

# COVID-19 – An Example of a Risk Assessment Undertaken by an IMCA Diving Contractor

This Information Note contains a sample of a robust risk assessment recently undertaken by an IMCA Member.

In this example, the bowtie risk assessment methodology was selected and used to help the company identify appropriate measures for preventing the occurrence of contagious disease (in this case COVID-19) on a DSV. It was also employed to identify suitable control and recovery measures should cases nevertheless occur.

Used in conjunction with the guidelines in *Novel Coronavirus (COVID-19) - Guidance for Diving Contractors* (IMCA D 06/20), the Bowtie risk assessment approach was found by our Member to be one effective way of developing appropriate company procedures and safeguards to reduce the risk of COVID-19 disease on its diving projects so far as reasonably practicable.

The essential elements of the Bowtie Risk Assessment Method are shown in the diagram below:

# Threat barriers and recovery measures control the release of the hazard or reduce/prevent the consequences



The bowtie methodology has four underlying steps of risk assessment and risk management as shown below:



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The information contained herein is given for guidance only and endeavours to reflect best industry practice. For the avoidance of doubt no legal liability shall attach to any guidance and/or recommendation and/or statement herein contained.

### Example of COVID-19 Bowtie Risk Assessment for a Diving Project

#### Introduction

The attached diving COVID-19 risk assessment was populated using the bowtie methodology as it is an effective risk evaluation method used to analyse and demonstrate relationships in high risk scenarios. The bowtie methodology defines the overall structure of barriers and controls required for the prevention and mitigation of major accidents and incidents.

This bowtie takes full account of the recommendations contained in Information Note *Novel Coronavirus (COVID-19) - Guidance for Diving Contractors* (IMCA D 06/20).

The bowtie has been used to help identify and implement appropriate measures for preventing the occurrence of contagious disease (COVID-19) amongst dive team members on a DSV. It was also employed to identify suitable control and recovery measures should cases nevertheless occur.

The bowtie is intended to focus primarily on COVID-19 risks which are specific to the safety of the project's saturation divers, including events which could adversely impact their safety/wellbeing whilst still in saturation. As part of this aim, the bowtie also considers risks to the divers should safety critical personnel (e.g. life support technicians and dive technicians) become ill with COVID-19.

General issues which are relevant for all crew members (such as reporting and subsequent testing requirements) are not addressed in this bowtie.

For those who are not familiar with the bowtie methodology, we have provided a brief explanation of its main elements below.

**Hazard and Risk** – A hazard is something in, around or part of the organisation which has the potential to cause harm. A risk is the chance, high or low, that any hazard will actually cause somebody harm. Hazards and risks occur from doing business.

**The Hazard / Top Event** – An identified hazard with the potential for significant harm is put into the centre of the bowtie diagram. This is known as the undesirable Top Event.

**Threats** – Threats are whatever may cause the Top Event. On the left-hand side, in blue bordered boxes are the identified potential "threats", which could lead to the Top Event.

**Consequences** – Consequences result from the Top Event. These are recorded in the red bordered boxes on the right-hand side (e.g. injury, fatality, illness, environmental pollution and/or business impacts etc).

**Barriers** – Barriers and controls in the bowtie appear on both sides of the Top Event. Barriers interrupt the scenario so that the threats do not result in a loss of control (the Top Event) or do not escalate into an actual impact (the consequences).

**Escalation Factors** – Even the best hardware barrier can fail. Anything that will make a barrier fail can be described as an Escalation Factor. The bowtie assessment must seek to identify why each barrier may fail and assign the appropriate Escalation Factors.

**Barrier Effectiveness** – Not all barriers are fully effective, and this is why some are scored differently. A minimum accumulative score of 2.0 for all the barriers that have been identified in the bowtie assessment is required.

Score	Effectiveness
0	No Effect
0.25	Marginally effective
0.5	Partially effective
0.75	Highly Effective
1.0	Fully effective

### **Summary of Bowtie Risk Assessment Process**

- 1. A hazardous event with potential for significant harm is put into the centre of the bowtie diagram (the Top Event). In this case, the suspected outbreak of contagious disease in saturation during the COVID-19 viral pandemic.
- 2. On the left-hand side, the potential threats are listed that may possibly cause the Top Event. On the right-hand side, the potential consequences of the Top Event are listed.
- 3. After the potential threats and consequences have been identified, the control and recovery measures are put in place. The control measures (also called threat barriers) are necessary to prevent the threats from causing the hazardous event. The recovery measures are needed to reduce the severity of the outcome.
- 4. The result is a logical and structured overview (quantified if required) of WHAT measures are needed and WHY.
- 5. Company procedures for prevention/mitigation of the Top Event are then checked against the findings of the bowtie assessment and revised as appropriate.

Bowtie Group: Dive Operations					
Hazard	Diving operations during viral pandemic				
Top event	Suspected outbreak of contagious disease				
Notes	The objective for this bowtie was to focus primarily on the risks which are specific to the safety of the divers, including events which would impact there safety/wellbeing whilst still in sat. This includes an additional threat and consequence which looks at infection of critical support personnel such as life support and dive technicians. Generic issues which are relevant for all crew members such as reporting and subsequent testing will be handled by the vessel master and onshore management teams and are not the scope of this Bowtie. It is designed to support the IMCA Information note D 06-20 Novel Coronavirus (COVID-19) – Guidance for Diving Contractors.				
Attendees	Deputy Group Diving Director Group Diving Director Occupational Health Lead				
Client Diving Review Group	Client Diving Technical Authorities				
Vessel Review Group	OCM/ Diving supervisors/ Life Support Supervisors/ DSV Medic				

Infected diver enters saturation					
Controls & I	Escalation Factors	Crit.	Control Type	Eff.	Accountable
Send joining instructions including current COVID-19 update COVID-19 update includes the following 3 criteria: -Travelled to or through a prohibited risk area within timeline specified including airport transfers, regardless of symptoms - Displaying COVID-19 symptoms - Known close contact with a confirmed COVID-19 case		Critical (1.00)	Mgt Management Control	Partially Effective (0.50)	Offshore personnel logistics coordinator
Answer yes to any of the 3 criteria	Self-isolate and notify company The crew member is accountable for notifying the company if they do meet any 1 of the 3 criteria	Critical (1.00)	BEH Behavioural	Partially Effective (0.50)	Crew member
<ul> <li>Procedure A - Self isolate for 14 days before travelling to vessel</li> <li>To be used in all countries where a nasopharyngeal COVID-19 test is not available.</li> <li>1. All personnel to join the vessel (regardless of whether they travel internationally or domestically) will be mobilised to a hotel or other suitable accommodation close to the vessel mob port.</li> <li>2. They will be in self-isolation for 14 days prior to joining the vessel</li> <li>3. Transfer from isolation accommodation to vessel under controlled means</li> </ul>		Critical (1.00)	Mgt Management Control	Highly Effective (0.75)	Offshore personnel logistics coordinator
<ul> <li>Procedure B - Test joiner / contractor and self-isolate whilst waiting on results</li> <li>To be used in a country where a nasopharyngeal COVID-19 test (swab test) can be provided</li> <li>1. All crew will be tested prior to joining the vessel</li> <li>2. Crew will be self-isolated in a hotel close to the vessel whilst the test results are processed</li> <li>3. Transfer from isolation accommodation to vessel under controlled means</li> </ul>		Critical (1.00)	Mgt Management Control	Highly Effective (0.75)	<no value<br="">Assigned&gt;</no>

Infected diver enters saturation						
Controls &	Escalation Factors	Crit.	Control Type	Eff.	Accountable	
Set up separate onboard area	and isolation area on quayside	Critical (1.00)	Mgt Management Control	Partially Effective (0.50)	Vessel Master	
Self declare compliance with C At the quayside or heliport th embarkation document before who is non-compliant with the	COVID-19 update at the vessel e crew member is asked to sign an e proceeding to the vessel. Anyone e criteria is isolated accordingly.	Critical (1.00)	Mgt Management Control	Partially Effective (0.50)	Crew member	
	Isolate affected person(s) in accordance with COVID-19: Suspected Case Process Flowchart	Critical (1.00)	Mgt Management Control	Partially Effective (0.50)	Vessel Master	
Suspect that diver is	Notify topside medical support and follow their response instructions	Critical (1.00)	Mgt Management Control	Marginally Effective (0.25)	Vessel Medic	
infected	Notify authorities of potentially infected crew member and follow case management instructions Always notify flag state. Notify port authorities if in or approaching port	Critical (1.00)	Mgt Management Control	Ineffective (0.00)	Vessel Master	
Check individual's temperatur	e before stepping onboard	Critical (1.00)	Mgt Management Control	Marginally Effective (0.25)	Vessel Medic	
Maintain social distancing as best as practicable before entering saturation Each vessel due to its configuration manage social distancing measures such as: - Meal timings and seating arrangement - Cabin allocation (separate same disciplines) - Use of recreational spaces - No physical greetings such as handshakes. - Limiting number of people using common spaces such as the messroom, smoking areas, TV rooms, gym, etc at the same time		Critical (1.00)	BEH Behavioural	Partially Effective (0.50)	Crew member	
Carry out pre saturation medi	cal checks	Critical (1.00)	Mgt Management Control	Highly Effective (0.75)	Vessel Medic	
Suspect that diver is infected	Isolate affected person(s) in accordance with COVID-19: Suspected Case Process Flowchart	Critical (1.00)	Mgt Management Control	Partially Effective (0.50)	Vessel Master	
	Notify authorities of potentially infected crew member and follow case management instructions Always notify flag state. Notify port authorities if in or approaching port	Critical (1.00)	Mgt Management Control	Ineffective (0.00)	Vessel Master	
	Notify topside medical support and follow their response instructions	Critical (1.00)	Mgt Management Control	Marginally Effective (0.25)	Vessel Medic	
Apply internal and external hygiene and cleaning protocols in DDC and SDC		Critical (1.00)	Mgt Management Control	Highly Effective (0.75)	Dive Supervisor/Life Support Supervisor	

# Example of COVID-19 Bowtie Risk Assessment for a Diving Project

Infected diver enters saturation						
Controls & Escalation Factors	Crit.	Control Type	Eff.	Accountable		

Monitor divers breathing and well being		Important to Operations (0.50)	BEH Behavioural	Partially Effective (0.50)	Dive Supervisor/Life Support Supervisor
	Notify topside medical support and follow their response instructions	Critical (1.00)	Mgt Management Control	Marginally Effective (0.25)	Vessel Medic
	Evaluate diver's condition with onshore hyperbaric specialists if displaying symptoms	Critical (1.00)	Mgt Management Control	Highly Effective (0.75)	Vessel Medic
Suspect that diver is infected	Plan to dive only at depths within a 5-day decompression period (within incubation period)				
	Current occupational health advice is that it takes approximately 5 days from symptoms to deterioration. TFMC will continue to take advice from the medical specialists	Critical (1.00)	Mgt Management Control	Ineffective (0.00)	Project Manager
Segregate new teams entering saturation	g saturation from those already in	Important to Operations (0.50)	Mgt Management Control	Partially Effective (0.50)	Offshore Construction Manager
Shared system and	Use a dedicated TUP and SDC for segregated dive teams	Important to Operations (0.50)	Mgt Management Control	Partially Effective (0.50)	Dive Supervisor/Life Support Supervisor
	Allocate personal diving equipment to each diver Personal diving equipment includes neck dam, hat liner, under suits, and hot water suits	Critical (1.00)	Mgt Management Control	Highly Effective (0.75)	Life Support Supervisor
	Apply internal and external hygiene and cleaning protocols in DDC and SDC	Critical (1.00)	Mgt Management Control	Highly Effective (0.75)	Dive Supervisor/Life Support Supervisor
	Apply maintenance and cleaning protocol for diving helmets and rebreathers	Critical (1.00)	Mgt Management Control	Highly Effective (0.75)	Dive Supervisor
Wash hands and/or disinfect with hand sanitiser This must be done frequently and as a minimum: Before eating or drinking After coughing or sneezing At the start and end of shift After handling potentially contaminated waste		Critical (1.00)	BEH Behavioural	Partially Effective (0.50)	Crew member
Follow personal hygiene guideleines Cover mouth and nose if coughing or sneezing. Use a paper tissue or crook of your arm. Put used tissues in the bin immediately and then wash hands. Direct coughs and sneezes away from others in the vacinity. Avoid touching your face		Critical (1.00)	BEH Behavioural	Partially Effective (0.50)	Crew member
Frequent washing of clothes and coveralls		Important to Operations (0.50)	Mgt Management Control	Partially Effective (0.50)	Life Support Supervisor

Infected critical support pe	rsonnel join the vesse				
Controls & Escalat	tion Factors	Crit.	Control Type	Eff.	Accountable
Send joining instructions including current COVID-19 update COVID-19 update includes the following 3 criteria: -Travelled to or through a prohibited risk area within timeline specified including airport transfers, regardless of symptoms - Displaying COVID-19 symptoms - Known close contact with a confirmed COVID-19 case		Critical (1.00)	Mgt Management Control	Partially Effective (0.50)	Offshore personnel logistics coordinator
Answer yes to any of the 3 criteria The crinotifyi meet a	olate and notify company ew member is accountable for ng the company if they do any 1 of the 3 criteria	Critical (1.00)	BEH Behavioural	Partially Effective (0.50)	Crew member
Procedure A - Self isolate for 14 days To be used in all countries where a na is not available.	before travelling to vessel asopharyngeal COVID-19 test	Critical (1.00)	Mgt Management Control	Highly Effective (0.75)	Offshore personnel logistics coordinator
Procedure B - Test joiner / contractor on results	and self-isolate whilst waiting	Critical (1.00)	Mgt Management Control	Highly Effective (0.75)	<no value<br="">Assigned&gt;</no>
Set up separate onboard area and isolation area on quayside		Critical (1.00)	Mgt Management Control	Partially Effective (0.50)	Vessel Master
Self declare compliance with COVID-19 update at the vessel At the guavside or heliport the crew member is asked to sign an		Critical (1.00)	Mgt Management Control	Partially Effective (0.50)	Crew member
Check individuals temperature before stepping onboard		Critical (1.00)	Mgt Management Control	Marginally Effective (0.25)	Vessel Medic
Apply internal and external hygiene a and SDC	nd cleaning protocols in DDC	Critical (1.00)	Mgt Management Control	Highly Effective (0.75)	Dive Supervisor/Life Support Supervisor
Wear additional PPE when dealing with possible contaminants Technicians, life support staff and surface based divers are accountable for wearing and disposing of PPE appropriately.		Critical (1.00)	BEH Behavioural	Highly Effective (0.75)	<no value<br="">Assigned&gt;</no>
Maintain social distancing as best as p saturation	practicable before entering	Critical (1.00)	BEH Behavioural	Partially Effective	Crew member
Follow personal hygiene guidelines Cover mouth and nose if coughing or sneezing. Use a paper tissue or crook of your arm. Put used tissues in the bin immediately and then wash hands. Direct coughs and sneezes away from others in the vacinity. Avoid touching your face		Critical (1.00)	BEH Behavioural	Partially Effective (0.50)	Crew member
Frequent washing of clothes and coveralls		Important to Operations (0.50)	Mgt Management Control	Partially Effective (0.50)	Crew member
Wash hands and/or disinfect with hand sanitiser This must be done frequently and as a minimum:		Critical (1.00)	BEH Behavioural	Partially Effective (0.50)	Crew member

# Example of COVID-19 Bowtie Risk Assessment for a Diving Project

Diver(s) become seri	ously ill whilst in saturation				
Inherent 5x2=32 (Life threat Residual 5x1=16 (Life threat	ening illness x unlikely) ening illness x very unlikely)				
Inherent	Residual				
[32]	16	HSE - Harm t	o People	- **	1
Controls &	Escalation Factors	Crit.	Control Type	Ett.	Accountable
Isolate affected dive team(s)		Important to Operations (0.50)	Mgt Management Control	Marginally Effective (0.25)	Offshore Construction Manager
Notify topside medical suppo instructions	rt and follow their response	Critical (1.00)	Mgt Management Control	Marginally Effective (0.25)	Vessel Medic
Mobilise medical specialist wi	th DMAC28 equipment	Critical (1.00)	Mgt Management Control	Highly Effective (0.75)	Occupational Health Lead
Familiarity with emergency equipment	Conduct emergency training drills with DMAC28 and DMAS equipment	Critical (1.00)	BEH Behavioural	Highly Effective (0.75)	Life Support Supervisor
Notify authorities of potentially infected crew member and follow case management instructions		Critical (1.00)	Mgt Management Control	Ineffective (0.00)	Vessel Master
Decompress affected dive tea	ım(s)	Critical (1.00)	Mgt Management Control	Highly Effective	Life Support Supervisor
Diver infects other personnel when removed from saturation	Inform rest of the crew of the situation This barrier is intended to assure other crew members and to raise the response level onboard to mitigate further spread. Do not hold a mass meeting, consider use of PA, phone or other means.	Important to Operations (0.50)	Mgt Management Control	Marginally Effective (0.25)	Vessel Master
	Notify authorities of potentially infected crew member and follow case management instructions Always notify flag state. Notify port authorities if in or approaching port	Critical (1.00)	Mgt Management Control	Ineffective (0.00)	Vessel Master
	Isolate affected person(s) in accordance with COVID-19: Suspected Case Process Flowchart	Critical (1.00)	Mgt Management Control	Partially Effective (0.50)	Vessel Master
Wear appropriate PPE when handling potentially contaminated items		Critical (1.00)	BEH Behavioural	Partially Effective (0.50)	Crew member
Manage contaminated items section within waste manage	in accordance with special waste ment procedure	Critical (1.00)	BEH Behavioural	Partially Effective (0.50)	Crew member

#### Critical support personnel infected resulting in shortage of competent personnel to support divers in saturation Inherent 5x2=32 (Life threatening illness x unlikely) Residual 5x1=16 (Life threatening illness x very unlikely) Inherent Residual [32] 16 HSE - Harm to People **Controls & Escalation Factors** Crit. Control Type Eff. Accountable Highly Offshore Manage shift pattern to ensure 24 hour coverage with competent Construction Critical (1.00) Mgt Management Control Effective personnel (0.75) Manager Highly Offshore personnel Organise relief crew to backfill ill personnel Critical (1.00) Mgt Management Control Effective logistics coordinator (0.75) Partially Manage contaminated items in accordance with special waste Critical (1.00) **BEH Behavioural** Effective Crew member section within waste management procedure (0.50) Wear appropriate PPE when handling potentially contaminated Partially Critical (1.00) **BEH Behavioural** Effective Crew member items (0.50) Inform rest of the crew of the situation Important to Marginally Operations Mgt Management Control Effective Vessel Master This barrier is intended to assure other crew members and to raise (0.50)(0.25)the response level onboard to mitigate further spread

## **COVID-19 Bowtie Diagram**

Please note that the actual Bowtie diagram overleaf appears very small on an A4 page. However, readers will find that if they zoom in to relevant parts, the text will become perfectly legible.



