MARINE
TRANSFER
FORUM

OFFSHORE PERSONNEL TRANSFER BY CRANE

BEST PRACTICE GUIDELINES FOR ROUTINE AND EMERGENCY OPERATIONS

REV 0 MAY 2016

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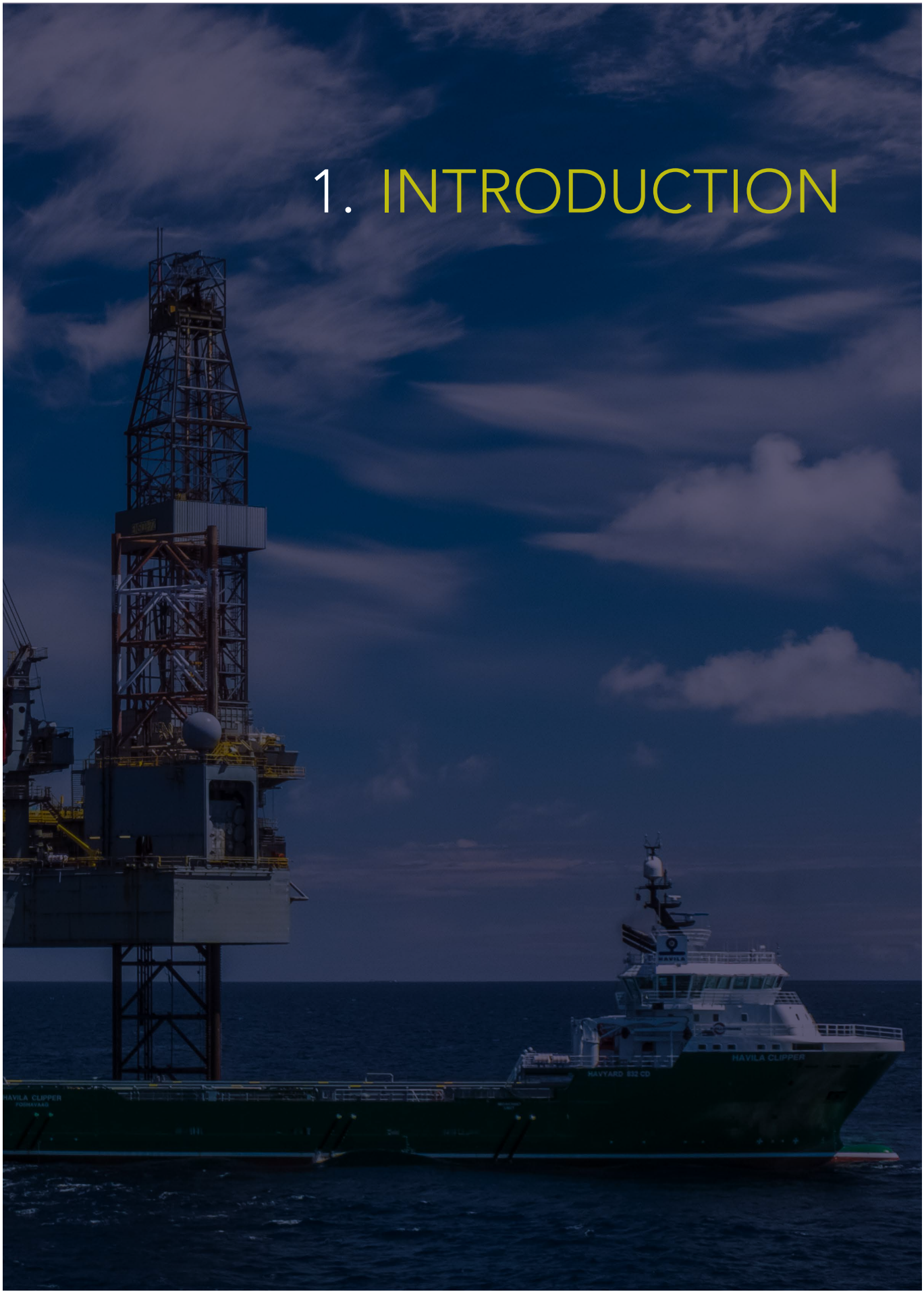


1. INTRODUCTION

1.1 PURPOSE OF THIS DOCUMENT

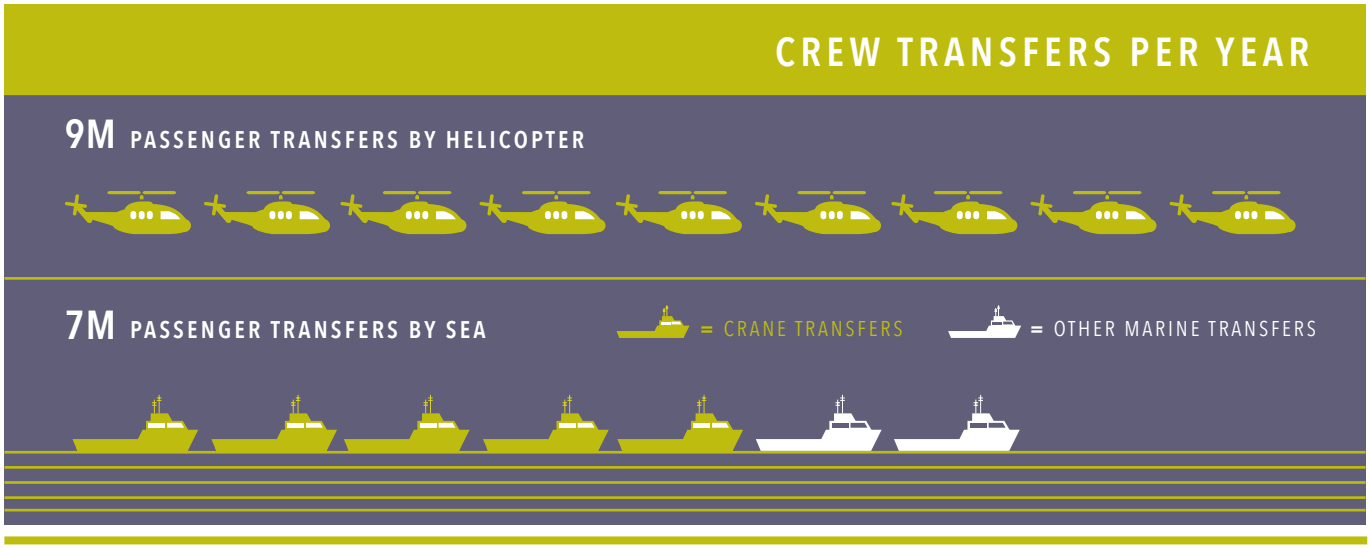
This document provides best practice guidance to help ensure that personnel transfers by crane are conducted safely, whether for routine crew changes or operational reasons. It also highlights the critical role that crane transfer can play in the management of emergencies, and the importance of preparation for such eventualities. It is of particular relevance to oil & gas exploration and production, offshore renewables construction and maintenance, as well as general marine operations. It is intended for those planning, managing and performing such operations.

Drawing on recent industry risk studies on offshore personnel transfer, it provides a broad operational context to assist risk-based decision making and objective assessment of the various transfer methods available. This guidance is based on worldwide experience and followed a thorough industry consultation.

This guidance document has been produced by the **Marine Transfer Forum** which aims to:

- Encourage the collation and sharing of activity and incident data to increase awareness, benchmark activity and quantify risks
- Share and develop industry best practice for both routine transfer operations and emergency planning
- Support the development of clearer objectives and strategies to improve equipment, services and industry practices.

More information on the Marine Transfer Forum and how you can join can be found at **www.marinetransferforum.org**



1.2 A GLOBAL PERSPECTIVE

Every year around nine million[1] passenger transfers to offshore installations are made by helicopter, and an estimated seven million[2] passenger transfers are conducted by sea. Marine based crew supply encompasses a range of different methodologies including crane transfer, walk to work, step-over (to a ladder or boat landing) and swing rope. Of these, crane transfer is the most common method, accounting for around five million[2] passenger transfers per annum.

Crane transfer practices vary considerably from region to region. In some areas of the world, these practices have changed little in the past fifty years. In other areas, such as Atlantic Canada, operators have collaborated and redefined industry best practice and have gained an impressive track record for safe operations in some of the most challenging environmental conditions globally.

Crane transfer has evolved significantly in recent years; carrier design, crane design, vessel design and operational practices have all improved greatly to allow crews to travel with increased safety and comfort. Safe crane transfers rely on collaboration across several disciplines; including lifting, marine logistics, health and safety, and asset management.

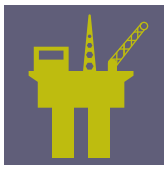
[1, 2] See references in Section 5

1.3 DEFINITION OF A CRANE TRANSFER SYSTEM

In order to address the risks and define best practice for crane transfer operations, it is necessary to consider all elements in the system. Each part of the system should be evaluated on its own merit, and finally the interactions of the various elements of the whole system should also be evaluated.

Applicable legislation, standards and codes

There are a range of statutory requirements, industry codes, standards and guidelines which may be applied to crane transfer operations. Some of these codes are quite specific on the design of equipment, such as cranes and personnel carriers, and others provide more general advice on best practice. Not all such guidance, however, reflects recent changes in the industry or represents current international best practice.



Offshore installation

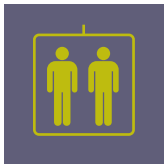
Cranes used for transfer of personnel may be positioned either on fixed or floating structures such as platform, jack-up, semi-submersible, FPSO, or barge. On floating structures and vessels the stability in varying sea conditions affects the movement of the crane boom tip, strongly impacting the dynamics of the lift. The lifting path, line of sight to the vessel and installation landing areas may vary greatly from site to site.

Crane

A crane suitable for personnel transfer should be certified for lifting people. Other relevant risk factors are the crane location relative to vessel landing areas and the prevalent weather, the crane operator view, lifting path, line speed, and rigging.

Vessel

A wide range of vessels are employed in personnel transfer, from large, specialised offshore support vessels to small crew transfer vessels. Vessels with suitable cranes can transfer personnel to other vessels or structures. In all cases, vessel stability, station-keeping, deck landing area and visibility from bridge should all be accounted for in assessing the suitability for each vessel and the operational risks.



Personnel carrier

Only devices designed specifically for the purpose of transferring personnel between vessels and offshore installations should be used. These may be collapsible standing 'baskets', rigid-standing or rigid-seated devices. Work baskets should not be used for the transfer of personnel between vessels and installations.

Personnel

The safe conduct of crane transfer operations requires the close collaboration of several different parties. Because it is conducted between a vessel and an installation two different organisations and work cultures are involved. Each party has specific responsibilities, pressures, and considerations to deal with; thus managing the risks effectively requires the close collaboration in both the planning, preparation and conduct of operations. The person in overall charge is normally appointed by the asset manager or vessel master and must ensure that the personnel involved have the relevant competence to conduct operations safely.

Competence often has a specific meaning, and the term 'competent person' can have a specific definition. Where used in this document it signifies that persons have sufficient practical and theoretical knowledge and experience of the lifting equipment to perform their duties safely.

The 'duty holder' is a statutory term in health and safety legislation and can be a company or an individual. They are responsible for things being done correctly, or put right. In the oil and gas industry, it is the operator of a fixed installation, and the owner of a mobile installation.

Key roles involved in crane transfer operations include:

> Onshore management
Onshore operations managers (often supported by safety advisors) are usually responsible for evaluating risks and defining the transfer methodology to be used, and making the appropriate provisions of equipment and processes.

> Logistics
Onshore and offshore logistics staff co-ordinate passenger bookings, briefings, luggage, security, and the issue of appropriate personal protective equipment (PPE).

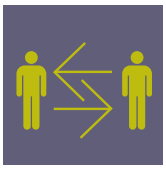
> Offshore management
The manager for the installation or vessel where the crane is located, is normally in overall control of individual transfer operations, and conducts local onsite risk assessments with the support of the crane operator and vessel master prior to any transfer. The manager should also consider, and if needed risk assess, other installation activities (SIMOPS) that could affect crane transfer activities.

> Vessel crew
The vessel master and crew are responsible for the safety of passengers during the voyage to and from the installation, and for operations on the vessel deck. The vessel master has a specific responsibility to maintain the vessel on station during the transfer operations and to check the safety of the designated landing area. Passenger briefings may also take place on the vessel during transit.

> Crane operator
The crane operator is responsible for operating the crane, which is also supported by a lifting supervisor and deck crews on both the vessel and the installation. The crane operator along with the crane mechanic are responsible for ensuring the crane is in a safe condition to perform personnel transfers, and coordinating operations with installation deck crews and the vessel master.

More information on training and competence is found in Section 2.2 (Personnel).

1.4 APPLICATIONS OF CRANE TRANSFER



Routine crew change

Marine based crew transfer is a standard operation in most regions of the world. Primary reasons for selecting marine transfer over other methods include:

- **Volume**: dedicated crew transfer vessels can transport large numbers of passengers
- **Economy**: marine transfer is a flexible and cost-effective method that can be tied-in with cargo operations
- **Safety:** marine transfer is safer than using helicopters, the main global alternative method
- **Infrastructure:** marine based transfers are generally easier to establish and support, particularly in remote areas
- **Distances from shore**: many offshore assets are relatively close to shore, so voyage times are relatively short. However, in some locations, marine transfer is selected because assets are a long way offshore and beyond helicopter operating range.

Contingency

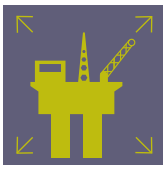
Where methods such as helicopter or walk to work are the primary means, crane transfer provides an important secondary means of access. This can be due to weather limitations, mechanical failure or planned maintenance.

Operational (inter-field) transfers

Relatively short inter-field transfers are frequently performed between installations and vessels such as dive support vessels. During construction and maintenance projects, helidecks or gangways may not be in place and marine transfer is often the main or only method for moving personnel. Although many operational transfers may be anticipated and planned, the risks involved can still vary considerably from routine crew change operations, and need to be considered accordingly.

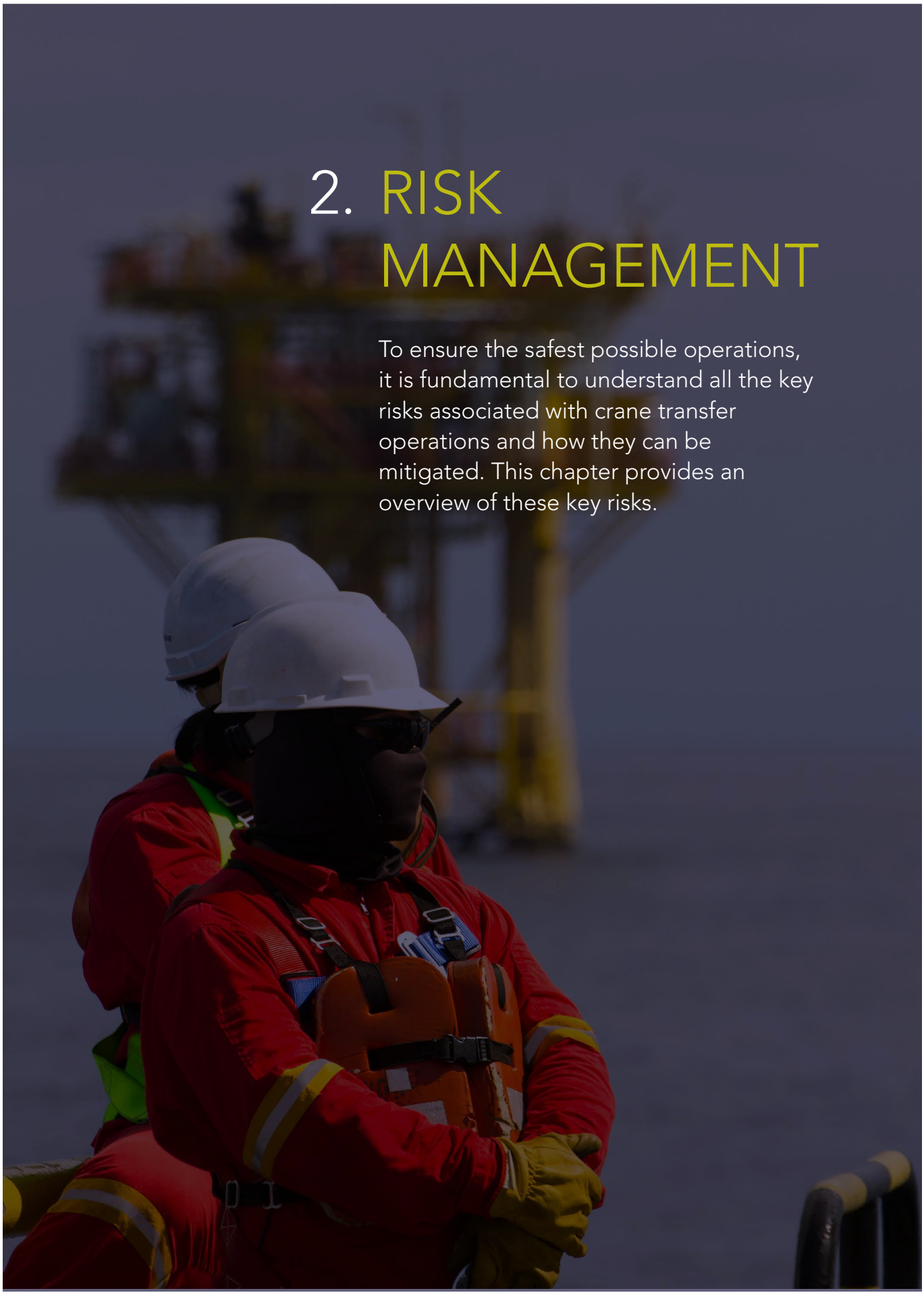
Emergency and medical transfers

Examples of emergency transfers include the transfer of injured crew; transfer of a paramedic to a vessel; and the evacuation of a distressed installation. Injured personnel are often transferred from vessels onto an installation with a helideck, for onward transfer to shore. Emergency planning should consider the safe transfer of the sick and injured in all conditions.



Evacuation

Crane transfer provides the option to rapidly commence a full evacuation or partial down-manning of a threatened installation, using nearby vessels e.g standby vessels. It offers a safe method of 'dry' evacuation, under the full control of the asset manager, which is also easily reversible if the threat abates.



2. RISK MANAGEMENT

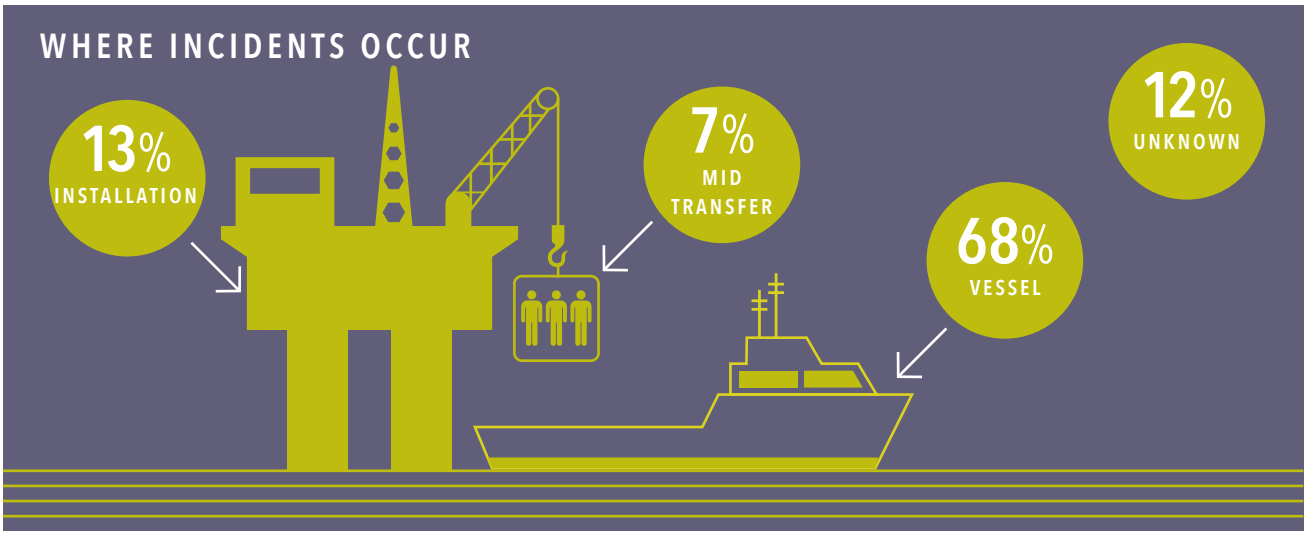
To ensure the safest possible operations, it is fundamental to understand all the key risks associated with crane transfer operations and how they can be mitigated. This chapter provides an overview of these key risks.

2.1 RISK AWARENESS

Asset managers, contractors, safety consultants, classification societies and other stakeholders frequently use incident and activity data and risk estimates as the basis for decision making. The data presented in this section is based on the most comprehensive review of global crane transfer incidents involving all carrier types, and is validated by DNV-GL[2]. Whilst the majority of the data is from 2000 onwards, it draws from data back to the 1970s.
This section describes the most common risks associated with crane transfer.

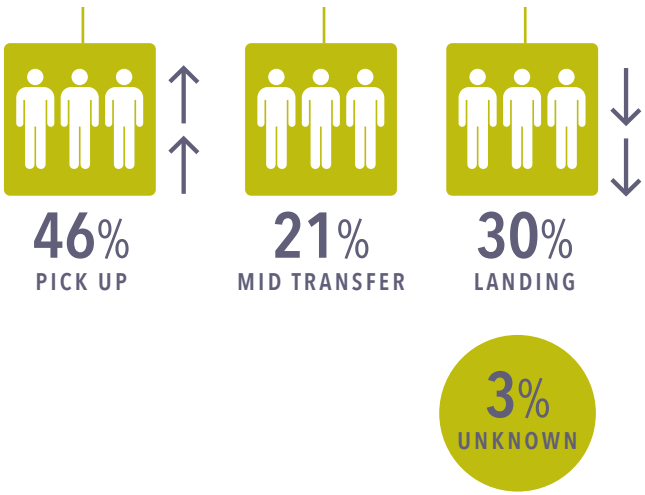
Where incidents occur

This illustration shows where incidents are most likely to occur in typical offshore transfer scenarios. The majority of incidents occur on or near the vessel (as opposed to the installation hosting the crane). Key factors include vessel motions, due to heave or station keeping, relative to the crane load. These risks rise with increasing sea state.

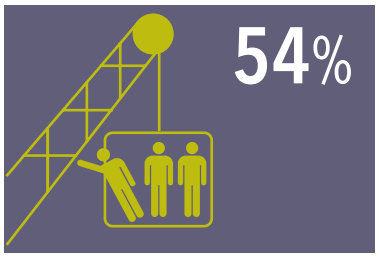


When incidents occur

The highest number of incidents occur during pick-up of the carrier, as opposed to landing. This is typically due to misalignment between the crane hook and the carrier during pick up (known as an off-centred lift), causing the carrier to swing in an uncontrolled manner. When using collapsible baskets the challenges are increased, as the crane operator needs to maintain tension in the net during heave cycles.

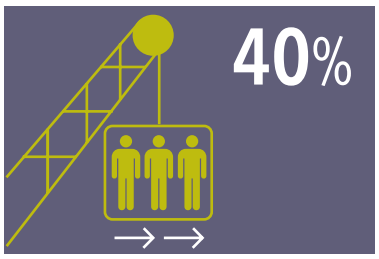


TYPES OF INCIDENT



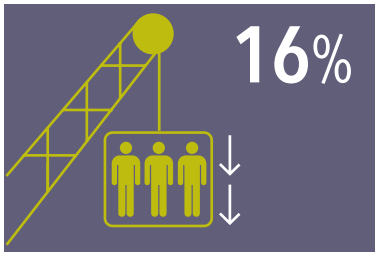
Falls from the carrier (54%)

This has historically been the most significant risk, particularly associated with traditional collapsible baskets that are ridden externally and offer little or no fall protection. The majority of falls occur following a collision with cargo or part of the vessel structure, so are often associated with lateral collisions (see below). Falls can also be caused by sudden or rapid movements of the crane, but much less frequently due to lifting equipment failures.



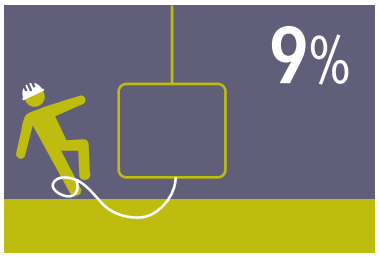
Lateral collisions (40%)

Lateral collisions occur most frequently during pick-upwhen the lift is off-centre. Incorrect timing of the lift with the heave-cycle can cause the carrier to collide with cargo or part of the vessel structure, presenting serious risks to unprotected or unrestrained passengers.



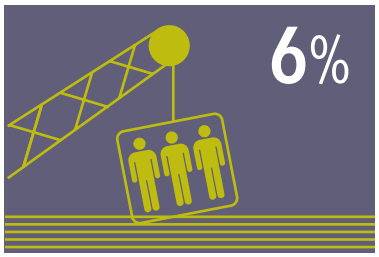
Vertical impacts (16%)

Heavy vertical impacts usually occur when a carrier lands on a heaving vessel. Timing landings in high sea states is challenging, and mistimed landings can result in injuries depending on the type of personnel carrier used. Vertical impacts can also occur when the carrier lands on a bulwark or other equipment, or arise from re-collision with the heaving vessel after pick up.



Trips and entanglement (9%)

Passengers face trip hazards when approaching, mounting or dismounting a carrier. Deck crews also face risk of entanglement with accessories such as tag lines or other obstacles, particularly if the landing area is not clear or is too small.



Immersion (6%)

Immersion of passengers or the carrier is uncommon. However, the consequences may be serious, meaning this continues to be a major concern for crews. Any impact or collision may result in unrestrained passengers being dislodged into the water. Also, in rare cases, the failure of lifting equipment or misjudged landings can result in immersion of the carrier. The ability of a carrier to float and self-right are a prerequisite of some national jurisdictions.

Note: since incidents can fall into more than one of the above categories the cumulative total for the categories used is not 100%.

2.2 RISK FACTORS

Personnel

Responsibilities

The knowledge, skills and experience of the personnel involved in planning and performing crane transfer operations is a key risk factor. The table below outlines the main roles involved, their responsibilities and an indication of their level of influence. This is intended as a qualitative guide to the importance of the particular role. The most critical roles are the crane operator and the vessel master.

	ROLE	KEY RESPONSIBILITIES	LEVEL OF INFLUENCE
INSTALLATION CREW	Installation manager	Overall management of personnel and planning	High
	Crane operator	Planning of transfers Control of lifting operations Crane condition checks Communication with vessel	High
	Deck crew	Preparation of carrier Directing and assisting passengers Handling carrier, rigging and luggage Communication with crane operator	Mid
	Lift supervisor	Possibly one located on each unit; vessel and platform Supervisor on unit with crane to lead on planning Risk assessment Pre-use check of carrier, rigging and certification Planning of transfer Toolbox talk and personnel briefings	High
VESSEL CREW	Vessel master	Planning of transfer and vessel preparations Communication with installation Assessing weather and sea conditions Maintaining vessel station Control of vessel deck crews	High
	Deck crew	Directing and assisting passengers, handling luggage Handling carrier and rigging Communication with crane operator	Mid
SUPPORT STAFF	Safety advisor	Risk assessment facilitation Appropriate training	Mid
	Safety representative	Investigating hazards and complaints Representing crews	Mid
	Operations & maintenance	Maintenance procedures and certification	Low
	Airport/port staff	Passenger check in, passenger briefings, luggage, PPE	Low
PASSENGERS	Regular	Risk awareness Procedural familiarity	Low
	Visitors	Risk awareness Following instructions	Mid

Experience

Incident data shows that the frequency of incidents and operating practices vary considerably from region to region. In regions where marine transfers are not performed regularly, experience can still be gained through training, regular drills and trial runs. Drills allow key personnel such as the crane operator, the vessel master and deck crews to develop and refine skills and procedures. This should enable monitoring and improvement of the procedures, and develop the communications involved. In areas where such operations are carried out regularly, complacency can also arise due to familiarity. Regular drills and monitoring can reduce the potential for such additional risks.

Crane operators should show a high degree of competence with cargo operations before they are permitted to transfer personnel. Many regions specify a minimum level of experience for conducting personnel transfers.

Training

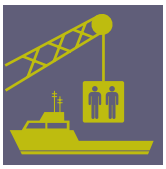
Familiarisation training should be provided to all personnel involved in crane transfer operations. This should cover pre-transfer inspection of the crane and carrier, passenger briefings, crew briefings, operational best practice and emergency operations.

Manufacturers often provide training resources, and many training centres cover personnel transfer in their safety or lifting courses. Some centres are also able to provide hands-on training using simulators or real equipment.

Environmental factors (weather)

The environmental conditions which can affect marine transfer are detailed below:

- **Sea-state**
  Wave height, direction, and current will affect vessel motions and be the main influencing factor for vessel station-keeping. In addition to heave, the horizontal motions (surge, sway and yaw) will be significant factors for pick up and landing phases on the vessel deck. For vessel to vessel transfers, pitch and roll will have an impact on crane tip motions and control of the load.
- **Wind**
  Wind may impact the crane operator's ability to control the load. The limits specified for the crane and the transfer carrier both need to be considered
- **Light and visibility**
  Transfers at night and in poor weather conditions may impact the safety of the transfer. The risks of reliance on non-visual communications should be assessed
- **Temperature**
  Low temperatures present additional risks to passengers such as reducing the passengers' ability to grip, which is especially important in standing carriers. Duty holders should consider the risk of hypothermia, equipment limitations and performance and emergency recovery procedures. Personnel should wear appropriate personal protective equipment.



Equipment

Vessel

The vessel must provide a stable and safe landing platform in all anticipated conditions of operation. Vessels should be assessed for their suitability including:

> **Motion characteristics and station-keeping**
Larger vessels generally provide the safest landing platforms. The ability of the vessel to maintain station is also a key safety factor. Many vessels have dynamic positioning. The dynamic positioning standard DP2 is increasingly specified as a minimum requirement for transferring personnel. Vessel motion is also influenced by factors such as cargo and ballast configuration and as such can vary greatly.

> **View and communications from bridge**
The vessel master should have a clear view of the landing area and suitable communications with deck crew. The vessel should have aft-facing bridge controls to allow the master to monitor deck operations whilst maintaining station.

> **Landing area**
The vessel should have a clear deck area with no snagging or collision hazards. A landing target should be marked on the deck well clear of obstructions. The deck should be anti-slip with clear exit routes marked for passengers. Appropriate storage provision should be made for personnel carriers which are stored on vessels.

Crane

Cranes used for personnel transfer may be located on fixed or floating installations. Key considerations for the crane are:

> **Specification**
Cranes used for personnel transfer should be certified to a recognised national or international standard for lifting personnel. Examples of relevant standards and guidelines include [7, 9, 10, 15, 16, 17] – see references in section 5. Important features for consideration in terms of managing crane related risks consist of:

- Manual personnel mode selection with rated capacity indication
- Increased wire ropes' factors of safety
- Independent secondary braking
- Freefall prevention in event of power failure
- Secondary power supply for load recovery
- Emergency stop and lowering capability
- Automatic disconnection of overload protection, heave compensation systems etc

In some cases cranes not specifically designed or certified for lifting personnel are used. In such cases it is recommended that specific risk assessments are performed.

> **Line of sight**
The crane should have a clear line of sight for all vessel positions and the full trajectory of the lift. The height of the crane and landing area above the vessel will affect this.

> **Line speed**
The line speed of the crane can determine what sea states in which transfers can take place. The use of technology such as boom tip cameras, line speed sensors, and vessel deck monitoring systems can reduce risks by providing the crane operator with useful information including additional viewing angles and accurate vessel and crane movements.

[3,7,10] See references in Section 5

> **Crane condition**

All lifting equipment should be well maintained in accordance with international or national regulations, or industry standards such as the European directive on machinery 2006/42/EC, API RP 2D Operation and Maintenance of Offshore Cranes[11], or Lifting Operations and Lifting Equipment Regulations[3]. Some of these national or regional standards are also followed in other parts of the world. If a crane has been modified, any impacts on its operation and maintenance should be evaluated and understood.

Carrier

The carrier should provide adequate protection for the conditions envisaged, this is to be demonstrated by a documented risk assessment. Where the carrier is provided with a manufacturer's operational envelope, its capability to operate within this should be demonstrated by product testing.

Recommended design features include:

- Appropriate restraints to protect passengers from falls or impacts
- Shock absorption systems to protect passengers during heavy landings
- The ability to float and self-right in the predicted worst-case sea-states
- Unimpaired entry and exit
- Lifting assembly comprising both a primary and back up lines in the lifting assembly (to avoid a single point of failure)
- Lifting assembly; comprising both a primary and back up line
- Lifting assembly should be supplied with the carrier. This should be of sufficient length to ensure the crane hook remains clear of the carrier and passengers
- High visibility sling covers help passengers, deck crew and the crane operator see the position of the slings. These should allow easy access for inspection and be of a breathable fabric to avoid trapping moisture

Carrier condition

The carrier should be well maintained and inspected in accordance with the manufacturer's recommendations. All critical load bearing components should be clearly identified in maintenance schedules.

Note: The wire rope lifting assembly is the most critical component to maintain and inspect on a carrier. More details are given in the following chapter.

Carrier types

There are three main types of carrier currently in mainstream use:

- Collapsible basket:
  This design provides an unsecured external standing position for passengers. Passengers stand on a cushioned base and grip a collapsible rope net which suspends the base. This design requires tension in the crane line when passengers mount the basket.
- Rigid basket:
  This design provides unsecured or tethered internal standing position for passengers. Passengers stand within a rigid internal or external framework. It provides some impact protection through a cushioned base.
- Rigid capsule:
  This design provides secured internal riding. Passengers are secured by a harness within a frame incorporating buoyancy for floating and self-righting. Where the capsule has seating a suspension system provides additional shock absorption.

Comparative protection of carrier types

Levels of protection for each type of carrier are assessed below:

CARRIER TYPE	VERTICAL IMPACTS	LATERAL IMPACTS	FALLS	IMMERSION	TRIP AND ENTANGLEMENT
Collapsible basket	Low	Low	Low	Low	Low
Rigid basket	Low	Medium	Medium	Low	Medium
Rigid capsule	High	High	High	High	High

RANKING	DESCRIPTION
Low	Little or no protection. Only suitable for benign operating conditions
Medium	Moderate protection. Suitable for moderate operating conditions
High	High level of protection. Suitable for harsh operating conditions

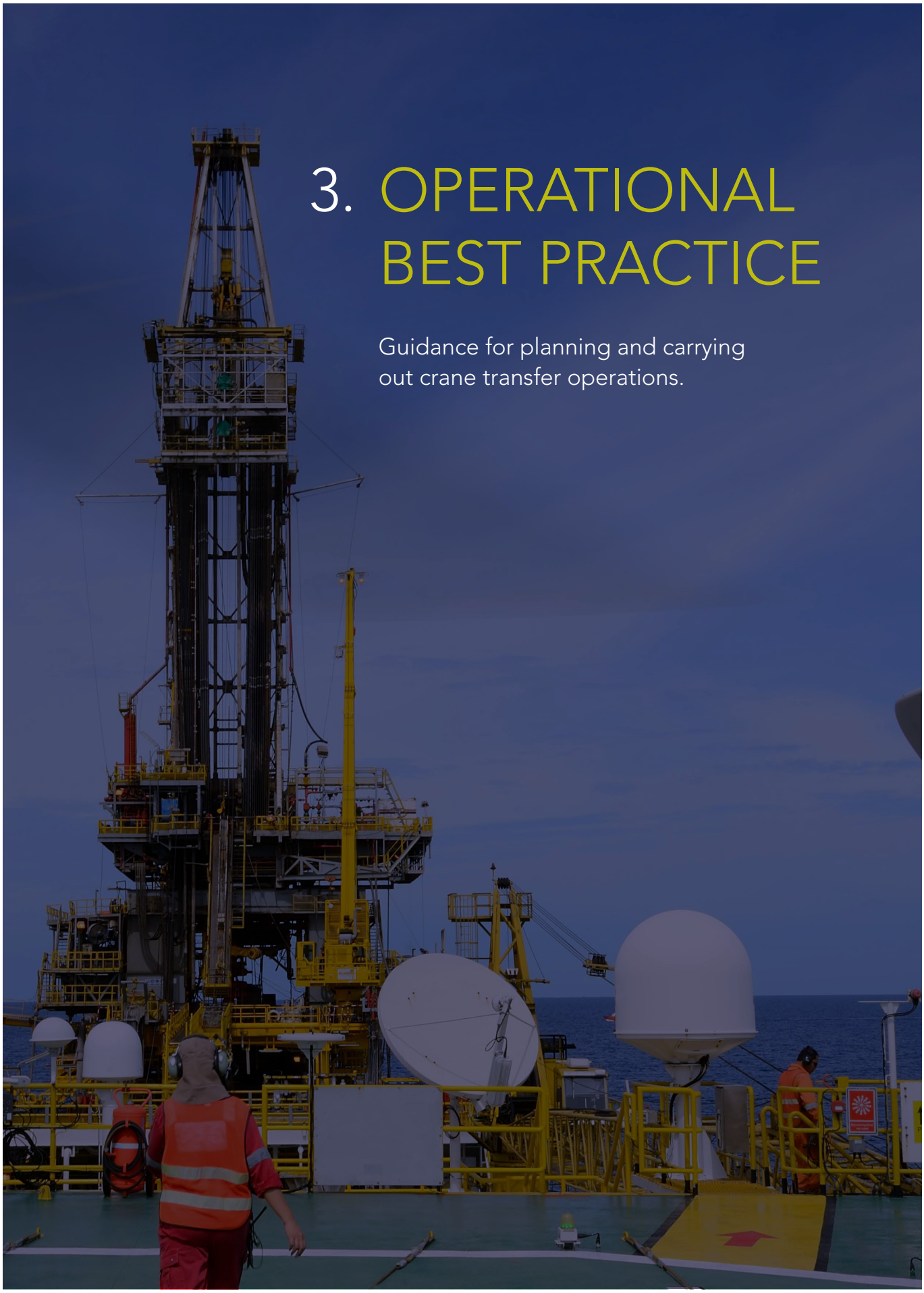
Collapsible basket

Rigid basket

Rigid capsule

2.3 RISK ASSESSMENT

Hazard identification is key to an effective risk assessment. The previous sections in this chapter (2.1 Risk awareness, 2.2 Risk factors) will help with understanding possible root causes and identifying the required controls. If a generic risk assessment has been provided for a particular operation or project, this should be reviewed by installation and vessel crews and management, and amended accordingly. A team based approach may well be beneficial. Whether for an installation or vessel, this would involve input from the crane operator, deck crew and lift supervisor and facilitated by a safety adviser. If installations and vessels already have their own risk assessments, these should be shared between them prior to a new operation or project. Appendix A contains a risk assessment template.



3. OPERATIONAL BEST PRACTICE

Guidance for planning and carrying out crane transfer operations.

3.1 GENERAL

Documentation

Planning and preparation

The assessment of risks is essential to effective planning and preparation, both in routine and non-routine operations.

Appendix A is a template for a general risk assessment, and appendix B is a template checklist for use prior to each operation.

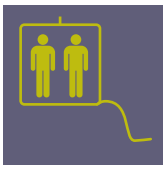
Record keeping

Keeping accurate and comprehensive records of operations is good practice, supporting future planning and risk assessment. These should include records of inspection, thorough examination and maintenance, data on passenger transfers, and post-transfer reviews. These records will allow more effective review of operations and support decision making, leading to continual improvement.

Appendices C and D include templates for the recording and reviewing of operations.

Rigging

- The crane hook should have a positive lockable latch
- An additional back up sling can be connected from above the crane hook to the master link of the carrier's lifting assembly, to mitigate risk of failure of the hook
- On rigid carriers the lifting assembly should allow sufficient slack to be paid out whilst the carrier is set down on a vessel deck, minimising the risk of it being inadvertently lifted or dragged
- The lifting assembly should be connected directly onto the crane hook avoiding the use of a pennant line
- The position of the lifting assembly should be actively managed by the deck crew so it does not become a hazard to passengers or the lift.
- In some circumstances a shorter lifting assembly may be required. This may increase the risk of a carrier being pulled over due to vessel motions, and of the crane hook striking the carrier or passengers. These should be covered in the risk assessment.



Tag lines

Tag lines may be used to control swing and orientation after pick up and before landing. Deck crew should be aware of the hazards associated with the use of tag lines:

- Be aware of any obstacles and snagging hazards in the landing area
- Snagging risks associated with tag lines should be minimised by using anti-snagging designs and handling tools.
- Maintain a suitable distance from the carrier and avoid standing underneath the load

Inspection and maintenance

All equipment used for personnel transfer operations should be inspected and maintained according to the Original Equipment Manufacturer's (OEM) recommendations, local regulations and the owner's policies. Personnel transfer equipment may be classified as lifting equipment, safety/lifesaving equipment, or both.

Transfer equipment should be included within a relevant planned maintenance programme, and maintenance should be performed by competent personnel in accordance with the manufacturer's recommendations.

Pay particular attention to any operational guidance provided by the carrier manufacturer. The guidance should provide inspection and maintenance checklists to assist inspections. These should cover pre-use checks, visual inspections and thorough examinations. The following key items should be included:

- All main and secondary (back up) load path
- Passenger restraints
- The carrier framework (structure)
- Buoyancy components
- Shock absorbing feet or base
- Luggage and stretcher mountings

The wire rope lifting assembly (rigging) is considered the most critical component on the carrier. This is due to its exposure to damage and degradation, and the severe consequence of failure. For this reason, a conservative inspection and replacement regime is considered essential: especially as if this equipment fails, there are serious and potentially life-threatening risks. The following checks will help ensure it is in a safe condition for use:

- Check that the correct OEM supplied rigging is installed and within certification
- Do not use a lifting assembly that has incurred mechanical damage – this includes damaged eyes or ferrules, kinks, crimps, 'birdcages' or broken strands
- Discard and replace any slings and rigging components that do not pass inspection
- Store the rigging in clean and dry conditions when not in use
- Consider removing sling covers to prevent build-up of condensation
- Do not leave a lifting assembly in a position where it is vulnerable to mechanical damage, contamination or contact with abrasive or corrosive materials
- Follow manufacturer's maintenance and lifespan recommendations

Communications

Local practices may vary, but as a minimum a dedicated three-way radio link should exist between the crane operator, vessel master and deck crew. Radio protocol should be agreed and adhered to. Contingency communications such as a loud speaker should also be available.

Standard hand signals should be used by deck crews to supplement radio communications. Any language issues (such as differences between the vessel crews and installation crews) should be considered and strategies for ensuring clear communication developed.

Luggage

It is recommended that luggage should be transferred separately using a suitable container. This will reduce the risk of falling objects, trips, entanglement and reduce transfer times and the time spent in the hazardous area. If luggage is to be transferred with passengers, all handling should be performed by deck crew as opposed to passengers. They should ensure luggage is correctly and efficiently stowed, and not be worn by passengers (e.g. back packs) thereby reducing passengers' exposure to unnecessary risks. Luggage should be loaded prior to passenger entry, and unloaded after exit.

Personal protective equipment (PPE)

Requirements for personal protective equipment vary from region to region according to climatic conditions and operational needs. Selection should consider the risks associated with routine operations as well as emergencies, in particular:

- Seasonal water temperatures and survival times
- Temperature ranges, including wind chill factors
- Proximity of overboard rescue facility, fast rescue craft and standby vessels
- Deployment time and personnel capacity of rescue craft
- Loss of power or failure of the crane
- Emergency evacuations. For instance, the ability to change into the survival suit during a medical evacuation.

Life jackets

Passengers should be provided with life jackets, with consideration paid to the following:

- The manual inflatable type should be used, and only be inflated after exiting the carrier.
- It should not interfere with the use of harnesses or fall restraints, or the ability to grip carrier
- They should ideally be designated for use for transfers, marked accordingly and kept in suitable storage near to the transfer reception area
- For high volume transfer activities, three sets will ensure maximum efficiency of the operation. This provides one set for the crew in transit and one for each of the waiting crews on the vessel and installation

Head protection

Passengers should wear head protection incorporating a chin strap. Ideally these would be of the same type used for rope access. Standard hard hats may not provide sufficient protection in the event of side impacts or falls from height.

Survival suits

Survival suits of the type used for helicopter transfers are recommended for cold weather regions. Snagging risks or restrictions on mobility should be identified, in particular seats and entry and exit points on the carrier.

Other PPE

Safety glasses, gloves, protective footwear and hearing protection may also be required.

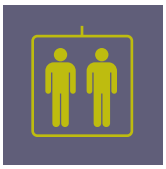
3.2 TRANSFER PROCEDURES

To achieve best-practice transfer procedures, the following should be considered:

Passenger briefing

Passengers should be briefed on the following topics prior to being transferred:

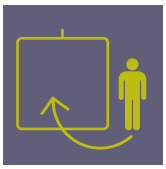
- Potential hazards
- Safety features of the carrier such as fall protection, impact protection and floatation
- Entry and exit procedures
- Passenger positioning instructions specific to the carrier type
- Personal protective equipment required
- Signals and communications procedures
- Location specific considerations such as waiting and landing areas
- Emergency procedures



Passenger entry/exit

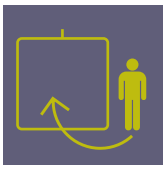
A well-rehearsed passenger loading procedure will help to ensure efficient operations and reduce the risks.

- Identify any passengers who may be unwell, inexperienced or anxious about being transferred
- There should be a designated passenger waiting area on the installation and vessel. For seated carriers, pre-allocating seating will reduce delays and the time passengers have to spend in the hazardous area.
- Passengers should be weighed prior to embarking the vessel. Prior to transferring, passengers should be grouped to ensure even weight distribution, and equipment capacities are not exceeded
- Entry or exit should only take place when the carrier is in a stable position on the deck
- Use barriers or other effective means to prevent unauthorised access to the lifting and landing areas
- Exiting passengers should be clear of the carrier before new passengers attempt to enter
- When advised by the deck crew, passengers should proceed to their allocated entrance
- If present, harnesses should be prepared in advance by deck crew to allow them to be secured quickly. Deck crews should be familiar with carrier harness or tethers, be able to assist passenger as required and should check passengers are correctly secured prior to transfer
- Following landing, passengers should unfasten any harnesses or lanyards and exit the carrier only when advised to do so by the deck crew



Lifting

- Carry out a pre-use check on the carrier and lifting assembly prior to every transfer operation. If this is carried out prior to being connected to the crane hook, an additional check of the connection should be performed prior to use. If the carrier is disconnected at any time then this should be repeated.
- In harsh weather and where possible, the transfer should take place with the vessel downwind of the installation (to provide lee-side protection)
- Consideration should be given to single passenger transfers which may cause collapsible baskets to become unbalanced. Inexperienced passengers or visitors should be accompanied by a member of crew.
- The hoisting, transfer and landing paths should be planned to ensure visibility and to avoid potential collisions. The crane operator should have a clear line of sight of the entire lift
- A designated banksman/signalman on the vessel will ensure multiple signals are not given to the Crane Operator
- The crane boom should be moved in a slow manner, avoiding sudden changes in speed or direction
- Raising and lowering should take place over water
- The designated landing areas on the vessel and installation should be clear of obstructions.
- If any abnormal risks are highlighted, dry runs recommended.should be carried out before any live transfers with passengers. The crane operator should then confirm that the transfer can be performed in a controlled manner
- For night-time operations, the crane boom should be fitted with adequate lighting to illuminate the crane hook and the transfer device. The crane operator must maintain a clear line of sight with the carrier. The take-off and landing areas should be illuminated to a level of at least 20 lux. The transfer device should be fitted with a strobe light.



Lifting (cont)

> After landing a carrier in rough weather, a member of the deck crew should control the lifting assembly and warn passengers to stay clear of the hazard
> In the event of substantial vessel motions, the lifting assembly may need to be temporarily disconnected from the hook
> In the event of a stuck lift, passengers should await instructions from deck crew whilst the crane safety features are implemented (such as emergency power lowering)

Emergency response

An emergency response plan should be developed and be consistent with the type of carrier utilised. It should be based on manufactures' guidelines where they exist, and cover the following:

> Immersion, which is an extremely rare event in crane transfer operations, although the consequences can be serious. Most carriers incorporate floatation features, although evidence of performance in actual immersion events is generally not provided.
> In the event of the crane stopping unexpectedly, passengers should await instructions from deck crew whilst emergency systems are implemented, such as emergency powered or manual lowering.
> Arrangements for rescue and recovery of personnel should be in place with good prospect of success.

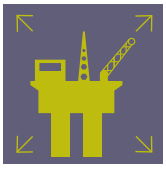
Vessel mounted cranes

> Personnel transfers using cranes mounted on floating vessels, either to fixed installations or other vessels, are more complex and higher risk. This is due to the effects of vessel motions on the crane. The following factors should be assessed.
> The stability and station keeping capability of both vessels should be fully understood.
> The relative height difference between the two vessels will affect the length of lifting assembly used and subsequent control of the carrier.
> The size of and clear access to landing areas on both vessels should be assessed
> If one or both vessels can 'vane' into weather, this can help to minimise relative motions
> Conducting trial runs for training purposes and pre-operations can help to prove operability in particular conditions.
> The use of any nearby installations with cranes should be considered.
> Crane motion compensation technology can improve stability and increase operating envelopes

3.3 EMERGENCY OPERATIONS

The risk profile for an emergency crane transfer may be greater than for a routine transfer operation. The risk should be compared to the risks of other modes of response (or of not responding) to an emergency.

This might warrant a separate, dedicated risk assessment process. Two key types of emergency operation where crane transfer can play an important role are considered here.



Evacuations

Crane transfer can be a very powerful emergency response tool, allowing large numbers of crews to be evacuated safely, quickly and efficiently.

The key advantages over other evacuation provisions include:

- It offers a relatively low risk option, compared to lifeboats or life rafts
- It is very flexible and immediately available, and can start as soon as a threat becomes apparent (even before a helicopter is mobilised)
- It is readily reversible, as opposed to abandonment by lifeboat or life raft

Special considerations when performing evacuations include:

- Weather conditions may be outside normal operating limits
- Regular practice drill to improve the safety and efficiency of such evacuations
- The availability of competent personnel
- The risk of loss of power to the crane should be considered
- Additional risk may introduced through using different vessels to those used for regular crew change
- A combination of different modes of evacuation may be employed, based on the developing situation

Possible scenarios for evacuations include:

- Hurricane evacuations prior to deterioration of weather
- General installation emergencies
- Contingency option in poor weather (e.g. fog, volcanic ash cloud)

One successful example was on the P-36 production vessel in Brazil in 2001, where an explosion caused an uncontrollable list and rescue efforts were impeded by bad weather. Crane transfer was used to evacuate 138 crew, with a further 18 being evacuated by helicopter.

Medical evacuation

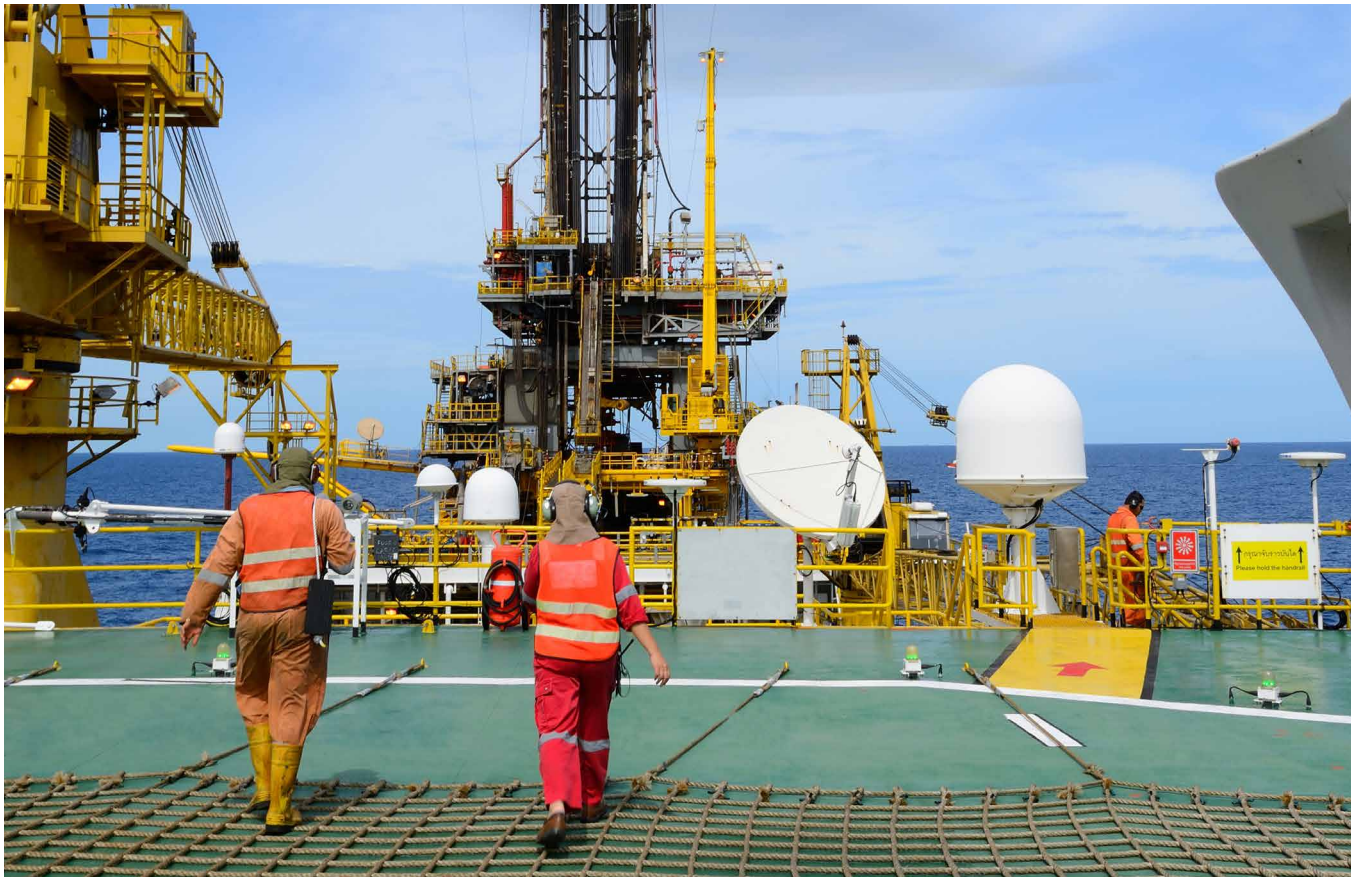
Injured persons can be transferred from vessels to offshore installations for treatment or onward helicopter transfer. Considerations for such transfers include:

- Regular practice drills help to ensure that these can be done safely and efficiently
- During a medical evacuation (MedEvac), the casualty should be accompanied by another person, such as a medic
- Some carriers are specially designed to carry one or more stretchers
- Seated carriers may offer a viable MedEvac option for injured or sick personnel that are not fit to perform standing transfers
- The carrier to be used should be assessed for its level of general protection, position of the stretcher in relation to the water line
- All equipment should be maintained in a suitable condition to be used at short notice

NEXT STEPS

If you are interested in joining the Marine Transfer Forum or have any suggestions for improving this document, visit **www.marinetransferforum.org**

One of the aims of the forum is to build on the data which is reported on in section 2. We therefore welcome any further contributions of data for future revisions in order to ensure this is as up to date and accurate as possible.



4 RESOURCES

American Petroleum Institute (API)	http://api-ep.api.org
DNVGL	http://www.dnvgl.com
Health and Safety Executive	http://www.hse.gov.uk
International Association of Oil and Gas Producers	http://info.ogp.org.uk/liftingandhoisting
International Marine Contractors Association	http://www.imca-int.com
Lifting Equipment Engineers Association	http://www.leea.co.uk
North Sea Lifting	http://www.nsl-aberdeen.com
Maritime and Coastguard Agency	http://www.mcga.gov.uk/c4mca/mcga-home
Step Change In Safety	https://www.stepchangeinsafety.net/safety resources/publications/marine-transfer-personnel

5 REFERENCES

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2 John Spouge et al, "Risks of Marine Transfer of Personnel Offshore", DNV GL & Reflex Marine, 2014

3 UK *Lifting Operations and Lifting Equipment Regulations*, 1998 SI 1998/2307

4 *Lifting of personnel offshore: Transfer between installation and vessel*, Offshore Mechanical Handling Equipment Committee, 2013

5 *The International Lifting Rigging & Lifting Handbook*, 13th ed, North Sea Lifting 1991 (revised 2014)

6 *Marine Transfer Of Personnel, Step Change in Safety*, 2014

7 *Technical guidance on the safe use of lifting equipment offshore*, 2nd ed, Health and Safety Executive, 2007

8 *Guidance on procedures for the transfer of personnel by carriers*, Health and Safety Executive, 2007

9 *Cranes - Offshore cranes - Part 1: General-purpose offshore cranes*, European Committee for Standardization, EN 13852-1:2013, 2013

10 *API Spec 2C Offshore Pedestal-mounted Cranes*, American Petroleum Institute, 2012

11 *API RP 2D Operation and Maintenance of Offshore Cranes*, 7th Edition, American Petroleum Institute, 2014

12 *Cranes — Equipment for the lifting of persons Part 1: Suspended baskets*, European Committee for Standardization, BS EN 14502-1:2010, 2010

13 *International Guidelines For The Safe Operation Of Dynamically Positioned Offshore Supply Vessels*, International Marine Contractors Association, IMCA M 182, 2009

14 *Guidelines for vessels with dynamic positioning systems*, International Maritime Organization, MSC/Circ.645, 1994

15 Guide for Certification of Lifting Appliances, American Bureau of Shipping, 2016

16 Standard for Certification No. 2.22 - Lifting Appliances, DNV GL, 2011

17 Code for Lifting Appliances in a Marine Environment, Lloyd's Register, 2016

RISK ASSESMENT

		SEVERITY				
		Insignificant **1**	Minor **2**	Moderate **3**	Major **4**	Fatal **5**
LIKELIHOOD	Very Unlikely **1**	**1**	**2**	**3**	**4**	**5**
	Unlikely **2**	**2**	**4**	**6**	**8**	**10**
	Fairly Likely **3**	**3**	**6**	**9**	**12**	**15**
	Likely **4**	**4**	**8**	**12**	**16**	**20**
	Near Certain **5**	**5**	**10**	**15**	**20**	**25**

RISK RATING		
1 – 3	Insignificant	Task may continue
4 – 9	Tolerable	Task may continue if all controls are in place and supervision is adequate
10+	Unacceptable	Task may not proceed until the risk is reduced

COMPILED BY	**1**	**2**	**3**	**4**	**REVIEWED & AUTHORISED BY**	
Name					Name	
Signature					Signature	
Postition					Postition	
Date					Date	

Completion Notes: 1. Detail each hazard below and score for likelihood and severity, as per the above table **2.** Multiply the likelihood score by the severity score to calculate a risk rating for each hazard. Then refer to the risk rating table above regarding course of action **3.** Required controls are those needed to ensure residual risks to all those involved in the transfer are as low as resonably possible (ALARP)
4. The first two have been completed as examples **5.** The authoriser should confirm the quality and suitability of the risk assessment and approve the operation

HAZARD DESCRIPTION[1]	EFFECT	WHO IS AT RISK	REQUIRED CONTROLS[3]	LIKELIHOOD	SEVERITY	RISK RATING
Swing on carrier on pick up	Personnel carrier collides with obstructions	Passengers and crew	Ensure crane hook is aligned with carrier, adequate station keeping, conduct trial runs	**2**	**3**	**6**
Passengers falling	Fall from height onto deck or water	Passenger	Select carrier designed with harness or passenger restraint. Ensure passengers and crew are trained in their use. Check harness as part pre use check. Crew to confirm passengers	**1**	**5**	**5**

USE FORM ON NEXT PAGE

RISK ASSESMENT

HAZARD DESCRIPTION[1]	EFFECT	WHO IS AT RISK	REQUIRED CONTROLS[2]	LIKELIHOOD	SEVERITY	RISK RATING

PRE-TRANSFER CHECKLIST

DATE	
TIME	
REASON FOR TRANSFER	

Completion Notes:

1. Fill in the check list.
2. Where a "No" response is selected, changes need to be made to the operation before continuing. If changes cannot be made an entry should be made on the risk assessment stating mitigating actions.
3. This is not a comprehensive list and there may be additional factors which should be included in the risk assessment not considered.

EQUIPMENT	
VESSEL	
Designated Landing Area	
Vessel Name	
Vessel Position	
DP System Type	
CRANE	
Crane Type	
Line Type	
Crane Position	
Man-riding	
INSTALLATION	
Designated Landing Area	
Installation Name	
Installation Type	
Line of Sight between Installation and Vessel	
CARRIER	
Crane Pre-use Check Complete	
Carrier	
Lifting Assembly Length	

PEOPLE	
PASSENGERS	
Number of Passengers	
Number of Lifts	
Passenger Briefing Complete	
CREW	
Vessel Crew Briefing Complete	
Installation Crew Briefing Complete	
Trial Run Complete	
CRANE OPERATOR	
Briefing Complete	
Suitable Experience	
Crane Pre-use Check Complete	

WEATHER	
MET-OCEAN	
Wind Speed (knts)	
Wind Direction	
Sea State	
Visibility	

OPERATION TYPE	
MEDEVAC	
Has the carrier been converted into MedEvac mode	
Has a pre use inspection been carried out post conversion	
Stretcher Test Fit complete	
NIGHT TIME TRANSFER	
Is a strobe light fitted	
Take Off/Landing Areas Lighting	
Crane Boom Flood Lights	

PASSENGER LOG

VESSEL	
INSTALLATION	
TIME/DATE	

NUMBER	NAME	WEIGHT	SEAT POSITION	LIFT NUMBER
1				
2				
3				
4				
5				
6				
7				
8				
9				
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11				
12				
13				
14				
15				
16				
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18				
19				
20				
21				
22				
23				
24				

POST-TRANSFER REVIEW

Completion Notes:

For recording information and outcomes of an operation, for continuous improvement and learning purposes.

NAME	
POSITION	
TIME/DATE	

COMMENTS	
Reason for Transfer	
Vessel/Installation Details	
Equipment Used	
Weather Conditions	
Other, Including Lessons Learned	