refuelling coupling to the aircraft and remain adjacent to the fuelling point.

8.59.4. If gravity refuelling, connect the secondary bonding lead to bond the gravity nozzle to the aircraft, then open the tank filler and insert the nozzle spout and prepare to operate the fuel lever when signalled to do so by the person in charge of refuelling. Ensure fire cover is provided next to the filler point in the form of a dry powder extinguisher.

8.59.5. The nominated person in charge of the operating the refuelling equipment (e.g. a Helideck Assistant - HDA) should operate the system pump control and open any necessary valves to start the flow of fuel only when given clearance by the pilot via the HLO; using correct hand signals. The HLO should remain in a position whereby he has full view of both the helicopter refuelling point, pilot (handling) and person operating the fuel station (e.g. HDA). Ideally refuelling teams should be wearing listening headsets so that HLO can communicate instantly with both them and the pilot in the event of an emergency.

8.59.6. If any abnormalities are observed during the refuelling the ‘off’ control should immediately be operated. When refuelling is complete or when the pilot signals that tanks are full, the pump should be shut down and the gravity nozzle handle released or the pressure refuelling coupling valve handle returned to the closed position.

8.59.7. Remove the gravity nozzle spout or disconnect the pressure refuelling coupling from the aircraft and replace the aircraft filler and refuelling equipment caps. Finally disconnect the secondary bonding lead.

8.59.8. Remove the delivery hose and pressure refuelling coupling / gravity nozzle from the helideck.

8.59.9. A fuel sample should now be taken from the hose end pressure refuelling coupling / gravity nozzle and checked for quality. The process should be witnessed by a flight crew member. Refer to paragraph 8.17 and 8.18 for sample retention requirements.

8.59.10. Carry out a final physical check that the aircraft filler cap is secure, then disconnect the primary bonding lead from the aircraft and check that all equipment is clear from the proximity of the aircraft.

8.59.11. The delivery hose and primary bonding lead should be rewound onto reels.

8.59.12. Enter the fuel quantity onto the 'Fuelling Daily Log Sheet' and obtain the pilot's signature for the fuel received.

8.59.13. **IMPORTANT SAFETY CONSIDERATIONS**

If for clear flight and helideck operational safety reasons the aircraft captain, in consultation with the HLO, has decided that the refuelling should be carried out with engines and / or rotors running and / or with passengers embarked, the following additional precautions should be undertaken:

NOTE: Refuelling (engines and / or rotors running or stopped) should never be executed while the passengers are embarking or disembarking. The passengers are either on board in accordance with the precautions listed below, or they are kept at a safe distance.

- Constant communications should be maintained between the flight crew (pilot handling), HLO and the refuelling crew.
- The HLO should remain in a position whereby he has full view of both the helicopter refuelling point, pilot (handling) and the person operating the fuelling installation. Ideally refuel teams should be wearing listening headsets so that HLO can communicate instantly with both them and the pilot in the event of an emergency.
- The passengers should be briefed by the pilot on what actions to take if an incident occurs during refuelling.
- The cabin doors on the opposite side to the refuelling point should remain open, weather permitting. The emergency exits opposite the refuelling point should be unobstructed and ready for use. Doors on the refuelling side of the helicopter should remain closed.

NOTE: Unless the Rotorcraft Flight Manual (RFM) gives other safety instructions.

- Passengers' seatbelts should be undone.

- At least one competent HDA should be positioned ready to supervise disembarkation in the event of an emergency.
- Provision should be made for safe and rapid evacuation as directed by competent helideck team personnel (HDAs). The areas outside the emergency exits should be kept clear.

NOTE: If the presence of fuel vapour is detected inside the helicopter, or any other hazard arises during refuelling, fuelling should be stopped immediately.

Quality control documentation

8.60 Recording of aviation refuelling system / component manufacture, routine maintenance and rectification, testing, fuel transfer history and aircraft refuelling, etc. should be completed on official company documentation. This documentation is normally provided by the helicopter operators and / or specialist fuel suppliers and system maintainers. The following table lists the general requirements, however, individual forms may require to be tailored to suit specific system set-ups and some forms may not be applicable. Retention periods are noted in two columns, 'S' representing the requirements of Static Storage Tank Systems, and 'T' representing the requirements of Transportable Tank Systems:

	Form / Document	**Description / Purpose**	**Retention - Months**	
			S	**T**
1	Fuel Release Certificate (FRC)	Certificate to authorise fuel movement, confirm compliance with DefStan 91-091 specification and provide traceability through batch numbering and QC testing details. Supplied with tank by fuel supplier / tank filling company.	36	12
2	Transportable Tank Receipt & Inspection Record	Recording of 'On receipt' inspection checks carried out on transportable tanks and tracking of tank movements for traceability purposes. To be completed by HLO.	36	12

	Form / Document	Description / Purpose	Retention - Months	
			S	T
3	Storage Tank Checks Before & After Replenishment	Recording of static storage tank stock level / ullage, pre-transfer fuel QC sampling of tanks & transfer filter, quantity, date & time of transfer, settling requirements & post-transfer fuel sampling. To be completed by HLO.	36	N/A
4	Daily System Fuel Sampling	Recording dates, times, quantities used & results of daily system pre-use sampling from tanks, filter vessels & hose-end nozzle. To be completed by HLO.	6	6
5	Fuelling Daily Log Sheet	Recording deliveries of fuel made to aircraft, including dates, times and quantities, pre & post refuel sample details, aircraft tail number and pilot acceptance. To be completed by HLO.	6	6
6	Fuel Reconciliation	Recording monthly fuel reconciliation, including opening fuel stock, fuel arriving, daily usage (sampling / fuelling / maintenance / wastage / reclaimed samples) residues returned and closing stock. To be completed by HLO.	12	12
7	Daily & Weekly Maintenance Checks	Recording of routine system maintenance and cleanliness including hoses, nozzles strainers, earth bonding, operational and housekeeping checks etc. To be completed by HLO.	6	6
8	Differential Pressure Record	Annual graph plot for individual filter vessels recording filter element performance on a weekly basis under normal flow conditions across the life of the elements. To be completed by HLO.	Element Life +12	Element Life +12

	Form / Document	Description / Purpose	Retention - Months	
			S	T
9	Hose Inspection & Test Record	Recording details of system hoses and results of weekly inspection under pump pressure across the life of the hose. To be completed by HLO.	Hose Life +12	Hose Life +12
10	3rd Party Maintenance Record	Quarterly system inspection reports produced by specialist Refuelling System Service Provider.	12	12
11	Storage Tank Inspection Record	12, 24 or 36 monthly static storage tank internal inspection and cleaning records produced by specialist Refuelling System Service Provider.	Last 3 reports	N/A

8.61 All helifuel related QC documentation should be checked for completeness, during independent inspection or audit.

Chapter 9

Helicopter landing areas on vessels

Vessels supporting offshore mineral workings and specific standards for landing areas on merchant vessels

9.1 Helidecks on vessels used in support of the offshore oil and gas industry should be designed to comply with the requirements of the preceding chapters of this publication.

9.2 The International Chamber of Shipping (ICS) has published a 'Guide to Helicopter/Ship Operations', updated in 2021, which comprehensively describes physical criteria and procedures on ships having shipboard heliport landing or winching area arrangements. Other than to address the basic design criteria and marking and lighting schemes related to shipboard heliport landing area arrangements, it is not intended to reproduce detail from the ICS document here in CAP 437. However, it is recommended that the 2021 5th edition of the ICS 'Guide to Helicopter/Ship Operations' should be referenced in addition to this chapter and, where necessary, in conjunction with Chapter 10 which includes information relating to shipboard heliport winching area arrangements.

9.3 Helicopter landing areas on vessels which comply with the criteria and which have been satisfactorily assessed will be included in the HLL. This list will specify the D-value of the helicopter landing area; include pitch and roll, SHR and helideck inclination category information with helicopter operator derived landing limits; list any areas of non-compliance against CAP 437; and detail any specific limitations applied to the landing area. Vessels having ships'-side or amidships purpose-built or non-purpose-built landing areas may be subject to specific limitations.

9.4 Helicopter landing areas on vessels should always have an approved D-value equal to or greater than the 'D' dimension of the helicopter intending to land on it (see Appendix H, paragraph H.1, condition 6)) .

9.5 Helicopter landing areas which cannot be positioned so as to provide a full 210º obstacle-free sector surface for landing and take-off will be assessed against specific criteria described in this chapter and appropriate limitations will be imposed.

9.6 It should be noted that helicopter operations to small vessels with reduced visual cues, such as bow decks or a deck mounted above the bridge superstructure with the landing direction facing forwards (bow deck) or abeam (high deck), in those cases where deck landings are permitted at night, will have stricter landing limits imposed with respect to the vessel's movement in pitch and roll, SHR and helideck inclination.

Amidships helicopter landing areas – Purpose-built or non-purpose-built ship's centreline

9.7 The following special requirements apply to vessels which can only accommodate a helicopter landing area in an obstructed environment amidships. The centre of the landing area will usually be co-located on the centreline of the vessel, but may be offset from the ship's centreline either to the port or starboard side up to the extent that the edge of the landing area is coincidental with the ship's side.

Size and obstacle environment

9.8 The reference D-value (overall dimension of helicopter) given at Table 1 (Chapter 3) also applies to vessels' landing areas referred to in this Chapter. It should also be noted that amidships landing areas are only considered suitable for single main rotor helicopters.

9.9 Forward and aft of the minimum 1D landing area should be two symmetrically located 150° LOS with apexes on the circumference of the 'D' reference circle. Within the area enclosing these two sectors, and to provide ‘funnel of approach protection’ over the whole of the D-circle, there should be no obstructions above the level of the landing area except those referred to in Chapter 3, paragraph 3.23 which are permitted up to a maximum height of 25 cm above the landing area level. For new build shipboard heliports completed on or after 10 November 2018 and for refurbishments, the height of essential items around the helideck should not exceed 15 cm for any shipboard heliport where the D-value is greater than 16.00m. For any shipboard heliport where the D-value is 16.00 m or less the height of essential items around the helideck should not exceed 5 cm above the landing area level.

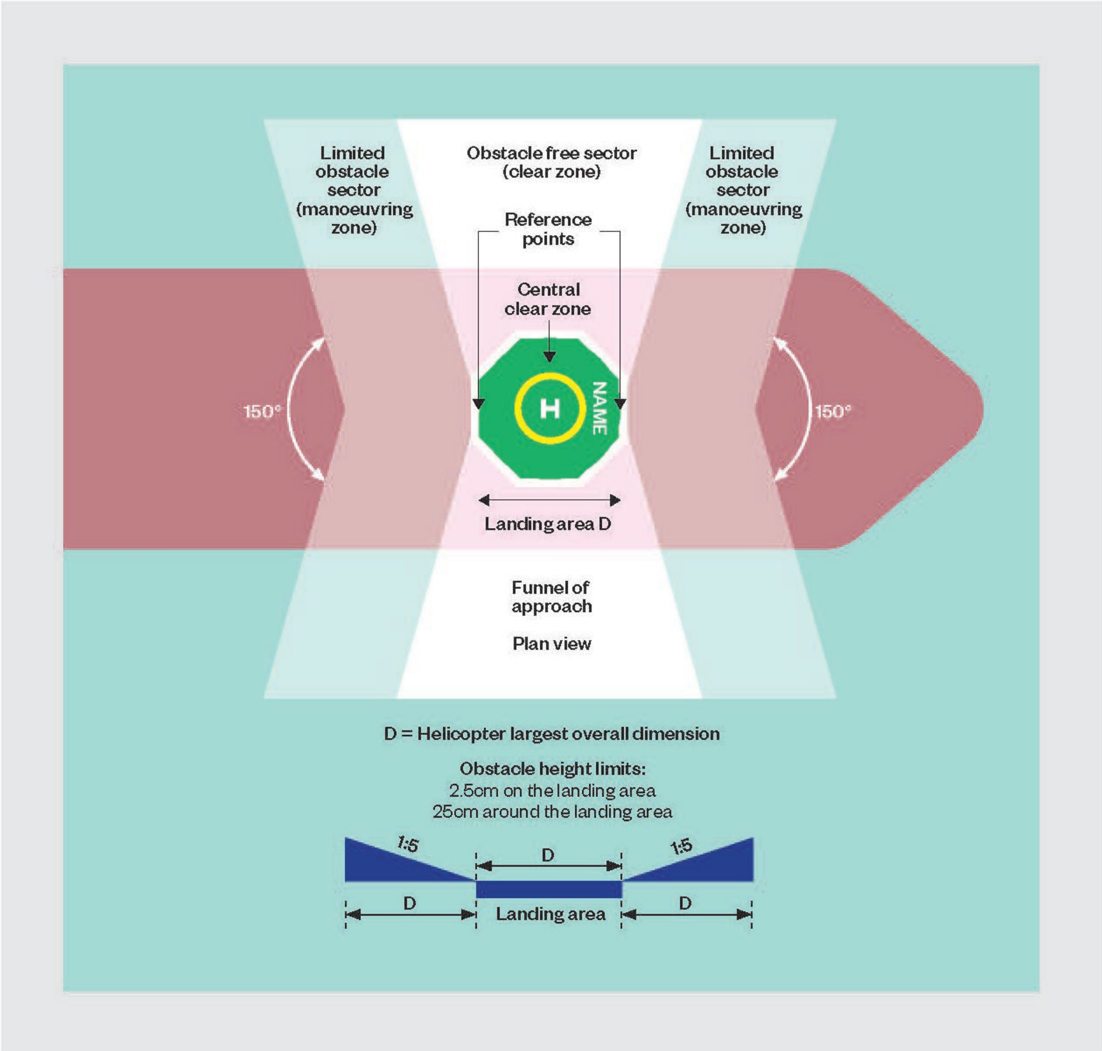
9.10 On the surface of the landing area itself, objects whose function requires them to be located there, such as deck-mounted lighting systems (see Chapter 4, paragraph 4.22 and Appendix C) and landing area nets (see Chapter 3, paragraph 3.45), should not exceed a height of 2.5 cm.

9.11 To provide protection from obstructions adjacent to the landing area, an obstacle protection surface should extend both forward and aft of the landing area. This surface should extend at a gradient of 1:5 out to a distance of D as shown in Figure 1.

9.12 Where the requirements for the LOS cannot be fully met but the landing area size is acceptable, it may be possible to apply specific operational limitations or restrictions which will enable helicopters up to a maximum D-value of the landing area to operate to the deck.

9.13 The structural requirements referred to in Chapter 3 should be applied whether providing a purpose-built amidships shipboard heliport above a ship’s deck or providing a non-purpose-built landing area arrangement utilising part of the ship’s structure, e.g. a large hatch cover.

Figure 1: A purpose-built or non-purpose-built midship centreline landing area[1]



NOTE: Where the D-value is 16.00 m or less the obstacle height limitation around the landing area is restricted to 5 cm (see paragraph 9.9).

Helicopter landing area marking and lighting

9.14 The basic marking and lighting requirements referred to at Chapter 4 and Appendix C will also apply to helicopter landing areas on ships ensuring that for amidships helicopter landing areas the TD/PM Circle should always be positioned in the centre of the landing area and both the forward and aft 'origins' denoting the LOS should be marked with a black

1 Figure courtesy of International Chamber of Shipping, ICS Guide to Helicopter/Ship Operations (2021).

chevron (see Chapter 4, Figure 2). In addition, where there is an operational requirement, vessel owners should consider providing the helideck name marking and maximum allowable mass ‘t’ marking both forward and aft of the painted helideck identification ‘H’ marking and TD/PM Circle.

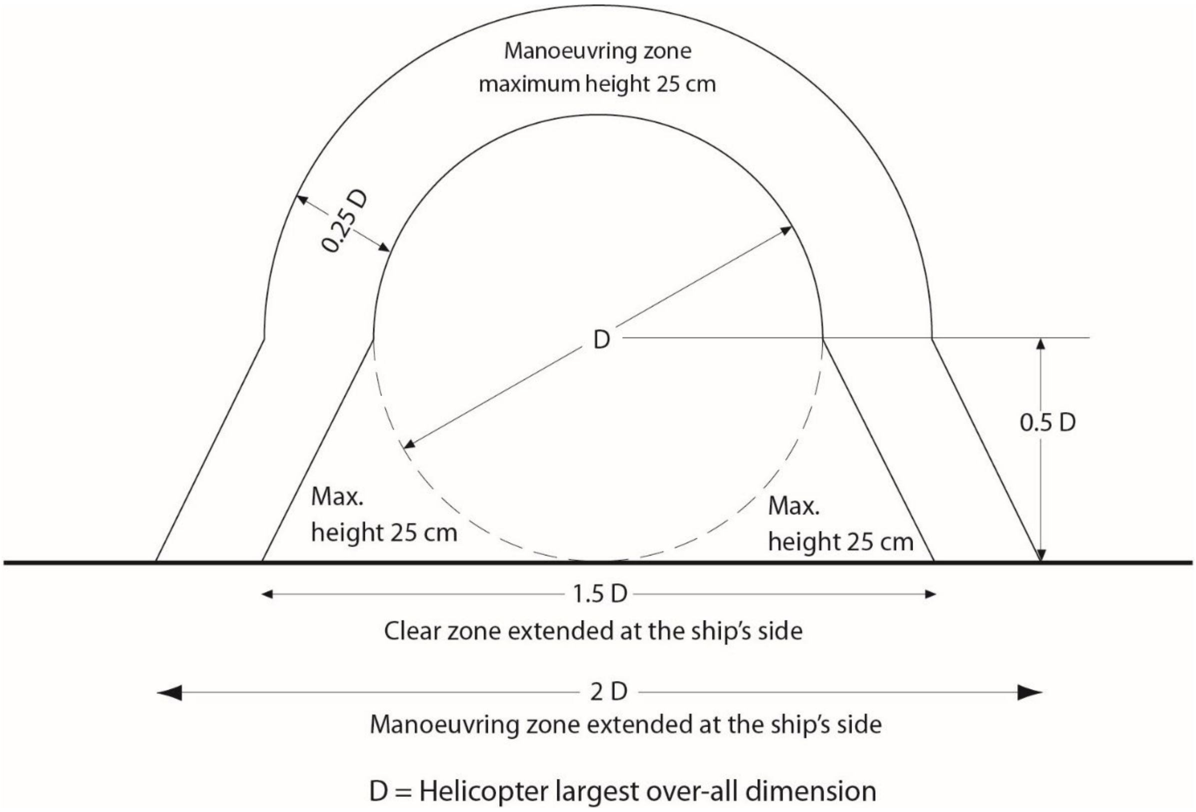
Figure 2: Markings for a purpose-built or non-purpose-built midship centreline landing area[2]

2 Original figure courtesy of International Chamber of Shipping, Helicopter Ship Guide (2021).

Ship's side non-purpose-built landing area

9.15 A non-purpose-built landing area located on a ship's side should consist of a clear zone and a manoeuvring zone as shown in Figure 3. The clear zone should be capable of containing a circle with a minimum diameter of 1 x D. No objects should be located within the clear zone except aids whose presence is essential for the safe operation of the helicopter, and then only up to a maximum height of 2.5 cm. Such objects should only be present if they do not represent a hazard to helicopters. Where there are immovable fixed objects located in the clear zone, such as a Butterworth lid, these should be marked conspicuously and annotated on the ship's operating area diagram (a system of annotation is described in detail in Appendix E to the 5th Edition ICS Helicopter Ship Guide). In addition, a manoeuvring zone should be established, where possible, on the main deck of the ship. The manoeuvring zone, intended to provide the helicopter with an additional degree of protection to account for rotor overhang beyond the clear zone, should extend beyond the clear zone by a minimum of 0.25D. The manoeuvring zone should only contain obstacles whose presence is essential for the safe operation of the helicopter, and up to a maximum height of 25 cm. Where the D-circle accommodated is 16.00 m or less, obstacles contained in the manoeuvring zone should not exceed a height of 5 cm.

Figure 3: Ship's side - Non-purpose-built landing area (16.0 m or greater)



9.16 Where the operating area is coincident with the ship's side, and in order to improve operational safety, the clear zone should extend to a distance of 1.5D at the ship's side while the manoeuvring zone should extend to a distance of 2D measured at the ship's side. Within this area, the only obstacles present should be those essential for the safe operation of the helicopter, with a maximum height of 25 cm (or 5 cm where the D-circle accommodated has a diameter of 16.00 m or less). Where there are immovable fixed objects such as tank cleaning lines they should be marked conspicuously and annotated on the ship's operating area diagram (see Appendix E in the 5th Edition ICS Helicopter Ship Guide).

9.17 Any railings located on the ship's side should be removed or stowed horizontally along the entire length of the manoeuvring zone at the ship's side (i.e. over a distance of at least 2D). All aerials, awnings, stanchions and derricks and cranes within the vicinity of the manoeuvring zone should be either lowered or securely stowed. All dominant obstacles within, or adjacent to, the manoeuvring zone should be conspicuously marked and, for night operations, lit (see paragraph 9.21 and Chapter 4, paragraphs 4.30 to 4.35).

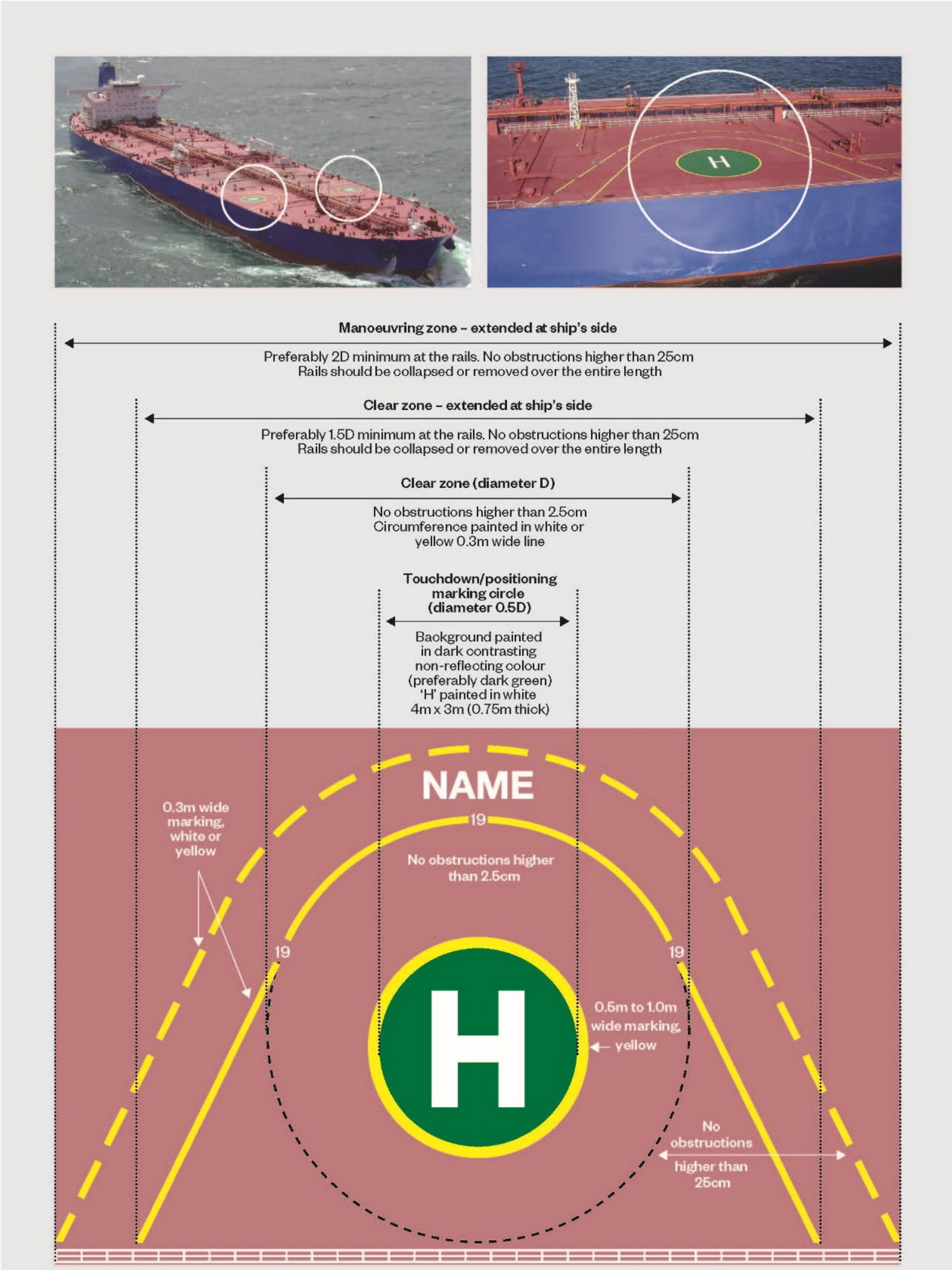
Ship's side non-purpose-built landing area markings

9.18 A TD/PM Circle, denoting the touchdown point for the helicopter, should be located centrally within the clear zone. The diameter of the clear zone should be 1 x D (D being the extent of the available operating area), while the inner diameter of the TD/PM should be 0.5D. The TD/PM Circle should be at least 0.5 m in width and painted yellow. The area enclosed by the TD/PM Circle should be painted in a contrasting colour, preferably dark green. A white 'H' should be painted in the centre of the circle, with the cross bar of the 'H' running parallel to the ship's side. The 'H' marking should be 4 m high x 3 m wide, the width of the marking itself being 0.75 m.

9.19 The boundary of the clear zone, capable of enclosing a circle with a minimum diameter of 1 x D and extending to a total distance of 1.5D at the ship's side, should be painted with a continuous 0.3 m wide yellow line. The actual D-value, expressed in metres rounded to the nearest whole number (with 0.5 m rounded down), should also be marked in three locations around the perimeter of the clear zone in a contrasting colour, preferably white. The height of the numbers so marked should be 0.9 m.

9.20 The boundary of the manoeuvring zone, located beyond the clear zone and extending to a total distance of 2D at the ship's side, should be marked with a 0.3 m wide broken yellow line with a mark: space ratio of approximately 4:1. Where practical, the name of the ship should be painted in a contrasting colour (preferably white) on the inboard side of the manoeuvring zone in (minimum) 1.2 m high characters (see Figure 4).

Figure 4: Ship's side non-purpose-built landing area markings[3]



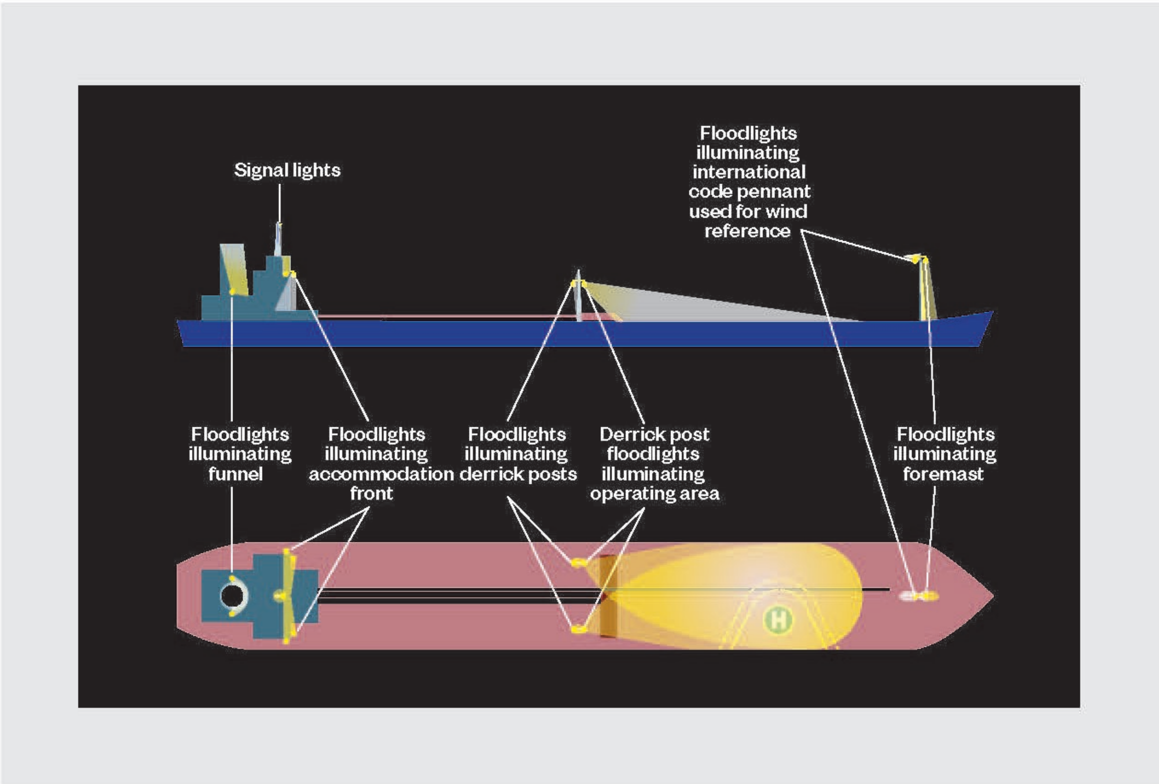
Notes: The diameter in metres of the clear zone 'D' to be marked in white figures of 0.9m at each of the points shown, so as to be easily visible to the helicopter pilot. The diameter (in metres) of the clear zone must be equal to or greater than the overall length of a visiting helicopter with rotors running.

3 Original figure courtesy of International Chamber of Shipping, Helicopter Ship Guide (2021).

Night operations

9.21 Details of landing area lighting for purpose-built landing areas are given at Chapter 4 and Appendix C. In addition, Figure 5 shows an example of the overall lighting scheme for night helicopter operations (example shows a non-purpose-built ship's side arrangement).

Figure 5: Representative landing area lighting scheme for a non-purpose-built ship's side arrangement[4]



Poop deck operations

9.22 Poop deck operations are addressed fully in the ICS Guide.

4 Figure courtesy of International Chamber of Shipping, Helicopter Ship Guide (2021).

Chapter 10

Helicopter winching areas on vessels and on wind turbine platforms

Winching areas on vessels

10.1 Where practicable, the helicopter should always land rather than hoist, because safety is enhanced when the time spent hovering is reduced. In both cases the Vessel's Master should be fully aware of, and in agreement with, the helicopter pilot's intentions.

10.2 The ICS has published a 'Guide to Helicopter/Ship Operations', updated to a 5th edition in 2021, which comprehensively describes physical criteria and procedures applicable for a shipboard winching area operation. It is not intended to reproduce the procedures from the ICS document in detail in this edition of CAP 437 and therefore the ICS Guide may need to be referenced in addition to Chapter 10, paragraph 10.1.

Design and obstacle restriction

10.3 A winching area should be located over an area to which the helicopter can safely hover whilst hoisting to or from the vessel. Its location should allow the pilot an unimpeded view of the whole of the clear zone whilst facilitating an unobstructed view of the vessel. The winching area should be located so as to minimise aerodynamic and wave motion effects. The area should preferably be clear of accommodation spaces (see also paragraph 10.13) and provide adequate deck area adjacent to the manoeuvring zone to allow for safe access to the winching area from different directions. In selecting a winching area the desirability for keeping the hoisting height to a minimum should also be borne in mind.

10.4 A winching area should provide a manoeuvring zone with a minimum diameter of 2D (twice the overall dimension of the largest helicopter permitted to use the area). Within the manoeuvring zone a clear zone should be centred. This clear zone should be at least 5 m in diameter and should be a solid surface capable of accommodating personnel and/or stores during hoisting operations. It is accepted that a portion of the manoeuvring zone, outside the clear area, may be located beyond the ship's side but should nonetheless comply with obstruction requirements shown in Figure 1. In the inner portion of the manoeuvring zone no obstructions should be higher than 3 m. In the outer portion of the manoeuvring zone no obstructions should be higher than 6 m.

Visual aids

10.5 Winching area markings should be located so that their centres coincide with the centre of the clear zone (see Figure 1).

10.6 The 5 m minimum diameter clear zone should be painted in a conspicuous colour, preferably yellow, using non-slip paint.

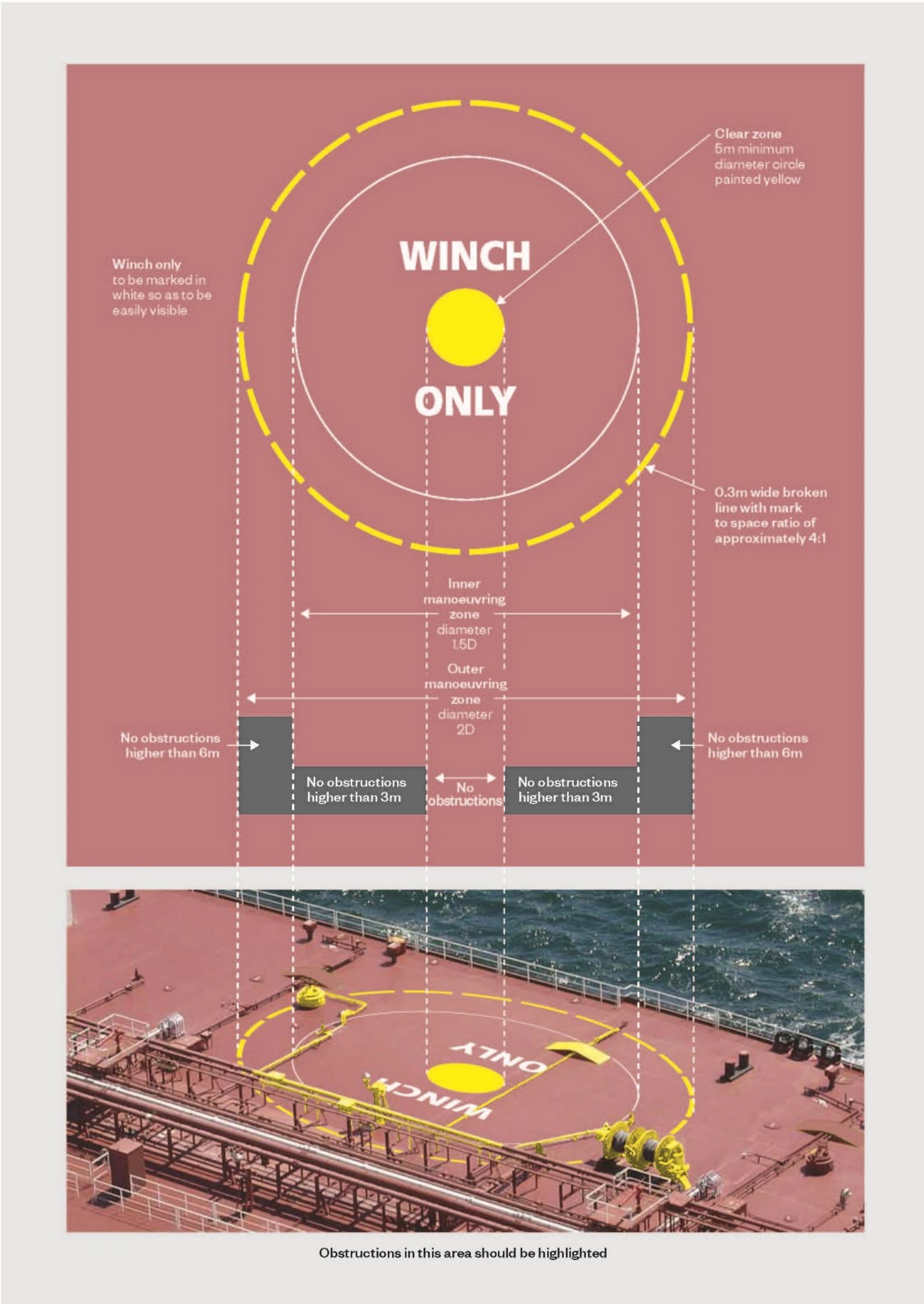
10.7 A winching area outer manoeuvring zone marking should consist of a broken circle with a minimum line width of 30 cm and a mark: space ratio of approximately 4:1. The marking should be painted in a conspicuous colour, preferably yellow. The extent of the inner manoeuvring zone may be indicated by painting a thin white line, typically 10 cm thickness.

10.8 Within the manoeuvring zone, in a location adjacent to the clear area, 'WINCH ONLY' should be easily visible to the pilot, painted in not less than 2 m characters, in a conspicuous colour.

10.9 Where hoisting operations to vessels are required at night, winching area floodlighting should be provided to illuminate the clear zone and manoeuvring zone areas. Floodlights should be arranged and adequately shielded so as to avoid glare to pilots operating in the hover.

10.10 The spectral distribution of winching area floodlights should be such that the surface and obstacle markings can be clearly identified. The floodlighting arrangement should ensure that shadows are kept to a minimum.

Figure 1: Winching area arrangement on a vessel[5]



5 Figure courtesy of International Chamber of Shipping, Helicopter Ship Guide (2021).

Obstructions

10.11 To reduce the risk of a hoist hook or cable becoming fouled, all guard rails, awnings, stanchions, antennae and other obstructions within the vicinity of the manoeuvring zone should, as far as possible, be either removed, lowered or securely stowed.

10.12 All dominant obstacles within, or adjacent to, the manoeuvring zone should be conspicuously marked and, for night operations, be adequately illuminated (see paragraphs 10.9 and 10.10. Also see Chapter 4, paragraphs 4.30 to 4.35).

Hoisting above accommodation spaces

10.13 Some vessels may only be able to provide winching areas which are situated above accommodation spaces. Due to the constraints of operating above such an area only twin-engined helicopters should be used for such operations and the following procedures adhered to:

- Personnel should be cleared from all spaces immediately below the helicopter operating area and from those spaces where the only means of escape is through the area immediately below the operating area.
- Safe means of access to and escape from the operating area should be provided by at least two independent routes.
- All doors, ports, skylights etc. in the vicinity of the aircraft operating area should be closed. This also applies to deck levels below the operating area.
- Fire and rescue personnel should be deployed in a ready state but sheltered from the helicopter operating area.

Helicopter winching areas on wind turbine platforms

NOTE 1: CAP 764 provides CAA policy and guidelines on wind turbines.

NOTE 2: Helicopter hoist operations to wind turbine platforms should be conducted by day in Visual Meteorological Conditions (VMC) only.

NOTE 3: The platform design criteria in the following paragraphs have been developed to promote a 'safe and friendly' environment for helicopter hoist operations. It should be recognised that any departure from 'best practice' topside arrangements / platform designs laid out in paragraphs 10.14 to 10.26, including deviations from specified dimensions, has potential to compromise the 'safe and friendly' environment secured for helicopter hoist operations. Therefore, any proposed conceptual arrangements should be subjected to appropriate testing including wind tunnel testing and/or CFD studies to establish the wind environment at and above the operating area. Studies undertaken should assess any impact on safe operations that may be caused by an increase in the incidence of turbulence and/or of rotor downwash effects as a result of proposed modified topside arrangements / platform design.

Platform design

10.14 The winching area platform (clear area) should be square or rectangular and capable of containing a circle having a minimum diameter of 4.0 m.

10.15 In addition to the winching area platform, provision needs to be made for a safety zone to accommodate Helicopter Hoist Operations Passengers (HHOP) at a safe distance away from the winching area during helicopter hoist operations. The minimum safe distance is deemed to be not less than 1.5 m from the inboard edge of the winching (clear) area.

10.16 The safety zone should be connected by an access route to the winching area platform located inboard of the winching area platform. The safety zone and associated access route should have the same surface characteristics as the winching area platform (see paragraphs 10.18, 10.19 and 10.20) except that the overall size may be reduced, such that the dimensions of the safety zone and access route are not less than 2.5 m (length) x 0.9 m (width).

NOTE: The dimensions of the safety zone may need to be increased according to the maximum number of HHOP that need to be accommodated safely away from the winching (clear) area during helicopter hoist operations.

10.17 To differentiate the safety zone and the associated access route from the winching area, it is recommended that the safety zone and access route be painted in contrasting colours to indicate to HHOP where it is safe to congregate during helicopter hoist operations (see paragraph 10.27 and Figure 2).

10.18 The platform should be constructed so that it generates as little turbulence as possible. The overall platform design should take account of the need for downdraft from the main rotor to disperse away from the platform. The incidence regarding the discharge of static electricity from the helicopter should be addressed by ensuring that the platform is capable of grounding the hoist wire and aircraft.

10.19 The platform deck should be capable of supporting a mass that is approximately five times the weight of an average HHOP.

10.20 The surface of the platform, including the safety zone and associated access route, should display suitable friction characteristics to ensure the safe movement of HHOP in all conditions. The minimum friction coefficient, which should be verified prior to installation, is 0.5.

10.21 The winching area platform and associated access route and safety zone should be completely enclosed by a railing system between 1.2 m and 2.0 m in height, to ensure the safety and security of HHOP at all times. The design of the safety rails should ensure that a free flow of air through the structure is not prevented or disrupted whilst also guaranteeing that no possibility exists for the hoist hook to get entangled in the railing or in any other part of the platform structure. It is permitted for the railing system to be located along the edge, within the specified clear area, of the winching area platform, the associated access route and safety zone.

10.22 The surface of the platform should be essentially flat for helicopter hoist operations. However, the floor may slope down towards the outboard edge of the platform to prevent the pooling of water on the platform. It is recommended that a slope not exceeding 2% (1:50) be provided.

10.23 The minimum clearance to be maintained between the tip-path plane of rotation of the helicopter rotor blades at hover height above the winching area platform and the rear of the plane of rotation of the wind turbine rotor blades at corresponding hover height, should be 5.0 m (see Figure 3).This should be determined with the central axis of the helicopter positioned directly above the winching area safety railing farthest from the turbine rotor blades.

10.24 During helicopter hoist operations, it is essential that the nacelle should not turn in azimuth and that the turbine blades should also be prevented from rotating by the application of the braking system. Experience in other sectors indicates that it is normal practice for the nacelle to be motored 90 degrees out of wind so that the upwind blade is horizontal and points into the prevailing wind (known as the advancing blade upwind position). This is considered to be the preferred orientation for helicopter hoist operations; however, the actual orientation of the blades may vary to suit specific operational requirements (for example, the retreating blade horizontal position or Y blade (Bunny Ears) position is often preferred when conducting search and rescue operations).

Obstacle restriction

10.25 Within a horizontal distance of 1.5 m measured from the winching (clear) area, no obstacles are permitted to extend above the top of the railing.

10.26 Beyond 1.5 m, and out to a distance corresponding to the plane of rotation of the turbine rotor blades, obstacles are permitted up to a height not exceeding 3 m above the surface of the winching area. It is required that only fixed obstacles essential to the safety of the operation are present, e.g. anemometer masts, communications antennae, helihoist status light etc.

Visual aids

10.27 The surface of the winching area (a minimum 4 m square 'clear area') should be painted yellow. For the safety zone, green is recommended and a contrasting grey for the associated access route (see Figure 2).

10.28 The railings around the entire winching area, safety zone and associated access route should be painted in a conspicuous colour, preferably red.

10.29 The wind turbine structure should be clearly identifiable from the air using a simple designator (typically a two-digit or three-digit number with block identification), painted in 1.5 m (minimum) characters in a contrasting colour, preferably black. The turbine designator should be painted on the nacelle top cover ideally utilising an area adjacent to the turbine rotor blades.

10.30 A procedure should be put in place to indicate to the helicopter operator that the turbine blades and nacelle are safely secured in position prior to helicopter hoist operations commencing. Experience in other sectors has demonstrated that this is best achieved by the provision of a helihoist status light located on the nacelle of the WTG within the pilot's field of view, which is capable of being operated remotely and from the platform itself or from within the nacelle. In consultation with the industry CAA has developed a system specification utilising a green light capable of displaying in both steady and flashing signal mode. A steady green light is displayed to indicate to the pilot that the turbine blades and nacelle are secure and it is safe to operate. A flashing green light is displayed to indicate that the turbine is in a state of preparation to accept hoist operations or, when displayed during hoist operations, that parameters are moving out of limits. When the light is extinguished this indicates to the operator that it is not safe to conduct helicopter hoist operations. The full specification for a heli-hoist status light is presented in Appendix J.

10.31 Requirements for lighting of wind turbine generators in United Kingdom territorial waters, aimed at 'warning off' aircraft transiting the generic area, are addressed in Article 223 of the ANO 2021 See also Directorate of

Airspace Policy – Policy Statement for The Lighting of Wind Turbine Generators in United Kingdom Territorial Waters.

10.32 Obstruction lighting in the vicinity of the winching area that has a potential to cause glare or dazzle to the pilot or to a helicopter hoist operations crew member should be switched off prior to, and during, helicopter hoist operations.

Figure 2: Winching area, access route and safety zone

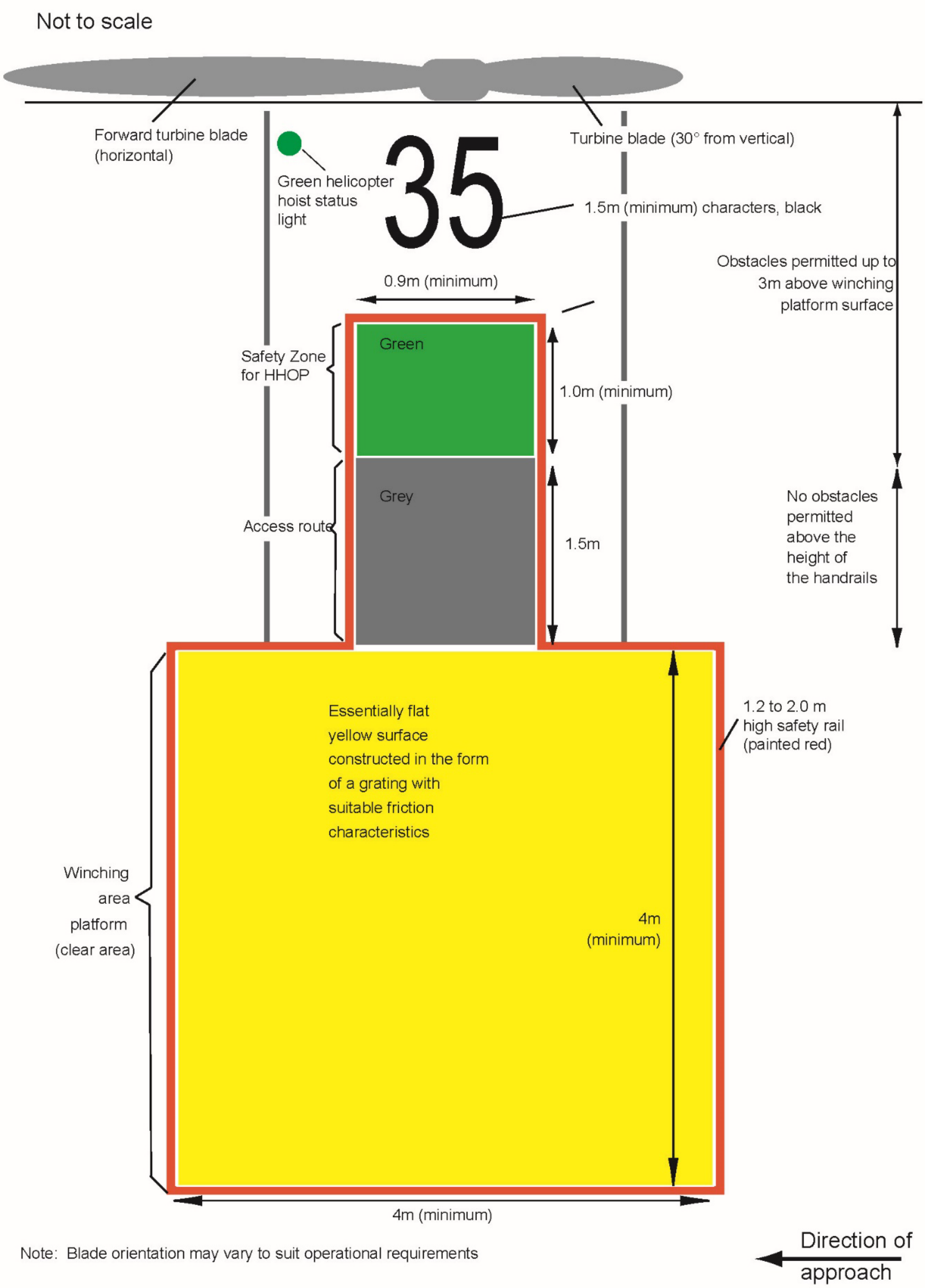
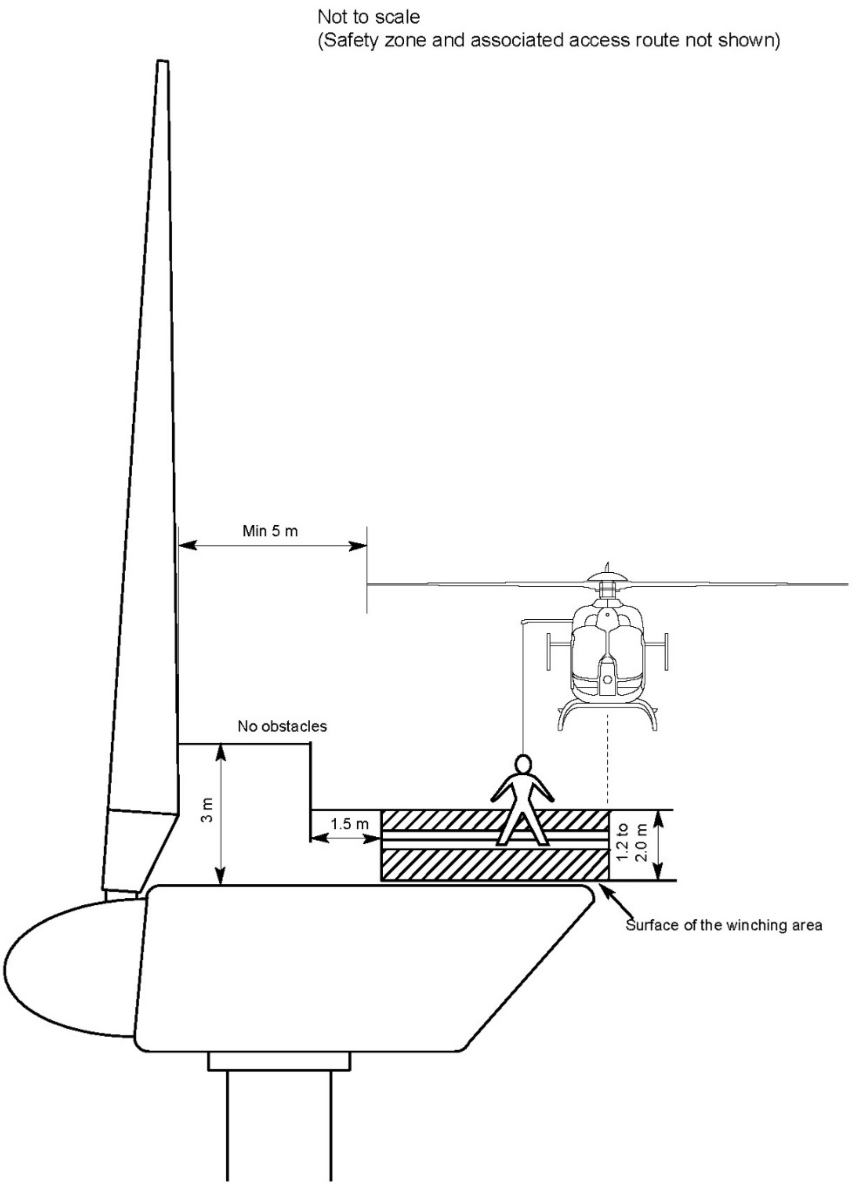


Figure 3: General arrangement drawing showing surfaces and sectors



Further operational conditions

10.33 For UK operations it is understood to be normal practice for the hoist arrangement to be located on the right hand side of the helicopter with the pilot positioned just on the inboard side of the outboard winching (clear area) platform railings (see Figure 3). In this configuration the pilot's perspective of the platform and turbine blade arrangement should be unimpeded and it is not considered usually necessary to provide any additional visual cues to assist in the maintenance of a safe lateral distance between the helicopter main rotor and the nearest dominant obstacle.

10.34 Where cross-cockpit helicopter hoist operations are envisaged an aiming point system may need to be established to assist the pilot in determining the position of the helicopter in relation to the winching area platform and to obstacles. This may be achieved by the provision of a sight point marker system or similar aids. Further guidance may be obtained from Flight Operations Inspectorate (Helicopters) Section.

10.35 Offshore Renewables Aviation Guidance (ORAG) on Good Practices for Offshore Renewable Energy Developments was published by RenewableUK in June 2016. More recently, in December 2020, Wind Farm Recommended Practice (WinReP) was published by Helioffshore - see Appendix B. It is recommended that helicopter hoist operators consult these additional reference sources.

Appendix A

Use of offshore locations

AMC1 SPA.HOFO.115

General

A.1 UK Regulation (EU) 965/2012 (Air Operations) requires operations to offshore installations to be conducted in accordance with Annex V - Part-SPA, Subpart K, Helicopter Offshore Operations (HOFO). Within these requirements, guidance on the use of offshore locations is contained in AMC1 SPA.HOFO.115.

A.2 The guidance contained in this appendix is reproduced from AMC1 SPA.HOFO.115, although some modifications have been made to expand this material for UK operations as agreed with the UK operators.

A.3 For UK operations, the source material required for the Helideck Directory (HD) can be obtained from the Helideck Certificate, the Helideck Inspection Plate and the Helideck Limitations List currently produced by the Helideck Certification Agency.

Guidance

A.4 The operations manual relating to the specific usage of offshore helicopter landing areas (Part C for CAT operators) should contain, or make reference to, a directory of helidecks (Helideck Directory (HD)) intended to be used by the operator. The directory should provide details of helideck limitations and pictorial representations of each offshore location and its helicopter landing area recording all necessary information of a permanent nature using a standardised template. The HD entries should show, and be amended as necessary, the most recent status of each helideck concerning non-compliance with applicable national standards, limitations, warnings, cautions or other comments of operational importance. An example of a typical template is shown in Figure 1 below.

A.5 In order to ensure that the safety of flights is not compromised, the operator should obtain relevant information and details for compilation of the HD, and the pictorial representation from the owner/operator of the offshore helicopter landing area.

A.6 If more than one name of the offshore location exists, the common name painted on the surface of the landing area should be listed, but other names should also be included in the HD (e.g. radio call sign if different). After renaming an offshore location, the old name should also be included in the HD for the following 6 months.

A.7 Any limitations associated with an offshore location should be included in the HD. With complex installation arrangements including combinations of installations/vessels (e.g. Combined Operations), a separate listing in the HD, accompanied by diagrams/pictures where necessary, may be required. Where such arrangements are of a temporary nature, the required information may be disseminated by other suitable means.

A.8 Each offshore helicopter landing area should be inspected and assessed based on limitations, warnings, instructions and restrictions to determine its acceptability with respect to the following as a minimum:

1) The physical characteristics of the landing area including size and load bearing capability and the appropriate 'D' and 't' values.

NOTE 1: 'D' is the overall length of the helicopter from the most forward position of main rotor tip to the most rearward position of tail rotor tip plane path, or rearmost extension of the fuselage in the case of fenestron or Notar tails. 't' is the maximum allowable mass in tonnes.

NOTE 2: When supported by a formal safety case assessment (described in Appendix H) it may be permitted to operate helicopter types with an overall D-value and/or t value greater than the certificated limits notified for the landing area. In this case the additional types should be annotated on the Helideck Inspection Plate (HIP).

2) The preservation of obstacle-protected surfaces (an essential safeguard for all flights). These surfaces are:

- the minimum 210° obstacle-free surface (OFS) above helideck level;
- the 150° limited obstacle surface (LOS) above helideck level; and
- the minimum 180° falling '5:1' gradient with respect to significant obstacles below helideck level.

If these sectors/surfaces are infringed, even on a temporary basis, and/or if an adjacent installation or vessel infringes the obstacle protected surfaces related to the landing area, an assessment should be made to determine whether it is necessary to impose operating limitations and/or restrictions to mitigate any non-compliance with the criteria.

3) Marking and lighting:

- for operations at night, adequate illumination of the perimeter of the landing area, utilising perimeter lighting meeting CAP 437 paragraphs 4.19 and 4.20;
- for operations at night, adequate illumination of the location of the touchdown marking by use of a lit touchdown/positioning marking and lit heliport identification marking meeting CAP 437 paragraphs 4.21 and 4.22;
- status lights (for night and day operations, indicating the status of the helicopter landing area, e.g. a red flashing light indicates 'landing area unsafe: do not land') meeting CAP 437 paragraphs 4.25 to 4.28;
- dominant obstacle paint schemes and lighting;
- condition of helideck markings; and
- adequacy of general installation and structure lighting.

Any limitations with respect to non-compliant lighting arrangements will require the HD to be annotated 'daylight only operations'.

4) Deck surface:

- assessment of surface friction;
- presence and condition of helideck net (where provided);
- fit for purpose drainage system;
- deck edge safety netting or shelving;
- a system of tie-down points adequate for the range of helicopters in use; and
- procedures to ensure that the surface is kept clean of all contaminants e.g. bird guano, sea spray, snow and ice.

5) Environment:

- risk of foreign object damage;
- an assessment of physical turbulence generators e.g. structure-induced turbulence due to clad derrick;
- bird control measures;
- air flow degradation due to gas turbine exhaust emissions (turbulence and thermal effects), flares (thermal effects) or cold gas vents (unburned flammable gas); and
- adjacent offshore installations may need to be included in the environmental assessment.

To assess for potential adverse environmental effects described in (b), (d) and (e), an offshore location should be subject to appropriate airflow studies, e.g. wind tunnel testing, computational fluid dynamics (CFD) analysis.

6) Rescue and firefighting:

- systems for delivery of firefighting media to the landing area e.g. Deck Integrated Fire-Fighting System (DIFFS);
- delivery of primary media types, assumed critical area, application rate and duration;
- deliveries of complementary agent(s), media types, capacity and discharge;
- personal protective equipment (PPE); and
- rescue equipment and crash box/cabinet.

7) Communications and navigation:

- aeronautical radio(s);
- radio-telephone (R/T) call sign to match offshore location name and side identification which should be simple and unique; and
- radio log.

8) Fuelling facilities:

- In accordance with the relevant national guidance and regulations.

9) Additional operational and handling equipment:

- Windsock (wind sleeve);
- meteorological information (an automated means of ascertaining and disseminating the meteorological information specified in Chapter 6, 6.16 at all times);
- helideck motion monitoring system (HMS) where applicable;
- passenger briefing system;
- chocks;
- tie-down strops/ropes;
- weighing scales;
- a suitable power source for starting helicopters (e.g. ground power unit (GPU)) where applicable; and
- equipment for clearing the landing area of snow and ice and other contaminants.

10) Personnel:

- Trained helicopter landing area staff (e.g. helicopter landing officer (HLO)/helicopter deck assistant (HAD) and fire-fighters).
- Persons required to assess local weather conditions or communicate with helicopter by radio telephony should be appropriately qualified.

A.9 The HD entry for each offshore location should be completed and kept up to date using the template and reflecting the information and detail in Figure 1 below. The template should contain at least the following:

1) Details:

- name of offshore location with ICAO designator code where allocated;
- operating company including contact number;
- R/T call sign;
- helicopter landing area identification marking;
- side panel identification marking;
- landing area elevation;
- maximum installation/vessel height;
- helideck size with any 'D' value approved variations;
- 't' value and any approved variations;
- approved helicopter types;
- type of offshore location;
  - i) fixed permanently manned installation,
  - ii) fixed normally unattended installation,
  - iii) vessel type (e.g. diving support vessel, tanker),
  - iv) mobile offshore drilling unit: semi-submersible,
  - v) mobile offshore drilling unit: jack-up,
  - vi) floating production storage offloading vessel (FPSO).
- name of owner/operator;
- geographical position, where appropriate;

  NOTE: The format of the coordinates should be degrees, minutes and decimal minutes for compatibility with helicopter Flight Management Systems (FMS).
- communication and navigation (Com/Nav) frequencies and identification;
- general drawing of the offshore location showing the helicopter landing area with annotations showing location of derrick, masts, cranes, flare stack, turbine and gas exhausts, side identification panels, windsock (wind sleeve), etc.;
- plan view drawing, chart orientation from the general drawing, to show the above. All superstructure above helideck height should be clearly identified (e.g. in bold). The plan view will also

show the 210 degree sector orientation in degrees true and include 150m radius circles centred on any cold flare stacks;

- photographs of the offshore location showing the helicopter landing area from the four main compass quadrants (N, S, E, W) at a range of 0.25 to 0.5 NM and a height above the helideck of approximately 200 ft;

  NOTE: Photographs taken from below helideck level (e.g. from a boat/dockside looking up) are unacceptable.
- type of fuelling:
  - i) pressure and gravity,
  - ii) pressure only,
  - iii) gravity only,
  - iv) none.
- type and nature of fire-fighting equipment;
- availability of ground power unit (GPU) and towing/parking equipment;
- deck heading;
- circle-H lighting systems (yes/no);
- status light system (yes/no);
- cleared for night operations (yes/no);
- helideck net (yes/no);
- revision date of publication; and
- one or more diagram/photograph and any other suitable guidance to assist pilots.

A.10 For offshore locations on which there is incomplete information, 'restricted' usage based on the information available may be considered by the operator, subject to risk assessment prior to the first helicopter visit. During subsequent operations, and before any restriction on usage is lifted, information should be gathered and the following should apply:

1) Pictorial (static) representation:

- template blanks should be available to be filled in during flight preparation on the basis of the information given by the offshore location owner/operator and flight crew observations;
- where possible, suitably annotated photographs may be used until the HD entry and template have been completed;
- until the HD entry and template have been completed, conservative operational restrictions (e.g. performance, routing, etc.) may be applied;
- any previous inspection reports should be obtained and reviewed by the operator; and
- an inspection of the offshore helicopter landing area should be carried out to verify the content of the completed HD entry and template. Once found suitable, the landing area may be considered authorised for use by the operator.

2) With reference to the above, the HD entry should contain at least the following:

- HD revision date and number;
- generic list of helideck motion limitations;
- name of offshore location;
- helideck size and/or ‘D’ value and ‘t’ value; and
- limitations, warnings, instructions and restrictions.

GM1 SPA.HOFO.115

Figure 1: Example of a helideck template

HELIDECK INFORMATION PLATE

Issue Date:	Installation name:	Operating company:	
12 Sep 2018	Acme Driller Producer IV	Acme Oil & Gas	Contact No. 01234 567890

ICAO Ident.: EGXX	Helideck marking: xxxxx	Side sign ident.: yyyyy

Position:	Mag. variation (deg.):	VHF Comms:		NDB:
Nxx xx.x Eyy yy.y	z.z	123.45	"call sign"	123 ABC

Helideck height: 123 ft
Installation height: 345 ft
Highest obstacle within 5 NM: drilling derrick

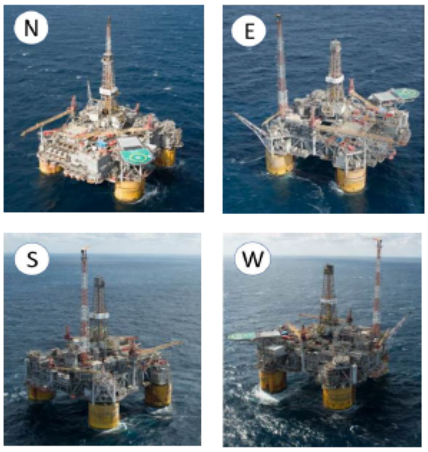
Helideck heading: "abc deg. M/variable"

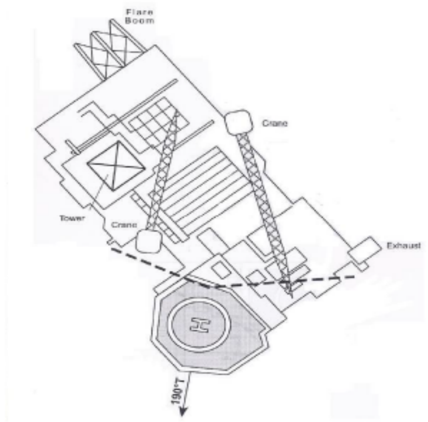
D value: 20.88 m
T value: 12.6
P/R/HR category: Fixed

Type of installation: "fixed/mobile etc."
Design helicopter type: S92
Fuelling/type: "yes/no" / "pressure/gravity"
Fire-fighting equipt. (NUIs only): "DIFFS / FMS / RMS / H1 / H2"
Helideck net: "yes/no"
Starting equipment: "yes/no"

External power: "yes/no"
Towing equipment: "yes/no"
Chocks / tie-down strops: "yes/no"
TD/PM circle lighting: "yes/no"
Status lights: "yes/no"
Cleared for night ops: "yes/no"

Views looking N, S, E, W:





Limitations

Wind		Limitation / Comment
Direction (deg. M)	Speed (kts)	
350 - 030	25 - 35	Table 2 (use 35 - 45 kts limitations).
350 - 030	> 35	No landings.
-	-	Table 1 (T) if overflight of south west foam monitor platform unavoidable.

Non-Compliances

150 deg. sector	Refuelling hose guide and barrier adjacent to refuelling cabinet over height.
5:1 gradient	South west foam monitor platform.
Misc.	• Windsock indication may be affected by derrick. Second wind sock installed on west side of derrick. • TD/PM circle offset due to obstruction in 150 deg. sector.

Appendix B

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OPITO Minerva House, Bruntland Road, Portlethen, Aberdeen, Scotland AB12 4QL T: 01224 787800, F: 01224 787830 E: reception@opito.com

RenewableUK, Greencoat House, Francis Street, London SW1P1DH. Telephone +44 (0) 20 7901 3000. Website: www.RenewableUK.com. E-mail info@RenewableUK.com.

Appendix C

Specification for helideck lighting scheme comprising perimeter lights, lit touchdown/positioning marking and lit heliport identification marking

Overall operational requirement

C.1 The whole lighting configuration should be designed to be visible over a range of 360° in azimuth. It is possible, however, that on some offshore installations the lighting may be obscured from the pilots' view by topsides structure when viewed from some directions. The design of the helideck lighting is not required to address any such obscuration.

C.2 The visibility of the lighting configuration should be compatible with the normal range of helicopter vertical approach paths from a range of 2 nautical miles (NM).

C.3 The purpose of the lighting configuration is to aid the helicopter pilot perform the necessary visual tasks during approach and landing as stated in Table 1.

Table 1: Visual tasks during approach and landing

Phase of approach	Visual task	Visual cues/aids	Desired range (NM)	
			5,000m met. vis.	1,400 m met. vis.
Helideck location and identification	Search within platform structure	Shape of helideck, colour of helideck, luminance of helideck, perimeter lighting.	1.5 (2.8 km)	0.75 (1.4 km)
Final approach	Detect helicopter position in three axes, detect rate	Apparent size/shape and change of size/shape of helideck, orientation and	1.0 (1.8 km)	0.5 (900 m)

Phase of approach	**Visual task**	**Visual cues/aids**	**Desired range (NM)**	
			5,000m met. vis.	1,400 m met. vis.
	of change of position.	change of orientation of known features/markings/lights.		
Hover and landing	Detect helicopter attitude, position and rate of change of position in three axes (six degrees of freedom).	Known features/ markings/ lights, helideck texture.	0.03 (50 m)	0.03 (50 m)

C.4 The minimum intensities of the lighting configuration should be adequate to ensure that, for a minimum Meteorological Visibility (Met. Vis.) of 1400 m and an illuminance threshold of $10^{-6.1}$ lux, each feature of the system is visible and useable at night from ranges in accordance with C.5, C.6 and C.7.

C.5 The Perimeter Lights are to be visible and usable at night from a minimum range of 0.75 NM.

C.6 The Touchdown/Positioning Marking (TD/PM) Circle on the helideck is to be visible and usable at night from a range of 0.5 NM.

C.7 The Heliport Identification Marking ('H') is to be visible and usable at night from a range of 0.25 NM.

C.8 The minimum ranges at which the TD/PM Circle and 'H' are visible and useable (see paragraphs C.6 and C.7 above), should still be achieved even where a correctly fitted landing net covers the lighting.

C.9 The design of the Perimeter Lights, TD/PM Circle and 'H' should be such that the luminance of the Perimeter Lights is equal to or greater than that of the TD/PM circle segments, and the luminance of the TD/PM circle segments equal to or greater than that of the 'H'.

C.10 The design of the TD/PM Circle and 'H' should include a facility to enable their intensity to be increased by up to approximately two times the figures given in this specification to permit a once-off (tamper proof) adjustment at installation; the average intensity over 360° in azimuth at each elevation should not exceed the maximum figures. The purpose of this facility is to ensure adequate performance at installations with high levels of background lighting without risking glare at less well-lit installations. The TD/PM Circle and 'H' should be adjusted together using a single control to ensure that the balance of the overall lighting system is maintained in both the 'standard' and 'bright' settings.

Definitions

C.11 The following definitions should apply:

Lighting element

C.12 A lighting element is a light source within a segment or sub-section and may be discrete (e.g. a Light Emitting Diode (LED)) or continuous (e.g. fibre optic cable, electro luminescent panel). An individual lighting element may consist of a single light source or multiple light sources arranged in a group or cluster, and may include a lens/diffuser.

Segment

C.13 A segment is a section of the TD/PM circle lighting. For the purposes of this specification, the dimensions of a segment are the length and width of the smallest possible rectangular area that is defined by the outer edges of the lighting elements, including any lenses/diffusers.

Sub-section

C.14 A sub-section is an individual section of the 'H' lighting. For the purposes of this specification, the dimensions of a sub-section are the length and width of the smallest possible rectangular area that is defined by the outer edges of the lighting elements, including any lenses/diffusers.

The perimeter light requirement

Configuration

C.15 Perimeter lights, spaced at intervals of not more than 3 m, should be fitted around the perimeter of the landing area of the helideck as described in Chapter 4, paragraph 4.19.

Mechanical constraints

C.16 For any helideck where the D-value is greater than 16.00 m the perimeter lights should not exceed a height of 15 cm above the surface of the helideck. Where a helideck has a D-value of 16.00 m or less the perimeter lights should not exceed a height of 5 cm above the surface of the helideck.

Light intensity

C.17 The minimum light intensity profile is given in Table 2 below:

Table 2: Minimum light intensity profile for perimeter lights

Elevation	Azimuth	Intensity (min.)
0º to 10º	-180º to +180º	30 cd
>10º to 20º	-180º to +180º	15 cd
>20º to 90º	-180º to +180º	3 cd

C.18 No perimeter light should have an intensity of greater than 60 cd at any angle of elevation. Note that the design of the perimeter lights should be such that the luminance of the perimeter lights is equal to or greater than that of the TD/PM Circle segments.

Colour

C.19 The colour of the light emitted by the perimeter lights should be green, as defined in ICAO Annex 14 Volume 1 Appendix 1, paragraph 2.1.1(c) or paragraph 2.3.1(c) as applicable.

Serviceability

C.20 The perimeter lighting is considered serviceable provided that at least 90% of the lights are serviceable, and providing that any unserviceable lights are not adjacent to each other.

The touchdown/positioning marking circle requirement

Configuration

C.21 The lit TD/PM circle should be superimposed on the yellow painted marking such that it is concentric with the painted circle and contained within it. It should comprise one or more concentric circles of at least 16 discrete lighting segments, of at least 40 mm minimum width. The segments should be straight or curve in sympathy with the painted circle. A single circle should be positioned such that the radius of the circle formed by the centre line of the lighting segments is within 10 cm of the mean radius of the painted circle. Multiple circles should be symmetrically disposed about the mean radius of the painted circle, each circle individually meeting the specification contained in this appendix. The lighting segments should be of such a length as to provide coverage of between 50% and 75% of the circumference and be equidistantly placed with the gaps between them not less than 0.5 m. A single non-standard gap up to 25% larger or smaller than the remainder of the circle is permitted at one location to facilitate cable entry. The mechanical housing should be coloured yellow - see CAP 437 Chapter 4 paragraph 4.18.

Mechanical constraints

C.22 The height of the lit TD/PM circle fixtures (e.g. segments) and any associated cabling should be as low as possible and should not exceed 25 mm. The overall height of the system, taking account of any mounting arrangements, should be kept to a minimum. So as not to present a trip hazard, the segments should not present any vertical outside edge greater than 6 mm without chamfering at an angle not exceeding 30° from the horizontal.

C.23 The overall effect of the lighting segments and cabling on deck friction should be minimised. Wherever practical, the surfaces of the lighting segments should meet the minimum deck friction limit coefficient (μ) of 0.65 (see Chapter 3 paragraph 3.39), e.g. on non-illuminated surfaces. Testing should be consistent with the method utilised for helideck surfaces (see Chapter 3 paragraph 3.41).

C.24 The TD/PM circle lighting components, fitments and cabling should be able to withstand a pressure of at least 1,655 kPa (240 lbs/in^2) and ideally 3,250 kPa (471 lbs/in^2) without damage.

Light intensity

C.25 The light intensity for each of the lighting segments, when viewed at angles of azimuth over the range + 80° to -80° from the normal to the longitudinal axis of the strip (see Figure 1), should be as defined in Table 3.

Table 3: Light intensity for lighting segments on the TD/PM circle

Elevation	Intensity	
	Min.	Max.
0° to 10°	As a function of segment length as defined in Figure 2	60 cd
>10° to 20°	25% of min intensity >0º to 10º	45 cd
>20° to 90°	5% of min intensity >0º to 10º	15 cd

C.26 For the remaining angles of azimuth on either side of the longitudinal axis of the segment, the maximum intensity should be as defined in Table 3.

C.27 The intensity of each lighting segment should be nominally symmetrical about its longitudinal axis. The design of the TD/PM Circle should be such that the luminance of the TD/PM Circle segments is equal to or greater than the sub-sections of the 'H'.

Figure 1: TD/PM segment measurement axis system

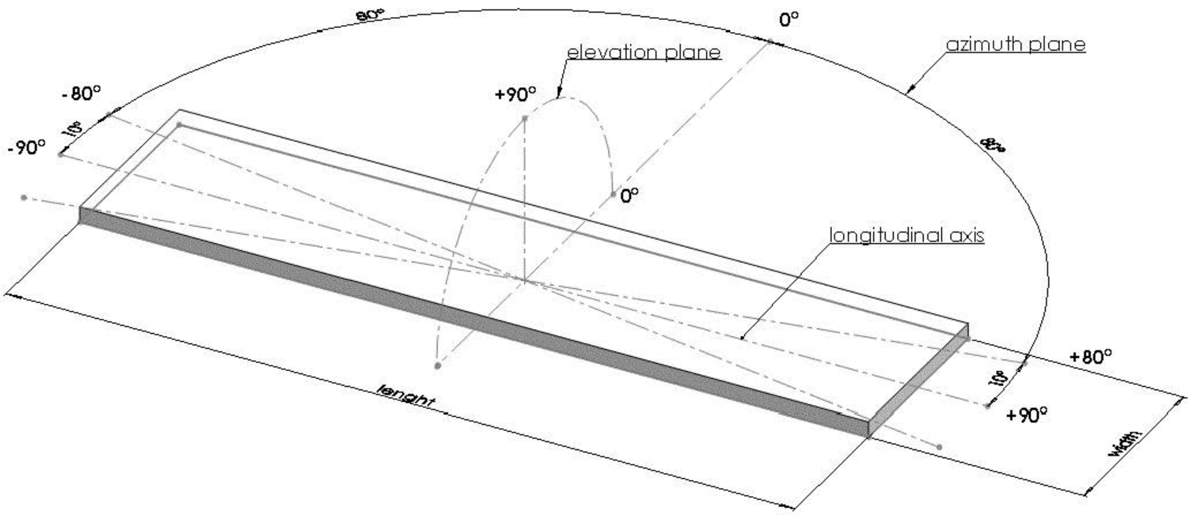
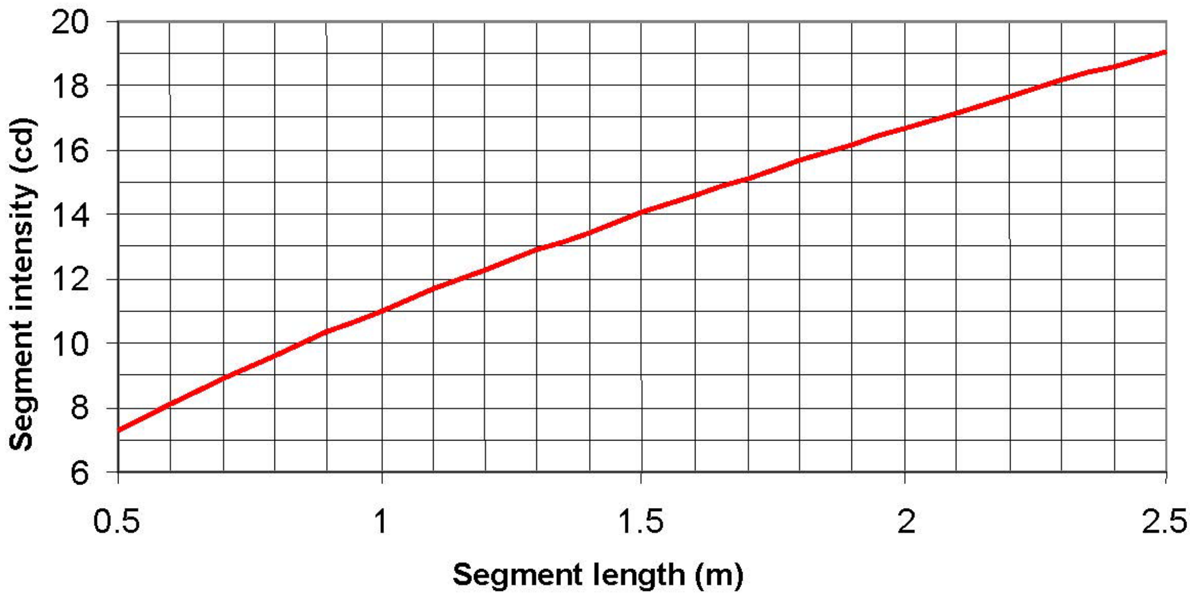


Figure 2: TD/PM segment intensity versus segment length



NOTE: Given the minimum gap size of 0.5 m and the minimum coverage of 50%, the minimum segment length is 0.5 m. The maximum segment length depends on deck size, but is given by selecting the minimum number of segments (16) and the maximum coverage (75%).

C.28 If a segment is made up of a number of individual lighting elements (e.g. LED's) then they should be of the same nominal performance (i.e. within manufacturing tolerances) and be equidistantly spaced throughout the segment to aid textural cueing. The minimum spacing between the illuminated areas of the lighting elements should be 3 cm and the maximum spacing should be 10 cm.

C.29 On the assumption that the intensities of the lighting elements will add linearly at longer viewing ranges where intensity is more important, the minimum intensity of each lighting element (i) should be given by the formula:

$$i = I / n$$

where: I = required minimum intensity of segment at the 'look down' (elevation) angle (see Table 3)
n = the number of lighting elements within the segment

NOTE: The maximum intensity of a lighting element at each angle of elevation should also be divided by the number of lighting elements within the segment.

C.30 If the segment comprises a continuous lighting element (e.g. fibre optic cable, electro luminescent panel), then to achieve textural cueing at short range, the element should be masked at 3.0 cm intervals on a 1:1 mark-space ratio.

Colour

C.31 The colour of the light emitted by the TD/PM circle should be yellow, as defined in ICAO Annex 14 Volume 1 Appendix 1, paragraph 2.1.1(b) or paragraph 2.3.1(b) as applicable.

Serviceability

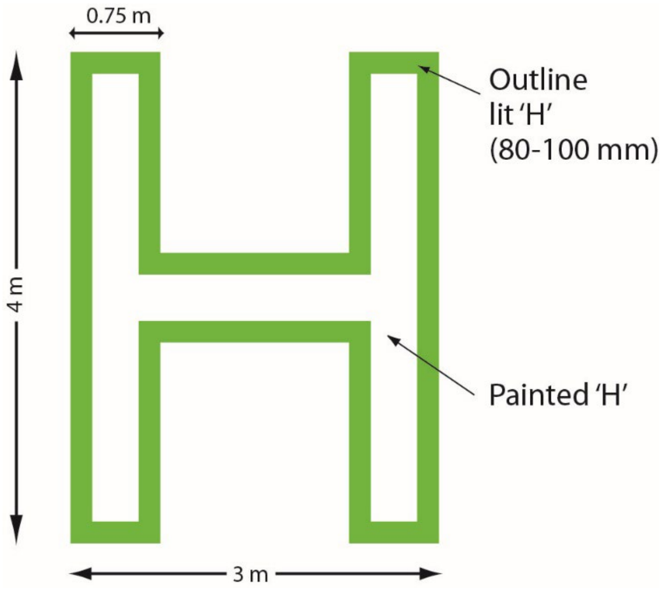
C.32 The TD/PM Circle: At least 90% of the lighting elements should be operating and visible for the TD/PM circle to be considered serviceable.

The heliport identification marking requirement

Configuration

C.33 The lit Heliport Identification Marking ('H') should be superimposed on the 4 m x 3 m white painted 'H' (limb width 0.75 m). The lit 'H' should be 3.9 to 4.1 m high, 2.9 to 3.1 m wide and have a stroke width of 0.7 to 0.8 m. The centre point of the lit 'H' may be offset from the centre point of the painted 'H' in any direction by up to 10 cm in order to facilitate installation (e.g. to avoid a DIFFS nozzle on the helideck surface). The limbs should be lit in outline form as shown in Figure 3.

Figure 3: Configuration and dimensions of heliport identification marking 'H'



C.34 An outline lit 'H' should comprise sub-sections of between 80 mm and 100 mm wide around the outer edge of the painted 'H' (see Figure 3). There are no restrictions on the length of the sub-sections, but the gaps between them should not be greater than 10 cm. The mechanical housing should be coloured white – see CAP 437 Chapter 4 paragraph 4.18.

Mechanical constraints

C.35 The height of the lit 'H' fixtures (e.g. subsections) and any associated cabling should be as low as possible and should not exceed 25 mm. The overall height of the system, taking account of any mounting arrangements, should be kept to a minimum. So as not to present a trip hazard, the lighting strips should not present any vertical outside edge greater than 6 mm without chamfering at an angle not exceeding 30° from the horizontal.

C.36 The overall effect of the lighting sub-sections and cabling on deck friction should be minimised. Wherever practical, the surfaces of the lighting sub-sections should meet the minimum deck friction limit coefficient (μ) of 0.65 (see Chapter 3 paragraph 3.39), e.g. on non-illuminated surfaces. Testing should be consistent with the method utilised for helideck surfaces (see Chapter 3 paragraph 3.41).

C.37 The 'H' lighting components, fitments and cabling should be able to withstand a pressure of at least 1,655 kPa (240 lbs/in^2) and ideally 3,250 kPa (471 lbs/in^2) without damage.

Light intensity

C.38 The intensity of the lighting along the 4 m edge of an outline 'H' over all angles of azimuth is given in Table 4 below.

Table 4: Light intensity of the 4 m edge of the 'H'

Elevation	Intensity	
	Min.	Max.
2° to 12°	3.5 cd	60 cd
>12° to 20°	0.5 cd	30 cd
>20° to 90°	0.2 cd	10 cd

NOTE: For the purposes of demonstrating compliance with this specification, a sub-section of the lighting forming the 4 m edge of the 'H' may be used. The minimum length of the sub-section should be 0.5 m. When testing a sub-section, the light intensities defined in Table 4 apply only when viewed at angles of azimuth over the range + 80° to -80° from the normal to the longitudinal axis of the strip (see Figure 1). For the remaining angles of azimuth on either side of the longitudinal axis of the sub-section, the maximum intensity should be as defined in Table 4.

C.39 The outline of the H should be formed using the same lighting elements throughout.

C.40 If a sub-section is made up of individual lighting elements (e.g. LED's) then they should be of nominally identical performance (i.e. within manufacturing tolerances) and be equidistantly spaced within the sub-section to aid textural cueing. The minimum spacing between the illuminated areas of the lighting elements should be 3 cm and the maximum spacing should be 10 cm.

C.41 With reference to C.29, due to the shorter viewing ranges for the 'H' and the low intensities involved, the minimum intensity of each lighting element (i) for all angles of elevation (i.e. 2° to 90°) should be given by the formula:

$$i = I / n$$

where: I = required minimum intensity of sub-section at the 'look down' (elevation) angle between 2° and 12° (see Table 4).
n = the number of lighting elements within the sub-section.

NOTE: The maximum intensity of each lighting element at any angle of elevation should be the maximum between 2° and 12° (see Table 4) divided by the number of lighting elements within the sub-section.

C.42 If the 'H' is constructed from a continuous light element (e.g. fibre optic cables or panels, electroluminescent panels), the luminance (B) of the 4 m edge of the outline 'H' should be given by the formula:

$$B = I / A$$

where: I = intensity of the limb (see Table 4)
A = the projected lit area at the 'look down' (elevation) angle

C.43 If the sub-section comprises a continuous lighting element (e.g. fibre optic cable, electro luminescent panel), then to achieve textural cueing at short range, the element should be masked at 3.0 cm intervals on a 1:1 mark-space ratio.

Colour

C.44 The colour of the ‘H’ should be green, as defined in ICAO Annex 14 Volume 1 Appendix 1, paragraph 2.1.1(c) or paragraph 2.3.1(c) as applicable.

Serviceability

C.45 The ‘H’: At least 90% of the lighting elements should be operating and visible for the ‘H’ to be considered serviceable.

General characteristics

C.46 The general characteristics detailed in the paragraphs below apply to helideck perimeter lighting as well as the TD/PM Circle and ‘H’ lighting except where otherwise stated.

Requirements

C.47 The following items are fully defined and form firm requirements.

C.48 All lighting components should be tested by an independent test house. The photometrical and colour measurements performed in the optical department of this test house should be accredited according to the version of EN ISO/IEC 17025 current at the time of the testing. The angular sampling intervals should be: every 10° in azimuth; every 1° from 0° to 10°, every 2° from 10° to 20° and every 5° from 20° to 90° in elevation.

NOTE: Test set-ups for lighting components should be representative of a typical in-service installation, i.e. any adjacent components such as junction boxes or cable trunking that might affect the optical output should be included.

C.49 As regards the attachment of the TD/PM Circle and 'H' to the helideck, the failure mode requiring consideration is detachment of components of the TD/PM Circle and 'H' lighting due to shear loads generated during helicopter landings. The maximum horizontal load may be assumed to be that defined in Chapter 3 paragraph 3.20, 4), i.e. the maximum certificated take-off mass (MTOM) of the largest helicopter for which the helideck is designed multiplied by 0.5, distributed equally between the main undercarriage legs. This requirement applies to components of the circle and H lighting having an installed height greater than 6 mm and a plan view area greater than or equal to 200 cm^2.

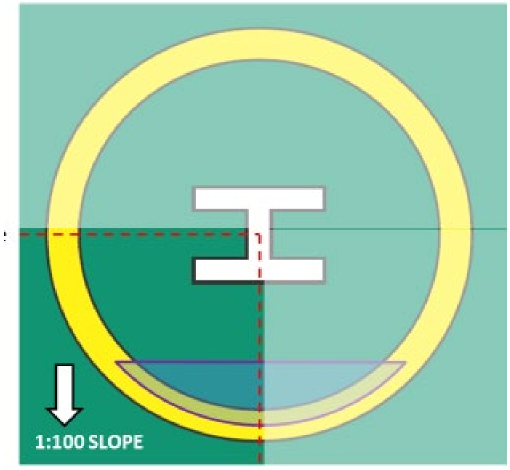
NOTE 1: Example – for a helicopter MTOM of 14,600kg, a horizontal load of 35.8kN should be assumed.

NOTE 2: For components having plan areas up to and including 1,000 cm^2, the horizontal load may be assumed to be shared equally by all fasteners provided that they are approximately equally spaced. For larger components, the distribution of the horizontal loads should be considered.

C.50 Provision should be included in the design and installation of the system to allow for the effective drainage of the helideck areas inside the TD/PM Circle and the 'H' lighting (see Chapter 3 paragraph 3.46). The design of the lighting and its installation should be such that, when mounted on a smooth flat plate with a slope of 1:100, a fluid spill of 200 litres inside the H lighting will drain from the circle within 2 minutes. The maximum drainage time applies primarily to aviation fuel, but water may be used for test purposes. The maximum drainage time does not apply to fire-fighting agents.

NOTE: Drainage may be demonstrated using a mock-up of a one quarter segment of a helideck of D-value of at least 20 m, configured as shown in Figure 4, and a fluid quantity of 100 litres. The surface of the test helideck should have a white or light-coloured finish and the water (or other fluid used for the test) should be of a contrasting colour (e.g. by use of a suitable dye) to assist the detection of fluid remaining after 2 minutes.

Figure 4: Configuration of quarter segment drainage test mock-up



Other considerations

C.51 The considerations detailed in this section are presented to make equipment designers aware of the operating environment and customer expectations during the design of the products/system. They do not represent formal requirements but are desirable design considerations of a good lighting system.

C.52 All lighting components and fitments should meet safety regulations relevant to a helideck environment such as explosion proofing (Zone 1 or 2 as appropriate) and flammability and be tested by a notified body in accordance with the ATEX directive or equivalent locally applicable hazardous area certification standards.

C.53 All lighting components and fitments installed on the surface of the helideck should be resistant to attack by fluids that they will likely or inevitably be exposed to such as: fuel, hydraulic fluid, helicopter engine and gearbox oils; those used for de-icing, cleaning and fire-fighting; any fluids used in the assembly or installation of the lighting, e.g. thread locking fluid. In addition, they should be resistant to UV light, rain, sea spray, guano, snow and ice. Components should be immersed in each of the fluids individually for a period representative of the likely exposure in-service and then checked to ensure no degradation of mechanical properties (i.e. surface friction and resistance to contact pressure), any discolouration, or any clouding of lenses/diffusers. Any other substances that may come into contact with the system that may cause damage should be identified in the installation and maintenance documentation.

C.54 All lighting components and fitments should be able to operate within a temperature range appropriate for the local ambient conditions.

C.55 All cabling should utilise low smoke/toxicity, flame retardant cable. Any through-the-deck cable routing and connections should use sealed glands, type approved for helideck use.

C.56 All lighting components and fitments should meet IEC International Protection (IP) standards according to the version of IEC 60529 current at the time of testing appropriate to their location, use and recommended cleaning procedures. The intent is that the equipment should be compatible with deck cleaning activities using pressure washers and local flooding (i.e. puddling) on the surface of the helideck. It is expected that this will entail meeting at least IP66 (dust tight and resistant to powerful water jetting). IP67 (dust tight and resistant to temporary submersion in water) and/or IP69 (dust tight and resistant to close -range high pressure, high temperature jetting) should also be considered and applied where appropriate.

NOTE: Except where flush mounted (e.g. where used to delineate the landing area from an adjacent parking area), perimeter lights need only to meet IP66. Lighting equipment mounted on the surface of the helideck (e.g. circle and H lighting) should also meet IP67. Any lighting equipment that is to be subject to high pressure cleaning (i.e. lighting mounted on the surface of the helideck such as the circle and H lighting) should also meet IP69.

C.57 Control panels that may be required for helideck lighting systems are not covered in this document. It is the responsibility of the Duty Holder / engineering contractor to select and integrate control panels into the installation safety and control systems, and to ensure that all such equipment complies with the relevant engineering standards for design and operation.

Appendix D

Helideck fire-fighting provisions for existing NUI assets on the UK continental shelf

Introduction

On 1st July 2016 CAA agreed a new scheme with the industry aimed at addressing deficiencies in the fire-fighting provisions at the 117 normally unattended installations (NUIs) operating on the UKCS at that time – the 59 current installations are listed in the annex to this appendix.

The basic concept behind the scheme is to allow the option of limiting exposure to the risk of a post-crash fire as an alternative to reducing the associated probability or mitigating the consequences. In view of the wide range of potential causes, achieving an adequate reduction in the probability of a post-crash fire event is considered to be unrealistic. Mitigation through the provision of fire-fighting equipment as detailed in Chapter 5 is possible but may be uneconomic for some installations.

The Scheme is mandated by CAA Safety Directive Number: SD-2022/001 Issued 1st June 2022: Offshore Helicopter Helideck Operations, which came into force on 1st January 2017, addressing offshore helicopter helideck operations, and comprises the following elements:

1. For any helidecks which do not comply with the requirements for the installation of an automated fire-fighting system, from 1st January 2017 an annual limit of 120 landings was applied when the helideck is unattended to constrain overall exposure. In addition, operations to such decks may not take place at night unless a circle and H helideck lighting system compliant with Appendix C is fitted.
2. When helidecks without an automated fire-fighting system are attended by personnel trained in the use of the fire-fighting equipment that is available, operations were permitted to continue with that equipment until 31st December 2017.

3. From 1st January 2018, the fire-fighting facilities should meet or exceed the H1/H2 Rescue and Fire-Fighting Service (RFFS) provisions detailed in this appendix.

4. Helidecks without an automated fire-fighting system that have not upgraded to the level stated in 3) above by 31st December 2017 are, in addition to the limit on unattended landings, subject to an annual limit on the total number of landings of 200 from 1st January 2018, decreasing to 160 from 1st January 2019 and finally decreasing to 120 from 1st January 2020.

The scheme is summarised in the table below updated to reflect the time period from 1st January 2020 onwards. The limits on the number of landings are derived from CAP 789 where 120 landings represent the upper limit for 'standard operations'.

Alternative solutions supported by a safety case acceptable to the CAA will be considered. Safety cases should describe in detail the operation (number of unattended / attended / day / night operations), aircraft types (including certification standard and configuration) and fire-fighting provisions and explain how the risks are to be minimised and managed.

It is the responsibility of each installation duty holder to determine what fire-fighting provisions are most appropriate for a particular asset based on the operational requirements and taking account of the restrictions detailed in the summary table below. A key factor in this determination will be the exposure to the risk of a post-crash fire (PCF) in terms of the anticipated annual number of landings on the helideck.

Equipment installed			Number of unattended (total number) of landings permitted
Automatic fire-fighting	**H1/H2 compliant**	**Circle and H lighting**	**From 01 January 2020 onwards**
✓	-	✓	UL[1]
✓	-	×	UL Night ban[2]
×	✓	✓	120 (UL)
×	✓	×	120 (UL) Night ban
×	×	✓	120 (120)[3]
×	×	×	120 (120) Night ban

1 UL = unlimited.

2 Night ban where automatic fire-fighting is installed took effect from 1st April 2018 (night time is defined as 30 minutes after sunset until 30 minutes prior to sunrise).

3 The numbers in brackets indicate the total number of annual landings permitted, i.e. the number of attended landings plus unattended landings. For example, “120 (120)” means a total of 120 attended and unattended landings are permitted of which up to 120 may be unattended.

An installation duty holder who wishes to avoid any limit on the number of landings will need to install an automatic fire-fighting system in accordance with the applicable sections of CAP 437, Chapter 5 noting in particular the following:

- the method of delivering primary extinguishing agent (foam) should be capable of discharging automatically in the event of a post-crash fire i.e. without the necessity for a manual intervention.

- The system should have a manual override function, both on the NUI and on a remote attended installation and/or from the beach, which allows it to be shut-off in the event of spurious activation or when a fire has been fully extinguished.
- the system utilised should be capable of delivering primary extinguishing agent (foam) to the whole of the helideck (landing area) simultaneously. This favours a system that dispenses foam in a dispersed pattern (spray) rather than a solid-stream (jet) i.e. a deck integrated fire-fighting system (DIFFS) where DIFF dispensing nozzles are evenly distributed across the entire helideck surface.
- equipment selected should be low maintenance so that periodic checks prescribed by the manufacturer may be contained within routine maintenance cycles for the installation.
- Prior to implementation of improvements the action plan should be submitted to the HCA to ensure that any rectification work, including the physical siting of foam dispensing equipment, does not compromise or invalidate any conditions of the current landing area certificate for the installation.

It is emphasised that the summary table is applicable only to the 59 NUI assets listed in the annex to this appendix. Appendix D is not applicable to any normally unattended installation not listed in the annex.

The purpose of the remainder of Appendix D is to set out the minimum technical requirements for an H1/H2 provision to address the landing case when fire-fighting equipment is attended. H1/H2 compliance is indicated in column 2 of the summary table above.

Definitions

For the purpose of Appendix D, the following definitions are being applied:

- Helicopter Category H1: A helicopter with an overall length up to but not including 15m.
- Helicopter Category H2: A helicopter with an overall length from 15m up to, but not including, 24m.

H1/H2 scheme details

H1 RFFS standard

Table 1: Extinguishing agent requirements for H1 standard

Foam meeting performance level B		Complementary agents		
Water (litres)	Discharge rate foam solution (l/min)	Dry chemical powder (kg)	and	CO_2 (kg)
500	250	23		18

NOTE 1: The discharge rate of complementary agents should be selected for optimum effectiveness of the agent used.

NOTE 2: Dry chemical powder should be of a foam compatible type which is capable of dealing with Class B fire for liquid hydrocarbons.

NOTE 3: Primary and secondary complementary agents should be delivered from one or two extinguishers.

Table 1 is predicated on a helicopter with an overall length up to, but not including, 15.0m, having an assumed average fuselage length of 8.5m and an average fuselage width of 1.5m (to which an additional width factor W1 of 4m is applied). However, most of the H1 types currently operated on the UKCS have fuselage lengths and fuselage widths which significantly exceed the H1 mean values derived from Table 6-4 of the ICAO Heliport Manual (doc. 9261). Therefore, it is necessary to recalculate the critical area assumed for the larger AS365N2/N3 types on the basis of a helicopter fuselage length of 11.63m and a fuselage width of 2.03m. See Table 2, H1 RFFS Large below.

H1 RFFS large

Table 2: Extinguishing agent requirements for AS365N2 and AS365N3 operations

Foam meeting performance level B		Complementary agents		
Water (litres)	Discharge rate foam solution (l/min)	Dry chemical powder (kg)	and	CO_2 (kg)
770	385	23		18

NOTE 1: The discharge rate of complementary agents should be selected for optimum effectiveness of the agent used.

NOTE 2: Dry chemical powder should be of a foam compatible type which is capable of dealing with Class B fire for liquid hydrocarbons.

NOTE 3: Primary and secondary complementary agents should be delivered from one or two extinguishers.

NOTE 4: As an alternative to H1 RFFS large, helidecks operating AS365N2/N3 types may alternatively select the quantities applicable to H2 RFFS Standard in Table 3.

H2 RFFS standard

Table 3: Extinguishing agent requirements for H2 standard

Foam meeting performance level B		Complementary agents		
Water (litres)	Discharge rate foam solution (l/min)	Dry chemical powder (kg)	and	CO_2 (kg)
1000	500	45		18

NOTE 1: The discharge rate of complementary agents should be selected for optimum effectiveness of the agent used.

NOTE 2: Dry chemical powder should be of a foam compatible type which is capable of dealing with Class B fire for liquid hydrocarbons.

NOTE 3: Primary and secondary complementary agents should be delivered from one or two extinguishers.

Table 3 is predicated on a helicopter with an overall length of 15.0m up to, but not including, 24.0m, having an assumed average fuselage length of 14.5m and an average fuselage width of 2m (to which an additional width factor W1 of 4m is applied). However, a number of NUIs, in the NNS, are operated by types which have a fuselage length and fuselage width that significantly exceeds the H2 mean values derived from Table 6-4 of the 1995 ICAO Heliport Manual (doc. 9261). Therefore, in this case it is necessary to recalculate the assumed critical area on the basis of the dimensions of a worst-case S92 helicopter, having a fuselage length of 17.10m and a fuselage width, including sponsons, of 3.90m. See Table H2 RFFS Large below.

H2 RFFS large

Table 4: Extinguishing agent requirements for S92 operations

Foam meeting performance level B		**Complementary agents**		
Water (litres)	Discharge rate foam solution (l/min)	Dry chemical powder (kg)	and	CO_2 (kg)
1500	750	45		18

NOTE 1: The discharge rate of complementary agents should be selected for optimum effectiveness of the agent used.

NOTE 2: Dry chemical powder should be of a foam compatible type which is capable of dealing with Class B fire for liquid hydrocarbons.

NOTE 3: Primary and secondary complementary agents should be delivered from one or two extinguishers.

Annex: Normally Unattended Installations – list of existing NUI assets on the UKCS by region, requiring a review of Rescue and Fire-fighting

Northern North Sea (6)		UK West Coast (7)	
Beryl SPM 2	Ineos Unity	Calder	Hamilton North
Erskine	Jade	DP-6	Lennox
Franklin	Mungo	DPPA	Millom West
		Hamilton	

Southern North Sea (46)			
49-30A (Davy)	Garrow	Leman 27F	
Amethyst A1D	Grove	Leman 27G	Ravenspurn RC
Amethyst A2D	Hoton	Leman 27H	Saturn
Anglia A	Hyde	Leman 27J	Sean R
Babbage	Inde 18B	Malory	Tethys
Barque PB	Inde 23C	Minerva	Trent
Barque PL	Inde 23D	Munro	Vanguard QD
Carrack QA	Kelvin	Neptune	Waveney
Chiswick	Kilmar	Ravenspurn North ST2	Wenlock
Excalibur	Lancelot	Ravenspurn North ST3	West Sole B
Galleon PG	Leman 27D	Ravenspurn RA	West Sole C
Galleon PN	Leman 27E	Ravenspurn RB	

Total No. NUIs = 59

Note: The original CAA letter to OGUK dated 01 July 2011 listed a total of 117 NUI installations. However, at the date of publication of CAP 437, Edition 9, this number has reduced to 59 as the balance of installations (58) have since been decommissioned.

Appendix E

Additional guidance relating to the provision of meteorological information from offshore installations

Introduction

E.1 This Appendix provides additional guidance on the provision of meteorological information from offshore installations, which is detailed in Chapter 6.

E.2 The provision of meteorological information for the safety, efficiency and regulation of international air navigation is subject to UK Aviation Law (Regulation (EU) 2017/373 as retained (and amended in UK domestic law) under the European Union (Withdrawal) Act 2018) which is derived from the international standards and recommended practices described in Annex 3 to the Chicago Convention published by ICAO. Requirements for observer training and observing accuracy are set out by the United Nation's World Meteorological Organization (WMO).

E.3 CAP 746 Meteorological Observations at Aerodromes provides the policy and guidance related to the provision of meteorological information at land-based aerodromes in the UK. To ensure compliance with these requirements, and to standardise the provision of meteorological information provided, the requirements for MET Observers and MET instrumentation should be followed in accordance with CAP 746, Chapter 1, Paragraph 1.14, “Official Meteorological Reports” by all offshore installations wherever practicable. Acceptable alternative arrangements for specific exceptions are detailed in this appendix.

NOTE: Certain information contained in CAP 746 is replicated in this appendix to highlight items of particular importance or relevance to the provision of meteorological information from offshore installations and/or for ease of reference.

Contents and standardisation of the weather reports issued by each offshore installation

Wind

E.4 To be reported as per CAP 746 (Chapter 4 for AUTO METARs and Offshore Weather Reports, and Chapter 5 for information provided to helicopters for take-off and landing).

NOTE 1: The wind speed and direction reported should always be taken directly from the automated information supplied by the primary anemometer

NOTE 2: The wind direction in AUTO METARs and Offshore Weather Reports should be given in degrees from true North. In reports to helicopters for take-off and landing, wind direction is to be expressed in degrees Magnetic.

NOTE 3: If the location of the primary anemometer is obstructed then a second anemometer should be fitted to cover any compass point that may be obstructed from the primary wind sensor.

NOTE 4: Gusts may be reported in pre-flight weather reports regardless of the difference between mean wind speed and gust speed but should always be reported if they exceed the mean wind speed as specified in CAP 746 (Chapter 4).

Visibility

E.5 To be reported as per CAP 746 (Chapter 4 for AUTO METARs and Offshore Weather Reports, and Chapter 5 for information provided to helicopters for take-off and landing).

NOTE: Visibility is to be reported in metres, as per CAP 746. The visibility reported is the minimum visibility. Visibilities greater than 10 km should be reported as 9999.

Lightning

E.6 When lightning is observed, it should be included in the report.

Present weather

E.7 Only the following weather phenomena are required to be reported:

Thunderstorm (no precipitation)
Thunderstorm with rain
Thunderstorm with rain and snow
Thunderstorm with snow
Thunderstorm with hail
Thunderstorm with heavy rain
Thunderstorm with heavy rain and snow
Thunderstorm with heavy snow
Thunderstorm with heavy hail
Thunderstorm in the vicinity

Drizzle
Heavy drizzle
Rain
Heavy rain
Rain and drizzle
Heavy rain and drizzle

Freezing rain
Heavy freezing rain
Freezing drizzle
Heavy freezing drizzle
Snow grains
Snow
Heavy snow
Rain and snow
Heavy rain and snow
Ice pellets

Rain shower
Heavy rain shower
Rain and snow shower
Heavy rain and snow shower
Snow shower
Heavy snow shower
Hail shower
Heavy hail shower
Shower in the vicinity

Fog
Freezing fog
Shallow fog
Fog in the vicinity
Haze
Mist
Smoke
Dust
Sea spray

Squall
Funnel cloud
Volcanic ash
Blowing sand
Sandstorm

NOTE 1: Guidance on the reporting of these present weather phenomena is as per CAP 746 (Chapter 4).

NOTE 2: No coding is required since the report is to be written in plain language.

NOTE 3: If none of the above is observed then the entry for Present Weather will be Nil.

NOTE 4: Where appropriate up to three of the above phenomena may be reported.

NOTE 5: When reporting Fog, Freezing Fog or Fog in the Vicinity a note should be added to the Remarks section indicating the direction in which the fog is seen.

Reporting of fog

E.8 If Fog (or Freezing Fog), Shallow Fog or Fog in the Vicinity is observed it should be reported as the Present Weather as detailed in **Table 1** below. When reporting Fog (or Freezing Fog) or Fog in the Vicinity a note should also be added to the Remarks section indicating the direction in which the fog is seen

Table 1: Fog reporting requirements

Fog Observed (by Accredited MET Observer)		**Fog Reported in Offshore Weather Report** (by Accredited MET Observer)	
		In the Present Weather Section	In the Remarks Field
Fog is observed within 1000m of the helideck and the visibility in the direction of the fog is <1,000m			
1.	The observed fog is covering MORE than half the area within 1000 m	Fog (or Freezing Fog)	N/A

2.	The observed fog is covering LESS than half the area within 1000m	Fog (or Freezing Fog)	Partial Fog (fog bank) and a note indicating a direction in which the partial fog is seen, e.g. Partial Fog to East
3.	The observed fog is in irregularly distributed patches within 1000m and the visibility in the direction of the majority of patches is <1000m	Fog (or Freezing Fog)	Fog Patches and a note indicating a direction in which the majority of fog patches are seen, e.g. Fog Patches to West
4.	Patchy fog or a continuous layer of fog is observed within 1000m and the fog is **BELOW helideck level** **Note:** The apparent visibility in the fog layer is <1000 m but the visibility **ABOVE** the fog layer is 1000 m or more.	Shallow Fog	N/A
Fog in the Vicinity – There is no fog observed within a 1000m of the helideck, but fog can be seen within 8km			
5.	No fog is observed within 1000m, but fog can be seen within 8km.	Fog in the vicinity	A note indicating the presence of Shallow Fog, Partial Fog (fog bank) or Fog Patches and a note indicating a direction in which the fog is seen, e.g. Partial Fog to East.

Cloud

E.9 Cloud amount is reported as:

- Few (FEW);
- Scattered (SCT);
- Broken (BKN); and
- Overcast (OVC);

as per CAP 746 (Chapter 4). Sky Obscured (VV///) and No Significant Cloud (NSC) should also be reported.

E.10 Cumulonimbus (CB) or Towering Cumulus (TCU) should be added to the report when present.

E.11 Cloud heights are to be reported in plain language in feet AMSL, rounded down to the nearest 100 ft. There is no requirement to report cloud above 5,000 ft unless CB or TCU is present.

E.12 A maximum of four cloud groups can be reported.

CAVOK (Cloud and Visibility OK)

E.13 To be reported as per CAP 746 (Chapter 4). When appropriate to do so, CAVOK should be reported as Present Weather.

Air temperature and dew point

E.14 To be reported as per CAP 746 (Chapter 4).

QNH and QFE (atmospheric pressure)

E.15 To be reported as per CAP 746 (Chapter 4).

Significant wave height

E.16 Where sensors are deployed for the measurement of Significant Wave Height the information should be included in the report. The Wave Height should be reported to one decimal place, e.g. 7.6 m.

NOTE: Only wave height information from sensors deployed at the installation concerned should be reported.

Pitch, roll, helideck inclination and significant heave rate

E.17 Current best practice is provided in CAP 437, Chapter 6.

Unserviceable Sensors

E.18 When a sensor is unavailable and an estimate has been made of the conditions, a note should be recorded in the Unserviceable Sensors section including the original date that the sensor became unserviceable

Remarks

E.19 This part of the form can be used to report additional helideck and Meteorological-related information that may assist the helicopter crew, e.g. Lightning seen at 12.30, Fog bank to SW, or Heavy Rain shower at 16.20.

Missing or unavailable information

E.20 Exceptionally, when a sensor is unserviceable and the contingency device is not able to be accessed, or is also unserviceable, the report should be annotated with N/A indicating that the information is not available and the original date that the primary sensor became unserviceable should be recorded in the Unserviceable Sensors section.

Example offshore reports

E.21 Pre-flight weather report form templates are given in Figure 1 (Fixed Installation) and Figure 2 (Mobile) that should be used to supply the relevant information. Examples of completed reports are also provided (see Figure 3 – Fixed Installation and Figure 4 – Mobile). Blank PDF Weather Report forms can also be downloaded from the OEUK OHWN Support page. It is recommended that a blank copy of the form is saved and made available to observers for contingency purposes, for example if OEUK OHWN is unavailable.

Figure 1: Offshore weather report form (Fixed Installation) – Template

Location		ICAO	
Date	/ /	Time	: UTC
Latitude (DD/MM/SS)		Longitude (DDD/MM/SS)	
Restricted Sector	From degrees To degrees		
Wind	Direction degrees Speed knots Gust knots Gust Always Reported		
Visibility	metres	Lightning Present	
Present Weather			
Cloud Layer 1 (Lowest)	Amount	Height	feet
Cloud Layer 2	Amount	Height	feet
Cloud Layer 3	Amount	Height	feet
Cloud Layer 4 (Highest)	Amount	Height	feet
Air Temperature	°C	Dew Point	°C
QNH	hPa	QFE	hPa
Significant Wave Height	metres		
Fuel	Serviceable Amount litres	Rescue & Recovery Available	
Radio	Traffic Freq. MHz Log. Freq. MHz	Marine Channel	
NDB	Serviceable Freq. kHz	Identity	
Cold Flaring			
Unserviceable Sensors	Any	Details *Max. 3 lines* *Include dates*	
Remarks *Max. 5 lines*			
Report prepared by			

Note: Fields highlighted in *red and italics* were entered manually, all other fields were generated from automatic observations.

Figure 2: Offshore weather report form (Mobile) – Template

Location		ICAO	Vessel Heading ___ degrees
Date	___ / ___ / ___	Time	___ : ___ UTC
Latitude (DD/MM/SS)		Longitude (DDD/MM/SS)	
Restricted Sector	From ___ degrees To ___ degrees	Helideck Height	___ m
Wind	Direction ___ degrees Speed ___ knots Gust ___ knots Gust Always Reported		
Visibility	___ metres	Lightning Present	
Present Weather			
Cloud Layer 1 (Lowest)	Amount	Height	___ feet
Cloud Layer 2	Amount	Height	___ feet
Cloud Layer 3	Amount	Height	___ feet
Cloud Layer 4 (Highest)	Amount	Height	___ feet
Air Temperature	___ °C	Dew Point	___ °C
QNH	___ hPa	QFE	___ hPa
Significant Wave Height	___ metres	Helideck Status	
Max. Pitch	___ degrees up ___ degrees down	Max. Roll	___ degrees left ___ degrees right
Significant Heave Rate	___ m/s	Max. Inclination	___ degrees
Fuel	Serviceable ___ Amount ___ litres	Rescue & Recovery Available	
Radio	Traffic Freq. ___ MHz Log. Freq. ___ MHz	Marine Channel	
NDB	Serviceable ___ Freq. ___ kHz	Identity	
Cold Flaring			
Unserviceable Sensors	Any	Details *Max. 3 lines Include dates*	
Remarks *Max. 5 lines*			
Report prepared by			

Note: Fields highlighted in *red and italics* were entered manually, all other fields were generated from automatic observations.

Figure 3: Offshore weather report (Fixed Installation) – Example

Location	Fixed Example		ICAO	ABCD	
Date	10 / 01 / 2023		Time	08 : 58	UTC
Latitude (DD/MM/SS)	N 56 09 02		Longitude (DDD/MM/SS)	E 003 17 51	
Restricted Sector	From	degrees	To	degrees	
Wind	Direction 270 degrees	Speed 02 knots	Gust	knots	
	Gust Always Reported				
Visibility	0450 metres		Lightning Present	No	
Present Weather	Fog				
Cloud Layer 1 (Lowest)	Amount	OVC	Height	200	feet
Cloud Layer 2	Amount		Height		feet
Cloud Layer 3	Amount		Height		feet
Cloud Layer 4 (Highest)	Amount		Height		feet
Air Temperature	08 °C		Dew Point	04 °C	
QNH	1003 hPa		QFE	999 hPa	
Significant Wave Height	1.8 metres				
Fuel	Serviceable *Yes*	Amount *2752* litres	Rescue & Recovery Available	*Yes*	
Radio	Traffic Freq. *121.500* MHz	Log. Freq. *122.500* MHz	Marine Channel	*16*	
NDB	Serviceable *No*	Freq. kHz	Identity		
Cold Flaring	*No*				
Unserviceable Sensors	Any *No*	Details *Max. 3 lines Include dates*			
Remarks *Max. 5 lines*	*Standby vessel advises good prospect of recovery*				
Report prepared by	*Example Name*				

Note: Fields highlighted in *red and italics* were entered manually, all other fields were generated from automatic observations.

Figure 4: Offshore weather report (Mobile) – Example

Location	Mobile Example	ICAO	ABCD
Vessel Heading	242 degrees		
Date	10 / 01 / 2023	Time	08 : 58 UTC
Latitude (DD/MM/SS)	N 56 09 02	Longitude (DDD/MM/SS)	E 003 17 51
Restricted Sector	From degrees To degrees	Helideck Height	*43* m
Wind	Direction 230 200V270 degrees; Speed 18 knots; Gust 32 knots; Gust Always Reported		
Visibility	2000 metres	Lightning Present	Yes
Present Weather	Rain Shower		
Cloud Layer 1 (Lowest)	Amount FEW	Height	800 feet
Cloud Layer 2	Amount SCT	Height	1200 feet
Cloud Layer 3	Amount BKN	Height	3000 feet
Cloud Layer 4 (Highest)	Amount BKN CB	Height	6000 feet
Air Temperature	08 °C	Dew Point	04 °C
QNH	1003 hPa	QFE	999 hPa
Significant Wave Height	1.8 metres	Helideck Status	BLUE
Max. Pitch	0.6 degrees up; -0.1 degrees down	Max. Roll	0.5 degrees left; 0.7 degrees right
Significant Heave Rate	0.2 m/s	Max. Inclination	0.9 degrees
Fuel	Serviceable *Yes*; Amount *2752* litres	Rescue & Recovery Available	*Yes*
Radio	Traffic Freq. *121.500* MHz; Log. Freq. *122.500* MHz	Marine Channel	*16*
NDB	Serviceable *No*; Freq. kHz	Identity	
Cold Flaring	*No*		
Unserviceable Sensors	Any *No*	Details *Max. 3 lines Include dates*	
Remarks *Max. 5 lines*	*Standby vessel advises good prospect of recovery*		
Report prepared by	*Example Name*		

Note: Fields highlighted in *red and italics* were entered manually, all other fields were generated from automatic observations.

Definition of an offshore meteorological observer

E.22 Offshore Meteorological Observer: any competent person who makes a weather observation or who updates a weather observation which is provided either as a Pre-Flight Weather Report or as a Radio Message to a helicopter en route to a fixed or floating offshore facility. Such personnel should be trained and qualified as a Meteorological Observer for Offshore Helicopter Operations.

NOTE 1: Platform operators should allocate sufficient time resources to the meteorological observing staff to enable them to carry out observing duties.

NOTE 2: Meteorological Observers should be located in a position that enables them to assess the weather from an outside observing position, whenever possible, in order to validate that observations are representative of the installation and its vicinity.

E.23 Master Mariners who have been issued with a Marine Coastguard Agency (MCA) Certificate Officer of the Watch (OOW) or equivalent qualification who have demonstrated ongoing competency through the renewal of their Certificate and are regularly providing WMO-compliant ship meteorological observations may be considered competent to provide weather observations for offshore helicopter operations. However, Master Mariners are strongly recommended to become certificated Offshore Aviation Met Observers to ensure that the information being provided specifically to helicopter operators is to the standards required since there are important differences compared to WMO ship observations. These differences are largely concerned with the format, coding and presentation (written and verbal) that are used in the different types of aviation weather reports that helicopter pilots are used to and which directly support pilot’s ability to make effective weather-related flight decisions.

Applicability of meteorological equipment to offshore helicopter landing areas and winching areas

E.24 To provide meteorological observations of the quality (accuracy, timeliness and completeness) required to support safe and efficient helicopter operations, all offshore helidecks and winching areas, whether they are operating for the Oil and Gas or Renewable Energy sectors, should be provided with an automated means of ascertaining the meteorological information specified in Chapter 6, Paragraph 6.16 at all times.

NOTE: In recognition of the nature of helicopter operations to Small Vessels and Normally Unattended Installations with Helicopter Landing Areas, alternative means of meeting the CAP 437 meteorological equipment requirements have been agreed as follows:

Small Vessels

Due to less frequent helicopter operations, the weather reports for smaller ships (e.g. Diving Support Vessels (DSVs), support and seismic vessels and tankers) are required to contain only wind, pressure, air temperature and dew point temperature information. For the purposes of this note, 'less frequent helicopter operations' may be interpreted to mean 'not exceeding 12 landings per year'.

Normally Unattended Installations (NUI) with Helicopter Landing Areas

Where weather information is being provided by NUIs with helicopter landing areas the weather report may include as a minimum wind, pressure, air temperature and dew point temperature information but it is recommended that where applicable e.g. at NUI with more frequent helicopter operations, an automated means of ascertaining all the meteorological information specified in Chapter 6, Paragraph 6.16 should be provided.

- Given the number and location of NUIs in the Southern North Sea (SNS) the Oil and Gas Southern Aviation Safety Forum (SASF) proposed an alternative equivalent means of meeting the criteria for NUI and it was agreed that only 25 NUIs in the Southern North Sea (SNS) would be required to provide meteorological information. The installations were selected as they were located in positions such that automated meteorological observations would provide an acceptable level of weather situational awareness across the SNS domain given that manned installations alone could not provide coverage for all areas of the SNS. The selected installations all had wind, pressure, air temperature and dew point temperature sensors as a minimum, with one installation also having a visibility (Visiometer) and cloud base (Ceilometer) measuring system. The automated reports are disseminated to users through the OEUK OHWN system. At the time of publication, the following 11 installations are providing automated weather reports:

SNS NUI	Wind, Pressure, air temperature & dew point	Visiometer & Ceilometer
Babbage	Yes	No
Barque PB	Yes	No
Blythe	Yes	No
Breagh A	Yes	No
Carrack	Yes	No
Clipper South	Yes	No
Cygnus B	Yes	No
Excalibur	Yes	No
Tolmount	Yes	No
Trent	Yes	No
York	Yes	No

NOTE: If one of the installations specified above stops producing automated weather reports, for example if it is de-commissioned, the impact to weather situational awareness should be assessed and automated weather reports should be produced by another installation in a suitable position as applicable.

Permanently Attended Installations – Reporting of visual elements

At a permanently attended installation that is not equipped with automated sensors for ascertaining the visual elements (cloud amount and height of base, visibility and present weather) but the installation is within 10NM of another installation that is equipped with an automatic observing system that is capable of reporting the visual elements, the output from the automatic observing system sensors may be used by the Met Observer as an aid to completing a weather report providing that the information from the automated sensors is made routinely available and has been manually checked and qualified by the Met Observer before issuing the report.

Design, siting and contingency requirements for meteorological equipment installed in offshore installations

Wind speed and direction

E.25 **Floating/mobile installations -** Wind data measured by anemometers located on floating/mobile installations for use by Helideck Monitoring Systems (HMS) is required to be scaled to a height of 10m above the helideck surface in accordance with Standard Measuring Equipment for Helideck Monitoring Systems and this data should also be used for the compilation of offshore weather reports.

NOTE 1: The height above the surface of the helideck of the anemometer should be recorded as “10m” in the Offshore Helicopter Weather Network system in the “Site Information” section for each installation.

E.26 **Fixed installations -** The wind speed and direction measurements produced by wind sensors (anemometers) located on fixed offshore installations should be included directly in weather reports without scaling.

NOTE 1: The height above the surface of the helideck of the anemometer used to produce wind measurements for weather reports should be recorded in the Offshore Helicopter Weather Network system in the "Site Information" section for each installation.

Performance

E.27 The wind measuring equipment should provide an accurate and representative measurement of wind speed and direction.

E.28 Wind direction data should be oriented with respect to True North.

NOTE: Wind direction should be reported in degrees from true North in AUTO METARs. In reports to helicopters for take-off and landing wind direction is to be expressed in degrees Magnetic.

E.29 The wind speed measurement should be to an accuracy of within ±1 kt, or ±10% for wind speeds in excess of 10 kt, of the actual wind speed (whichever is the greater), over the following ranges:

Table 1: Tolerance values of sensors and equipment - Wind speed

Variable	In-tolerance operating range	Recoverable range
Wind speed	0 to 100 kt	0 to 130 kt

E.30 With wind speeds in excess of 2 kt, the wind direction system should be capable of producing an overall accuracy better than ±10°. The sensor should be sampled at a minimum rate of four times every second. Where wind systems measure the gust, the equipment should calculate the three-second gust as a rolling average of the wind speed samples.

E.31 The equipment should be capable of producing two- and ten-minute rolling averages of the wind speed and direction. The algorithms used for the production of such averages should be defined. The average direction displayed should take regard of the numerical discontinuity at North.

Contingency

E.32 Alternative anemometry meeting the siting requirements specified below and in Chapter 6 should be provided.

NOTE: It is recommended that a hand-held anemometer is used as a contingency in case of the failure or unavailability of the automated sensors; any readings that are taken should be taken from the centre of the helideck. The pilot should be advised that a hand-held anemometer has been used to estimate the wind speed and a remark should be added to the offshore weather report form.

Siting

E.33 This is detailed in Chapter 6, paragraph 6.17, Assessment of Wind Speed and Direction.

E.34 The aim is to site the primary anemometer (wind sensor) in such a position to capture the undisturbed flow. It is recommended that the wind sensor be mounted at the highest practical point, e.g. on the drilling derrick or the telecommunications mast. However, it should be noted that regular servicing is required and for that reason the flare stack should not be used. If no suitable mast is available then a specific wind sensor mast should be erected; however, this should not interfere with helicopter operations. If it is not possible to site the primary anemometer in an unrestricted air flow, and the location is obstructed in certain directions then a second anemometer should be fitted to cover any compass point that may be obstructed from the primary wind sensor to ensure that reliable wind information is provided in all wind directions. Ultrasonic sensors should not be fitted in close proximity to electromagnetic sources such as radar transmitters. The height above the surface of the helideck for each anemometer should be recorded within the offshore duty holder's management system.

NOTE: When an ultrasonic sensor is mounted on the top of a derrick there is an increased risk of lightning damage. Consideration should be given to establishing a secondary contingency location where a temporary replacement sensor could be installed until the primary sensor is repaired (e.g. if repairs to the primary sensor are delayed because access to the derrick is restricted due to drilling operations).

Temperature

E.35 See CAP 746, Chapter 7.

Performance

E.36 The equipment should be capable of measurement to an accuracy better than ±1.0°C for air temperature and dew point, over the following range:

Table 2: Tolerance values of sensors and equipment - Temperature and humidity

Variable	In-tolerance operating range	Recoverable range
Temperature	-25°C to +50°C	-30°C to +70°C
Humidity	5 to 100% Relative Humidity condensing	0 to 100% Relative Humidity condensing

NOTE: Dew point should be displayed for temperatures below zero; frost point should not be displayed.
Temperature and dew point measurements should be measured to a resolution of 0.1°C. Electronic sensors should be sampled at a minimum rate of once per minute.

Contingency

E.37 Alternative sensors should be provided with an accuracy better than ±1.0°C for air temperature and dew point measurement. These sensors should be able to be easily read by the observer in the event of a failure of the main sensor.

Siting

E.38 Temperature and humidity sensors should be exposed in an instrument housing (e.g. Stevenson Screen), which provides protection from atmospheric radiation and water droplets as either precipitation or fog. The sensors should be located in an area that is representative of the air around the landing area and away from exhausts of building heating and equipment cooling systems. For this reason it is recommended that the sensors are located as close to the helideck as possible. The most common area is directly below the helideck, since this provides mechanical protection to the Screen itself. The site should be free of obstructions and away from areas where air may be stagnant, e.g. near blast walls or close to the superstructure of the platform.

Pressure

E.39 See CAP 746, Chapter 7.

Performance

E.40 No observing system that determines pressure automatically should be dependent upon a single sensor for pressure measurement. A minimum of two co-located sensors should be used. The pressure sensors should be accurate to within 0.5 hectopascals of each other.

NOTE: In the event of failure of one or more individual pressure sensors, or where pressure sensors are not accurate to within 0.5 hectopascals of each other, the system should not provide any pressure reading to the user.

E.41 Automatic sensors should be sampled at a minimum rate of once per minute in order to detect significant changes.

E.42 The measurement system should provide a pressure reading to an accuracy of ±0.5 hectopascals or better over the following range:

Table 3: Tolerance values of sensors and equipment - Pressure

Variable	In-tolerance operating range	Recoverable range
Pressure	900 to 1050 hPa	850 to 1200 hPa

E.43 The sensor should provide an output with a minimum system resolution of 0.1 hPa.

Contingency

E.44 Suitable contingency instrumentation includes:

- precision aneroid barometers; and
- digital precision pressure indicators.

E.45 Where the pressure is not being determined automatically the observer should ensure that the appropriate height and temperature corrections are applied.

E.46 Manual atmospheric pressure measuring equipment (as noted above) should be checked daily for signs of sensor drift by comparison with other pressure instrumentation located on the offshore installation. CAP 746, Appendix D, Daily Atmospheric Pressure Equipment QNH Check, provides an example of the type of form that may be used to assist in the monitoring process.

Siting

E.47 Pressure readings are of critical importance to aviation safety and operations. Great care should be taken to ensure that pressure sensor siting is suitable and provides accurate data.

E.48 Pressure sensors can accurately measure atmospheric pressure and will provide representative data for the weather report provided the sensors are correctly located and maintained.

E.49 The equipment should be installed so that the sensor measurements are suitable for the operational purpose and free of external influences.

E.50 If the equipment is not installed at the same level as the notified helideck elevation, it should be given a correction factor in order to produce values with respect to the reference point. For QNH this is the height above sea level and for QFE the height of helideck above sea level.

E.51 Where required, the manufacturer's recommended venting method should be employed to isolate the sensor from the internal environment. The pressure sensor should be installed in a safe area, typically the

Telecommunications Room, and in close proximity to the Meteorological processing system. In most cases, internal venting of the pressure sensors will be satisfactory. However, if it is determined that internal venting may affect the altimeter setting value to the extent that it is no longer within the accuracy limits given below, outside venting should be used. When the pressure sensor is vented to the outside a vent header (water trap) should be used. The venting interface is designed to avoid and dampen pressure variations and oscillations due to 'pumping' or 'breathing' of the pressure sensor venting equipment.

E.52 The sensors should also be located in an area free of jarring, vibration and rapid temperature fluctuations (i.e. avoid locations exposed to direct sunlight, draughts from open windows, and locations in the direct path of air currents from heating or cooling systems). Regular inspections of the vent header should be carried out to ensure that the header does not become obstructed by dust etc.

Visibility

E.53 See CAP 746, Chapter 7.

Performance

E.54 The performance of the measuring system is limited by the range and field of view of the sensor. The equipment should be capable of measurement to the following accuracy limits to a range of 15 km:

Table 4: Performance of the visibility measuring system

Range	Accuracy
Up to and including 550 m	Visibility ±50 m
Between 600 m and 1,500 m	Visibility ±10%
Between 1,5000 m and 15 km	Visibility ±20%

E.55 The visibility measuring system should measure to a resolution of 50 m.

E.56 The sensor(s) should be sampled at a minimum rate of once per minute. An averaging period of 10 minutes for weather reports should be used; however, where a marked discontinuity occurs only those values after the discontinuity should be used for obtaining mean values.

NOTE: A marked discontinuity occurs when there is an abrupt and sustained change in visibility, lasting at least two minutes, which reaches or passes through the following ranges:

10 km or more
5,000 m to 9 km
3,000 m to 4,900 m
2,000 m to 2,900 m
1,500 m to 1,900 m
800 m to 1,400 m
740 m or less

Contingency

E.57 The accredited observer should assess the visibility by eye. Where possible, visibility reference points should be provided. Structures illuminated at night should be indicated. When the visibility has been assessed by eye a remark should be included in the weather report form.

Siting

E.58 The sensor should be positioned in accordance with the manufacturer's specifications and is normally mounted on a mast. The visibility sensor transmits an infrared beam that measures the refraction caused by suspended particles that obstruct visibility, i.e. mist, fog, haze, dust and smoke. For this reason it is important to avoid any interference such as flares, smoke vents, etc. Areas of the installation that are used for wash-down or are susceptible to sea spray should be avoided. The sensor should be located as far away as practicable from other light sources that might affect the measurement, including direct sunlight or spotlights etc., as these will cause interference. These sensors are only suitable for safe areas. These sensors require routine maintenance, calibration and cleaning; hence they should be positioned in a location that is easily accessible.

Present weather sensor

E.58 See CAP 746, Chapter 7.

Performance

E.59 The sensor should be capable of detecting a precipitation rate greater than or equal to 0.05 mm per hour, within 10 minutes of the precipitation commencing.

E.60 Where intensity is measured, the sensor should be capable of measuring the range of intensity from 0.00 mm per hour to 100 mm per hour and resolve this to the following resolutions:

Range	Resolution
0 to 10 mm per hour	0.1 mm
10.5 to 50 mm per hour	0.5 mm
51 to 100 mm per hour	1.0 mm

E.61 The sensor should be accurate to within ±30% in the range 0.5 to 20 mm per hour.

E.62 Where the sensor is capable of doing so, it should discriminate between liquid precipitation and frozen precipitation.

Contingency

E.63 The accredited observer should assess the present weather manually, assisted by reference material as appropriate. When the present weather has been assessed manually a remark should be included in the offshore weather report form.

Siting

E.64 The sensor should be positioned in accordance with the manufacturer's specifications. The sensor should be located as far away as practicable from the shielding effects of obstacles and structures.

Cloud

E.65 See CAP 746, Chapter 7.

Performance

E.66 The performance of the cloud base recorder is limited by the view of the sensor. The equipment should be capable of measurement to the following accuracy limits, from the surface up to 5,000 ft above ground level:

Range	Accuracy
Up to and including 300 ft	Cloud height ±30 ft
Above 300 ft	Cloud height ±10%

E.67 The cloud base recorder should measure to a resolution of 100 ft.

E.68 The sensor(s) should be sampled at a minimum rate of once per minute.

E.69 Where appropriate software is utilised, cloud base detection systems may also provide an indication of the cloud amount. A cloud cover algorithm unit calculates the cloud amounts and the heights of different cloud layers, in order to construct an approximation of the entire sky. Such an approximation is limited by the detection system's coverage of the sky and should not be used in the weather report unless validated by the accredited observer.

Contingency

E.70 The accredited observer should assess the cloud by eye and estimate the height, assisted by reference material where appropriate. It should be noted that human estimates of cloud height without reference to any form of measuring equipment (particularly at night) may not meet the accuracy requirements stated above, so it is essential that when the cloud height has been assessed manually a remark is included in the offshore weather report form.

Siting

E.71 The sensor should be positioned in accordance with the manufacturer's specifications and is normally mounted on a platform or pedestal. The sensor should be located as far away as practicable from other light sources or reflections that might affect the measurement. Most ceilometers are fitted with blowers that prevent precipitation from settling on the lens; however, it is recommended that the sensor is installed in an area free of sea spray and away from any areas that are used routinely for wash-down. The sensor should have a clear view of the sky, uninterrupted by cranes or other structures that may obscure the sensor's view. The height of the sensor above sea level should be noted to ensure that the necessary correction is applied to all readings. These types of sensors are only suitable for installation in safe areas and should not be installed near to radars or other radio transmitters.

Calibration, maintenance and servicing periods

E.72 All primary and contingency sensors should be serviced by an engineer on at least an annual basis. Calibration should take place according to the instrument manufacturer's recommendation. Cleaning and routine maintenance should take place according to the instrument manufacturer's guidance; however, due to the harsh offshore environment, cleaning routines may have to be increased in certain conditions.

NOTE: Ultrasonic wind sensor systems do not use bearings or have moving parts and consequently do not need as frequent maintenance as cup and vane systems.

E.73 Faults and unserviceable sensors should be reported to the OEUK OHWN system provider using the contact details provided on the system.

E.74 Sensors should be repaired as soon as possible to ensure that accurate, timely and complete meteorological observations are provided in support of safe and efficient helicopter operations.

Appendix F

Procedure for authorising offshore helicopter landing areas – letter to offshore helicopter operators, October 2011

Safety Regulation Group

Flight Ops Inspectorate (Helicopters)

October 2011

Dear Sirs

PROCEDURE FOR AUTHORISING OFFSHORE HELICOPTER LANDING AREAS

This letter updates the legal requirements and related industry procedure for the authorisation of offshore helicopter landing areas on installations and vessels for the worldwide use by helicopters registered in the United Kingdom.

Article 96 of the Air Navigation Order (ANO) 2009 requires a public transport helicopter operator to reasonably satisfy himself that every place he intends to take off or land is suitable for purpose.

A UK registered helicopter, therefore, shall not operate to an offshore helicopter landing area unless the operator has satisfied itself that the helicopter landing area is suitable for purpose and that it is properly described in the helicopter operator's Operations Manual.

CAP 437 gives guidance on standards for the arrangements that the CAA expects an operator to have in place in order to discharge this responsibility under article 96. The Helideck Certification Agency (HCA) procedure is established through a memorandum of understanding to withdraw helicopter landing area certification on behalf of the four offshore helicopter operators - Bristow Helicopters Ltd, Bond Offshore, CHC Scotia and British International Helicopters - to enable each to discharge its responsibilities under the ANO.

Article 12 of the ANO 2009 provides that to hold an Air Operator's Certificate (AOC) an operator must satisfy the CAA that amongst other things its equipment, organisation and other arrangements are such that it is able to secure the safe operation of aircraft.

When looking at a particular operator, the CAA will therefore have regard to its ‘other arrangements’. These arrangements include the manner in which the operator discharges its duty under article 96, and the CAA for the grant or ongoing assessment of an AOC will audit the helicopter operators’ application of the process on which the operator relies. As part of such an audit the CAA will periodically audit the processes and procedures of the HCA, in acting in the role of a sub-contractor to the helicopter operators providing their services to AOC holders for the purpose of authorising offshore helicopter landing areas. As part of such an audit, the CAA will review the HCA procedures and processes and may accompany an operator when the operator undertakes an audit of the HCA procedures or inspects an offshore helicopter landing area.

The legal acceptance for the safety of landing sites rests with the helicopter operator.

Yours faithfully

Captain C Armstrong
Manager Flight Operations Inspectorate (Helicopters)

Appendix G

Helideck friction survey protocol

Introduction

G.1 The protocol contained in this document represents a test method acceptable to the CAA for the conduct of helideck friction surveys in compliance with paragraph 3.41 of Chapter 3 of CAP 437, 9th edition, Standards for Offshore Helicopter Landing Areas.

Friction measuring equipment

G.2 The exercise of measuring helideck friction involves a number of factors, all of which have to be taken into consideration:

- The limiting friction values cited in CAP 437 are related to the threshold at which a helicopter would be expected to slide on a helideck. The test method should therefore result in friction values that are representative of the 'real' situation of a helicopter on a helideck. For example, this suggests the use of a wheeled tester employing a tyre made of the same material as helicopter tyres.
- Within certain limits, a helicopter could land almost anywhere on a helideck and an adequate level of friction should exist wherever the helicopter wheels touchdown. This favours devices employing a continuous measurement technique and surveys that cover the entire surface of the helideck.
- Human error and the influence of commercial pressure commonly arise as factors in accidents, hence a measurement method that is less reliant on human input would be expected to deliver greater integrity. Devices that provide automatic electronic data collection, storage and analysis are therefore to be preferred. In addition, this also favours devices employing a continuous measurement

technique and surveys that cover the entire surface of the helideck which, together, reduce the opportunity for missing ‘poor’ areas of a deck during testing.

G.3 In view of the above, the CAA considers that continuous friction measuring equipment (CFME) testers providing automated data collection, storage and processing facilities should be used for measuring helideck friction. They enable the key variable of surface wetness to be consistently controlled, measure the surface friction in a representative manner, and enable the entire helideck area to easily be surveyed in a reasonable time.

G.4 Accordingly, the following protocol is applicable only to the use of CFME.

Survey procedure

General

G.5 The following general considerations should be applied:

- Helideck surface should ideally be dry but may be tested wet provided that any puddles are removed (e.g. swept into the guttering) and prevented from reforming during the survey.
- It is recommended that the survey should not be conducted when it is raining; conditions of drizzle/light rain are acceptable provided that puddles are not allowed to form.
- Survey resolution of $1m^2$ minimum.

Preparation

G.6 The following actions should be completed prior to conducting the survey:

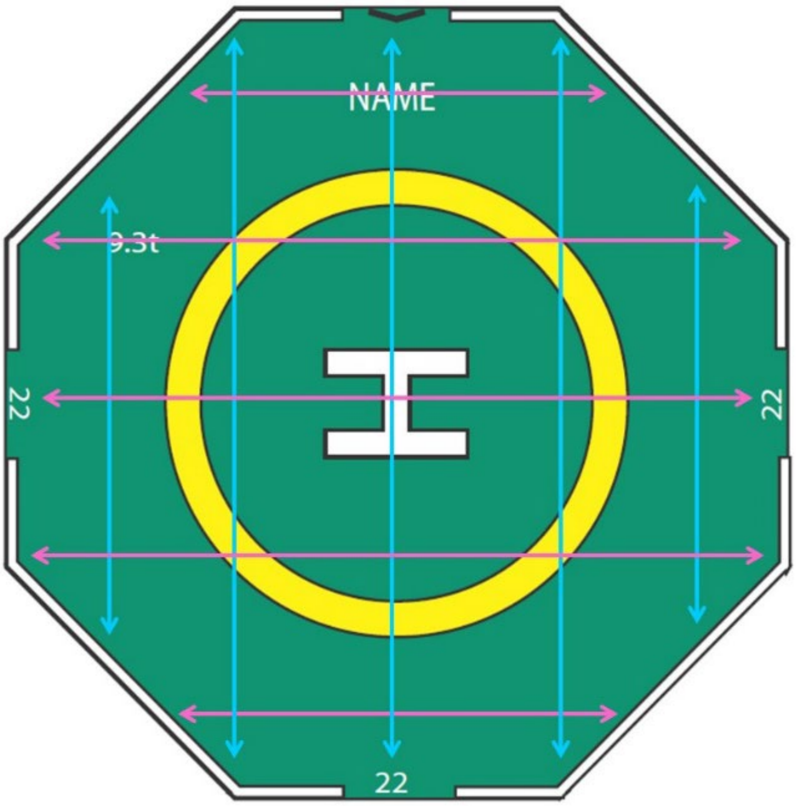
- Calibration of tester in accordance with manufacturer’s instructions.
- Remove landing net if fitted.
- Inspect site for debris etc., rectify as required.
- Mark out site ready for survey.

Survey

G.7 The survey should be performed as follows:

- Entire landing area to be covered by parallel runs at no greater than 1m centres, repeated with orthogonal runs as shown in Figure 1 below.
- For profiled helideck surfaces only, the direction of testing should be parallel to the ribs. No orthogonal runs are required

Figure 1: Helideck friction survey procedure using CFME testers



Survey reporting

General

G.8 The following information should be included in the survey report:

- The name of the helideck/installation.
- The name of the surveyor.

- The date of the survey.
- The type of helideck, e.g. flat textured, profiled (grit blasted/friction painted/no texturing).
- The condition of the helideck surface at the time of testing, e.g. wet/dry.
- Details (e.g. location, size, nature of damage) of any damaged or suspect areas on the helideck surface.
- The prevailing weather conditions.
- The type, serial number and calibration details of the friction tester.
- The orientation of the test runs.
- Photograph(s) showing the entire deck surface with close-up photographs of any non-compliant or damaged areas.
- Survey results as described below.

Presentation of Results

G.9 The results should be presented as follows:

- For entire landing area, a matrix of readings for each 1m square comprising:
- for flat helidecks the average of the 1m square readings for the two orthogonal runs;
- for profiled helidecks the 1m square readings for the runs parallel to the ribs only.
- Average values comprising the average of the 1m square average values for the 1m squares:
- inside TD/PM circle,
- outside TD/PM circle,
- on the paint markings (where TD/PM circle and H lighting not installed).

Appendix H

Risk assessment for helicopter operations to helidecks in the UKCS which are sub-1D

H.1 The following table should form the basis of an aeronautical study (risk assessment) conducted by, or on behalf of, an offshore helicopter operator if intending to service helidecks using helicopters with an overall length (D) greater than the design D of the helideck (referred to in this Appendix as a sub-1D operation). The assumption is made that sub-1D operations will only be considered in the following circumstances and/or conditions:

1) Applicable only for multi-engine helicopters operating to performance class 1 or class 1 equivalent, or to performance class 2 when taking into account drop down and deck edge miss during the take-off and landing phase.

2) For a helideck that provides a load bearing surface (represented by the Touchdown and lift-off area - the TLOF) of between 0.83D and 1D, it should be ensured that a minimum 1D circle (representing the Final approach and take-off area – the FATO) is assured for the containment of the helicopter. From the periphery of the FATO (not the TLOF) the LOS extends; the non (dynamic) load-bearing area between the TLOF perimeter and the FATO perimeter should be entirely free of ‘non-permitted’ obstacles while ensuring that any objects essential for the operation located on or around the TLOF (load bearing) perimeter should not exceed the revised obstruction height criteria set out in paragraph 5 below.

3) This assessment may be considered for any helideck on a fixed offshore installation whether a PMI or NUI. An installation or vessel that is subject to dynamic motions not exceeding HCA stable deck conditions - specified criteria in pitch, roll and heave, may also be considered for alleviation from the CAP 437 1D Standard.

4) This assessment when applied to helidecks completed on or before 1 January 2012, may take advantage of an ICAO alleviation permitting the outboard edge of the (approximately) 1.5m helideck perimeter netting to extend above the level of the landing area by no more than 25 cm (i.e. no structural modification of deck edge netting supports is mandated by Annex 14 where the 25cm height limitation is not exceeded for older installations). However, for installations completed on or after 1 January 2012 it is expected that the new standard introduced in 4th Edition of Annex 14 Volume II (3.3.15) be met - this requires that the height of the helideck safety net be no greater than the adjacent helideck load-bearing surface.

5) For helidecks that are minimum size (0.83D) and/or 16.00m or less, ICAO Annex 14 Volume II prescribes the height limit for permitted objects around the edge of the TLOF, and in the 1st segment of the LOS, to be 5 cm. For helidecks which are =>1D (and also have a D-value >16.00m) a 15cm limitation is applied. This risk assessment is content to permit, for helidecks completed before 10 November 2018 with a TLOF between the 0.83D minimum and the 1D (standard) and a certificated D-value of 16.01m or greater, and for helidecks with a TLOF between 0.83D and 1D, having a certificated D-value of 16.00m or less, and completed before 15 November 2013, an ascending scale for the treatment of essential objects around the TLOF perimeter and for the 1st segment of the LOS. "Essential objects" permitted around the edge of the TLOF are notified in CAP 437, Chapter 3, paragraph 3.23 and include helideck guttering and raised kerb, helideck lighting and foam monitors (or ring-main system) where provided. For sub-1D operations the following limits may apply between the TLOF and FATO boundary and in the LOS 1st segment: For a TLOF: >0.83D = 5 cm ADL, >0.92D = 15 cm ADL, 1D> = not more than 25 cm ADL. For helidecks completed after 14 November 2013 where the TLOF is 16.00m or less, or after 9 November 2018 where the TLOF is greater than 16.00m, essential objects around the TLOF should be limited to 5 cm and 15 cm respectively. Figure 1 illustrates a 0.83D minimum size TLOF. The inner circle bounded by the octagonal-shaped helideck represents the sub-1D TLOF (in the illustration a 0.83D load bearing surface). The outer circle illustrates the 1D FATO which provides containment of the helicopter and from which is derived the origin of the LOS. The chevron denoting the origin should be physically marked at the periphery of the FATO. The diameter of the TLOF is the declared D, marked at the chevron.

6) Operations to sub-1D helidecks should not be considered below 0.83D. Operations to moving helidecks should not be considered below 1D unless operating under HCA stable deck conditions.

7) The size of the landing area should not be less than minimum dimensions prescribed in the approved Rotorcraft Flight Manual Supplement.

Table 5: Non-compliance with ICAO standards/considerations/mitigations to account for compromise

1	Potential for a reduction in the distance from helideck (TLOF) centre to the limited obstacle sector (LOS) (denoting the origin of the 1st and 2nd segments). Annex 14 Volume II (4th Edition), Section 4.2.16 and Figure 4-9	It is essential that clearance from obstacles in the LOS is maintained; for this reason, the sub-1D load bearing (landing) surface (the TLOF) should be surrounded by a 1D circle (the FATO) that is, with the exception of permitted objects, free of any obstacles. This will reflect the obstacle clearances provided for a 1D helideck (but see also the provision of 6a). To ensure that obstacle clearances are maintained for the helicopter, the touchdown and positioning marking circle should be 0.5 of the notional 1D FATO (not of the landing surface (the TLOF)). The TD/PM circle requires repainting if the difference in the inner diameter of the circle is significant i.e. >0.5m (or if the obstacle environment is already compromised). The TD/PM circle is located at the centre of the TLOF; and never offset (Annex 14, Volume II, 5.2.10.4 and CAP 437 Glossary of Terms for TD/PM circle refer). E.g.: For a helicopter with a D=17.50m operating to a 16.00m diameter load bearing TLOF, the inner diameter of the TD/PM circle, located on helideck (TLOF) centre, should be 17.50 x 0.5 = 8.75m. The FATO minimum diameter should be 17.50m.

2	Reduction in suitable and sufficient visual references required for the pilot during all flight phases.	Adequate visual cues provided for aircrew are essential for the conduct of safe operations to helidecks. On a sub-1D helideck it is likely these will to some extent be compromised. An aeronautical study should ensure that visual cues, within their field of view are adequate for aircrew to perform the following visual tasks: ▪ Identification of helideck location early-on in the approach ▪ Visual cues to help maintain the sight picture during approach ▪ Visual cues on final approach to hover position ▪ Visual cues for landing ▪ Visual references on lift-off and hover It is important that the helideck visual cues (in the form of effective markings and lighting) are in accordance with CAP 437, Chapter 4 and Appendix C and that markings and deck mounted lighting remain uncontaminated at all times (e.g. deposits of guano on the surface of a helideck may compromise markings and/or deck-mounted lighting). A wind sock should be provided to facilitate an accurate indication of wind direction and strength over the helideck. For night operations lighting systems should include effective obstruction lighting in addition to helideck lighting (consisting of perimeter lights and “H” and circle lighting) and an illuminated windsock (wind sleeve).
3	Reduction in the space available for passengers and crew to safely alight and embark the helicopter and to transit to and from the operating area safely.	The reduction in available load-bearing surface (area) means that clearances between passengers/crew moving around the helideck and the rotor systems of the helicopter are reduced. It is essential that this is fully considered on a helicopter type specific basis. It should be ensured that sufficient access points are available to avoid the situation of passengers and crew having to pass close to helicopter ‘no-go’ areas (e.g. in relation to main and tail rotor systems). Where, to avoid these issues, personnel are required to transit close to the deck edge, an operating (wind) limit may need to be considered to

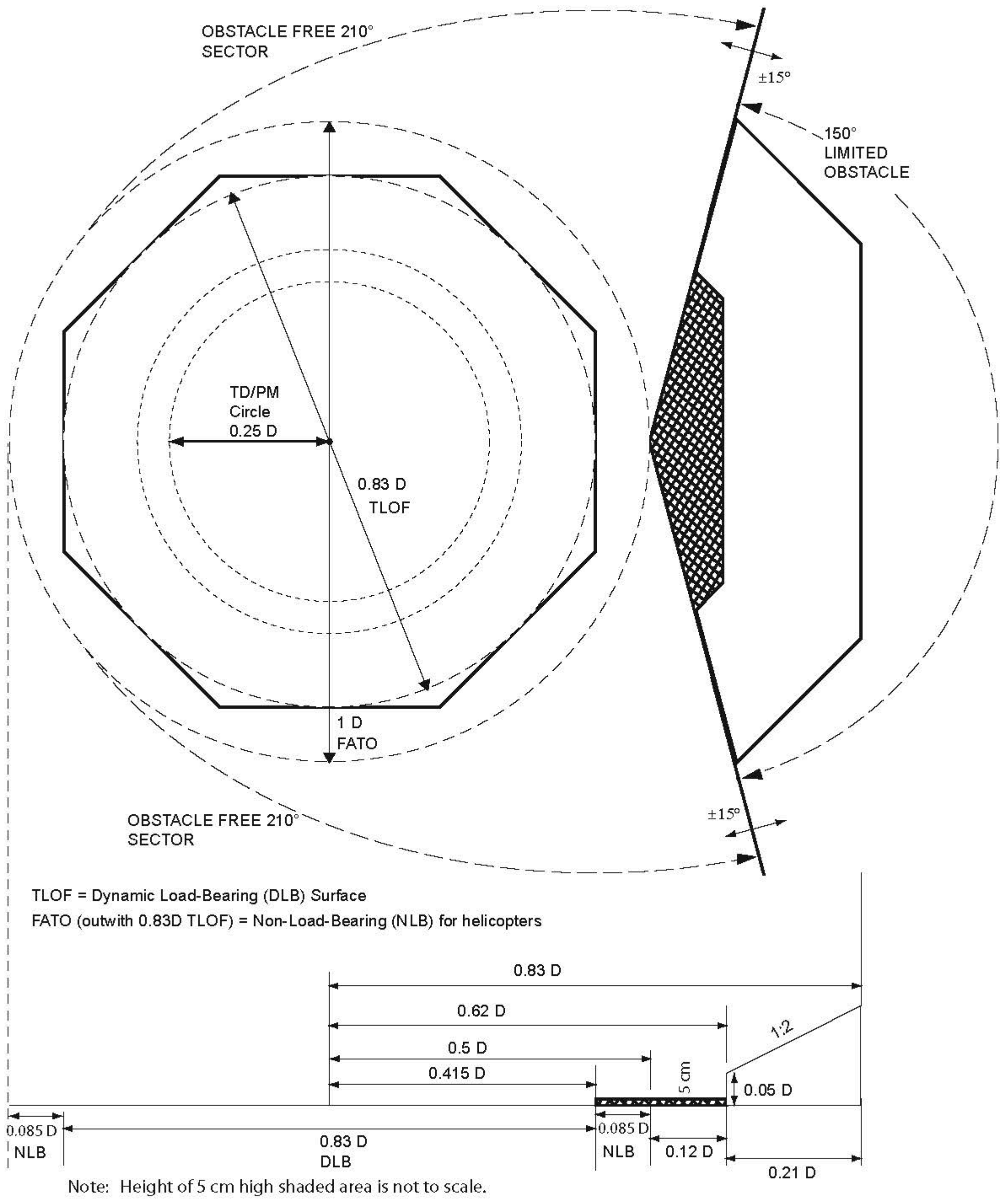
		assure the safe movement of passengers. Additional lighting may be required to ensure safe movements are maintained at night.
4	Reduction in the space available for securing helicopters, for the conduct of safe and efficient refuelling operations (where provided) and for post-crash teams to provide effective fire and rescue intervention in the event of an incident or accident occurring.	The surface area available should be able to comfortably accommodate a sufficient tie-down pattern arrangement to allow the most critical helicopter(s) to be tied-down (as required). Where refuelling operations are conducted the space available around the helicopter should allow this to occur safely and efficiently at all times. Sufficient access points should be provided to allow fire and rescue teams to move to the scene of a helideck incident or accident from an upwind location and to allow passengers to escape downwind to safety.
5	Elements of the helicopter will be over permitted obstacles at the edge of the load bearing landing surface. ICAO Annex 14 Volume II, Section 3.3.4, 3.3.5, 3.3.11, 3.3.12 and 3.3.13	Commencing from the 3rd Edition of Annex 14 Volume II, the permitted height for essential objects located around the TLOF in the 210° obstacle free sector and in the 1st segment of the 150° limited obstacle sector reduced from 25 cm (10') to 5 cm (2') for a TLOF which is less than 1D and/or 16.00m or less. For new-builds this is regarded as adequate mitigation for the reduction in the dimension of the load bearing area to address the presence of objects which because of their function are required to be located immediately around the TLOF. For existing installations where a TLOF is provided which is larger than the minimum (0.83D), but <=1D, the maximum height of essential objects around the perimeter may be relaxed [on an ascending scale] in accordance with H.1 Condition 5.
6	Reduction in the margin built-in to allow for touchdown/positioning inaccuracies during landing.	It should be assumed that even amongst experienced, well-trained aircrew there will inevitably be some degree of variability in the actual point of touchdown within the landing area. The touchdown/positioning marking circle provides an effective visual reference to guide the handling pilot to the point of touchdown (See CAP 437 Glossary of Terms,

	ICAO Annex 14 Volume II, Section 5.2.10.1 and 5.2.10.2	including Note, for the TD/PM circle) but scatter has potential to occur, particularly where external factors beyond a pilot's control come into play. This may include the influences of prevailing meteorological conditions at the time of landing (e.g. wind, precipitation etc.), and/or any helideck environmental effects encountered (e.g. turbulence, thermal effects). There is also the unplanned incidence of a sudden partial power loss (an engine malfunction) to consider at a critical stage of the approach to land or take-off. Chapter 3 of CAP 437 addresses environmental effects in detail and where these cannot be fully 'designed out', it may be necessary to apply operating restrictions to ensure flights only occur in acceptable conditions. To mitigate for touchdown /positioning inaccuracies in challenging Meteorological conditions it may be necessary to impose additional restrictions e.g. limits applied for a combination of wind speed and direction. It is essential that a good visual means of assessing wind strength and direction is always provided for the pilot by day and by night. Markings should be kept free of contamination which may reduce a pilot's ability to touchdown accurately. The TD/PM circle and "H" should be lit for night operations.
7	Reduction in 'helpful ground cushion' effect from rotor downwash. Annex 14 Volume II, Section 3.3.9	It is a condition of Annex 14 Volume II, Section 3.3.9 that the TLOF shall provide ground effect. The reduction in the load bearing area (TLOF) for sub-1D operations means that the beneficial effect of ground cushion will likely suffer some reduction. The reduction in helpful ground cushion needs to be considered for each helicopter on a case-by-case basis, particularly when operating to a sub-1D helideck with a perforated surface i.e. some modern helideck designs incorporate a passive fire-retarding feature which allows unburned fuel to drain away through specially manufactured holes consisting in a drain-hole pattern over the surface of the load bearing area.

Glossary of terms and abbreviations	
FATO	Final approach and take-off area – A defined area over which the final phase of an approach manoeuvre to hover or landing is completed and from which the take-off manoeuvre is commenced.
TLOF	Touchdown and lift-off area – A dynamic load bearing area on which a helicopter may touchdown and lift-off.
FATO/TLOF	For helidecks of ≥ 1D, the FATO and TLOF are always coincidental and therefore occupy the same space and have the same load bearing characteristics. For helidecks which are < 1D, but no less than 0.83D, it is the TLOF only that is permitted to reduce, the FATO remains as 1D. In this case the TLOF and the FATO are assumed to be collocated.

Note: Essential objects permitted includes, but may not be limited to a) around the TLOF: perimeter lights and floodlights, guttering and raised kerb, foam monitors or ring main system, handrails and associated signage, status lights, b) on the TLOF: helideck net and helideck touchdown marking (“H” and “circle”) lighting, c) in the area between the TLOF perimeter and the FATO perimeter, helideck safety netting is present: for installations completed on or before 1 January 2012 this is permitted to exceed above the TLOF surface by no more than 25 cm. For helidecks completed after 1 January 2012 the outboard edge of netting should be flush level with the adjacent TLOF).

Figure 1: Obstacle limitation surface and sectors for a 0.83D TLOF



Note: For a sub-1D operation where the TLOF >0.83D, but less than 1D, obstacle restrictions (limitations) are applied on an ascending scale e.g. for a >0.92D operation, the obstacle restriction (limitation) around the TLOF and in the 1st segment of the LOS/NLB is 15 cm (see H.1, condition 5)

Appendix I

CAA protocol for operations to a Normally Unmanned Platform (NUI) in an abnormal state or with Status lights non-functioning, in an alarm state, or having been in an alarm state

NOTE: NUIs that are 'attended' for a period of work remain NUIs and subject to this protocol.

I.1 The following definitions apply:

Installation NORMAL:

- Communications/telemetry available, AND
- Confirmed no Fire & Gas panel alert, AND
- Confirmed no process upset, AND
- Confirmed no Emergency Shut Down (ESD) triggered.

Installation ABNORMAL:

- Communications/telemetry unavailable, OR
- Fire & Gas panel alert triggered, OR
- Process upset has occurred, OR
- Emergency Shut Down (ESD) has been triggered, OR
- Installation is 'black'.

SAFE CONDITION:

- Confirmed inventory vented, AND
- Confirmed correct installation configuration (pressures, levels, valve positions) via communications/telemetry link.

EXTERNAL INSPECTION:

- To be performed from standby vessel and/or drone,
- Check for noise (gas leak) and signs of smoke, fire or gas AND

- Check for hydrocarbon spillage in the sea and subsea gas leaks, AND
- Check for any other hazards.

Hazard levels (LOW / MEDIUM / HIGH):

Hazard	Mitigation	LOW	MEDIUM	HIGH	Comments
Status lights on	1. None			X	Assume genuine alarm & installation in unsafe condition.
	2. No process related hydrocarbons on installation.		X		Hazard reduced by limited quantity of combustible inventory.
	3. ESD completed (any hydrocarbons vented) and installation confirmed safe by EXTERNAL INSPECTION.		X		No external evidence of hazard but alarm system inoperative/unavailable (unable to reset status lights).
	4. ESD completed (any hydrocarbons vented) and installation confirmed in SAFE CONDITION.	X			Assume alarm situation addressed but alarm system inoperative/ unavailable (unable to reset status lights).
	5. Confirmed sensor fault.	X			Genuine alarm unlikely but alarm system effectively inoperative/ unavailable.
‘Black’ installation	6. None			X	Assume installation in unsafe condition.
	7. SAFE CONDITION confirmed within 24 hours prior to loss of comms/telemetry.		**X**		Assume alarm situation addressed but alarm system inoperative/ unavailable.
	8. Installation confirmed safe by EXTERNAL INSPECTION.		**X**		No external evidence of hazard but alarm system inoperative/ unavailable.

Table I.1: Installation hazard status

I.2 The decision process should follow the flow chart in Figure I.1 below:

If the status lights are OFF and the installation is NORMAL, operations may proceed normally.

If the status lights are ON and/or the installation is ABNORMAL, refer to Table I.1 above and establish the hazard level.

(i). If the hazard level is LOW, a limit on the number of operations per month to the installation should be agreed with FOI(H).

(ii). If the hazard level is MEDIUM, one operation to the installation may be performed in order to establish/ensure that the hazard level is LOW. This operation should be restricted as follows:

- Flight by day only,
- Only essential personnel should be carried,
- No bus stopping.

Once a hazard level of LOW has been formally confirmed, the process in I.2 (i) above may be followed.

(iii). If the hazard level is HIGH, no operations to the installation should take place.

For all hazard levels, the risk assessment should be documented and reported to HCA using the proforma below. HCA should add an appropriate entry to the HLL.

NOTE: If the installation status is not adequately captured by Table I.1, consult CAA FOI(H) to establish the hazard level.

CAA protocol for operations to a Normally Unattended Installation (NUI) in an abnormal state or with status light non-functioning, in alarm state or having been in an alarm state	Civil Aviation Authority

Installation name:		**ICAO ID:**	

Installation operator:	
Helicopter operator:	

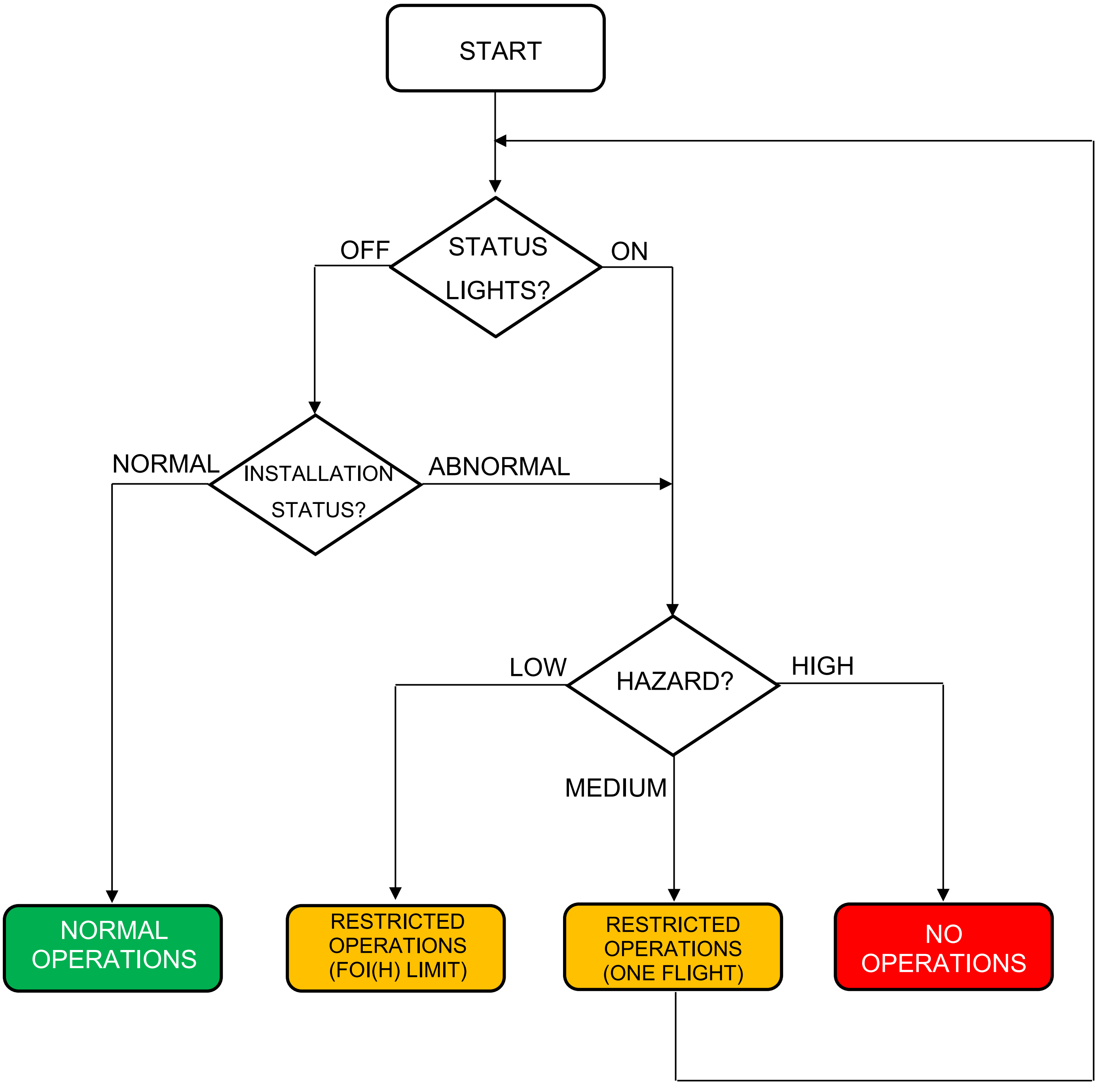
Date:		**Time:**	

Installation hazard status: (Refer to CAP 437 Table I.1 and/or provide details and hazard level allocated.) **Details:**	**Hazard level:**

	Name	**Signed**
Field OIM:		
Helicopter operator:		

Please forward a copy of this proforma to HCA at info@helidecks.org

Figure I.1 Process flow chart



Appendix J

Specifications for helideck signalling light systems

General

J.1 This appendix contains specifications for the following helideck signalling light systems:

- Helideck status light system (reference Chapter 4, paragraph 4.26).
- Helideck Monitoring System (HMS) repeater light system (reference Chapter 6, paragraph 6.4).
- Helicopter hoist status light (reference Chapter 10, paragraph 10.30).

The helideck status light requirement

Operational requirement

J.2 The operational requirement for the system is to provide a light signal that the pilot will recognise as a warning while the helicopter is landed on the deck, and at any range within at least 900m from the installation at all angles of azimuth in meteorological visibilities down to 1400m (day and night).

J.3 CAA Paper 2008/01 provides a detailed specification for a status light system which is summarised in paragraphs J.4 through J.19.

NOTE: The CAA Paper 2008/01 specification also addresses a second, potential future operational requirement relating to a minimum range of 900m in meteorological visibilities down to 900m in anticipation of developments that may lead to a reduction in operating minima. A lower bound for meteorological visibility of 900m has been assumed due to consideration of obstacle environments offshore.

Configuration

J.4 The topsides layouts of offshore installations (specifically the presence of superstructure above the level of the helideck which can obscure the pilots' view of lights located on the helideck), and the requirement that the signal be visible from any approach direction, may dictate the provision of more than one 'main' signalling light.

J.5 At least one light must be visible to the pilot when the helicopter is landed on the helideck, regardless of its orientation relative to the helideck. This dictates that more than one light is required. However, given the very short range associated with this requirement, it could likely be met using supplementary 'repeater' lights of significantly lower intensity in addition to the 'main' signalling light(s).

J.6 The light units forming the helideck status signalling system should be mounted on, or as near as possible to the helideck. Typically, maximum coverage in azimuth will be obtained by mounting the 'main' signalling light(s) on the outboard edge of the helideck, opposite the origin of the 210° obstacle free sector (OFS). If the size (essentially height) of the light(s) prohibits this location, then a position within the LOS or partially recessed into an access/monitor platform within the OFS may be considered.

J.7 Where it is not possible to obtain 360° coverage in azimuth with lights mounted on or around the helideck, off-deck locations remote from the helideck may need to be considered. In this eventuality, careful consideration should be given to the effect of single system failures on overall system performance (see paragraph J.18).

J.8 The light system should be integrated with platform safety systems such that it is activated automatically in the event of any occurrence or activity that could endanger the helicopter or its occupants.

J.9 Facilities should be provided for the HLO to manually switch on the system and/or override automatic activation of the system.

J.10 The system should provide a “status light activated” signal to the HMS for deactivation the HMS repeater lights.

J.11 Facilities should be provided for resetting the system which, in the case of NUIs, do not require a helicopter to land on the helideck.

Mechanical constraints

J.12 For any helideck where the D-value is greater than 16.00 m the status lights should not exceed a height of 15 cm above the surface of the helideck. Where a helideck has a D-value of 16.00 m or less the status lights should not exceed a height of 5 cm above the surface of the helideck.

Light intensity

J.13 The minimum light intensity profile is given in Table 1 below.

Table 1: Minimum light intensity profile for helideck status lights

Elevation	Azimuth	Main Light			Repeater Light Intensity	
		Normal Intensity (min.)	Dimmed Intensity			
			Min.	Max.	Min.	Max.
0º to 2º	-180º to +180º	176 cd	N/A	60 cd	N/A	60 cd
>2º to 10º	-180º to +180º	700 cd	16 cd	60 cd	16 cd	60 cd
>10º to 90º	-180º to +180º	176 cd	N/A	60 cd	16 cd	60 cd

J.14 The system should be provided with a facility to enable the output of the lights (if and when activated) to be dimmed to an intensity of between 16 and 60 cd while the helicopter is landed on the helideck.

J.15 Where supplementary ‘repeater’ lights are employed for the purposes of achieving the ‘on deck’ 360° coverage in azimuth, the light intensity profile should be as detailed in Table 1 above.

J.16 The light system as seen by the pilot at any point during the approach should flash at a rate of 120 flashes per minute. Where two or more lights are needed to meet this requirement, they should be synchronised to ensure an equal time gap (to within 10%) between flashes. While landed on the helideck, a flash rate of 60 flashes per minute is acceptable. The maximum duty cycle should be no greater than 50%.

J.17 The light system should have a response time to the full intensity specified not exceeding 3 seconds from start-up at all times.

Colour

J.18 The colour of the helideck status light(s) should be red, as defined in ICAO Annex 14 Vol.1 Appendix 1.

Serviceability

J.19 The system should be designed so that no single failure will prevent the system operating effectively, i.e. no single failure should lead to a significant loss of coverage in azimuth for approaching helicopters, and at least one serviceable light must be visible to the pilot when the helicopter is landed on the helideck. In the event that more than one light is used to meet the flash rate requirement, a reduced flash frequency of at least 60 flashes per minute is considered acceptable in the failed condition for a limited period.

J.20 Since the normal state of the helideck status light system is inactive, measures should be employed to avoid undetected failures that would prevent the system from functioning adequately when activated. This could be achieved by:

- including a degree of redundancy in the system design;

  NOTE 1: This implies a minimum of two 'main' signalling lights meeting the full photometric specification (except for flash rate if more than one unit is employed in order to meet the minimum flash rate requirement).

  NOTE 2: Light units mounted remotely from the helideck will likely not qualify as contingency for lights mounted on the helideck and vice versa.

- including built-in monitoring functionality in the system to:
  - monitor the serviceability of the lamps/LEDs;
  - monitor the system power supply;
  - monitor the software operating status (e.g. using a 'time-out' monitor);
  - monitor the continuity of the wiring between the control panel and the lights.

The Helideck Monitoring System repeater light requirement

Operational requirement

J.21 A repeater light system indicating the helideck operational status is required on moving helidecks to provide information directly to the helideck crew and helicopter flight crew. The operational status annunciated by the repeater lights shall be identical to that displayed on the Helideck Monitoring System (HMS) display and should comprise blue, amber and red lights.

J.22 The HMS determines the helideck operational status according to the following criteria:

Before landing:

- Blue status (steady burning): safe to land based on pitch/roll/'processed' SHR/inclination and MSI/WSI limits.
- Amber status (steady burning): MSI/WSI limit only exceedance (consider using modified operating procedures).
- Red status (steady burning): do not land (pitch, roll, 'processed' SHR or inclination out of limits).

NOTE: Amber MSI/WSI limit exceedances alert the flight and helideck crew to the potentially marginal helideck motion conditions and the need to consider mitigating action. Operations may be lost if the flight and/or helideck crew are unable to take mitigating action or do not judge the mitigating actions to be sufficient for the prevailing conditions.

After landing:

- Blue status (slow flash): relative wind direction within limits.
- Amber status (fast flash): impending relative wind limit exceedance (investigate cause and identify appropriate mitigating action required).
- Red status (fast flash): relative wind limit exceeded (take appropriate mitigating action).

The lights are extinguished if the HMS is inoperative.

NOTE: Switching between states should be accomplished in less than 10 seconds, i.e. to be compatible with the minimum HMS display update rate.

J.23 Prior to landing the lights are operated in steady burning mode only and should be detectable at a range of at least 500 m and conspicuous at a range of at least 400 m in a meteorological visibility of 1400 m in daylight ($E_t = 10^{-3.5}$) and at night ($E_t = 10^{-6.1}$).

NOTE: During the approach, the height of the helicopter above the helideck is assumed to be 40 to 50 ft at 100 m and around 150 ft at 200 m. This implies that, as an absolute minimum, the main beam of the lights should cover elevations between 7° and 13°.

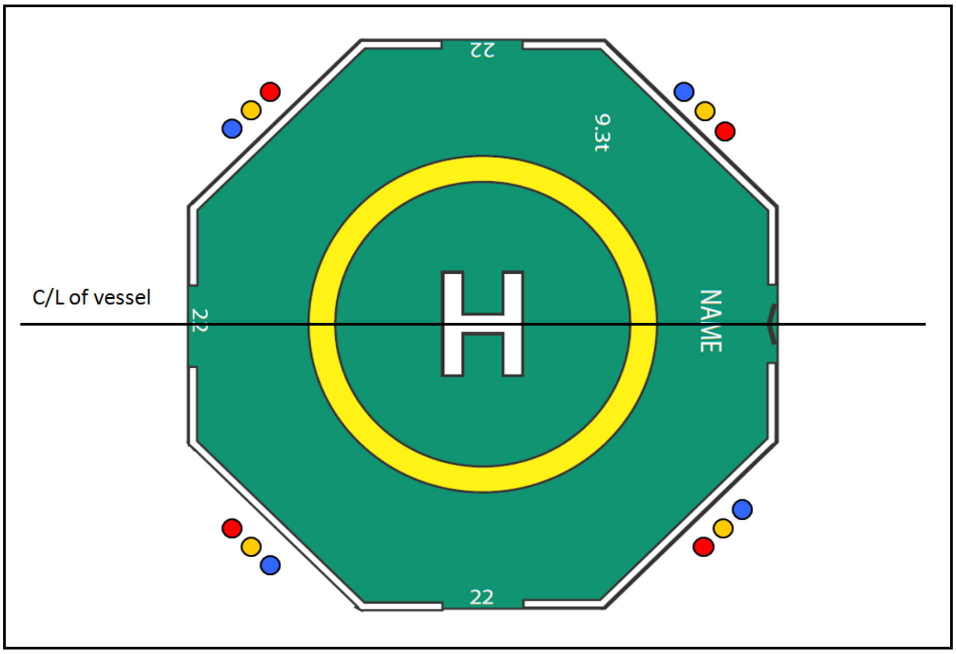
J.24 After landing the lights are operated in flashing mode only and will be viewed at close range (approx. 5 m). The maximum and minimum intensities for daytime operation are therefore halved for the flashing mode to avoid dazzling the pilot. When landed on the helideck, the lowest elevation of the pilot's eyes relative to the light is assumed to be 20°, i.e. a minimum pilot eye height of 1.85 m and a maximum range from the lights of 5 m.

NOTE: Lights with small apertures will result in higher luminance and will be more likely to cause glare; care shall be taken in designing the light to avoid excessive luminance.

J.25 Operations to moving helidecks can take place in daylight and at night. Light intensities for both daytime and night operations are therefore specified. During night-time operations, the light unit intensity should be controlled by a photocell as operation of the light at the daylight setting at night is very likely to dazzle the pilot. The photocell needs to be shielded from direct sunlight in order to correctly measure ambient light, particularly during sunset and sunrise when the sun is low in the sky.

Configuration

J.26 A sufficient number of lights shall be provided to ensure that the flight crew will be able to easily see at least one light/set of lights regardless of the orientation of the helicopter on the helideck. This is expected to require at least four lights or sets of lights arranged in a cross oriented 45deg to the bisector of the Obstacle Free Sector (OFS) as illustrated below.



J.27 The repeater light system may comprise sets of individual blue, amber and red lights or single light units each capable of displaying all three colours. There are no restrictions on the communication protocol/format between the HMS and the repeater lights for signalling the status to be displayed. However, the three-input signal interface detailed in the Table

2 below shall always be available (either provided in the hardware or available as a purchase/order option) in order to maximise interoperability between HMS and lighting systems provided by different manufacturers.

Table 2: Standardised HMS repeater light interface

HMS Signal (24 vdc or volt free)			Repeater Light Mode	
Input #1	**Input #2**	**Input #3**	**Colour**	**Mode**
0	0	0	OFF	N/A
0	1	0	BLUE	Steady burning
1	0	0	AMBER	Steady burning
1	1	0	RED	Steady burning
0	0	1	OFF	N/A
0	1	1	BLUE	Slow flash
1	0	1	AMBER	Fast flash
1	1	1	RED	Fast flash

Mechanical constraints

J.28 When mounted on helidecks with a D value greater than 16 metres the height of the repeater lights should not exceed 15 cm above the surface of the helideck. For smaller helidecks, the height of the repeater lights should not exceed 5 cm above the surface of the helideck.

J.29 It is preferred that a neutral colour (e.g. grey or white) be used for the housing/body of the repeater light.

Light intensity

J.30 The following characteristics should apply for both steady burning and flashing modes of the HMS repeater lights.

J.31 The minimum light intensity profile is given in Table 3 below.

Table 3: Minimum light intensity profile for HMS repeater lights

Day/Night	Steady/ Flashing	Min Intensity (cd)		Max Intensity (cd)	
		5° to 15°	>15° to 90°	0° to 20°	>20° to 90°
Day	Steady	400	100	800	200
	Flashing	200	50	400	100
Night	Steady	30	10	60	60
	Flashing	30	10	60	60

J.32 The effective intensity specified in the table should apply to all angles of azimuth.

J.33 In flashing mode the maximum duty cycle shall be 50% ±1%, and:

- the blue light should flash at a rate of 30 flashes per minute (i.e. 0.5 Hz), ±1%,
- the amber and red lights should flash at a rate of 60 flashes per minute (i.e. 1.0 Hz), ±1%.

J.34 The light should transition from the daylight setting to the night-time setting when the ambient illuminance falls below 500 lux and should switch before it reaches 50 lux. The light should transition from the night-time setting to the daylight setting when the ambient illuminance rises above 50 lux and before it reaches 500 lux. The transition from one setting to another should be accomplished smoothly (linear transition to within ±10%) without any noticeable step changes.

Colour

J.35 The colours of the HMS repeater lights should be as defined in ICAO Annex 14 Vol.1 Appendix 1, noting that yellow is to be used for the amber status.

Serviceability

J.36 As noted in paragraph J.26 above, at least one helideck repeater light directly visible to at least one member of the flight crew with the helicopter landed on the helideck shall be operative for the repeater light system to be considered serviceable.

J.37 In order to prevent erroneous information being presented to the helicopter flight crew:

- Any failure detected by the HMS which could result in the output of an incorrect helideck motion status should result in all the lights being extinguished.
- Any failure detected by an individual repeater light should result in that light being extinguished. The failure modes covered should include:
  - lamp/LED failure;
  - system power supply failure;
  - software 'crash'/'hang';
  - loss of control input to lights.

The helicopter hoist status light requirement

Operational requirement

J.38 With reference to paragraph 10.30 in Chapter 10 of CAP 437 – Standards for Offshore Helicopter Landing Areas, wind turbine platforms are required to be provided with a means of indicating that the blades and nacelle are safely secured prior to commencing helicopter hoist operations. A single green light is recommended for this purpose which is capable of displaying both a steady and flashing green signal as follows:

- A steady green signal is displayed to indicate to the pilot that the turbine blades and nacelle are secure, and it is safe to operate.
- A flashing green signal is displayed to indicate that the turbine is in a state of preparation to accept hoist operations or, when displayed during hoist operations, that parameters are moving out of limits.
- When the light is extinguished this indicates that it is not safe to conduct helicopter hoist operations.

J.39 The light should be conspicuous at a range of at least 500m and detectable at a range of at least 700m in a meteorological visibility of 3km in daylight ($E_t = 10^{-3.5}$) and, if required, at night ($E_t = 10^{-6.1}$).

J.40 The light should not present a source of glare or dazzle the pilot. The critical case in this respect is when the helicopter is closest to the light during the winching operation itself; at this point the lowest elevation of the helicopter relative to the light is assumed to be 15 degrees, i.e. at least 3m above the light and laterally displaced by no more than 10m. Note that lights with small apertures (e.g. lights using LED sources) will result in higher luminance and will be more likely to cause glare; care should be taken in designing the light to avoid excessive luminance.

J.41 Winching operations are presently conducted in daylight (VMC) conditions but may be permitted to take place at night in the future. Light intensities for both daytime and night operations are therefore specified. In the event that night-time operations are being conducted, the light unit intensity should be controlled by a photocell as operation of the light at the daylight setting at night is very likely to dazzle the pilot. The photocell should be installed such that it is shielded from direct sunlight in order to correctly measure ambient light, particularly during sunset and sunrise when the sun is low in the sky.

Configuration

J.42 The light should be located on the winching area platform of the wind turbine such that it remains within the field of view of the pilot during the approach to the wind turbine and throughout the winching operation, i.e. the coverage should be 360 deg. in azimuth. (The preferred location of the light is on top of the Safety Zone railing as shown in Chapter 10 and in Figure 1 below.

NOTE: Obscuration of the light when installed due to the wind turbine blades may be ignored.

Mechanical constraints

J.43 Not applicable.

Light intensity

J.44 The following characteristics should apply for both steady burning and flashing modes of the helicopter hoist status light.

J.45 The minimum light intensity profile is given in Table 4 below.

Table 4: Minimum light intensity profile for the helicopter hoist status light

Day/Night	Min. intensity			Max. intensity	
	0° to 2°	>2° to 10°	>10° to 90°	0° to 15°	>15° to 90°
Day	16cd	410cd	16cd	750cd	120cd
Night	3cd	16cd	3cd	60cd	60cd

J.46 The effective intensity specified in Table 1 should apply to all angles of azimuth.

J.47 In flashing mode, the light should flash at a rate of 120 flashes per minute (2 Hz), ±10%. The maximum duty cycle should be no greater than 50%.

J.48 The light should transition from the daylight setting to the night-time setting when the ambient illuminance falls below 500 lux and should switch before it reaches 50 lux. The light should transition from the night-time setting to the daylight setting when the ambient illuminance rises above 50 lux and before it reaches 500 lux. The transition from one setting to another should be accomplished smoothly (linear transition to within ±10%) without any noticeable step changes.

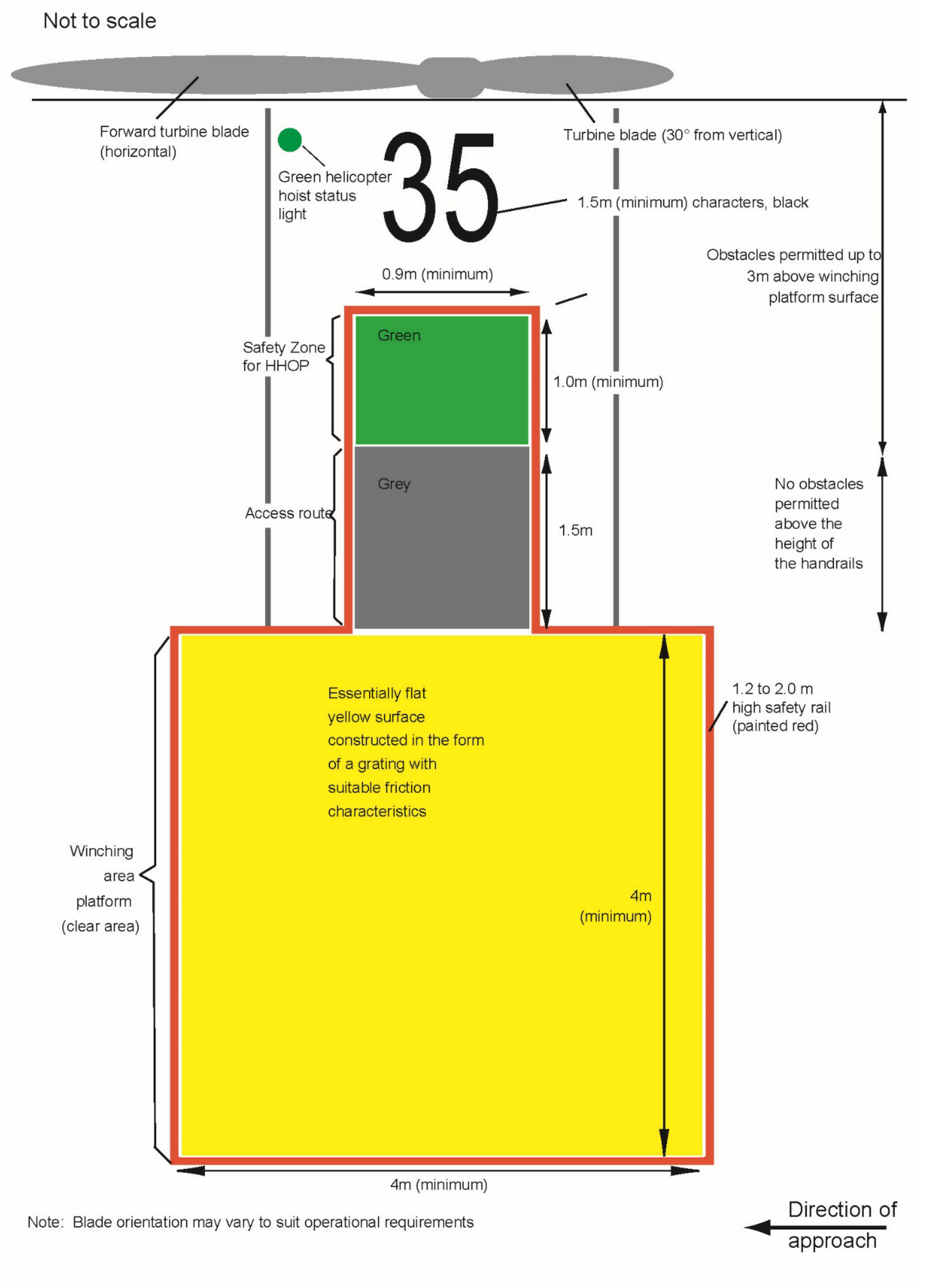
Colour

J.49 The colour of the helicopter hoist status light should be green as defined in ICAO Annex 14 Vol.1 Appendix 1, para. 2.1.1(c) or para. 2.3.1(c) as applicable.

Serviceability

J.50 The system should be designed so that it fails safe, i.e. any failure in the helicopter hoist status light system should result in the light being extinguished.

Figure 1: Preferred location of the helicopter hoist status light (located on top of the safety railing)



General Characteristics

J.51 The general characteristics detailed in the paragraphs below apply to helideck status light systems, Helideck Monitoring System repeater light systems and helicopter hoist status lights except where otherwise stated.

Requirements

J.52 The following items are fully defined and form firm requirements.

J.53 All lights should be tested by an independent test house to ensure verification with the specification. The photometrical and colour measurements performed in the optical department of the test house should be accredited according to the version of EN ISO/IEC 17025 current at the time of the testing. The angular sampling intervals should be every 10° in azimuth; every 1° within the main beam of the light and every 5° elsewhere in elevation.

J.54 For flashing modes, lights should be tested in accordance with the flashing light test procedure detailed in Appendix B of CAA paper 2008/01. The modified-Allard method (see Appendix C of CAA Paper 2008/01) should be used for calculation of the effective intensity.

Other considerations

J.55 The considerations detailed in this section are presented to make equipment designers aware of the operating environment and customer expectations during the design of the products/system. They do not represent formal requirements but are desirable design considerations of a good light signalling system.

J.56 All lighting components and fitments should meet safety regulations relevant to a helideck environment such as explosion proofing (Zone 1 or 2 as appropriate) and flammability and be tested by a notified body in accordance with the ATEX directive or equivalent locally applicable hazardous area certification standards.

J.57 All lighting components and fitments should be able to operate within a temperature range appropriate for the local ambient conditions.

J.58 All cabling should utilise low smoke/toxicity, flame retardant cable. Any through-the-deck cable routing and connections should use sealed glands, type approved for helideck use.

J.59 All lighting components and fitments should meet IEC International Protection (IP) standards according to the version of IEC 60529 current at the time of testing appropriate to their location, use and recommended cleaning procedures. The intent is that the equipment should be weatherproof and compatible with deck cleaning activities using pressure washers. It is expected that this will entail meeting at least IP66 (dust tight and resistant to powerful water jetting).

J.60 Control panels that may be required for helideck lighting systems are not covered in this document. It is the responsibility of the Duty Holder / engineering contractor to select and integrate control panels into the installation safety and control systems, and to ensure that all such equipment complies with the relevant engineering standards for design and operation.

Appendix K

Inbound Flight Preparation

Check in Preparation - Equipment and Documentation

Scales

K.1 Scales suitable for the accurate measurement of passengers, baggage and freight weights should be situated in the helicopter administration/freight area, or equivalent.

All scales should be compliant to a recognised national or manufacturers standard.

Scales should be calibrated IAW the standard manufacturer's procedure across the full range of the scales and the appropriate confirmation records retained and produced on request.

If no calibration timescale is stated, then scale calibration should be at six monthly intervals in alignment with the requirements for onshore scales.

Scales for the use of passengers should be floor mounted and calibrated up to 250kgs.

Calibration records should be retained offshore and be part of a documented check. Evidence of these checks should be made available on request.

IT/ Computer Access

K.2 An appropriate, internet-accessible computer should be available at every check in point (Passengers, Baggage and Freight) to enable access to an electronic, approved passenger tracking system for the correct completion of the check in process. In the event electronic manifesting is unavailable, a manual manifest may be used in agreement with, and approved by, the helicopter operator.

Printers

K.3 Printers should be available and able to produce clear, legible manifests for all flights.

Note: Operator documentation required for the completion of a manual check in of passengers and freight should be maintained to ensure the required flight documentation can be created, in the event the approved, electronic passenger tracking system or printer are is not available.

Freight and Dangerous Goods Packing Materials, Labels, Forms, Reference Material and Processes

K.4 Appropriate packing materials/ labels should be retained at the offshore location to enable freight and Dangerous Goods items to be packaged correctly and securely. These include, but are not limited to:

1. Operator approved Notification to Captain (NOTOCs) and Shippers Declaration forms for use in the transportation of Dangerous Goods.
2. All required current labels and marks for any Dangerous Goods shipment.
3. Suitably robust packaging materials to ensure the freight item will remain intact on loading/ unloading.
4. Controlled copies of Safety Data Sheets (SDS) for routinely shipped substances, or Technical Data Sheet for routinely shipped articles.
5. Controlled copies of Health and Safety Executive / Explosives Storage and Transport Committee classifications, where Class 1 shipments are prepared for transport. Controlled copies of package approval certificates and schedules for all types of UN Specification packagings held.
6. In accordance with the operator requirements, suitable packaging for the carriage of spare Lithium Batteries/Powerbanks.
7. ‘Heavy’ labels for any item that exceeds 25lbs.

In addition to the above, the following should be documented,

1. Process of identifying articles as Dangerous Goods before distribution.
2. Process of identifying appropriate packaging for Dangerous Goods.
3. Process to ensure that most updated versions of MSDS and Technical Data Sheets are maintained.
4. Process on how changes, addendums and corrigendum to the regulations are captured, tracked and managed.

Stock control and supply methodology should be evidenced on request and actual stock on board recorded.

K.5 For compliance to the requirements for preparing any Dangerous Goods shipment for transport by air, the latest version of the IATA Dangerous Goods Regulations Manual and printed Checklists should be retained at each location.

Version control governance should be evidenced on request.

Declarations

K.6 Passenger Safety Declaration:

All passengers should declare their compliance with the requirements below, whether electronically, or written, prior to flight closure:

1. Have packed their bag(s) themselves
2. Understand what items are prohibited/ restricted and have not packed any of these items in their bag(s)
3. Are not carrying any items for someone else
4. Have not allowed anyone access to their bag(s) or left them unattended
5. Have declared all spare Lithium Batteries / Powerbanks

6. Have safely secured all sharp objects, including needles (medication)

7. Have retained any breath activated E cigarettes and refill cartridges on their person (if applicable) and are not carrying any other type purchased offshore

8. Have stipulated the number of Portable Electronic Devices (PEDs) being carried and that they will present these PEDs at Check-in for checks to ensure they are in flight safe mode, switched off and packaged to prevent damage or accidental activation

9. Understand it is a criminal offence to make a false statement in response to these questions, or if any prohibited items/ PEDs are switched on, or if undeclared spare Lithium Batteries/ Powerbanks are subsequently found in their possession

All paper declaration forms being utilised should be maintained and version controlled. These, and evidence of the managed process at the location, should be provided on request.

K.7 Heli Admin Declaration:

An adequate supply of Heli Admin declarations is to be maintained and be available for all inbound flights. These should document the required safety and security checks to be completed being, as a minimum, that:

1. All passengers were present at the designated area for the flight check in and photographic ID was checked

2. All passengers and baggage were weighed correctly, and weight figures verified on the final manifest produced

3. All passengers held the required certification for transport on a UK Commercial Air Transport flight, i.e. CAT A EBS, BOSIET/ HUET

4. All inbound passenger declarations have been checked

5. All passengers were directed to the Prohibited Items information to confirm that they were not carrying these items on their person, or in their bags
6. All Portable Electronic Devices were checked to ensure they have been switched to flight safe mode and switched off
7. All declared spare Lithium Batteries/ Powerbanks were removed and prepared for carriage IAW the operator's procedure
8. All freight items were recorded correctly and match the number of items being presented for the flight
9. The required number of bag searches have been conducted
10. All passengers have received a pre-departure safety briefing in the preceding 24-hour period.

Electronic copies of the forms being utilised should be maintained, version controlled and evidenced on request.

Safety Media (DVD's or electronic versions)

K.8 A helicopter operator approved, serviceable, and up to date flight safety brief should be available. (Note: Unless alternative means of completing the brief has been agreed with the operator or aircraft commander).

Extra Broad (XBR) Armbands

K.9 An appropriate supply of XBR armbands should be retained offshore and available for use on flights if required.

Stock control and supply methodology should be evidenced on request and actual stock on board recorded.

Posters

K.10 Safety and Security posters should be clearly displayed at the Heli Admin/ Check in/Safety Briefing Area as appropriate. These should include, but not be limited to:

1. Details of prohibited, restricted and permitted items (CAA approved)
2. Rules on the carriage of Portable Electronic Devices
3. Danger Areas around the helicopter (by type)
4. XBR seating plans
5. Lifejacket Emergency Equipment activation

Additionally, each location should ensure that sufficient notices are prominently displayed at visible locations in freight preparation and acceptance areas. Information should relate to the transport of Dangerous Goods to alert shippers/agents about any Dangerous Goods that may be contained in their cargo consignment(s).

Check in

Training - Heli Admin

K.11 All personnel involved in the check in of passengers onto an inbound flight from an offshore location and/or passenger baggage checks, in accordance with Paragraph K.19, should be trained in the requirements of the following disciplines. These include, but may not be limited to:

1. Accurate completion of the approved, electronic flight management system data entries, or, if required, manual procedures for:
   a. Flight set up completion
   b. Flight check in completion
   c. Check in summary completion, adding payloads offered and communicating the figures
   d. Freight transfers
2. Correct allocation of additional weights for survival suits and Lifejackets in accordance with the operators' requirements

3. Correct selection of Kilos v Pounds weight entry requirements of different aircraft types

4. Correct adherence to operators' requirements for the carriage of spare Lithium Batteries/ Powerbanks

5. Correct adherence to the local procedure for passenger flight declarations

6. Correct adherence to operators' requirements for denoting carriage of Portable Electronic Items in hold baggage and for ensuring these items are powered down and switched off

7. Ability to recognise and understand prohibited and restricted items for a helicopter flight, in accordance with IATA's Dangerous Goods Minimum Training Requirements for 'Operators & Ground Handling Agents' and be suitably qualified in the subjects required to perform their duties

Evidence of the training and records should be retained.

> Special note: All helicopter operators can provide training for competency of personnel undertaking these tasks. On request, they will provide the opportunity to complete any element (with exception of Dangerous Goods training) of the above training requirement within their own onshore bases, if practical to do so.

Training - Freight and Dangerous Goods Carriage Preparation

K.12 All personnel undertaking the preparation of Freight & Dangerous Goods Carriage by Air should be:

1. Qualified to Dangerous Goods by Air for Shippers and Packers by a regulatory approved organisation.

2. Fully conversant with the individual operators' requirement for pre-notification of the Carriage of Dangerous Goods.

3. Fully conversant with the loading limitations for each individual freight item both in terms of weight restrictions of the item itself and on the individual compartments within the helicopter hold.

4. Fully conversant in recording Freight & Dangerous Goods on Vantage POB, Offshore Personnel Management System (OPMS) or other electronic flight managed system, or when a manual Check in is performed.

5. Fully conversant with all packaging and labelling requirements for the safe transport of each item.

6. Fully conversant with the operators' requirements for the carriage of spare Lithium Batteries/ Powerbanks.

An operator approved Training Manual/ Module should be available and suitably qualified persons should undertake the training with appropriate records retained for all personnel.

Training should be conducted IAW regulatory requirements.

Evidence of the Training Manual/ Module and records should be provided on request.

All Dangerous Goods training records should be retained for a minimum period of 36 months, from the most recent training completion month.

Special note: All helicopter operators are supportive of training initiatives for competency of personnel undertaking these tasks. On request, they will provide the opportunity to complete any element of the above training requirement within their own onshore bases if practical to do so, or training guidance.

Check in Report Times & Communication

K.13 Check in report times should provide adequate time for the process to be completed effectively, including the required security and safety checks.

In the event the process needs to be completed in advance to accommodate night shifts, additional procedures should be in place to ensure final checks are completed, i.e. baggage re weighed/ re checked.

Information should be documented and provided to the passengers on what will be required as part of the check-in process including, but not limited to, completion of Declaration Form, PED and spare Lithium Battery/ Powerbanks process and Prohibited Items awareness.

A check-in process should be established and on request, be able to be evidenced.

ID Check

K.14 All passengers should present their valid Passport or, in agreed exceptional circumstances, a copy of Passport & secondary government issued Photographic ID, as confirmation that the correct passenger is being checked in for the flight.

Passenger Safety Declarations

K.15 All passengers should complete a safety declaration (as detailed under Equipment and Documentation, K.6 Passenger Safety Declarations).

Declarations should be retained for a period of 7 days post flight and be available to be presented to the flight crew, or operator, for inspection on request.

Any non-compliance will be recorded and reported by the operator.

Passenger and Baggage Weights

K.16 All passengers and baggage should be weighed in the presence of the Heli Admin who should ensure each person stands, and each bag is placed, centrally on the scales to enable the weight to be accurately recorded.

On onshore arrival, anomalies will be reported and recorded by the operator.

Portable Electronic Devices (PEDs)

K.17 All passengers should evidence that their PEDs have been powered down/ switched off by presenting them switched on and switching them off in the presence of Heli Admin. Apart from a mobile phone (if approved to be carried on their person), all other PEDs should then be placed in hold baggage.

An operator approved procedure should be documented for identifying and ensuring correct carriage of Portable Electronic Devices and be evidenced on request.

Special Note Portable electronic device (PED)' means any kind of electronic device, typically but not limited to consumer electronics, brought on board the aircraft by crew members, passengers, or as part of the cargo, that is not included in the configuration of the certified aircraft. It includes all equipment that is able to consume electrical energy. The electrical energy can be provided from internal sources such as batteries (chargeable or non-rechargeable) or the devices may also be connected to specific aircraft power sources. (UK Regulation (EU) 965/2012 (Air Operations)).

Spare Lithium Batteries/ Powerbanks

K.18 All spare Lithium Batteries/ Powerbanks are to be carried in the conditions as approved by the individual helicopter operator. Spare Lithium Batteries/ Powerbanks should be recorded on the passenger manifest together with the number of items.

An operator approved procedure should be documented for identifying and ensuring correct carriage of spare Lithium Batteries/ Powerbanks and be evidenced on request.

Baggage Checks

K.19 A minimum of 10% of all passengers' baggage should be searched on each flight, or as an average across all flights conducted and it is critical that all reasonable steps are taken to prevent prohibited items including spare Lithium Batteries/ Powerbanks, or PEDs not switched off, being carried in the aircraft hold. The searches can be conducted by hand or by utilising operator approved hand-held detectors.

An operator approved procedure should be documented for baggage checks to ensure no prohibited items are travelling undeclared, or PEDs not switched off. Additionally, details of the bag searches should be recorded. These should be evidenced on request.

On onshore arrival, the operators reserve the right to conduct ad hoc bag searches and non-compliant items will be reported and recorded.

Confirming a Passenger on the Flight

K.20 A passenger is required to be physically present at Heli Admin, have presented the required ID, and should hold valid certification for travel prior to flight having completed all the required processes detailed above (K.13 to K.19) before being confirmed as actually 'manifested' on the flight.

Freight

K.21 Freight being shipped from offshore locations via helicopter requires:

1. The item to be safely and securely packaged - prevention of leaking as well as safe handling should always be considered. Polystyrene chips or similar products should not be used as a packing material
2. All items to be “clearly, legibly and accurately” labelled not only with its contents but also with its weight. Labelling should be durable and should remain in place for the duration of transit. All old labelling should be removed.

Operator approved procedures should be in place to ensure the above is adhered to and is evidenced on request.

Non-compliant items found on arrival onshore will be recorded and reported.

K.22 All freight should be documented and identifiable during transfer from offshore. All freight weights and descriptions with relevant information should also be recorded in the operator approved passenger tracking

Operator approved procedures should be in place to ensure the above is adhered to and is evidenced on request.

Dangerous Goods Cargo

K.23 All Dangerous Goods shipments should be prepared, packaged, labelled, marked and documented for transport by air, in accordance with the IATA Dangerous Goods Regulations and the process undertaken and completed by only appropriately trained and qualified personnel. Extreme care should be taken being that there are restrictions to what can be carried on different helicopter types.

K.24 Notification of intention to ship Dangerous Goods should be e-mailed to the operator with the operator required lead in time. The notification should include:

- The Proper Shipping name of the Dangerous Goods
- The UN Number
- The Packing Group
- The net quantity or weight as necessary.
- The gross weight and dimensions of the package.
- Where Class 1 Dangerous Goods are intended to be shipped, the Net Explosive Mass or Quantity should be indicated in addition to the net quantity or weight of the package.

(E-mailing a correctly completed Shippers Declaration is a simple and effective means of achieving this)

K.25 The helicopter operator will acknowledge receipt of this notification. This acknowledgement does NOT constitute ACCEPTANCE of the Dangerous Goods, but merely indicates that appropriate staff will be ready to receive the goods on arrival at the heliport. However, any discrepancies, or compliance concerns that may prevent carriage will be communicated.

K.26 The package and documentation should then be checked for accuracy using an approved and current Dangerous Goods Acceptance Checklist. Appropriately trained personnel should complete the checklist.

On completion, the Acceptance checklist/ documentation should be signed on behalf of the operator and sent to them with a copy of the training certificate of the signatory attached.

K.27 Upon satisfactory completion of the checklist the package should be stored prior to loading and two (2) copies of the operator approved NOTOC prepared, but not signed.

Note: The NOTOC requires the exact loading position to be detailed, therefore it may not be possible to complete this until after loading.

K.28 On arrival of the helicopter and immediately before loading, the package should be visually inspected for signs of damage and leaking. If any such signs are found, the package should not be loaded.

K.29 The stowage location for the Dangerous Goods should be agreed with the aircraft commander. All Dangerous Goods items loaded onto an aircraft should be positioned so that it is safe and secure in the hold.

The following Dangerous Goods transport documentation should then be presented to the pilot:

- 2 copies of the Shippers Declaration
- 1 copy of the completed Acceptance checklist
- 2 copies of the signed operator approved NOTOC
- A copy of the Dangerous Goods Certificate for the person signing the Checklist.

The pilot will sign both copies of the NOTOC and retain one (1) copy. The HLO will keep the other copy, to be retained on the installation.

K.30 On departure of the helicopter, all stations on route and the destination should be notified that there are Dangerous Goods onboard. This will be done by e-mailing the NOTOC to all destinations.

Note: an e-mail containing all the relevant details found on the NOTOC will also suffice.

K.31 IATA Dangerous Goods Regulations requires that all paperwork be retained for a minimum period of three months. As a minimum the following documentation will be retained:

- One (1) copy of the Shippers Declaration
- One (1) copy of the signed Acceptance Checklist
- One (1) copy of the NOTOC signed by both HLO (or other suitably trained person) and Pilot

K.32 As well as protected from any risk of damage, the individual weights should be clearly identifiable on the package.

Procedures should be in place to ensure all processes required for the carriage of Dangerous Goods are adhered to and should be evidenced on request.

All personnel involved in the shipping and loading of General Freight or Dangerous Goods as freight, should have undertaken the appropriate training prior to commencement of duties and commensurate with their responsibilities.

Any non-compliance found on onshore arrival will be reported to the CAA as a Mandatory Occurrence Report / DG Occurrence Report and actions to be prevent re-occurrence required to satisfy the operator before further Dangerous Goods shipments are approved.

All operators reserve the right to request sight on the details of the suitable qualified personnel on any platform at any time.

Heli Admin/ Check in Declaration

K.33 On completion of the check in process, a declaration (as detailed under Check in Preparation - Equipment and Documentation, K.7 Heli Admin/ Check in Declarations) should be completed for assurance that the required security and safety tasks have been conducted.

The declaration should be attached to the manifest and presented to the crew with the flight paperwork for each flight.

An operator approved procedure should be documented for Heli Admin/ Check in Declarations and be evidenced on request.

Any non-compliance will be recorded and reported by the operator.

Post Check In

Baggage Security

K.34 Once baggage has been weighed, and searched if selected, it should be secured to ensure no tampering can occur, or additional items added. The baggage should be placed in a secure, locked area and/ or appropriately secured with a tamper proof seal.

In the event the bags are sealed, checks should be undertaken before loading into the helicopter to ensure they are still in place.

An operator approved procedure for sample checks designed to ensure compliance offshore, should be documented.

On onshore arrival, the operators will undertake further sample checks of seals, if in use, and non-compliances will be reported and recorded.

K.35 Pre-Departure Final Check

a) **XBR Armbands**
Identified XBR passengers should be issued with the appropriate armband and directed to highlighted XBR seating on the aircraft.

XBR passengers should board the aircraft first to ensure they have visibility of the seats assigned for their use.

b) **Clothing**

All passengers should be in compliance with Step Change in-Safety (i) for helicopter transfer.

c) **Safety Briefing**

Passengers should be provided with a suitable room/ space to enable the safety brief to be conducted free of distraction and checks should be undertaken to ensure all passengers are paying the appropriate attention to the briefing.

d) **Survival Suit & CAT A EBS Lifejackets**

Appropriate checks should be completed to ensure all passengers are wearing the critical safety equipment correctly and all personal items are securely stowed in the pockets for carriage.

An operator approved procedure for the completion of these checks should be documented and evidenced on request.

e) **Mobile Phones**

In the event passengers can retain their mobile phones on their person, adequate checks should be undertaken to ensure these are in flight safe mode and switched off prior to departure.

An operator approved procedure for the completion of these checks should be documented and evidenced on request.

f) **Pre-Boarding Briefing**

A documented safety brief detailing final checks should be undertaken prior to departing for the helideck.

An operator approved procedure for the completion of the safety briefing should be documented and evidenced on request.

Baggage / Freight Load planning

K.36 Aircraft hold, and shelf weight restrictions should be enforced when freight is carried, and safety nets used, when fitted, to prevent items falling when the hold is opened.

Operator approved procedures should be in place to ensure the above is adhered to and should be evidenced on request.

K.37 The weight limit for freight items carried in the hold should not normally exceed 25kg (55lb) per item due to manual handling considerations, but certain offshore locations may impose a lower limit. (Exceptions may be considered with pre-notification and approval from the operator).

The carriage of items exceeding 25kgs should be subject to a Manual Handling Risk Assessment prior to loading and unloading. Due to manual handling regulations the weight limit for individual items of baggage is 11.5kgs (25lbs)

Operator approved procedures should be in place to ensure the above is adhered to and these should be evidenced on request.

Freight exceeding the agreed limitations will be quarantined on onshore arrival. These will be subject to further checks and assurance that actions will be undertaken to prevent re-occurrence before being released.

K.38 Items that require to be cabin loaded, are subject to additional constraints such as floor-loading limits, Centre of Gravity (CoG) limitations and access dimensions. Notification of requirement should be provided to the operator in advance to ensure approval is sought and appropriate tie down straps are loaded for the flight. A further assessment with the aircrew prior to loading should also be undertaken, to ensure the item can also be safely unloaded on arrival.

Operator approved procedures should be in place to ensure the above is adhered to and should be evidenced on request.

K.39 Transport of lightweight items should be carefully considered, taking into consideration the downdraft of the helicopter and potential for the item to become a FOD hazard. The use of weighted sacks/ containers to increase overall weight should be considered for these types of items.

Operator approved procedures should be in place to ensure the above is adhered to and should be evidenced on request.

On the Helideck

General

K.40 Prior to commencing any activity on the helideck, the aircrew should have been provided with the following information relating to the flight.

1. Actual passenger numbers & weights
2. Actual passenger baggage numbers & weights
3. Actual freight numbers & weights
4. Dangerous Goods and/or Lithium Batteries/ Powerbanks details

Operator approved procedures should be in place to ensure the above is adhered to and should be evidenced on request.

Passenger Control

K.41 All helideck teams should be trained to Offshore Petroleum Industry Training Organisation (OPITO) or equivalent standard.

K.42 A headcount should be undertaken prior to leaving the departure area to ensure that the number of passengers' present aligns with those documented on the manifest.

K.43 The HLO should check with the crew that they are ready to board passengers prior to commencing the embarkation process.

K.44 XBR passengers should be positioned to board the aircraft first to ensure they have visibility of the allocated seating denoted with a matching chequered seat marker.

K.45 The HLO and deck team should be correctly positioned to ensure that passengers are routed across the helideck away from helicopter danger zones and ensure that they are supervised at all times.

K.46 The helideck team should be familiar with the seat loading plans of each aircraft type and follow any additional instructions from the aircrew.

K.47 A member of the helideck team should ensure all passenger seatbelts are secured before the aircraft departs.

For all 'Passenger Control' activities, operator approved procedures should be in place to ensure the above is adhered to and should be evidenced on request.

Training records should be available on request.

Baggage and Freight Loading

K.48 On arrival offshore care should be taken to ensure all freight and baggage for that destination is removed.

K.49 All passenger baggage and freight loading, and stowage should be carried out in a safe manner ensuring appropriate manual handling techniques are adopted.

K.50 All passenger baggage and freight loading should be undertaken in accordance with weight (by item and by compartment) restrictions on the aircraft type.

K.51 In the event additional aides, such as integrated ladders, are fitted to the aircraft type, these should be used during all loading/ unloading manoeuvres.

For all 'Baggage and Freight Loading' activities, operator approved procedures should be in place to ensure the above is adhered to and should be evidenced on request.

An operator approved Training Manual/ Module should also be available. Suitably qualified persons should undertake the training with appropriate records retained for all personnel. These should be available on request.

Refuelling

K.52 For any refuelling activity undertaken offshore the following should be adhered to:

1. The refuel team should be fully conversant with the operators approved procedures for each aircraft type.
2. Fuel sampling should be undertaken IAW CAP437, Chapter 8 prior to commencing any refuelling activity.
3. All refuelling activity should be supervised by the HLO and a member of the aircrew and a communication process agreed.
4. A fireguard should be present during any refuelling activity.
5. Passengers should not embark the aircraft during the refuel activity, or be present onboard, unless directed by the aircraft commander to do so in exceptional circumstances.

For all 'Refuelling' activities, operator approved procedures should be in place to ensure the above is adhered to and should be evidenced on request.

An operator approved Training Manual/ Module, should also be available. Suitably qualified persons should undertake the training with appropriate records retained for all personnel. These should be available on request.

Abbreviations

BOSIET	Basic Offshore Safety Induction and Emergency Training
CoG	Centre of Gravity
DGR	Dangerous Goods Regulations
DVD	Digital Versatile Disk
EBS (CAT A)	Emergency Breathing System (Category A)
HLO	Helideck Landing Officer
HDA	Helideck Assistant
HUET	Helicopter Underwater Escape Training
IATA	International Air Transport Association
IAW	In accordance with
NOTOC	Notification to Captain
OPITO	Offshore Petroleum Industry Training Organisation
OPMS	Offshore Personnel Management System
PED	Portable Electronic Device
POB	Persons on Board
PSTASS	Passenger Short Term Air Supply System
SDS	Safety Data Sheet
XBR	Extra Broad