Guidance on Operational Communications

IMCA M 205, D 046, LR 013 Rev. 1
June 2021

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IMCA M 205, D 046, LR 013 Rev. 1 – Version History

Date	Reason	Revision
June 2021	Further updating of references and adoption as an L&R document	Rev. 1
August 2016	Update of references; rewording of section 19	
August 2010	Initial publication	

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1 Purpose

Members have noted that standards of communication in offshore projects vary and are often not uniform in style, resulting in some confusion and communication difficulties.

The variation in standards can be from project to project or even between different work sites operated by the same company, sometimes even in the same operational areas of the globe. In addition, a number of users of communication equipment have not had any specific training in its use, particularly in the use of radio. Clearly ships' officers have that training (although they can also fall into bad habits!), but other members of project teams often do not. Also, company procedures are sometimes difficult to implement when non-company personnel are involved. These factors clearly have implications in relation to safety.

The purpose of this guidance is thus to assist those personnel who:

- have not received training; or
- who work where good practice has not been followed; and
- to assist companies in establishing communication procedures in line with good industry practice.

As implied above, those who are for example very experienced project managers or ships' officers might find some of the guidance to be a statement of the obvious. But those who are new to the industry and/or do not have relevant training should benefit; and it is worth recalling that it is often the obvious that gets overlooked.

There are few better demonstrations of a company's quality than by the manner in which it is heard to communicate by radio. Poor communication can cause misunderstandings and misunderstandings cause accidents.

2 Scope and Summary of Guidelines

This document provides general IMCA guidance on operational communications in part A and specific communications between bridge and dive control stations in part B and lifting operations in part C.

3 Definitions

BOP	Blowout preventer
CCTV	Closed circuit television
Crane operator	Person operating the controls of a crane and, for the purposes of this document, includes any operator of lifting equipment controls
Debriefing	Review of job performed, to identify best practices, lessons learnt and possible improvements
DP	Dynamic positioning
DPO	DP operator
ECR	Engine control room
Field controller	Oil & gas field controller or renewable energy farm co-ordinator
GMDSS	Global maritime distress and safety system
IEC	International Electrotechnical Commission
IMO	International Maritime Organization
ITU	International Telecommunication Union
Lift supervisor	The person who supervises the lift and the lifting team. Examples of a lift supervisor could be: deck officer, diving superintendent, deck foreman, banksman/slinger, shift supervisor
Open Communication	A talk back system generally between one station and another providing direct and uninterruptible communication, ie direct link between dive control and bridge/DP, Dive control and ROV.
PABX	Private automatic branch exchange
PTW	Permit to work
Round Robin	This open communication system is where all stations can hear all transmissions, ie Bridge/DP, Dive Control, ROV control , crane operator and deck riggers. It is often a hard wire system into which VHF and UHF channels can be patched.
ROV	Remotely operated vehicle
SIMOPS	Simultaneous operations
SMCP	Standard Marine Communication Phrases
SWL	Safe working load
Toolbox talk	Review of planning, procedures and risk assessments by all those involved in the operation and exchange of relevant information relating to its safety and efficiency
UPS	Uninterruptible power supply
UTC	Coordinated universal time

VDR	Voyage data recorder
VHF/UHF	Very/ultra-high frequency

Part A

GENERAL GUIDELINES FOR OPERATIONAL PROCEDURES

4 Introduction to Part A

Part A of this guidance covers general communication issues and for completeness should be read and understood before reading Parts B and C.

The term ‘users’ is intended to apply to all personnel utilising a communication method.

5 General Communications Guidance

5.1 The Basis of Good Communications

Company procedures should ensure that a high level of communications discipline is exercised at all times. Effective communications are vital to the safety and success of any operation and the term 'communication' covers all means of communication, such as hard-wire systems, sound powered systems, radios and emergency back-up systems, computer systems, alarms, warning and indicator lights and audio alerts, CCTV, word of mouth, hand signals, other visual signals, toolbox talks and post operational debriefing. With regard to toolbox talks and post operational debriefing, supervisors' encouragement toward clear comprehensive communication is extremely important at these talks and debriefings.

All personnel directly involved in an operation should be fully aware of the work being undertaken and the status of any unusual situation that may arise during operations.

Apart from the obvious safety benefit from exercising good communication procedures, radio communications are often heard by other personnel in the field, who are not necessarily involved, therefore a professional standard should be maintained at all times.

5.2 Vessel/Work Site Systems

5.2.1 Communication Facilities on the Vessel/Work Site

It is helpful if company procedures for communications in any work location, such as on a vessel, or an operational unit, set out the general description of the communication systems available for each type of operation. A communications flowchart, or a matrix as described in section 5.3, could be useful.

For example, in diving operations, the flowchart or matrix could explain the systems available between bridge/DP and dive control and to an installation or other vessel/unit. In a lifting system a similar diagram could be useful.

5.3 Communications Flowchart or Matrix

It is useful to provide a graphic description of the communications available by the use of a flowchart or a matrix diagram. This will give an immediate understanding of the communications available and would be of valuable use as a handout at crew change, or when personnel unfamiliar with the vessel join for a project. It can also act as a useful reminder to users, especially in emergency situations. A communications matrix is a requirement in some operational areas. An example is given in *Table 2* (section 15.2).

5.4 Alarm and Control Panels

Alarms are a vital part of a communications system. Members who work or who are familiar with the regulations and standards that stem from the International Maritime Organization (IMO) and the International Electrotechnical Commission (IEC) have suggested that the philosophy behind the selection of alarm lighting and sound applications should be consistent with other alarm lights and sounds used on a vessel's bridge. In the absence of specific guidelines concerning control panels for, for example, dive and lifting systems and bearing in mind the guidance in relation to DP status alarms as set out in IMCA M 103 – *Guidelines for the design and operation of dynamically positioned vessels*, it would clearly be advantageous for alarms, warnings and indicators to comply not only with the requirements specified in existing individual standards for navigational systems and equipment, but also with the recommended DP status alarm system in general use. Thus the aim of designing alarm panels should be to prevent inconsistency with the messages indicated by all other alarm panels on the vessel. Notes below may assist.

Ergonomics need to be considered. It is quite common, especially on older vessels, for systems to have grown up independently of each other and new communication controls and alarm panels placed with little overall appreciation of how they can be easily operated and viewed. CCTV monitors are not always placed to best advantage for viewing; sometimes they are put where it is more convenient for an installation engineer to access a cable run. Similarly alarm lights or audible signals can be spread in an apparently random manner in, for example, bridge, crane or dive control positions or winch rooms. If it is possible for these disparate systems to be combined in an area or areas where the relevant operator can see, hear and control all that is necessary in one place, so much the better.

Functional requirements of general alarm and public address systems on vessels need to comply with IMO Resolution A.1021(26).

Sometimes alarms are displayed on computer screens. If alarm messages are displayed on colour monitors, as stated in IMO MSC/Circular 891 – *Guidelines for the on-board use and application of computers*, the distinctions in the alarm status should be ensured even in the event of failure of a primary colour in the monitor display. Also, where computer screens are used, the level of lighting and the brightness of visual display units should be controllable.

When lights are used on alarms, control panels or computer screens, they should be sited so that they do not produce back scatter on bridge windows.

If there are a number of telephone systems, their ring tones need to be considered in relation to the sounds made by alarms; and relative volumes may need adjusting in relation to priority.

5.5 Design and Presentation of Alarms Other Than DP Alarms

Alarms, warnings and indicators should ideally be displayed and labelled on a dedicated panel and should not obscure other essential information.

Information labels on alarms, warnings and indicators should be self-explanatory, so that the cause of the alarm can be easily and quickly identified by the operator.

If there are several alarms, warnings, or indicators likely to be active, it would be helpful to have a clearly set-out explanatory list giving further information where required. For example, the likely causes of a warning or alarm. Such a list would need to be easily available and accessible to the operator.

A suggested general presentation of alarms, warnings and indicators for control panels could be as shown in Table 1.

Status	**Visual Indication**	**Audible Signal**
Active alarm, not acknowledged	Red, blinking	Accompanied by audible signal
Active alarm, acknowledged	Red	Silence
Active warning, not critical (see note below re DP operations)	Yellow	May be accompanied by a short audible signal (between 2 and 5 seconds)
Normal	Green (or no indication)	Silence

Table 1 – General characteristics for the presentation of alarms, indications, warnings, as applied to vessel bridge systems (not DP alarms)

Clearly there is a difference between the yellow DP alarm, indicating a degraded operational status, with its associated required actions, and the 'active but not critical' yellow light status often used in bridge alarm systems, and care is required to ensure that the two meanings are not confused.

5.6 Other Alarm Signals

Many vessels have designed their own specific status and warning lights in addition to those required by regulations such as provided by IMO in the *Convention on the International Regulations for Preventing Collisions at Sea* (COLREGs) and the *International Code of Signals*. For example, one company's dive support vessel uses dive/bell in the water indicator lights displayed on a tower to make personnel aware of the relevant operational status.

A vessel will have general alarm signals, for fire and boat stations, which are internationally applied and provided by bells in the accommodation and engine room and by the vessel's whistle or siren.

Personnel should be made familiar with the vessel's alarms and communication issues regarding emergency situations. Frequent drills could assist.

5.7 CCTV

Closed circuit television systems can be a vital addition to communication systems. Their use has to be tempered, however, in relation to the information that becomes available to a number of operators in the loop.

Divers' helmet cameras can give the dive supervisor valuable information. The provision of the pictures to monitors at all stations can help all concerned understand what is happening and better appreciate their part in the operation, helping to encourage a teamwork approach. Feedback from users is positive, especially in relation to bridge to dive control. But it should be noted that some operators are wary of providing too much information to everybody in the team.

When a simple operation is being conducted on deck, say a small lifting exercise with a one tonne SWL crane working well within its capacity, with all those concerned in close proximity and in sight and sound of one another, it should be clear who is in charge of the operation. Orders are taken from one person.

Conversely, when an operator of a large crane is helping with a diving operation, and he is situated in a cab remote from others on the vessel and from the divers in the water, with only occasional instructions by radio, the crane driver has a different perspective. If he has a view of a CCTV monitor in his cab and he sees something happening on the screen, he might be very tempted to take some action independently. It might be the correct action, but equally it might not. His camera view might be giving a different or distorted perception from what is happening in reality; or something else might be happening of which he has no knowledge. The working team needs to consider this human factor and establish how it should be dealt with on their project.

Each project requires clear procedures to be established between operators of all the equipment in use. Communication needs to be clear and the various operators in no doubt as to the structure of command and responsibility.

When CCTV or other audio/visual equipment is used, it should not obstruct natural references nor produce reflections or back scatter on, for example, bridge or crane cab windows.

6 Data Recording

Many items of equipment are fitted with data recording devices, for example diver communications, dive profiles, gas analysis, 'black box' dive video, cranes and various other items of machinery on the vessel.

Voyage data recorders (VDR) are fitted on some vessels and these, combined with other electronic recording devices available in the equipment fitted on bridges and in dive control systems, can provide helpful records of a project and or any incidents. But all of these systems need to be linked to a common time line.

Communication procedures can help by setting a common time for all systems. If the time recorded in a machine is different from that used on the vessel and it cannot be adjusted, then at least a record can be kept of the error between the two times. Thus the accuracy of timing in data recording systems could be checked when opening communications; at the start of each shift for example.

When working from a vessel it is usual to use bridge time as the common time, because the bridge has to keep its time as accurate as possible for navigational purposes. Using the same time line helps avoid confusion in communications and in records.

7 Operational Communications

In operational areas within the offshore energy sector there is a requirement that vessels in that area are advised and updated on current vessel operations. The usual procedure is for the vessel to seek permission from or inform the field controller about intended operations and request that all units in the area are advised as necessary.

Operational changes of status that field controllers are likely to be informed of include, but are not necessarily restricted to, the following:

- Vessel entering or leaving an oil & gas field or renewable energy farm
- entering/leaving 500m zones of oil & gas installations;
- vessel setting up on DP and location;
- start and finish of four-point mooring and unmooring operations;
- start and finish of any other mooring/unmooring operation;
- diving bell down and bell up. Diver out/returned;
- first start and last finish of a surface diving operation;
- start and finish of any other operation, e.g. ROV launch and recovery, crane operations, passenger transfer, etc.

Local area requirements should always be checked.

8 Working on VHF/UHF Channels

When first arriving on location, a vessel needs to establish a working VHF channel with the field controller. This channel has to be monitored on the bridge of the vessel at all times.

Strict radio procedures should be followed, as indicated below. When using radio telephone, procedures set out in the current International Telecommunication Union (ITU) rules of procedures as approved by the Radio Regulations Board (as contained in IMO – *Global maritime distress and safety system (GMDSS) Manual*) should be observed even when using relatively short range UHF handsets.

Use of hand held radio transmitters can interfere with computers within closed or partially closed spaces. Care might therefore need to be taken in their use; for example in bridge/DP, dive or machinery control stations, to avoid affecting computerised equipment.

This also applies to mobile telephones and any other device utilising radio transmissions.

9 Use of Communication Channels

Company procedures can help establish a routine adherence to best practice in communication methods. The accepted international maritime language is English. Where this is applicable to the work site, it is recommended that, for an understanding of marine communication phrases and of radio procedure, reference should be made to IMO – *Standard Marine Communications Phrases* (SMCP) and IMO – *GMDSS Manual*.

It is an international legal requirement that a licensed operator is responsible for the use of all the radio equipment held by that station (vessel). This is aimed at preventing inadvertent abuse of radio systems through ignorance of protocol, but the certificated operator cannot physically be present at all times and places that the radio equipment is in use, especially with regard to the portable units.

Personnel should understand the need for, and use, correct radio procedure. The referenced publications will give further details but some examples follow:

- The unnecessary use of radio communications within an oilfield or wind farm and/or between vessels is to be avoided;
- When establishing or testing communications, for example at the beginning of a watch, strength and clarity of communications can be checked and operators familiarised with the sound and clarity of the personnel they are talking to;
- Working channels should be established on radio links and care taken that the channels selected do not interfere with other operations;
- It is useful to establish how each communicator is identified, to avoid confusion. For example, on a radio link "[Vessel name] dive control to bridge" is preferable to "Jim to Bob" – there might be two Jims and six Bobs in range;
- Personnel should be clear about the use of radio procedure, for example in the use of "over" at the end of speaking and "out" when finally completing a communication;
- Commands should be repeated by the recipient; not just by using the term "roger" and not for example by using click sounds by using the transmitter button on the radio;
- Personnel not directly involved with an operation should not break into its working channel, apart from when emergency situations occur;
- Poor radio discipline can and will lead to accidents;
- Conversations should be limited to operational matters only, being as brief as possible and being expressed clearly and precisely;
- Users should avoid speaking so quickly that the words run together. Users should also remember that communication systems are often subject to interference, transmission breaks or other failures in clarity and that an indistinct run of words can easily become garbled and meaningless or, worse, misunderstood;
- Users should remember that the recipients of a message may not be working in their native language. Similarly the use of slang or colloquial expressions can lead to misunderstandings;
- It is necessary to bear in mind that the recipient of a spoken radio message, particularly one with numerical content, will begin to lose track of the message content after 15/20 seconds of continuous transmission;
- The use of offensive language on the radio is not allowed;
- Cultural issues affect how communications are operated in different areas. Application of good company procedures should help remove such problems. And if a company implements an effective standard global procedure, it is likely to be copied by others;

- The human element is always a significant factor. For example, people react to alarms in different ways. Perhaps an inexperienced DPO does not tell divers that a problem is arising, because he or she expects to regain status quickly; then is not able to give adequate warning when the situation deteriorates. Provision of information to a controller is vital;
- Similarly, too much information can result in overload, especially when some information proves to be irrelevant. Experienced team members should have learnt the required balance of information to pass on to the controller, but controllers need to quickly assess who needs guidance in providing information so that intelligent appraisals of information can be made;
- Users should also avoid the use of ambiguous words. See the next sub-section with regard to the SMCP.

9.1 Standard Marine Communication Phrases (SMCP)

The IMO's Standard Marine Communication Phrases (SMCP) are contained in its publication as referenced in section 29. As stated in the SMCP, some words in the English language have different meanings depending on the context in which they appear. Misunderstandings frequently occur and can cause accidents. Examples given in the SMCP relate to the use of the conditionals "may", "might", "should" and "could".

The examples given in the SMCP relate to vessel pilotage, but could easily be adapted, for example to diving operations, as follows:

May

Do Not Say: "May divers enter the water?"

Say: "QUESTION. Do divers have permission to enter the water?"
[Or "...is it safe for divers to enter the water?"]

Do Not Say: "Divers may enter the water."

Say: "ANSWER. Divers have permission to enter the water."
[Or "…it is safe for divers to enter the water]

Might

Do Not Say: "Divers might enter the water"

Say: "INTENTION. Divers will enter the water"

Should

Do Not Say: "You should use the ten tonne crane"

Say: "ADVICE. Use the ten tonne crane."

Could

Do Not Say: "You could be using the wrong shackle"

Say: "WARNING. Check the shackle is correct"

The SMCP goes on to describe the possible problems attached to using the word "can", which describes the *possibility* or the *capability* of doing something. The phrases used throughout the SMCP are selected to make it clear what is meant. In an ambiguous context, the same advice would apply as is set out above under '*May*'.

Knowledge and use of the phonetic alphabet is essential and figures should be spoken singly. For example not ‘forty two’ but ‘fower – too’ and repeated slowly as required.

Cultural issues affect how communications are operated in different areas. Application of good company procedures should help remove such problems. And if a company implements an effective standard global procedure, it is likely to be copied by others.

10 Emergency Communications

During an emergency, the unnecessary use of communication systems and channels has to cease to ensure direct and unobstructed communications between the personnel involved in the emergency.

11 Maintenance

All communication equipment should fall within the vessel's safety management system and radio certification where appropriate. It will be fitted to class requirements where relevant, such as requirements governing cabling and emergency power arrangements. If working from a small unclassified vessel, procedures need to be established to ensure that the communication equipment is maintained correctly and that it is to required standards.

Suitable records of maintenance should be kept.

Maintenance manuals and drawings provided with the equipment giving operational and technical information for service and maintenance purposes should be kept on board and conveniently available to users.

12 Communications Diagrams

It is useful to have a clear method of displaying how links can be established between communication stations. If for example a flowchart is used, a copy could be posted at communication stations around the vessel or work site.

This can be achieved with simplified line diagrams showing the communication links. More detailed diagrams might be required for some stations in the network which are dealing with specific operations. It is important to show how each communication station links in with the rest of the vessel or work site.

An example flowchart is given in section 15.3, which highlights a bridge to dive network, but shows how that links in with the rest of the vessel. Similar flowcharts could be developed for other parts or the whole of the communications systems

Part B
COMMUNICATIONS IN BRIDGE TO DIVE CONTROL

13 Introduction to Part B

Part B deals with guidance particularly relevant to bridge and dive control communication. Please refer to Part A for basic communications guidance.

13.1 Scope of Part B

The scope of Part B covers bridge to dive control communication but does not include communication during dives. This is addressed by the IMCA publications referenced in section 14.1.

14 Types of Diving Operations

14.1 Diving Operations – General

Effective communications between the divers, dive supervisor, bridge, deck and engine room personnel and, in ROV operations with the ROV supervisor, are vital.

Communications from the ROV supervisor are normally routed through the diving supervisor. If an ROV is monitoring a diver, back-up hand signals should be rehearsed. More detailed guidance on this subject is given in IMCA D 054/IMCA R 020 – *Remotely operated vehicle intervention during diving operations* – and IMCA R 004 – *Guidance for the safe and efficient operation of remotely operated vehicles*.

Some guidance on communication with divers can be found in IMCA D 022 – *Guidance for diving supervisors*, Chapter 5 *Communications*.

14.2 DP Operations

A large number of diving operations are carried out with the aid of dynamic positioning. Thus, before dealing with diving communications it is necessary to consider DP operations and reference should be made to IMCA M 103 – *Guidelines for the design and operation of dynamically positioned vessels*, particularly section 3 *Operational guidance* and Appendix 1 *Diving support vessels*. The term 'bridge/DP' is used in this document to define bridge control. This is to emphasise that DP can play such an important role in diving operations and to ensure that the DP operator is certain to be included in the communication loop. However it is appreciated that not all diving is necessarily carried out from a DP vessel and the term bridge control can equally apply to a non-DP vessel or a fixed platform control position.

14.3 Multi Vessel Operations and Simultaneous Operations (SIMOPS)

When the vessel is involved in work with other vessels, either working on the same task or when simultaneous operations (SIMOPS) are being undertaken, it is important to define and establish lines of communication, working frequencies/channels and, for example, calling procedures prior to commencement of operations. When personnel are communicating from different vessels, they need to identify which vessel they are on; and personnel need to establish how they are individually identified (see section 9). This also applies to daughtercraft. When daughtercraft are being deployed, ensure radios are in good working order before deployment, with sufficiently charged batteries. Also that personnel using the radios are appropriately experienced in using them. IMCA M 203 – *Guidance on simultaneous operations (SIMOPS)* – covers communication issues specific to SIMOPS.

15 Communication Links

15.1 Between Bridge (DP) and Dive Control

There should be both primary and secondary means of communication between dive control and the bridge, both of which should be continuously available; and one should operate without the need for external power supply.

If the vessel is operating in DP, then the primary link must be hard-wire and dedicated (see IMCA D 023 – *Diving equipment systems inspection guidance note (DESIGN) for surface orientated (air) systems* – and IMCA D 024 – *DESIGN for saturation (bell) diving systems*.

Typical systems for use between bridge/DP and dive control are listed in section 16.1.

An example of a communications matrix is set out in *Table 2*. Alternatively, or additionally, a flowchart could be used as shown in section 15.3. The particular matrix shown is only provided as an illustration, and study will show that it could be expanded and populated further. A range of variations could be included; for instance, some operators might differentiate between bridge and DPO positions, have different crane, moon pool, ROV or bell dive control positions; and other key personnel's cabins might be included.

The entries on the matrix could also be rearranged, for example to suit an order of importance.

15.2 Bridge (DP) to Engine Control Room

A description of a vessel system between bridge and engine room could be helped by a similar matrix or flowchart showing, for example:

- conventional dial phone;
- sound powered phone;
- VHF;
- UHF;
- back-up systems;
- CCTV links.

RR	Station	Telephone	Dive control primary	Dive control secondary	Dive control tertiary	Saturation control primary	Saturation control secondary	Saturation control tertiary	Air dive control primary	Air dive control secondary	Air dive control tertiary
2	DP Desk	Tel. No. 1200	**OC**	**RR 12**	**VHF**	**OC**	**RR 15**	**VHF**	**OC**	**RR 10**	**VHF**
1	Bridge	Tel. No. 1000	**OC**	**RR 12**		**OC**	**RR 15**		**OC**	**RR 10**	
3	ECR	Tel. No. 2000	**OC**	**RR 12**		**OC**	**RR 15**		**OC**	**RR 10**	
	Hospital	Tel. No. 1250	Tel No. **1238**			Tel. No. **1239**			Tel. No. **1240**		
4	Master	Tel. No. 3000	Tel No. **1238**	**RR 12**		Tel. No. **1239**	**RR 15**			**RR 10**	
5	Ch. Eng.	Tel No. 4000	Tel No. **1238**	**RR12**		Tel. No. **1239**	**RR 15**			**RR 10**	
6	Supt Cabin	Tel. No. 0001	Tel No. **1238**	**RR 12**		Tel. No. **1239**	**RR 15**		Tel. No. **1240**	**RR 10**	
	Day Shift Supt	Tel. No. 3456		Tel. No. **1237**		Tel. No. **1239**			Tel. No. **1240**		
	Night Shift Supt	Tel. No. 5678				Tel. No. **1239**			Tel. No. **1240**		
	Medic/Nurse	Tel. No. 6666 Pager 124		Tel. No. **1237**		Tel. No. **1239**	Tel. No. **1550**		Tel. No. **1240**	Tel. No. **1655**	
	Technicians	Pager 125									

Key:

Open communications link **OC**
Round Robin system and call number **RR 12**
VHF radio **VHF**
UHF radio **UHF**

Table 2 – Communications matrix: Bridge to dive control

15.3 Flowcharts

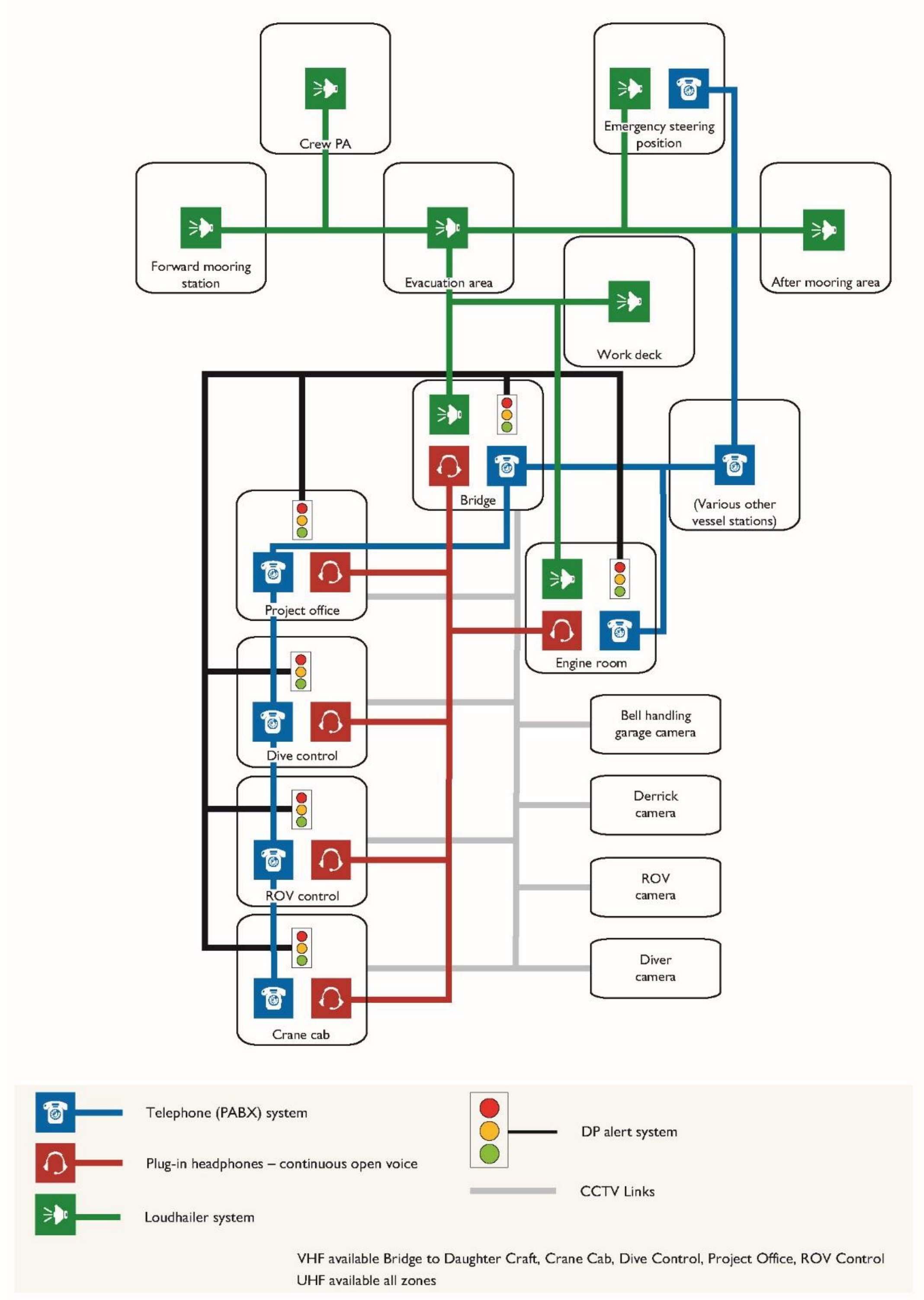

Figure 1 – Flowchart showing an example communications system

15.4 Stations Likely to be linked by Bridge/Dive Communication Systems

- bridge/DP;
- ECR;
- dive control/bell dive control;
- ROV launch/control;
- crane;
- work deck/riggers/deck crew;
- saturation chamber/control;
- cabins of crucial personnel;
- other vessels/platforms/units.

16 Equipment

16.1 Typical Communication Systems

- hard-wire;
- round robin;
- voice activated;
- VHF/UHF;
- ship telephone system;
- public address;
- alarm/warning/indicator lights and audio alarms;
- satellite phone;
- CCTV;
- back up separate power supply systems.

The vessel communications matrix should clearly set out all the available systems and be made conveniently available to system operators on the bridge and in the dive control stations.

17 Testing Communication Systems

Adequate time should be allocated for the testing of all communication systems likely to be used between bridge and dive control and any other units/vessels/small craft that are part of the operation.

Power availability, audibility and clarity should be checked, keeping in mind the likely ranges over which the radios will be used.

If portable units are being used, consider whether the batteries will be adequate for the intended period of use and check that the next set of batteries are charged or will be charged when required.

An entry should be made in the appropriate logbooks that the test has been made, what was tested and at what time.

Interference should be reduced as much as possible, such as by preventing equipment being used in the vicinity which might be unsuppressed, or which might create so much noise as to prevent messages being heard clearly, or by using different frequencies from radios being used in other operations in range.

Other points to be aware of are, for instance, that sometimes the proximity of structures or other vessels can affect radio links and this might not be apparent until a stage in the operations when the relative positions of vessels and other vessels or structures might change.

There may be other vessels arriving in radio range during operations.

18 Alarms – Bridge to Dive

Further to the notes at sections 5.4 and 5.5 and in the absence of specific guidelines concerning bridge to dive, and dive control panels, and bearing in mind the guidance in relation to DP alarms as set out in IMCA M 103 – *Guidelines for the design and operation of dynamically positioned vessels*, it would clearly be advantageous for alarms, warnings and indicators to comply with the requirements specified in existing individual standards for navigational systems and equipment; and with the recommended DP alarm system in general use.

As stated in section 5.5, clearly there is a difference between the yellow DP alarm, indicating a degraded operational status, with its associated required actions, and the 'active but not critical' yellow light status often used in bridge alarm systems and care is required to ensure that the two meanings are not confused. If dive control panels or slave panels are in close proximity to DP alarm panels, as is possible, it would be clearly desirable for there to be clear distinction between the alarm signals.

Personnel should be clear as to what they are expected to do when alarms are activated. Procedures for all alarm contingencies should be set out and become part of the risk assessment carried out prior to operations. Both bridge and dive control personnel need to be certain that there is no ambiguity in this respect.

19 Other Alarm Signals

In addition to the notes at section 5.6 relating to vessel alarms other than bridge/dive operations, the emergency status should be capable of being immediately transmitted to the divers. On a designated dive support vessel DP status lights should be displayed in dive control rooms and are often also displayed in saturation control, on deck and in the ROV control room. Yellow and red alerts are accompanied by audio alarms sounding in dive control rooms. Sometimes alarms also sound in the master's cabin, diving superintendent/senior supervisor's cabin, the crane operator's cabin and generally over the PA system. DP alerts are operated from the DP control room.

Members might find themselves working from a less sophisticated work site. If the dive supervisor is not working in a purpose-built dive control office, equipped with the vessel alarm bells, and/or is subject to other noise, for example from some work on deck, consideration should be given to the audibility of those signals to those who might be using earphones and communicating with divers.

20 Data Recording

In addition to the notes under section 6, a diving project can involve a number of personnel working in different disciplines. Each will have their own methods of recording the events that occur in the project, whether in electronic data in different sets of equipment, or in the bridge log or other logs.

To avoid confusion in communication, the time line that each discipline works under should be understood and agreement established as to which time is referred to when passing instructions. It is usual for bridge time to be used as this has to be constantly monitored for accuracy for navigational purposes and all others working on the dive support vessel will be governed by bridge time.

21 Personnel

Unauthorised personnel, or those not directly connected with an operation, should avoid dive control rooms and the bridge. These are both critical areas for dive control.

There can be large numbers of personnel involved in an operation and as the dive supervisor may have to be in contact with all of them in respect of different aspects of the task, this is an extremely important and pivotal communications role. Thus personnel not directly involved with an operation should not distract the dive supervisor except in an emergency; but if there is some need to communicate, it could be prudent to establish a link at an agreed lower level of the command chain.

Part C
COMMUNICATIONS IN LIFTING OPERATIONS

22 Introduction to Part C

Part C provides operational guidance for systems and methods of communications in lifting operations.

Please refer to Part A for basic communication guidance.

Reference should also be made to IMCA LR 006 – *Guidelines for lifting operations* – particularly in relation to all issues that affect communications.

The term 'lift supervisor' has been used in this document and is defined as the person who supervises the lift and the lifting team.

The term 'crane operator' is used throughout for simplicity, but for the purposes of this document it is meant to include any operator of lifting equipment controls.

22.1 Scope of Part C

To provide additional guidance on good communications practice in respect of lifting operations, on vessels working in the offshore industry.

23 Communications in Lifting Operations – General

Lifting operations involve human decisions and actions and good communication is the key to ensuring that personnel involved in the lifting operation work effectively and safely as a team.

23.1 Planning a Lift – Communications Aspects

A degree of preparation is needed for all lifting tasks and from the initial stages communications planning is an important part of that. Communications failures are a common root cause of lifting incidents, which fact highlights the importance of addressing communications issues at the risk assessment and planning stages and then again at the toolbox talk; and ensuring that clear communication through an operation is a prime focus of all in the lifting team.

24 Procedures

24.1 Toolbox Talk

The toolbox talk (see section 5.92 of IMCA LR 006 – *Guidelines for lifting operations*) is the prime opportunity for all those involved with the lifting operation to check the safety issues and ensure that communication is established between all concerned. The toolbox talk is itself a method of communication and a vital communications asset.

The following communications issues should be resolved at the toolbox talk:

- The talk should include all personnel involved or, if this is not practicable, each department should be represented;
- Have all affected parties been informed of the lifting activities?
- Are signs/barriers/audible warnings required?
- There have been occasions, after a lift has started, when it has been discovered that personnel included in an open communications loop have the same or similar name. To minimise the obvious opportunities for misunderstandings, personnel representing all the departments involved should attend the meeting, all personnel included in the communications loop identified; and where personnel have similar names, call signs or alternative names should be agreed;
- If members of the team do not share a common language, this needs to be identified at the toolbox talk to ensure that a sufficient level of understanding exists to proceed safely with the task (see section 24.8);
- Confirmation that relevant personnel agree on and understand all of the hand signals to be used (see section 25);
- Confirmation of the identity of the lift supervisor who will be in charge of the lift. The lift supervisor should be made easily identifiable by use of clearly distinctive clothing;
- If more than one lift supervisor is needed (to maintain visibility of the load), the way they will hand over control of the lift should be agreed at the toolbox talk, if it has not already been decided at the earlier planning stage;
- Reiteration that only one person – the lift supervisor – is in charge of the lifting operation. The lift supervisor should have no other duties for the duration of the lifting operation (see section 3.3 of IMCA LR 006);
- The lift supervisor's job should be the control of the load and will, therefore, have no reason to touch it or handle other equipment, leaving hands free for communication;
- Selection of the communication equipment to be used (see section 26);
- Confirmation that radios and headsets are in good working order;
- Personnel should be informed of the radio frequency channel to be used;
- Consideration of a secondary method of communications. What will happen if the principal method fails?
- Consider whether the communications methods are adequate for the operation;
- The communications protocol to be used should be described. That is, whether instructions will be issued continuously (with a default position of stopping if communications cease) and that there should be positive acknowledgement of communication by the receiving party;
- Personnel should be clear about what to do if the communications equipment fails or communication ceases unexpectedly (see section 24.4);

- Personnel should understand what to do if a communication is not clear;
- Personnel should know how to stop the job for safety reasons;
- Personnel should know the sequence of events;
- Personnel should know what other work is going on around them;
- Personnel should understand the management of change procedure;
- Personnel should know what to do in case the DP status light changes;
- What communications links are available for technical assistance?
- A signal such as a single blast on the crane's horn or ship's siren could be made to indicate the start of the lift, perhaps for significant lifts if not for every lifting operation. This signal should be known and understood by all involved and, if the ship's siren is used, should be subject to the bridge duty watchkeeper's consent;
- The method of lifting and how each part of the operation will be communicated within the team should be described;
- Arrangements should be made regarding change of shift (see section 24.9);
- Checklists are often helpful to key personnel, such as the lift supervisor and crane operator, especially for critical lifts. These checklists could be prepared on laminated boards. Note that checklists are meant as an aid, and may not necessarily be complete nor meant to be;
- Schematic diagrams can be used to identify the parties involved in the lift and their location. The communications methods available to all should be clearly displayed;
- It is useful to have such diagrams laminated so that names, extension numbers, etc. can be written on in chinagraph pencil. Sample schematic diagrams are described and shown for different lifting scenarios in section 28;
- Make arrangements for debriefing as soon as possible after the operation, to identify learning points, good practices and improvements.

24.2 Testing Communications Equipment

Communications equipment such as radios or headsets should have been issued at the start of the shift and tested at that time. Testing usually takes the form of a call to another person who will provide confirmation that the equipment is working.

By the time the toolbox talk or pre-task meeting occurs (subsequently referred to as the toolbox talk) all communications equipment should have been tested. At the toolbox talk, testing should be confirmed by the equipment user.

24.2.1 Selecting a Radio Frequency Channel

If possible, identify a channel that will only be used by the team involved in the lift. This will help avoid cross-talk from other personnel nearby, ships in the vicinity, cranes on other operations, etc. Cross-talk can be disruptive to the whole team and can jeopardise safety.

A good time to establish and/or confirm the channel is when personnel are gathered together for the toolbox talk. Alternatively, channel selection can be decided beforehand as part of the lifting risk assessment, but reiterated at the toolbox talk.

Depending on the location of the lift, there might already be established radio channels in use by, for example, subsea operations, cranes, drill floor, mechanics and maintenance departments. On a job that requires personnel from various departments to come together, the working channel needs to be agreed.

Some maritime industry operators use radios with built-in crystal encoding to maintain a secure channel. These radios can be highly beneficial in providing effective communications, particularly if they are integrally strong, rugged and, where appropriate, intrinsically safe.

If it is not possible to use a unique channel, use of call signs for each crane, winch or lifting team member as required, will assist in identifying caller and receiver. The call sign should precede any radio communication to avoid confusion.

24.2.2 SIMOPS

Where simultaneous operations (SIMOPS) are involved, it is essential to focus on communication issues and reference should also be made to IMCA M 203 – *Guidance on simultaneous operations (SIMOPS)* – which covers communication issues specific to SIMOPS; also IMCA LR 006 – *Guidelines for lifting operations* – which will advise of the likely complications of lifting operations and where focus on communications is specifically necessary.

24.3 Maintaining Communications Protocols and Good Practice

As a job proceeds it is natural for an individual's sensitivity to risk to diminish, potentially because of familiarity and the knowledge that a job is going according to plan.

Be aware of the danger of:

- shortcuts in protocol threatening to disrupt procedures, especially after an hour or two of a lifting operation starting;
- assumptions being made instead of clear instructions and responses.

Reliance on assumptions such as 'personnel always make the correct decisions and take the correct actions' or that 'communications equipment works unfailingly' raises the level of risk in lifting operations. Several serious incidents could have been prevented if personnel had verified assumed situations and communicated adequately with colleagues before taking some action.

Maintaining established protocols and procedures is a key factor in avoiding incidents. Elements identified in many accidents are as a result of when:

- personnel, perhaps whilst trying to be helpful but without having full awareness of the situation, instigate an action which results in an incident;
- personnel carry out actions outside their planned area of control or responsibility.

Personnel should also not be distracted from the lifting operation by mobile telephones or other devices which are not part of the agreed communications procedure.

All involved in the operation should keep within the conformed appointed roles, responsibilities and communication protocols.

Continuous communications should be maintained during lifting operations; see the next sub-section.

24.4 Maintaining Continuous Communication

Communication from the lift supervisor to a crane operator should be continuous (see next paragraph), particularly during blind lifts. Should communications cease, the lift should stop.

'Continuous' communications are recommended to be at transmission intervals of a few seconds, ideally not more than 10 or 15 seconds.

Any person using the radio should avoid keeping the transmission button pressed for unnecessarily long periods and potentially blocking other transmissions. The radio might be the only quick way for contact between vital lifting team members.

Lifting should stop if there is an interruption to communication, for example if a third party breaks into the frequency in use.

24.5 Acknowledgement and Understanding

Good practice indicates that communications should be positively acknowledged. Traditionally some companies have required that the acknowledgement take a slightly different form of words to show that the instruction has been comprehended and to expose any ambiguity. For example, if 'lower two metres' is said, the response should be along the lines of 'lowering by two metres now' rather than a simple echo of the first statement.

Distraction is a risk factor. Accordingly, communication should be clear and limited to what the crane operator has to do.

Discussion or explanation as to why the lift is being conducted in a certain way should be held at the risk identification stage, or the toolbox talk, but not continued when the lift is underway. If there is a need to discuss any aspect of the lift then a stop should be called and the issue dealt with.

Fatigue will affect understanding and co-ordination and should be guarded against.

24.6 Completion of Each Crane Motion

The lift supervisor should, when practical, inform the crane operator that one activity (slewing, lowering, etc.) is to stop before commencing with the next activity. This will help the crane operator to maintain control during the lift.

24.7 Assistance from the Crane Operator

The crane operator has several sources of information available about the status of the load. He is, therefore, in a good position to provide an early warning to the team if there is a discrepancy between the instructions issued to him and his understanding of the lifting situation. Such communications should, whenever possible, be routed primarily to the lift supervisor.

The crane operator might have access to the following instrumentation communicating the state of the lift:

- Line out meter – this indicates the length of wire rope out and can also give an indication of the weight of the load suspended, if the meter has been appropriately calibrated. Deep water operations using wire ropes can result in there being a significant weight suspended simply as a result of the length of wire rope deployed. The amount of load shown on the meter can also give an approximation of the depth to check against the line out reading;

- CCTV camera trained on the rope drum(s) – this allows the crane operator to see how much line is available and, therefore, how much flexibility the lift supervisor has in lowering an item;
- CCTV camera on the crane boom.

There is a potential risk in delegating responsibility to the crane operator to indicate, for example, when the load reaches the desired depth, despite whatever instrumentation is available to him, as the primary focus of his attention should be the lift supervisor. Cameras and instrumentation can be used as an aid, but only the lift supervisor should be in charge of the lift.

24.8 Common Language

It is highly recommended that key personnel – for example lift supervisor, crane operators, chief rigger, dive supervisor – are able to communicate fluently in a common language.

An inability of one or more of the lifting team to communicate fluently can lead to misunderstandings and increase the risk of human error. It has been the cause of incidents.

In emergency situations people can quickly revert to their own language, indicating the necessity for individuals to be able to speak coherently and competently in what might be a second language when other mental demands are high.

As indicated in section 10 of Part A, the international maritime language is English and – wherever is practical – it is recommended that English be the language of choice in lifting operations. Refer to Part A for guidance generally and particularly section 10 regarding communications phrases and protocol.

Where lifting teams are involved from two separate entities, such as in ship to platform, ship to shore or ship to ship operations, it is even more likely that a lack of common language could be a problem, so planning should include agreed signalling methods that will avoid misunderstandings.

24.9 Shift Change

Lifting teams need to ensure safe handover at changes of shift. Communication is vital between the duty team and the relief team. Adequate briefing, including all toolbox talks and liaison with all relevant parties, needs to be thorough and this requires good communications procedures and skills from all concerned.

24.10 Debriefing

'Communication' includes feedback from the lift team after the operation and provision should be made for this in operational procedures. The intention of the debriefing is to note any faults, possible improvements to current practice and obtain lessons learnt for the benefit of future operations. Such lessons learnt should be communicated to other lifting teams. Companies can also share such experiences through IMCA, through safety flashes or by contacting the IMCA Lifting & Rigging core committee.

24.11 Communications Diagrams

Communications diagrams provide a quick reference and overview of the communications system. They can be used for planning; as links between different areas can be seen at a glance and back-up means of communication can be easily seen. Such visual representation can aid understanding and is useful for new personnel or anyone unfamiliar with the communications arrangements.

Communications diagrams should be displayed at all principal communications hubs, such as the bridge, dive control room, ROV control as appropriate. If the cards are laminated, space could be included for details of names and extension numbers, as mentioned in the bullet points near the end of section 24.1.

Examples of communications system diagrams can be found in section 28.

25 Hand Signals

25.1 Standardised Hand Signals

There is a range of different hand signals used internationally, often standardised by countries or by companies, but it is unlikely that they will be standardised globally into one system within the near future. It is therefore very important that those involved know exactly which system of signals is to be used in an operation and that they are familiar with each individual hand signal in the system to be used.

For example if it is known that the vessel will be working in Australian waters a particular set of signals may be agreed upon with all concerned. If the vessel is working in Norwegian or United States waters different signals may be appropriate. As there are such close similarities between many sets of signals it is imperative that careful study is made and personnel practised in the use of the agreed set to be used. Special note should be taken of hand signals from different areas which have different meanings, sometimes opposite to that expected; and lifting teams should be alerted to those differences.

Whatever hand signals are to be used should be displayed, for example inside the crane cab, around the operational area, mess rooms and so on. Companies are encouraged to produce laminated copies of the standardised hand signals to be used and provide easy access to them. When moving to a different operational area care must be taken to ensure the relevant set of signals are displayed and that lifting teams understand the system of signals to be used.

25.2 Using Hand Signals

Personnel using hand signals should ensure that they:

- know the set of signals agreed;
- use the signals correctly;
- use the signals confidently and clearly;
- face the crane operator whenever possible when signalling.

There should always be a line of sight between the lift supervisor and the crane operator – operations should be halted if visual contact is lost and there is no agreed arrangement for communication by other means, such as through a second signaller or by radio.

25.3 Man-Riding Hand Signals

Pre-lift planning and toolbox talks should clearly set out signalling and all relevant operational details for any man-riding lifting operation.

A number of injuries occur in man-riding operations because the person being lifted has not been ready. Lifting should not commence until the individual being lifted has clearly signalled, by a pre-planned method, confirmed at the toolbox talk, that he or she is ready.

25.3.1 Personnel Transfer Lifts

Where personnel transfer lifts are done, for example by a crane from a platform, lifting personnel to and from the deck of a vessel, then prior to transfer, there should be clear understanding of communication and signalling methods to be used between the vessel and the crane and the personnel being transferred.

25.4 Hand Signals versus Hand-Held Radios

There are advantages and disadvantages to using hand signals rather than radios as the primary means of communicating between the deck or quay and a crane operator. The advantages of hand signals over radios are that:

- hand signals rely less on knowledge of the local language (though key personnel do require competency in the same language, as mentioned in section 24.8);
- equipment breakdowns or cross-talk from others on the same channel are avoided when hand signals are used;
- there is likely to be less room for ambiguity in hand signals, provided that both parties understand the same signalling protocol. For example, the radio message 'stop' might be interpreted by anyone listening as a call for all to stop. The message 'Can you lower another twenty feet?' might be interpreted as a question rather than an instruction (see Part A section 10 for correct ways of phrasing communications);
- hand signals should avoid problems caused by radio transmission failures, especially when the sender or the person receiving has not realised that there is a failure.

Radios offer these advantages over hand signals:

- hand signals rely on knowledge and experience of the system used;
- blind lifts are made possible with radios;
- the operation can, if agreed in the lift plan, continue if the line of sight between the crane operator and the lift supervisor is temporarily lost, so long as continual communication is maintained;
- lifts where one lift supervisor hands over to another in a different location are easier when radios are used;
- the crane operator does not need to keep the lift supervisor in sight all of the time and can refer to CCTV or instrumentation within the cab so long as voice communication is maintained;
- the radio gives the crane operator a facility for responding to the lift supervisor or others;
- the lift supervisor might not be in the same line of sight as the load, perhaps in order to avoid being too close to it – and radio allows the crane operator to look at what is most important for the operation;
- radio would be a better means of communicating if a lift is unexpectedly affected by heavy rain or failing light where hand signals become less obvious;
- radio offers more flexibility in communication than hand signals.

25.5 Non-Recommended Methods of Signalling

In some ports around the world, whistles are blown by lift supervisors as a way of giving instructions to the crane driver, sometimes in conjunction with a limited range of hand signals. This method of communication is not recommended, as it is likely to lead to ambiguity if the crane operator becomes unsure of the number of whistle blasts heard, either because of other sounds occurring at the same time, or if he was distracted or even if there was a change of wind direction or force. There would be several opportunities for confusion if there were more than one lifting operation being undertaken in the vicinity in which whistles were used for communicating.

When pressing the transmission button on a radio, there is an audible click which can be heard on some equipment by others on the same channel. It has been known for a click language to develop, where two clicks for example means 'It is clear or safe'. This practice should not be used. Double clicking (or other patterns involving clicks and pauses) could occur by accident and there might not be enough time to correct the mistake if the crane operator is waiting for a confirmatory message before manoeuvring.

Communicating using codes instead of voice or hand signals is not recommended: it is non-standardised and prone to misinterpretation by the receiver.

26 Equipment

26.1 Typical Levels of Redundancy in Lifting Communications

Some forms of communication equipment are preferred to others because of their usability, convenience and fitness for purpose. In addition to alarm/warning/indicator lights and audio alarms and CCTV (see section 27); the hierarchy tends to follow this order:

1) Radio, or the nearest means to hand for convenience;
2) 'Squawk box' – a hard-wired system with a loudspeaker connected to an intercom system. Different locations are connected by selecting the appropriate number, such as 1 for bridge, 2 for project office, etc. If this system can link several communication stations simultaneously it might be referred to as a 'round robin' system;
3) Conventional or wireless telephone;
4) Sound-powered telephone (requires use of a crank handle). These telephones require the use of both hands and are becoming less common.

Consideration should be given to availability of uninterruptible power supply (UPS) to communications systems and procedures organised to deal with any breakdown of power supplies to communications.

26.2 All-Stop Emergency Buttons

Some vessels and quayside areas are fitted with emergency buttons that cause a klaxon to sound when activated. The klaxon means that all lifting activities should stop. Where this system is fitted, personnel on-site need to know what the sound means. The benefits of this system are that any individual, whether or not they have access to other communications equipment, can quickly bring a halt to operations.

26.3 DP Alert Status Signals

A vessel might have signals displaying its DP alert status. The lifting team should understand the relevant signals and know what action is required when they are displayed.

26.4 Open Microphone Systems and Background Noise

The performance of open microphone systems is often diminished because of background noise. During complex situations, and in particular in an emergency, it is likely that background noise will be greater than normal. Headsets can be useful where open communications systems are used to avoid background noise, but the advantage needs to be set off against possibly losing important sounds local to the wearer.

26.5 Selecting Hand-Held Radios

End user input to the selection of equipment is very important in ensuring fitness for purpose. Ideally, equipment should be trialled before committing to purchasing all of the units that will be needed. Radios that do not function well in wet weather, or are prone to breaking if knocked or dropped, should not be selected.

Aspects to consider when trialling hand held equipment would include:

- reliability in all conditions in which the radio will be used;

- equipment to be intrinsically safe if required, for example where hydrocarbon gas may be present;
- ease of use when wearing gloves or when the user's hands are cold;
- consideration of size and weight;
- durability or ruggedness in the relevant operational environment;
- clarity and service range of radio equipment;
- any special types that might be required for use below decks;
- effects of transmission output on sensitive or critical electronic equipment (see part A, section 8), for example divers' communications, gas analyser alarms, computerised control systems and instrumentation.

26.6 Protecting the Hand-Held Radio

Radios should be carried in a holster designed for the purpose or worn on a lanyard or belt. It is not good practice to carry a radio in a pocket because it could fall out, for example when climbing a ladder or getting through a manhole.

Care should be taken that the microphone is not exposed to rain. So long as it does not impede the clarity of voice, cling film or a tightly fitted clear plastic bag can be used to protect the radio.

26.7 Selection of Headsets and Integrated Personal Communications Systems

Comfort and usability should be tested carefully before headsets are purchased. If headsets are uncomfortable to wear or not felt to be performing well, personnel will generally find a way around having to use them; or wear them incorrectly.

Communications systems that integrate with a hard hat and hearing defenders can be useful. Points to watch out for are comfort over the duration of a shift and technical performance. Usually a degree of background noise will leak in with these systems. The integrity of the hearing defenders, if worn, to dampen potentially harmful noise should be investigated carefully – see section 26.4 regarding the need to hear some local sounds.

26.8 Open Communications Channels and Crane Operators

It is not recommended that open communications channels be used routinely in a crane cab. This is because the flow of communication can easily become distracting. There is a limited amount of attention that can be paid to several competing sources of information and eventually the individual must 'time slice' – that is, concentrate for short periods of time on one thing to the exclusion of others. A common example of this in leisure time is turning off a radio programme in order to concentrate on a personal conversation.

There are operations when open links can be helpful, however, such as where two cranes are used in the lift, when a 'round robin' communications system can be useful. That is, a system whereby two or more stations can be linked and its open microphone/speaker used at each station. In this way both crane operators and the lift supervisor(s) can maintain awareness of the activities of their counterparts.

Typically the crane operator will transmit by pressing a foot pedal. Voice-activated radio is sometimes used but carries with it the problem of inadvertent operation. On balance, use of a foot pedal to control the radio rather than have a voice-activated system is probably better.

26.9 Built-In Communications Circuits

New vessels increasingly have communications circuits built in. These provide a ready-made matrix for different scenarios. The person in charge of the lifting operation can select the appropriate private automatic branch exchange (PABX) to include the relevant areas: dive control communications, crane communications, etc.

The PABX approach is generally superior to an open communications circuit that goes to all areas, because there is less opportunity for confusion as only those involved are included.

27 Human–Machine Interaction

As new communication equipment and technologies become available, they are often adopted in support of lifting operations. Care needs to be taken that the equipment matches operator requirements and abilities, bearing in mind that it is possible to overload the individual with information. The placement of transmission and receiving units, alarms and displays influences the extent to which equipment helps or hinders performance. This is especially significant if there are several modifications to the control, communication and other instrument panel areas.

End user requirements should be implemented in the design of new vessels, cranes and facilities in order that integrated communications circuits work well.

27.1 Audible Equipment and Alarms

Within the crane cab, the operator might have instrumentation and communications equipment that incorporates audible alerts and warnings. Where fitted in the cab, safety-critical alerts should be clearly distinguishable from operational alerts.

The facility to provide personnel with access to several communications circuits might exist, providing ready access to communications for key personnel and ensuring sufficient levels of equipment redundancy. But care should be taken that an individual does not have to monitor too many radios, telephones and display panels.

27.2 Displays

CCTV monitors provided in the crane cab should be used by the crane operator for guidance only, but he should not use them to decide how to proceed with the lift, because this is the role of the lift supervisor. The crane operator can inform the lift supervisor what he sees, but the lift supervisor should make the necessary decision.

A CCTV monitor should be placed in such a way that the crane operator does not have to significantly twist his body or neck to see it. However, it is a secondary aid to operating the crane, so it should not be placed in a 'prime' position such that it makes the operator routinely adopt an awkward posture to look past it.

28 Types of Lifting Operation

There are a number of maritime operational environments in which lifting can take place and, within those environments, several types of lifting machinery can be employed. Communications requirements will depend on factors such as whether the lift stays above the waterline or has a subsea component, the presence of divers, availability of lines of sight between the lift supervisor and crane operator and whether the vessel is under DP control.

28.1 Quayside Lifting

A lot of lifting related incidents, some of them major, occur while ships are safely berthed alongside in harbour. This might be because perception of risk is lower given that the ship is safely berthed. There might also be perceived pressure to hurry the job, which makes mistakes more likely. The deck crew and shore personnel might not have worked with one another before, or very often, which can increase the possibility of miscommunication.

If the pick-up and lay-down areas are not within the control of one lift supervisor there should be two lift supervisors, whose areas of control and hand-over should be clearly identified. Special attention at the planning stage should be paid to the way in which responsibility will be handed over from one to the other. Hand-held radios have the advantage over hand signals for communicating the hand-over of responsibility to all concerned.

28.2 On the Deck at Sea

Non-involved personnel should be kept clear of the pick-up and lay-down areas and, unless adequately shielded by the vessel structure, should be cleared from the area over which the load will pass.

It is good practice to issue a warning across the vessel public address system prior to commencing the lifting operation. The warning should describe the planned lift and its likely duration.

A crane horn, ship's siren or public address system can also be used to warn personnel immediately prior to the lift (see toolbox talk section 24.1), subject to the bridge duty officer's consent if using the ship's siren.

Should part of the lift be blind from the point of view of the lift supervisor, it might be necessary to have more than one lift supervisor to ensure line of sight to the load is maintained. Where hand signals are used, the second lift supervisor might signal to the first so that the first can then give instructions to the crane operator. Such hand-over procedures and signals should be identified, clearly understood and addressed at the toolbox talk.

If at some part of the lift path it is difficult to discern the lift from its background, it might be possible to make it more visible by use of colour contrast, for example by covering either the lift or the relevant part of the superstructure with a plastic sheet of a different colour to the lift.

28.3 Subsea Lifting or Lowering

The lift supervisor is defined for the purposes of this guidance as the person who is charged with actively supervising the lifting operation on site. This could be a deck officer, diving supervisor, deck foreman, shift supervisor or similar.

For diving operations, the diving supervisor may often also act as the lift supervisor and make use of the video images broadcast from the divers and ROV to keep a watch over the lift. Only one person at a time should act as lift supervisor. Arrangements should be made to ensure smooth transfer of responsibility from a deck lift supervisor to a diving lift supervisor (or vice versa), usually when the lift is in the area of the splash zone (see section 28.3.1). The transfer of responsibility should be defined beforehand (during the toolbox talk) and, during operations, positively acknowledged.

To help indicate depth, a beacon fitted to the object lifted is sometimes used. It sends a signal to a receiver on the bridge indicating the depth of the object.

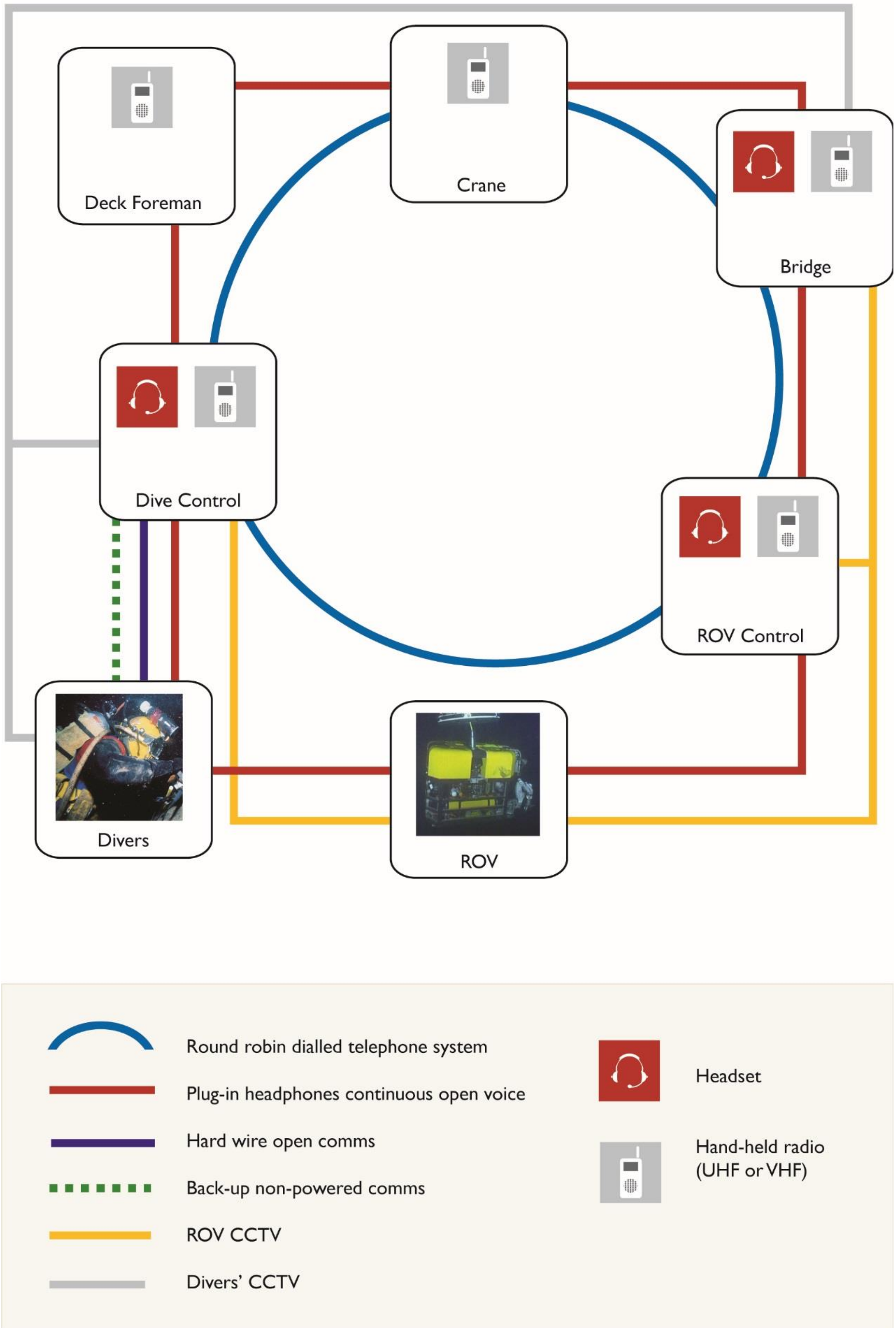

Figure 2 – Subsea lifting: Possible schematic communications diagram

The divers will have hard-wired communications. In these instances that means a continuous open voice to dive control via the umbilical line. Inside a closed diving bell divers will also have access to sound-powered through-water communications for use as a back-up.

The continuous open voice communications will mean that any voice communication will be heard by all parties connected to the system. Adoption of professional standards of voice communication is particularly important when using open communications because of the potential for distraction and error.

As shown in Figure 2, the video images from the ROV and divers will normally be sent to the bridge.

Where an ROV is used, within dive control, it is possible that the view from the ROV and from the divers is shown on the same monitor, with a toggle switch to select between these sources. Clear labelling is required to indicate whether the view shown is from a diver or ROV, to ensure that the relative positions of the divers, ROV, load and slings are understood.

28.3.1 The Splash Zone

A technique sometimes adopted during lowering is to stop the load once it is through the splash zone and submerged. This provides an opportunity for the load, lifting system and slings to settle and for the team to re-assess the plan once the load is in the water. During this period, it is usual for the responsibility for guiding the load to pass from the lift supervisor on deck to the diving supervisor.

28.3.2 ROV Operations

As a simple way of describing communications in an ROV operation an example is shown below.

28.3.2.1 Example of ROV Operational Communications

The schematic communications diagram in Figure 3 shows an alternative team make-up for lifting an item from the seabed. Divers are not involved in the example shown but the shift supervisor would be part of the lifting team.

Load handlers are also shown. Normally load handlers would not be issued with a radio unless verbal contact with the deck foreman was expected to be compromised or lines of sight would be obscured. Only the chief load handler (or chief rigger, chief slinger) would generally need to be issued with a radio.

In this example, the lift supervisor (in this case the deck foreman) would communicate with the crane operator (and possibly the chief load handler) on one radio channel and switch channels to communicate with the bridge. In an emergency, and when not on the bridge channel, the lift supervisor and crane operator would be alerted using a Tannoy from the bridge or via hard-wired telephone to the crane.

The lift supervisor may move around and to maintain situational awareness might go into the ROV control room or on to the bridge to obtain a perspective of the job from there or to influence the positioning of the vessel. The shift supervisor is also mobile and will be able to use a hard-wired telephone connection to the bridge or a hand-held radio. The shift supervisor will maintain an overview of the lifting operation and provides input to the operation as appropriate.

The 'round robin' dialled system (see section 4526.1 **Error! Reference source not found.**) shown in the diagram may be used when there is a need for information to be passed to several personnel at once.

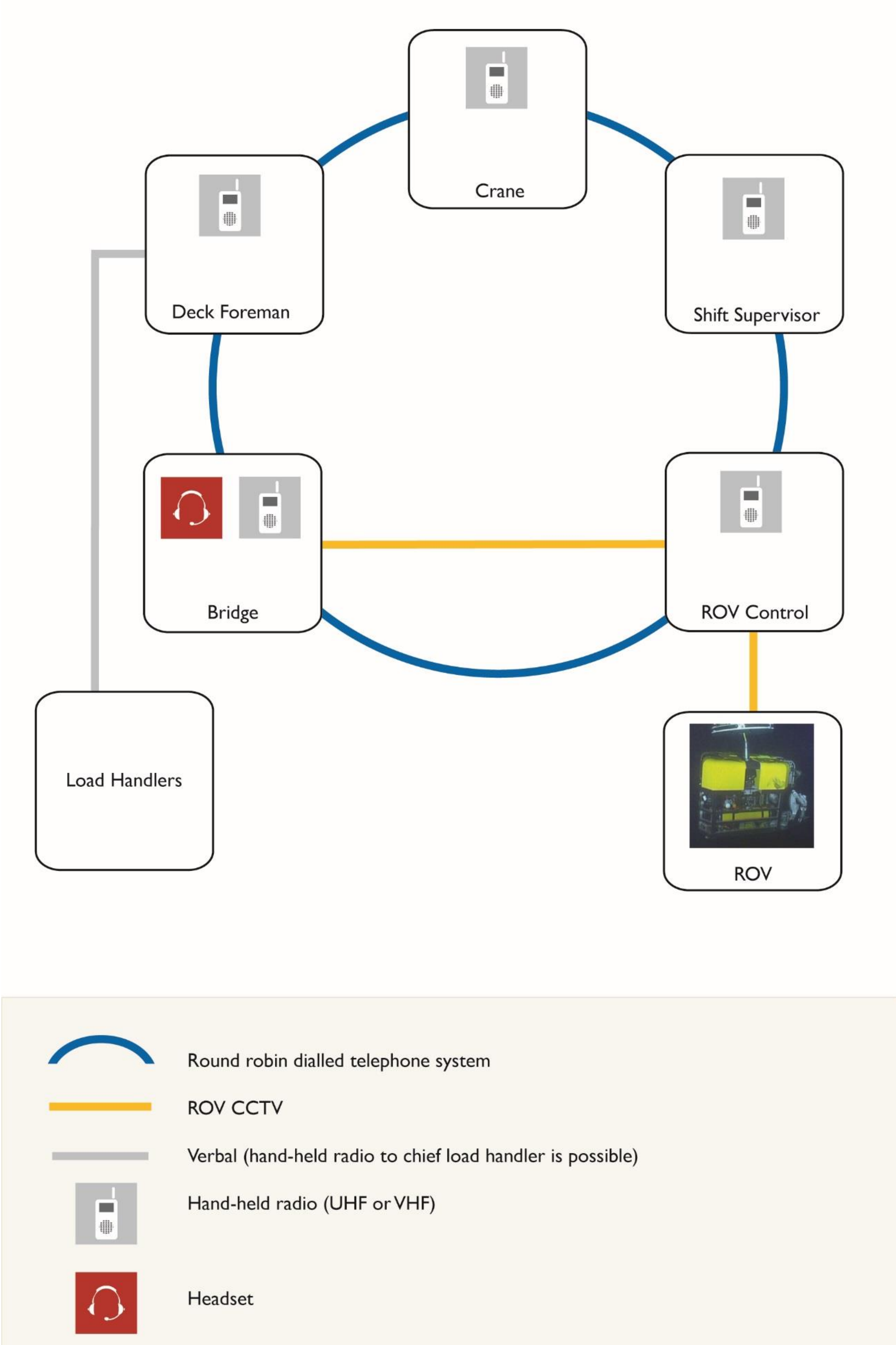

Figure 3 – Subsea lifting: Possible schematic communications diagram

28.4 Lifting Between Platform and Ship

The lift supervisor should maintain communications between the vessel and platform crane.

Lifts between vessel and platform are known to be hazardous and a standardised approach to language and hand signals is important in reducing the risk of accidents. Instructions, signalling and radio channels should be agreed beforehand. Positive confirmation of instructions is advised because of the risks involved in the task and the potential language barrier.

With the pick-up and lay-down areas being separate, there might be a requirement for two lift supervisors (one for the vessel and one for the platform). Only one person should be in control at one time, so transfer of responsibility should be handled carefully and the transfer positively confirmed.

28.5 Ship to Ship

Usually radio is used to communicate between vessels.

Ship to ship transfer of lifts at sea may sometimes be unavoidable, although this is usually as a last resort when there is no other option than to carry out the transfer by a direct ship to ship process. That is, for example, when it is not practical to transfer to a platform and then to the other ship.

In such cases there should be a risk assessment to establish whether it would be safe and practical to make a ship to ship transfer, in which such aspects as environmental conditions, vessels' relative sizes, DP class, operational restrictions and distances off would be discussed by radio. If in a field, then permission would need to be obtained by radio from the field controller. Procedures for simultaneous operations (SIMOPS) and permits to work (PTWs) would need to be agreed and all necessary pre-planning discussed on air before a toolbox talk could be carried out.

The communications aspects discussed should include the establishment of how personnel involved would communicate, by which radios and on which channels and how communications would be used to deal with issues such as management of change, for example a change in sea or weather conditions.

With the pick-up and lay-down areas on different vessels, the handover of responsibility from the lift supervisor on one ship to the lift supervisor on the other for the lift should be agreed beforehand. This could need careful planning; for example if the respective sizes, construction and relative movement of the vessels prevented clear lines of sight from each vessel's lift supervisor positions.

During operations handover of lift supervisor responsibility should be positively communicated.

28.6 Launch and Recovery of Small Craft

Failure of communication is one of the most significant risks that can cause injury to personnel or damage to equipment, along with pendulum or rotational movement of the craft during lifting or lowering operations. Use of hands-free radio on a dedicated channel is recommended to maintain communications between the crane operator and the small craft. Both visual and radio communication are required between these parties.

28.7 Drilling Operations Involving a Crane

The communications links shown in Figure 4 might be used in operations such as running the blowout preventers (BOP) down.

The drill operator is generally 'in charge' of communications during this type of operation. That is, the driller will be the first point of contact before operational decisions are made and he should be kept informed of the status of the lift.

Hard-wired systems such as the 'round robin' (see section 26.1 **Error! Reference source not found.**) telephones are usually used, except between the lift supervisor and crane where hand signals or radio are normally used. Communications to the crane operator should be continuous while the crane is in motion. The drill operator, unable to see through the rotary, should also be directed with continuous communications with a default position of halting if communication is broken.

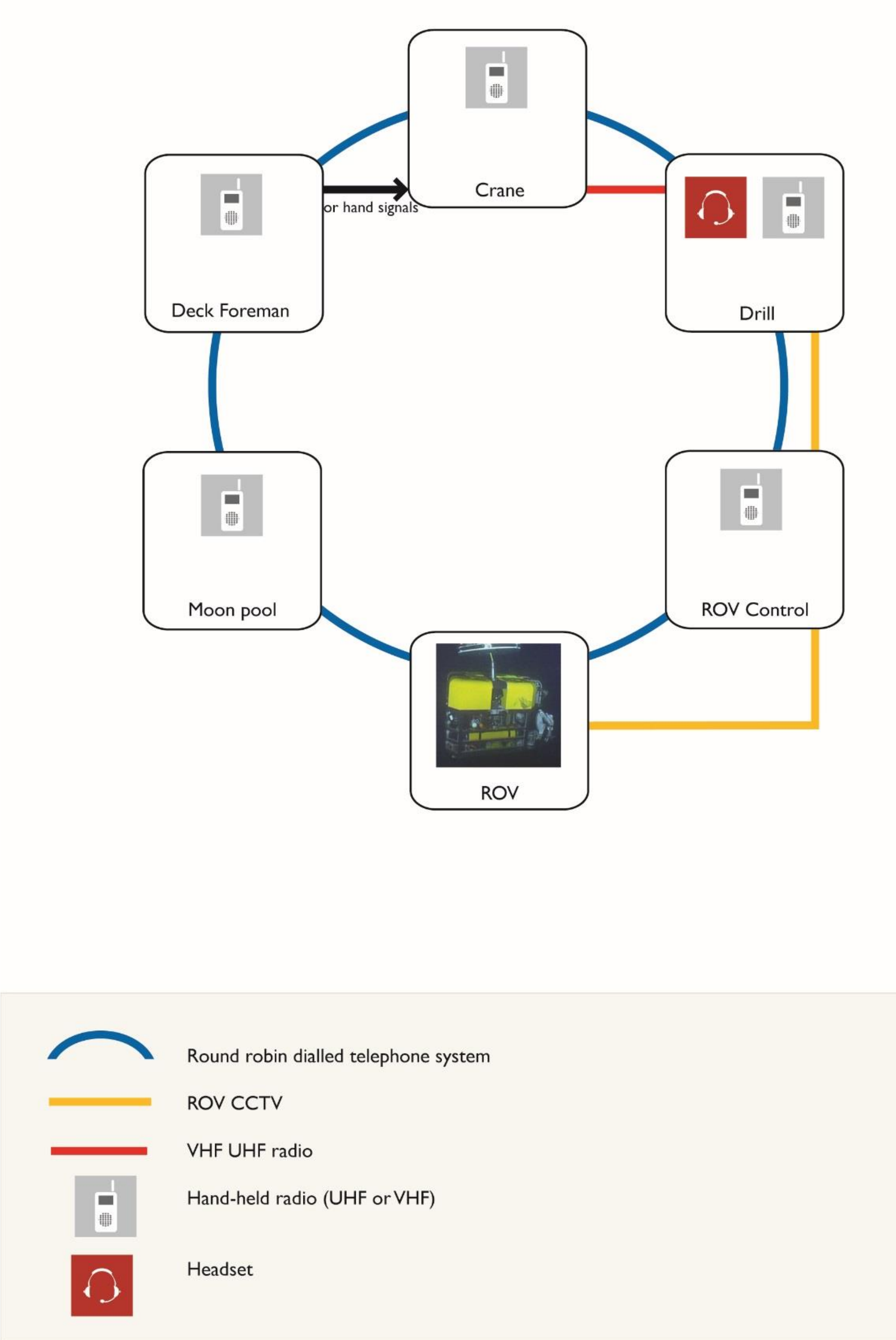

Figure 4 – Drilling operations: Possible schematic communications diagram

If the hard-wired system fails, hand held radios should be used as a back-up. It is possible that radios would not be issued routinely and would have to be handed out if the primary system failed.

In this example, as the riser travels down through the rotary, the driller would be in contact with the subsea engineer in the moon pool via the 'round robin' telephone.

The ROV would be used later in the process, such as when landing the BOP; there is usually some communication between the driller and the ROV operator to place the ROV in the best position. The subsea engineer in the moon pool would liaise with the drill operator about this stage of the operation before instructing the ROV operator. There might be an assistant drill operator present in the ROV control room to help with communication between the drill operator, client and ROV personnel. IMCA D 054/IMCA R 020 – *Remotely operated vehicle intervention during diving operations* – and IMCA R 004 – *Guidance for the safe operation of remotely operated vehicles* – for further guidance.

28.8 Subsea Well Intervention and Pumping Operation

A further example of a possible schematic communication is shown in Figure 5, where a subsea well intervention and pumping operation is anticipated.

It is usually helpful to use such diagrams to aid personnel in fully understanding the communication possibilities.

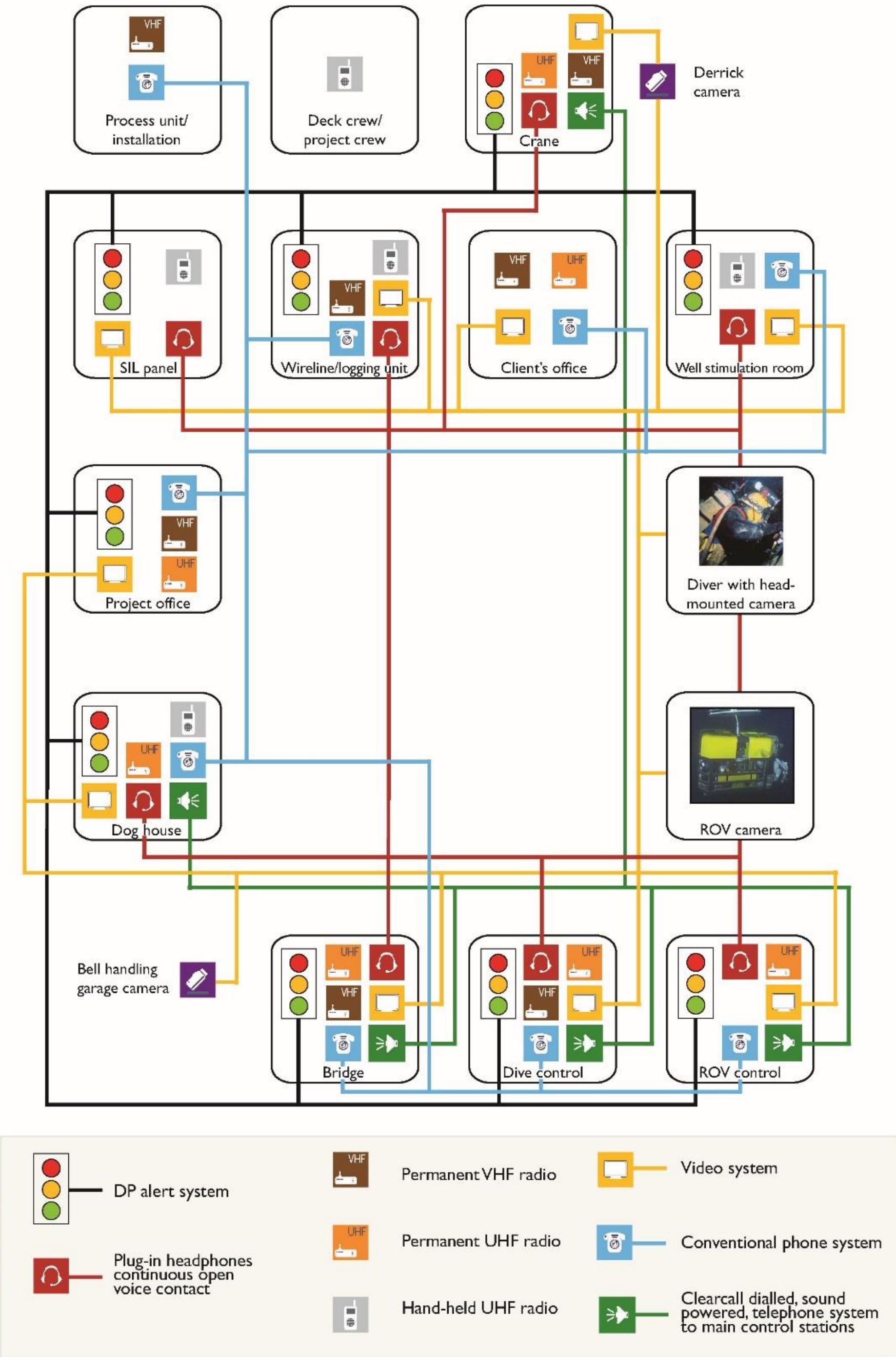

Figure 5 – Subsea well intervention and pumping operation: Example communications diagram

29 References and Further Reading

IMCA D 014 – *IMCA International code of practice for offshore diving*

IMCA D 022 – *Guidance for diving supervisors*, Chapter 5 Communications

IMCA D 023 – *DESIGN for surface orientated (air) diving systems*

IMCA D 024 – *DESIGN for saturation (bell) diving systems*

IMCA D 037 – *DESIGN for surface supplied mixed gas diving systems*

IMCA D 040 – *DESIGN for mobile/portable surface supplied systems*

IMCA D 054/IMCA R 020 – *Remotely operated vehicle intervention during diving operations*

IMCA M 103 – *Guidelines for the design and operation of dynamically positioned vessels*

182 MSF – *International guidelines for the safe operation of dynamically positioned offshore supply vessels*

IMCA M 203 – *Guidance on simultaneous operations (SIMOPS)*

IMCA R 004 – *Guidance for the safe and efficient operation of remotely operated vehicles*

IMCA LR 006 – *Guidelines for lifting operations*

IMO – *Convention on the International Regulations for Preventing Collisions at Sea* (COLREGs)

IMO – *International Code of Signals*

IMO – *GMDSS Manual*

IMO – *Standard Marine Communication Phrases* (SMCP)

IMO Resolution A.1021(26) – *Code on Alerts and Indicators*, December 2009

IMO MSC/Circular 891 – *Guidelines for the on-board use and application of computers*, December 1998