Guidance on operational activity planning

IMCA M 220 Rev. 2
January 2021

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Members are expected to adopt as a minimum standard the technical guidelines (published documents, information notes and other materials) produced by the Association appropriate to the technical division(s) and region(s) to which the relevant Member belongs.

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IMCA M 220 Rev. 2 – Version History

Date	Reason	Revision
January 2021	Updated and reordered following review by the IMCA DP committee	Rev. 2
December 2017	To review that the guidance meets current industry practice following recent publication of IMO MSC.1/Circ.1580	Rev. 1
November 2012	Initial publication	Rev. 0

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1 Aim

The aim of this guidance on operational activity planning is to provide an overview of methods used in the planning and execution of offshore marine vessel projects and routine offshore support activities.

The operational requirements in section 4 of IMO MSC.1 Circular 1580, *Guidelines for vessels and units with dynamic positioning (DP) systems*, requires that, before every DP operation, the DP system should be checked according to applicable vessel specific location checklist(s), and other decision support tools such as ASOG, in order to make sure that the DP system is functioning correctly, and that the system has been set up for the appropriate mode of operation. It should be noted that section 4 Operational Requirements applies to all new and existing vessels and units, as appropriate.

The methods described here apply to all sectors of the offshore marine sector, including offshore drilling, project and construction vessels and offshore supply vessels. Although usually applied to Dynamically Positioned (DP) vessels, the processes described in this guidance can be used for non-DP vessels too. Operational activity planning utilises a decision support tool; Activity Specific Operating Guidelines (ASOG) that defines either a Critical Activity Mode (CAM) or Task Appropriate Mode (TAM) of operation.

Operational activity planning should address the following:

- define the vessel's systems and equipment configuration appropriate to the location and the activity the vessel is undertaking (CAM or TAM);
- define the variable limits in equipment and operational parameters for the location and specific activity (ASOG) including the triggers and criteria that would cause a change in the traffic light system used in the ASOG;
- define the actions to be taken by the key vessel personnel in response to faults deteriorating conditions and a change in status of the traffic light in the ASOG;
- present the guidance to key vessel personnel in a user friendly, easy to understand decision support tool.

This approach produces a document which provides a cross reference for key vessel personnel such as DPO, driller, project superintendent, engine room staff etc.

2 Acronyms

ASOG	Activity specific operating guidelines
CAM	Critical activity mode
CPA	Closest point of approach
DA	Diesel alternator
DGNSS	Differential global navigation satellite system
DP	Dynamic positioning
DPO	Dynamic positioning operator
ER	Engine room
ESD	Emergency shutdown
FMEA	Failure modes and effects analysis
FSOG	Field specific operating guidelines
FW	Fresh water
IJS	Independent joystick
IRM	Inspection, repair and maintenance
LSOG	Location specific operating guidelines
MODU	Mobile offshore drilling unit
MRU	Motion reference unit
OIM	Offshore installation manager
PMS	Power management system
PRS	Position reference system
SG	Shaft generator
SIMOPS	Simultaneous operations
SW	Sea water
TAM	Task appropriate mode
UPS	Uninterruptible power supply
VMS	Vessel management system
VRU	Vertical reference unit
WCF	Worst case failure
WSOG	Well specific operating guidelines

3 Introduction to Operational Activity Planning

3.1 Activity Specific Operating Guidelines (ASOG)

An ASOG provides guidelines on the operational, environmental and equipment performance limits for the location and specific activity. Typically, a vessel would have a developed base ASOG that is altered to the specific requirements of planned activity taking into consideration, for example, weather, proximity to surface/subsea installations and specific client requirements.

The performance limits are established based on the level of risk. Because they are activity specific, a DP vessel may have several different ASOGs, each applying to different locations and activities and different levels of risk. The terms well specific operating guidelines (WSOG), field specific operating guidelines (FSOG) and location specific operating guidelines (LSOG) denote equivalent concepts as applied by specific offshore sectors.

A comprehensive ASOG, typically contains:

1. A Summary Section (Contains specific nuances of the vessel and or project as pertains to the Industrial Mission or Activity that the vessel is undertaking).
2. A configuration Section (CAM/TAM)
3. A Criteria Section
4. A SIMOPS section if SIMOPS are contemplated.

The ASOG embeds notifications to be made and high-level actions to be taken upon a change in the traffic light status of the ASOG from green. It should contain pertinent information such as single line diagrams, list of acronyms and abbreviations used, control power and UPS power supply distribution depicted to ascertain allocation of redundancy group and presence of common points and/or cross connections.

It is essential for the Master, Chief Engineer, DPOs, engineering officers and those with specific mission responsibilities to be familiar with ASOG and for the vessel crew to take ownership of it.

3.2 Critical Activity Mode (CAM)

The CAM defines the most fault tolerant configuration for the DP system. The CAM configuration must take the environmental conditions and external forces acting on the vessel into consideration.

CAM should be implemented for all critical activities undertaken by the vessel. For DP Class 2 and 3 vessels the CAM will ensure that a vessel's worst case failure design intent (WCFDI) is not exceeded. The post failure capability limits in CAM are derived from applying the WCF validated by testing.

3.3 Task Appropriate Mode (TAM)

A TAM is a risk-based operating mode in which the DP vessel may be set up and operated accepting that a failure has the potential to exceed the vessel's identified worst-case failure. Because of the variances of operational tasks and locations a vessel may have several task appropriate modes.

A TAM may be applied where a thorough risk assessment has demonstrated that the consequences of exceeding the vessel's identified worst-case failure are acceptable.

The decision to categorise operations as TAM does not alleviate the burden of additional controls to be put in place to mitigate the consequences of a vessel experiencing a worst-case failure such as, to operate in drift off condition, etc.

3.4 Operational Activity Planning

The above three processes should be undertaken by all those involved with the vessel's position keeping operations. It is essential for the Master, Chief Engineer and DPOs of the vessel to be knowledgeable of the technical and operational considerations that go into the development of the ASOG. They must participate in the development of the ASOG as far as practicable. In the case of a MODU or, for example, a pipelay vessel or crane vessel, it will be important to seek input or involve the driller/OIM/superintendent in the development and implementation of the ASOG. It is imperative that the vessel crew take ownership of the ASOG.

The CAM / TAM and ASOG are to be based on:

- a thorough knowledge of the DP system;
- DP operational manual;
- the DP FMEA;
- the industrial mission;
- vessel location and consequences of a loss of position and or heading;
- risk assessment.

A DP vessel can have one or more CAM and TAM, although some vessel owner/operators may decide not to operate in TAM. The CAM/TAM should specify a minimum number of thrusters and generators in use at any time throughout the activity. The owner/operator is responsible for the CAM and TAM, including determining the situations requiring CAM and where a TAM may be used, however the client may expect to be involved in the decision-making process.

In general, CAM should be the default and any decision to operate in TAM should be substantiated by robust and documented risk assessments with the risk owner accepting and signing off on the consequences.

When developing the specific ASOG for a project, it is necessary to refer to information of the location, the activity, environmental conditions and, if available, from project plans, procedures and drawings. This information is especially important for project/construction vessels since it will be used to identify the different phases and different risk levels throughout the project.

All parties with an interest in the vessel's operational activity planning should agree on the contents of the CAM/TAM and ASOG. There is a signature section at the end of the combined document (Table 3). The suggested signatories in that section are for guidance only and may be altered according to company and mission specific requirements.

The final ASOG should be available at the DP control console and in the engine control room. It should be a document providing a cross-reference for the DPOs and engine room watchkeepers in a range of responses or actions to be taken in the event of degraded condition. Appropriate initial and periodic DP checklists are used to set up a vessel for operations.

It is not advisable to overload the ASOG with information that is already covered in the operational checklists as this may dilute the important information that is communicated via the document.

3.5 DP Drills and Emergency Response Drills

Scenarios for DP drills should be relevant to operational activity and can be built around the ASOG ensuring all personnel know what actions to take and what to expect when operating parameters are reaching limits or being exceeded. In real life, emergency scenarios, proactive thinking and situation handling is of prime importance. For instance, with the build-up of a storm or hurricane, the initiation of "safely terminate the operation" is often too late due to pressure to continue the operations for as long as possible.

DP operational manual, annual DP trials and vessel FMEA/FMECA should always be readily available for information and reference by operational personnel. Drill scenarios can also be developed from DP station keeping events reported as part of the IMCA DP event reporting scheme.

For more information and examples refer to IMCA M 117 "The training and experience of key DP personnel" and IMCA DP bulletins publications.

3.6 Worst Case Failure (WCF)

Worst-case failure means the identified single fault in the DP system resulting in maximum detrimental effect on DP capability as determined through the FMEA and validated during the proving trials.

Any DP2 or DP3 vessel should be able to keep position after WCF, operational limits should be determined from DP capability analysis and plots.

4 Applicable Reference Documents

The following reference documents should be considered during the development of the CAM, TAM and ASOG:

- IMCA M 103 – *Guidelines for the design and operation of dynamically positioned vessels*
- IMCA M 117 – *The training and experience of key DP personnel*
- IMCA M 166 – *Guidance on failure modes and effects analysis (FMEA)*
- 182 MSF – *International guidelines for the safe operation of dynamically positioned offshore supply vessels*
- IMCA M 190 – *Guidance for developing and conducting DP annual trials programmes*
- IMCA M 203 – *Guidance on simultaneous operations (SIMOPS)*
- 245 IMO – *Guidelines for vessels and units with dynamic positioning (DP) systems (MSC.1/Circ. 1580)*
- IMCA M 247 – *Guidance to Identify DP System Components and their Failure Modes*
- IMO MSC Circular 768 – *Guidelines for dynamic positioning system (DP) operator training*
- IMCA M 252 – *Guidance on Position Reference Systems and Sensors for DP Operations*

5 Decision Support Tools

IMO MSC.1/Circ. 1580 states, *"Before every DP operation, the DP system should be checked according to applicable vessel specific location checklist(s) and other decision support tools such as Activity-Specific Operating Guidelines (ASOG) to make sure that the DP system is functioning correctly and that the system has been set up for the appropriate mode of operation."*

5.1 Activity Specific Operating Guidelines (ASOG)

The ASOG should define the operational, environmental and equipment performance limits for the DP vessel with respect to the specific activity that the DP vessel is undertaking. Therefore, an ASOG should be updated for each different type of activity and location where the vessel is to work and when the conditions differ. It is often the case that an ASOG is prepared for a project with multiple scopes of work, and the most stringent criteria can therefore be applied.

To develop the appropriate ASOG, the following need to be appreciated:

- the technical suitability of the vessel for the specific activity;
- the identification of the vessel's CAM / TAM (if applicable);
- an understanding of the vessel's station keeping capabilities following worst-case failure;
- environmental conditions in relation to work location;
- consequences of loss of position and or heading.

The vessel's operational personnel and, where applicable, the shore-based personnel, i.e. company operations, technical department, should be trained in risk identification and risk assessment procedures and should play a key role in the development of the ASOG. Client's specific requirements may be included, and the completed document should be signed by the vessel's Master/OIM, Chief Engineer, senior Watchkeeping Officers and DPOs and, where applicable, reviewed by the company operations and technical department. The sign-off requirements will depend on each company's management structure.

The ASOG contains information pertinent to station keeping from the operational procedures developed to execute the industrial mission. Changes in procedures should be assessed for potential impacts and changes to the ASOG. The ASOG may be modified in the field, subject to the strict consent of the Master/OIM and in accordance with the company's management of change procedure.

A typical ASOG for a DP project/construction vessel will cover the following items:

- Set speed of vessel rotation and speed of moves, for example, 10˚per minute and 0.3 m/sec respectively;
- whether thruster biasing is permitted and, if so, the maximum release levels defined;
- maximum environmental operating conditions, including wind speed limits, current limits and wave heights;
- weather-specific vessel positioning performance, including position and heading excursions within a defined period;
- maximum excursions permissible from the set point position;
- drive off, drift off scenarios;
- diesel generators (or other energy sources), including the minimum number required for the activity, performance limits and failures;

- diesel generator (or other energy source) loading;
- thrusters, including the minimum number required for the activity, performance limits and failures;
- permissible thruster loading;
- power management system (PMS) and vessel management system (VMS) status of operation;
- auxiliary systems performance limits and failures, including fuel, SW and FW cooling and compressed air;
- UPS operation, charger output, supply status and failures;
- DP control system, including operation and performance of DP controllers and failures;
- DP control system displays, including mimics, performance and failures;
- DP networks, including operation, redundancy and failures;
- position reference systems, including number of enabled systems, performance and criticality to operation and failures;
- sensors, including number of enabled systems, performance and criticality to operation and failures;
- communications, including onboard systems, performance and failures;
- non-essential DP related systems, including ventilation and air conditioning performance and failures;
- fire, flood, visibility, collision, including threat to the DP operation;
- vessel's mission equipment failures and limitations
- simultaneous operations, including communications with assets – see IMCA M 203 – *Guidance on simultaneous operations (SIMOPS)*;
- maximum watch circle radius (if applicable) for maximum environmental conditions identified for that activity;
- hybrid power systems (if applicable) and batteries;

5.2 ASOG Tabular Format – Column Definitions

Guidance in the ASOG is presented in four categories, as follows:

5.2.1 Green DP Status

Green indicates normal operations. Planned operations can be undertaken within agreed safe limits.

- the DP system is operating correctly and is configured in accordance with agreed CAM or TAM;
- operational, environmental and equipment performance criteria are all categorised as normal.

5.2.2 Advisory DP Status

If an indicator light is used, then it is recommended that this be BLUE. Operations can continue whilst risks are being assessed:

- operational, environmental or equipment performance limits are being approached;
- an event or failure has occurred that does not compromise single-fault tolerance of the DP system.

After dynamic risk assessment, operations may "continue with mitigating measures" or the "advisory status will be raised to yellow". The outcome of the risk assessment process could also mean returning to green. There are no conditions where advisory status should be considered or treated as a normal situation. If the DP system is fitted with consequence analysis, a position keeping consequence warning may trigger an advisory or yellow DP status.

An example of the advisory DP status is a failure of one of the main engines starting air compressors. This failure would not normally create a risk to activities if the engine was online however may affect the ability for a standby engine to start, therefore it may be prudent to postpone activities until the compressor is repaired.

5.2.3 Yellow DP Status

Yellow indicates a condition which may require a suspension of operations.

- a failure in the DP system has occurred leaving the DP system in an operational state but with its DP redundancy compromised. An additional failure in that system may result in an inability to maintain the vessel's position and / or heading;
- operational, environmental or equipment performance limits are reached;
- any other condition which may lead to a suspension of the operation.

The vessel is still maintaining position although some DP critical equipment will have lost its redundancy. When in a yellow DP status, preparations should be made to suspend any operations the vessel is undertaking in a controlled manner. If the DP system is fitted with consequence analysis, a consequence alarm may trigger yellow status.

An example of yellow DP status would be the loss or failure of one bow thruster where the vessel is only fitted with two. In this example, redundancy has been lost. The vessel would still be able to maintain position but would lose position if the remaining bow thruster failed.

5.2.4 Red DP Status

Red indicates a **severely degraded status or emergency**. A condition exists which requires an immediate termination of operations:

- a system failure or other condition has occurred that results in an inability to maintain position or heading control;
- operational, environmental or equipment performance limits have been exceeded;
- any other emergency situation that warrants the most rapid termination that is possible for the activity being undertaken.

A **red** status should immediately initiate contingency procedures to terminate all DP dependent operations as the vessel is about to lose position and or heading.

An example of a **red** DP status would be a fire in a DP critical compartment or space.

ASOG Table Outline: An ASOG table uses all four columns; **green** (normal), **blue** (advisory), **yellow** (degraded) and **red** (emergency).

Activity Specific Operating Guidelines – Outline				
	Green	**Blue**	**Yellow**	**Red**
Definition	Normal operations – operational, environmental and equipment performance criteria are all categorised as normal.	Advisory status – operational, environmental or equipment performance limits are being approached. An event or failure has occurred that does not compromise single-fault tolerance of the DP system.	Degraded status – approaching operational, environmental or equipment performance limits have been reached. A condition exists which may require a suspension of operations.	Emergency status – operational, environmental or equipment performance limits have been exceeded. A condition exists which requires an immediate termination of operations.
Response	For DP operations to commence and continue the conditions in the **green** column must be met.	Operations can continue whilst risks are being assessed. Conduct dynamic risk assessment to determine whether to continue, change position or cease operations.	Preparations should be made to suspend operations in a controlled manner. Contingency procedures should be initiated with a view to reducing the time to terminate. The operation should not be resumed before the vessel has regained redundancy or before all risks have been fully assessed to determine whether it is acceptable to resume operations with compromised redundancy.	Abandon operations. Take immediate action, to ensure the safety of people, the vessel, the environment and the operation. The vessel should be moved to a safe position. No DP operation is to be recommenced until a full investigation has been implemented with the failure resolved and full normal capacity verified by testing.

Table 1 – Activity specific operating guidelines – outline

Table 3 on page 16 illustrates a more detailed example of an ASOG table.

5.3 Critical Activity Mode (CAM)

It is recognised that a DP vessel may be operated in different operational configurations depending on the activities to be carried out, the environmental conditions, and the consequences of a loss of position. Any DP vessel can have its redundancy concept compromised if its systems are not configured or operated in the correct way. The CAM defines the most robust configuration of the DP system. The development and the implementation of the CAM is therefore vessel specific.

The CAM identifies the equipment configuration and methods of operation that ensure the vessel meets its maximum level of redundancy, functionality and operation, and that no single failure will exceed the identified WCF. Typical items contained in the CAM include the following:

- power plant set up, including whether operating open or closed bus ties, for example, with the minimum number of generators connected to each bus;
- diesel generators, including confirmation of maximum designed output in DP;

- thrusters and propulsion equipment including confirmation of maximum designed output in DP;
- power management, including configuration and confirmation of the set up for auto stop and black out recovery;
- uninterruptible power supplies (UPS), including confirmation of power supply, and functional testing;
- control power supplies including alignment with the redundancy concept and isolation of cross connected power supplies if applicable and if validated;
- manual controls and independent joystick, including confirmation of readiness and testing;
- DP control system, including consequence analysis, mode availability and selection;
- position reference systems, including availability, testing and selection, absolute and relative systems, placement of targets including maximum acceptable operating distance and maximum water depth for hydroacoustic systems;
- sensors, including availability, testing and selection;
- back-up DP control system status (DP Class 3), including alignment of set points with the main DP control system and confirmation of readiness and testing;
- fuel systems, including confirmation of redundancy, tank levels, stand-by pump starts, isolations and closed cross-over valves between redundant equipment groups;
- sea-water cooling, including confirmation of redundancy, stand-by pump readiness, isolations, and closed cross-over valve between redundant equipment groups;
- fresh-water cooling, confirmation of redundancy, stand-by pump readiness, isolations and closed cross-over valve between redundant equipment groups;
- compressed air/control air, confirmation of redundancy, safest compressor operating mode;
- HVAC, machinery space ventilation and exhaust and critical equipment air conditioning;
- automatic sensors, including external force, draft measurement and latitude correction for gyros to be set to manual;
- DP and ER manning, including watchkeeping schedules, qualifications and competency of watchkeepers;
- emergency shutdown (ESD) status (if applicable);
- the configuration and use of hybrid power systems such as battery banks, or fuel cells, etc. (if applicable).

Critical or Task Appropriate Mode Table Outline:

The CAM or TAM typically uses only two columns (traffic lights); **green** (normal) and **blue** (advisory). It is possible that the **green** (normal) conditions for TAM may differ from the CAM.

	Green	**Blue**
Definition	Normal operations – all systems and equipment fully operational, DP verification processes completed, and DP set up confirmed.	Advisory status – where any of the green conditions are not met.
Response	For DP operations to commence and continue the conditions in the green column must be met.	Conduct dynamic risk assessment to determine whether to continue, change position or cease operations.

Table 2 – Critical or Task Appropriate Mode Table Outline

Table 4 on page 17 illustrates a more detailed example of CAM / TAM configuration table.

5.4 Task Appropriate Mode (TAM)

There are two main reasons why a decision to operate in TAM may be made, one is to achieve fuel efficiency and the other is to maintain equipment whilst still operating in DP. It may be appropriate in certain situations, following a detailed risk assessment, that the consequences of a loss of position and or heading are considered to be low enough to permit operating with a level of redundancy that is lower than is achieved in CAM. The basis for such decisions should be documented in the form of a detailed documented risk assessment acknowledging the potential for a loss of position and or heading and the consequences deemed acceptable and signed off by the risk owner.

Whenever TAM is used, there should be no danger to personnel, the vessel, structures (including subsea), 3rd party vessels or the marine environment by the vessel's loss of position and or heading.

The following examples are for guidance only and show when operations conducted in TAM might be appropriate:

Example 1: A DP MODU may operate in TAM during non-BOP connected operations or while drilling ahead and not in a hydrocarbon zone.

Example 2: A DP construction vessel may operate in TAM on the leeside and more than 500 m from a surface or mission critical subsea asset but in CAM when inside 500 m.

Example 3: A PSV may operate in TAM with only two position reference systems when standing by outside of the 500 m zone of an offshore installation, or within the 500 m zone when delivering targets to the installation for the vessel's other position reference systems, when not engaged in the activity requiring the use of CAM.

Example 4: A diesel electric subsea support vessel may operate with a thruster offline for maintenance or repair purposes, when sufficient thrust capability is available or the consequences of loss of position and or heading are acceptable.

6 Example of ASOG Table

Note: This example of the ASOG is for illustrative purposes only, it is a basic two split configuration including shaft generators which should be used only as a guide on how the vessel ASOG may be structured. It is common that additional information specific to the operation and including client information and instruction is included at the start of the ASOG.

Activity Specific Operating Guidelines for the DP Vessel xxxxx on Project xxxxx *This setup **only** applies when the vessel is carrying out DP operations on the xxxxx project.*				
This setup applies when the vessel is carrying out ROV operations:				
ROV operations: Required position reference sensors; at least three reference systems in use (at least two different principles, different IO and two UPS; two PRs can be GPS)				
A change in status to yellow or red triggers notification to client (signatory on statement of verification). Vessel not permitted to return to work after yellow or red, without concurrence from client. Requirement to seek concurrence waived for 'proactive' or 'precautionary' yellows initiated by vessel operational teams				
Vessel to operate in critical activity mode (CAM). Inspection, repair and maintenance (IRM) on vessel's station keeping equipment, while executing DP operations requiring CAM configuration, is not permitted				
Pre-watch and pre-task meetings to cover IJS setup and use, precautions about inadvertent change of mode, need to set up and monitor position offsets independent of DP control system				
Condition	**Green**	**Advisory**	**Yellow**	**Red**
Notify Master, chief engineer and all other senior project critical personnel	No	Yes	Yes	Yes
Action	**Continue normal operations**	**Informative/consultative status (risk assess)**	**Prepare to suspend operations and initiate contingency plan (be ready to move off)**	**Stop operations Disconnect/bell recovery/DP reliant operation to stop**
Current and predicted weather conditions	Within operating limits	Approaching operating limits	Exceeding operating limits	
Checklists: 6 hr; watch; 500 m zone	Completed	Not completed or abnormalities noted		
Drive off	All systems operating correctly	Difference in vessel position between visual, navigation and DP	Immediately when recognised by the DPO	Unable to bring vessel under control
Drift off	All systems operating correctly	Difference in vessel position between visual, navigation and DP	Immediately when recognised by the DPO	Unable to bring vessel under control
Vessel footprint/weather related excursion	No position alarms or warning	If warning position limits reached (>3 m)	If alarm position reached (>5 m)	
Heading loss	No heading alarms or warning	If heading warning limit reached (>3°)	If heading alarm limit reached (>5°)	
Heading and position control (thruster load/DP feedback limits)	Heading and position control achieved (<45%)	Approaching 50%	More than 50%	

Action	Continue normal operations	Informative/consultative status (risk assess)	Prepare to suspend operations and initiate contingency plan (be ready to move off)	Stop operations Disconnect/bell recovery/DP reliant operation to stop
Shaft generators SG1-2	SG1 and SG2 online, DA1 and DA2 stand-by. No alarms	Any other setup or alarms	Any generator failure	
Shaft generator loading	SG1 and SG2 <45%	Any SG approaching 50%	Either >50% or failure of a generator	
DP UPSs	No UPS in bypass, no alarms	Any UPS in bypass or alarm	Loss of one DP UPS	
24 Vdc system	All 24 Vdc active and fully charged. No alarms	Any alarms	Loss of 24 Vdc system or charger failure	
Main propulsion (engines and rudders)	Both enabled, no alarms	Any other setup, any alarms or poor control	Loss or either port or starboard engine or rudder	
Bow thrusters available	Both enabled, no alarms	Any other setup, any alarms or poor control	Loss of any bow thruster	
Stern thrusters available	Both enabled, no alarms	Any other setup, any alarms or poor control	Loss of any stern thruster	
Fuel systems	No alarms	Any sign or potential threat of fuel oil contamination, supply line blockage, or any other supply failure	Loss of any generator due to fuel oil contamination, line blockage, or any other supply failure	
DP control system (power system mimics)	All displays checked and up to date	Any incorrect information	Incorrect information that affects DP operation	
DP control system (controllers and operator stations)	All controllers and operator stations online	Any alarms or poor performance	Loss of one controller or operator station	
DP network	Both networks available, no alarms	Any alarms or poor performance	Loss of one network	Complete loss of networks
Position references	All fully operational and verified. No conflicts between relative and absolute reference systems	Any alarms or poor performance	Loss of a reference	Loss of more than one reference
Heading sensors (gyros)	All three gyros enabled	Gyro alarms, loss of one gyro	Failure of two gyros	
Wind sensors	Both available	Mismatch alarm or loss of either wind sensor	Both wind sensors failed	
VRUs/MRUs	All units available	Mismatch alarm or loss of one unit	Loss of two units	
Communications (ECR/deck/platform/ dive control)	Redundant communications	One system remaining	No communications	
Ventilation and air conditioning	All operating as required	Any reduced ventilation or air conditioning	Reduced ventilation or air conditioning resulting in power reduction/equipment temperature alarms	
Starting air	No alarms	Any alarm		
Fire	No fire or active alarms	Any fire alarm	Fire confirmed	Fire in DP critical compartment or space

Action	Continue normal operations	Informative/consultative status (risk assess)	Prepare to suspend operations and initiate contingency plan (be ready to move off)	Stop operations Disconnect/bell recovery/DP reliant operation to stop
Flood	No bilge alarms active, no flooding	Multiple bilge alarms	Flood confirmed	Flooding in DP critical compartment
Visibility	Daylight with good visibility	Any other condition		
Collision	No collision imminent/minimum approach >500 m	Minimum approach will be <500 m	Potential for collision	Collision imminent

SIMOPS – Activity Specific Operating Guidelines				
Condition	**Green**	**Advisory**	**Yellow**	**Red**
Notify Master, chief engineer, senior project critical personnel	No	Yes	Yes	Yes

Action	Continue normal operations	Informative/consultative status (risk assess)	Prepare to suspend operations and initiate contingency plan (be ready to move off)	Stop operations Disconnect/bell recovery/DP reliant operation to stop
Change from green DP status of any other vessel in the field	Green	Advisory		
Communications/interaction with other vessels	Vessels operating normally with no known problems	Comms problem or possible position conflict	No comms or definite position conflict	
Vessels approaching to 500 m work site zone	Distance to another vessel >500 m. Comms established, approaching vessel passing working site with CPA >500 m	Distance to another vessel >500 m. Comms established, approaching vessel changed course and passed working site with CPA <500 m	Distance to another vessel <1000 m >500m. Comms not established, vessel approaching working site with CPA <500 m	Distance to another vessel < 500 m. Comms not established, vessel approaching working site with CPA <200 m
Helicopter operations	No planned ops	Planned helicopter operations pending	Ops with landing and take-off zone conflicts	
Communications with surface facility	Redundant comms	Comms problem	One comms system remaining	No comms remaining

This document is to be strictly followed for the named operation.

DPO Name Signature(s)

Master Name Signature

Engineer Name Signature(s)

Chief Engineer Name	Signature
Client (seen/ acknowledged)	Signature(s)

Table 3 – Activity specific operating guidelines – example

7 Example of a Configuration Table (CAM / TAM) in the ASOG

Note: This example of a Configuration Table (CAM / TAM) in an ASOG is for illustrative purposes only and should be used only as a guide on how the vessel specific CAM / TAM may be structured.

Condition	**Green**	**Advisory**
Notify Master, Chief Engineer and all other senior project critical personnel	No	Yes
Action	**Continue normal operations**	**Informative/consultative status (risk assess)**
Switchboard configuration	All bus ties open	Any other configuration
SG1, SG2, DA1 and DA2 (testing)	Tested at 100% on field arrival or within last 6 months	Not tested to 100% within 6 months or problems present
SG1, SG2, DA1 and DA2 configuration	SG1 and SG2 online, DA1 and DA2 stand-by	Any other configuration or problems present
Emergency generator	Auto-start selected and available for use. Auto start/connect tested prior to arrival on field	Any other configuration or know problems that reduce redundancy
Blackout drill (single fuel system)	Blackout drill conducted for all DPOs and engineers. Procedures in place	Any DPOs or engineers not performed blackout drill within the last 6 months
DP power supply	All UPS functional and load tested for 30 mins 24 hours prior to field arrival. Note: Batteries to be at optimum charge before entering 500 m zone	Any other configuration or known problems that reduce redundancy. Not tested for 30 mins prior to field arrival
24 Vdc power systems (load test)	All fully functional with crossover breakers DC 10 and DC 20 open. 30 min battery tests performed and at optimum charge before entering 500 m zone	Any other configuration or known problems that reduce redundancy. Not tested for 30 mins prior to field arrival
Main engines (drive)	Operational and tested to 100% prior to field arrival	Engines not capable of 100% output or problems present
Propellers and rudders (configuration)	One pump running on each with stand-by pumps ready	Any other setup or loss of any rudder
Bow thrusters 1 and 2	Thrusters tested to 100% in both directions on manual and DP at field arrival	Thrusters not capable of 100% command or problems present
Stern thrusters 1 and 2	Thrusters tested to 100% in both directions on manual and DP at field arrival	Thrusters not capable of 100% command or problems present
Thruster/main propellers/ rudder manual levers	Tested and fully operational on field arrival	Any known deficiencies or not tested at field arrival
Independent joystick	Tested and fully operational on field arrival	Any known deficiencies or not tested at field arrival
Manual control	Within 24 hours the Master and each DPO practise holding the vessel on position for 10 mins	Not completed
Emergency stops	Stops tested from the bridge on field arrival	Stops not tested or problems present
Thrusters, main propellers and rudders	All online and selected into DP system	Any known deficiencies, problems or issues
DP control system	Consequence analysis enabled no alarms active	Any other setup or consequence analysis alarm
DP related maintenance	Not being carried out	Requested by permit to work
DP position reference system	Median check setup and enabled, with three independent position references online based on 2 different principles, different IO, different UPSs	Less than three references online, position reference deviation >3 m

Action	Continue normal operations	Informative/consultative status (risk assess)
DGPS	Both units operational and available DGPS 1 and 2 on different differential systems and elevation masks (e.g. 7° and 10°)	Any other setup
DGPS line of sight	Field of operation is clear of possible obstructions	Possibility of masking by cranes/structures
Laser based	Operational Prisms in use with appropriate gate settings to avoid spurious signals	Not operational or faulty Other reflectors in use or unable to attain gate settings
Microwave based	Operational X-band radar off, i.e. if there is insufficient vertical separation or metallic shielding from microwave sensor	Not operational or faulty X-band radar on with no separation
Microwave sensor	Operational Sensor mounted on outside edge of fixed structure within vertical limits (≤2 m below or ≤5 m above microwave sensor unit on vessel). Battery charge confirmed sufficient for duration of operation	Not operational or faulty Sensor mounted out of vertical limits or located within installation structure. Battery charge not confirmed for duration of operation
Wind sensors	Both available	Any other setup
Gyros	All three units operational. Alignment <1°	Any other setup
Gyros	Manual input of speed and latitude	Auto input of speed and latitude
VRUs	Both VRUs online, no alarms, alignment <1°	Any other setup
Radar and traffic	Both radar on and 100% operational, no traffic conflicting with planned operations	Any other situation
Weather forecast	Reviewed and found within DP capability and DP footprint plots	Any other conditions
Position and heading alarms	Tested ok; heading warning/alarm set at 3° and 5°; position warning set at 3 and 5 m	Any other condition
Escape route (in degrees true)	Escape route identified and agreed with field operations	Escape route blocked or that possibility during planned operation
Speed of moves inside 500 m zone	From 500 m to 200 m, <=0.5 m/sec From 200 m to work site <=0.3 m/sec	Any other setting
Ventilation	All fans running in ER and thruster spaces	Any problems found
Air conditioning	Adequate cooling of DP computer area on bridge and switchboard room	Any known deficiencies
Watertight doors	All closed	Any open
Engine room manning	Manned	Not manned
Bow thruster room	Checked every watch for machinery function, flooding	Not checked
Fuels systems	Supply and return crossovers closed. Both port and starboard supplies and returns open. Day tanks sludged every watch	Any other setup or level alarm for day tanks. Any sign of fuel contamination, blockage or supply failure
Compressed air systems	Both compressors fully functional, auto start function tested and receivers full	Any other setup
FW cooling system	All FW cooling systems operational. Stand-by pumps tested prior to arrival on site	Any other configuration or know problems reducing redundancy
Sea water cooling system	All systems 100% operational. Stand-by pumps tested prior to arrival on site	Sea water temperature alarm

Table 4 – Critical activity mode – example