Mobile/Portable/Daughtercraft Surface Supplied Systems

International Marine Contractors Association

www.imca-int.com

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The International Marine Contractors Association (IMCA) is the international trade association representing offshore, marine and underwater engineering companies.

IMCA promotes improvements in quality, health, safety, environmental and technical standards through the publication of information notes, codes of practice and by other appropriate means.

Members are self-regulating through the adoption of IMCA guidelines as appropriate. They commit to act as responsible members by following relevant guidelines and being willing to be audited against compliance with them by their clients.

There are two core activities that relate to all members:

- Competence & Training
- Safety, Environment & Legislation

The Association is organised through four distinct divisions, each covering a specific area of members' interests: Diving, Marine, Offshore Survey, Remote Systems & ROV.

There are also five regional sections which facilitate work on issues affecting members in their local geographic area – Asia-Pacific, Central & North America, Europe & Africa, Middle East & India and South America.

IMCA D 015 was originally published in 1998 and dealt specifically with small systems which are commonly referred to as SCUBA replacement. The text has now been extensively updated to reflect the wide variations in the capability of mobile/portable/daughtercraft surface supplied systems and also includes a new section on operational considerations.

IMCA D 015 Rev. 1

www.imca-int.com/diving

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1 Introduction

A mobile/portable/daughtercraft surface supplied system, can, in certain circumstances, be used in place of a complete conventional surface supplied diving system where access for a full system is restricted or not possible.

Mobile/portable/daughtercraft systems vary considerably in their capabilities.

At the simplest they comprise three cylinders of breathing air mounted in a frame with a small control panel and umbilicals which can be placed in an inflatable boat, typically to carry out a single dive, or may be used on a large barge or platform to allow diving from a location remote from the main diving area. This type of system is commonly referred to as SCUBA replacement and has the advantage of being readily portable, thus offering greater flexibility during the diving operation, but is limited in the supply of breathing air available.

At the other extreme they can be quite large, custom designed, daughtercraft with the ability to have two divers working in the water at the same time and to carry out several dives before needing to return to the mothercraft for replenishment.

When this technique is being used with diving from a small vessel (inflatable or larger daughtercraft) then there will always be a support vessel (known as the mothercraft) in the vicinity carrying all necessary extra diving support equipment and fitted with a suitable handling system for the safe launch and recovery of the small vessel. In some circumstances the support vessel may be replaced by a fixed installation carrying all the necessary extra diving support equipment and handling system.

2 Scope

This guidance sets out what is generally regarded in the industry as good safe practice when diving using such equipment. The guidance is not mandatory and persons may adopt a different standard in a particular situation where to do so would maintain an equivalent level of safety.

It is not intended that such equipment be used as a substitute for a complete surface supplied diving system, particularly if the full system can be safely accommodated at the diving location.

In general this technique is used when diving from a small vessel with a mothercraft in the vicinity but it may also be used on a large barge or platform to allow diving from the deck in a location remote from the main diving area. In such cases, the requirements relating to a separate small vessel obviously do not apply.

The type of work to be carried out should be carefully considered to ensure that this method of diving will be suitable and the diving should be planned to avoid the need for decompression.

Note: The breathing gas used may be compressed natural air or else a mixture of nitrogen and oxygen with different percentages to natural air (often called nitrox). If nitrox is being used, then the word 'air' used in this document should be replaced with the word 'nitrox'.

3 Risk Assessment

All diving projects should be planned and managed in accordance with the diving safety management system.

An assessment of the general principles of the diving technique to be used should be carried out, as well as of the needs of the particular operation.

This would normally comprise a systematic assessment of the diving equipment to confirm that the equipment provided for the diving operation is both adequate and fit for its intended use (this assessment may take the form of a hazard and operability study (HAZOP), failure modes and effects analysis (FMEA) or detailed project risk assessment) and a risk assessment to identify the site-specific hazards and to evaluate their risks.

The following are required:

- an adequate safety management system;
- hazard identification and risk assessment;

- provision of approved working procedures relevant to all parties;
- adequate briefing prior to the commencement of all diving operations;
- suitable permit to work system in operation.

These principles apply to all types of diving operation; however the site-specific risk assessment should consider in particular:

1. weather forecast for the period of remote operation;
2. tides and currents;
3. sea-keeping capabilities of the small vessel;
4. mooring arrangements for the small vessel;
5. launch/recovery system for the small vessel;
6. availability of a second transit vessel;
7. depth of the intended operation;
8. minimum dive team size;
9. amount of breathing gas available;
10. life-saving apparatus and personal protective equipment (immersion suits, work vests, etc.) available;
11. maximum time and ease of access for recovery of the diver (possibly unconscious) to the twinlock air chamber;
12. any suction or discharge points in the vicinity;
13. lock outs and tag outs if relevant;
14. emergency contingency plans.

Mobile/portable/daughtercraft surface supplied systems should only be used if the results of the risk assessment indicate this is a safe method of operation.

4 Equipment Requirements

A mobile/portable/daughtercraft surface supplied system should consist as a minimum of at least three cylinders, each with a minimum floodable volume of 46 litres and a working pressure of not less than 150 bar. In the case of daughtercraft diving there would normally be a greater number of cylinders to allow for extended operations.

The cylinders should be manifolded through a diving control panel to provide both the diver and the stand-by with their own dedicated air supply. The third cylinder could be used to supply either diver as their back-up (secondary) supply. Each diver must be provided with an adequate emergency air supply bail-out bottle.

The diving control panel should be provided with appropriate high pressure regulators, high pressure (HP) and low pressure (LP) gauges and separate control circuits for each diver. Note: Panel HP regulators and gauges will not normally be required for daughtercraft systems as the pressure is reduced before entering the cabin. There should also be facilities at the panel to record the communications between diver(s) and supervisor. A separate pneumofathometer (pneumo) or other means of displaying the diver's depth to the supervisor should be provided for each diver.

As a minimum, for one diver working in the water, two complete sets of divers' equipment should be provided. Each set should contain, as a minimum, a diving helmet or full-face mask, communication set (providing two-way communications with the supervisor), umbilical, diver's personal equipment (diving suit, boots, fins, etc.) and appropriate harnessing to allow safe recovery of the diver.

Divers (including the surface standby diver) need to be able to enter and leave the water safely and in a controlled manner. This should be possible in all normal circumstances. Arrangements should also be in place to recover an injured or unconscious diver from the water to the deck of the small vessel.

5 Depth Limitation

The technique is only suitable using compressed air or oxygen and nitrogen mixtures (nitrox) to a maximum depth of 50 metres of water. Generally this diving technique is limited to depths of less than 30 metres; diving below this up to maximum depth of 50 metres should only be considered in exceptional circumstances where the risk assessment indicates it is safe to do so. Special consideration should be given to the quantity of gas available and the proximity of the twinlock air chamber.

6 Minimum Gas Requirements

All dives should be planned so that at all times there is sufficient gas available to satisfactorily complete the planned dive, including a sufficient reserve quantity in the event of an emergency where the working diver is delayed, may require decompression and/or it may be necessary to deploy the standby diver. This quantity will normally have been established during the risk assessment process. See also IMCA D 050 – *Minimum quantities of gas required offshore* – for detailed guidance.

7 Decompression Facilities

It is difficult to treat decompression illness if access to recompression facilities is not immediately available. Suitable recompression facilities (typically a twinlock air chamber complying with the requirements of IMCA D 023 – *DESIGN for surface orientated (air) diving systems*) should be provided on the mothercraft (or barge/ platform if relevant) to provide suitable therapeutic recompression treatment. Such a facility needs to be kept in a state of immediate readiness while diving operations are taking place.

There should be a designated route from the point where the small vessel is recovered to the chamber. This route should be kept unobstructed at all times when diving is taking place and the route should be such that an injured diver can be recovered from the small vessel (possibly on a stretcher) and taken to the chamber in a reasonably short time period. A trial should be conducted to prove this capability.

8 Medical Equipment

A minimum amount of medical equipment (typically as listed in DMAC 15 – *Medical equipment to be held at the site of an offshore diving operation*) should be held at the mothercraft (or barge/platform if relevant) to provide first aid and medical treatment for the dive team.

A first aid kit and an oxygen administration set should be provided in the small vessel to aid in transport of an injured diver to the mothercraft.

9 Testing and Certification

Since all diving plant and equipment is likely to be used in harsh conditions, including frequent immersion in salt water, regular inspection, maintenance and testing is necessary to ensure fitness for use.

All equipment should be tested and certified in accordance with IMCA D 018 – *Code of practice for the initial and periodic examination, testing and certification of diving plant and equipment.*

10 Divers' Umbilicals

A mobile/portable surface supplied system should not be used where there is a reasonable possibility of the diver, or his umbilical, becoming fouled or where immediate recovery of the diver cannot be achieved.

11 Diving Personnel

The diving contractor will need to specify the size of the dive team, which should be decided on the basis of a risk assessment. As a minimum, when diving from a small vessel, the dive team should consist of a supervisor, diver, stand-by diver and two tenders. Consideration should be given to the individual competences of the dive team in relation to such things as the ability to operate the chamber, operate any relevant equipment, etc.

The stand-by diver in the small vessel (or on the barge/platform if relevant) will need to be in immediate readiness to provide any necessary assistance to the diver, whenever the diver is in the water. He needs to be protected from weather and other elements (including dropped objects) which may affect his concentration. This also means he needs to be kept suitably warm (or cool).

The diving supervisor should also be protected from weather and other elements (including dropped objects) which may affect his concentration. This also means he should be kept suitably warm (or cool). The diving supervisor needs good access to all relevant areas of control and needs to be able to read all gauges and displays without difficulty.

A person acting as coxswain of the small vessel should be competent and familiar with the vessel. A member of the dive team may act as the coxswain provided he is competent to do so but may not dive unless a second competent coxswain is also on board.

If the dive team is likely to spend an extended period away from the mothercraft (such as a daughtercraft carrying out multiple dives) then planning should include consideration of personnel change out by suitable replacements from the mothercraft, possibly using the fast rescue craft or similar.

12 Diving From a Small Vessel

Note: Clearly if diving does not involve the use of a small vessel (inflatable or daughtercraft or similar) then the requirements below relating to a separate small vessel do not apply.

The small vessel should be suitable for the purpose. It needs to be able to accommodate the number of personnel required plus the portable or built in diving system and still allow free movement around the vessel.

Any intakes for cooling water or other items that may be running during diving should be fitted with suitable guards to prevent accidental injury to a diver in the water or damage to his equipment.

The small vessel should have been subject to a suitable marine audit/inspection using IMCA M 189 – *Marine inspection for small workboats (Common marine inspection document for small workboats)* – or similar.

The small vessel should have the ability to display the international signal(s) that diving is under way. This will typically be the flag Alpha, suitable lights (if relevant), etc.

If the dive takes place from a small vessel, a dedicated lookout will be required on the support vessel to watch the small vessel. There should be reliable and continuous communications between the supervisor in the small vessel and the lookout.

The small vessel should be in close vicinity and always within line of sight of the support vessel. The line of sight criterion should be interpreted as maintaining close visual contact.

A second recovery craft (such as a fast rescue craft) should be identified and available at the support vessel to assist the small vessel in the event of a problem with the small vessel. This second craft needs to be ready at all times and its crew should not be required to carry out any other duties that could interfere with their ability to provide assistance to the small vessel. The cox and crew of this second craft need to be familiar with and competent to operate the second craft.

The small vessel should be fitted with an appropriate means of propulsion that will allow it to return to the support vessel in any reasonably foreseeable weather conditions in a time not exceeding 15 minutes.

13 Environmental Considerations

The safe and efficient deployment and operation of divers is dependent upon suitable environmental conditions. The environmental limits should be clearly defined following the risk assessment. However there are certain restrictions that apply to this diving technique:

Visibility

The dive should only take place in conditions of good surface visibility. Diving should be restricted to daylight hours unless the small vessel is provided with suitable electrical power generation (including back-up power source) for lighting. Where a small vessel is used, this should be equipped with the normal marine emergency equipment of torches, flares, etc. If diving in darkness, the worksite area should be lit up by floodlights on the small vessel or from the client's asset.

Sea State/Wave Height/Swell

Consideration should be given to the sea state/wave height/swell and the location from which the dive will take place. Particular consideration should be given to conditions local to the diving site possibly caused by effects such as vortexes. For example if diving from a small vessel, particular consideration needs to be given to the sea state both during launch and recovery from the support vessel and during the diving operation as well as the sea-keeping capabilities of the small vessel.

Wind

For diving from a small vessel, consideration needs to be given to wind speed and direction, especially if these are forecast to change during the planned dive.

Currents

Currents can cause considerable problems in diving operations but unfortunately accurate quantitative data is often not available, as currents are often not constant. Currents vary with location and surface currents can be affected by the wind. The risk assessment should take into account the effect of currents in relation to the type of work to be undertaken and the depth of dive.

Temperature

Extremes of temperature (hot or cold) can affect the personnel involved and consideration needs to be given to allowing for this. In extremes of heat even the diver in the water can be susceptible to dehydration.

14 Operational Considerations

The small vessel used for diving is particularly vulnerable to interference from other operations taking place in the same area (SIMOPS). Prior to diving commencing, it should have been established that such operations will only take place if they do not interfere with either the diving or the small vessel. This will normally be part of the permit to work system.

The sort of SIMOPS involved may be:

- supply boat unloading;
- helicopter operations;
- other diving operations such as saturation or other surface diving;
- overboard discharges from client's asset;
- ROV operations;
- nearby scaffolding;

- dropped objects;
- proximity to underwater hazards such as intakes and fire pumps.

Prior to diving, a mooring plan (possibly agreed with the client) should exist. Diving should only take place once the small vessel is securely moored or anchored and any propulsion systems have been shut down.

The relevant dive system operating and emergency procedures should be available on the small vessel. These would typically comprise generic diving procedures supplemented by project specific addendums.

On the small vessel, there needs to be a level of access available around the diving equipment (and any working areas) sufficient to allow operational personnel to safely and efficiently carry out their duties. Similarly on the mothercraft there needs to be a sufficient level of access available around the system used to launch/recover the small vessel.

If the dive team is likely to spend an extended period away from the mothercraft (such as a daughtercraft carrying out multiple dives) then planning should include consideration of the requirements of the dive team for drinking water and food. Adequate supplies should be available on the small vessel and arrangements should be considered to replenish these from the mothercraft, possibly using the fast rescue craft or similar.

15 References

1. DMAC 15 *Medical equipment to be held at the site of an offshore diving operation*
2. IMCA D 018 *Code of practice for the initial and periodic examination, testing and certification of diving plant and equipment*
3. IMCA D 023 *DESIGN for surface orientated (air) diving systems*
4. IMCA D 040 *DESIGN for mobile/portable surface supplied diving systems*
5. IMCA D 048 *Surface supplied diving operations using nitrox*
6. IMCA D 050 *Minimum quantities of gas required offshore*
7. IMCA M 189 *Marine inspection for small workboats (Common marine inspection document for small workboats)*