

Position reference systems – A timely reminder

Observation ●

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Overview

Events reported to IMCA include incidents, where station keeping capability has been lost and undesired events where redundancy has been compromised.

Recent DP events reported to IMCA include the following learnings:

- Incorrect selection of PRSs – the requirement for at least two different principles not being followed leading to position instability.
- Over reliance on one PRS, Global Navigation Satellite system (GNSS), to the exclusion of others:
 - Intermittent DGNSS signal outages in certain geographical locations.
 - Use of GNS without differential correction.
 - Common mode failures of DGNSS caused by selection of hardware from single supplier and differential positioning services from one supplier.
 - DGNSS signal reception becoming unsteady because of either shielding or shadowing.
- DP reference sensor UPS supplies not following the redundancy concept of the vessel – loss of UPS led to no references online.
- During cargo operations, removal of relative positioning system transponders/reflectors by installation crew prior to station keeping activities being completed.
- Laser based system locking onto a crew member standing close to the reflector (in a restricted area);
- Incorrect selection of PRSs for the mission requirements.
- Poor MoC processes leading to loss of redundancy of Position Reference Sensors – rewiring of sensors post worst-case failure to finish the mission.
- Incorrect PRS selection for use at a mobile installation leading to conflict between absolute and relative sensors causing drift off.
- Feed from the GNSS to the gyro leading to inaccurate latitude and speed correction signals.
- Poor MoC leading to the antenna of one GNSS being connected to two GNSS systems, creating a common mode failure.
- Select the most suitable reference origin considering the mission to be completed.
- In the case of instability, know the manufacturer's procedure for resetting the reference origin.
- Make sure to fully understand the different tests carried out on each PRS and the actions to be taken when a test suggests that a position measurement is not accurate.

IMO Guidelines

The guidelines for vessels with DP systems (MSC/Circ.645) were approved by the IMO Marine Safety Committee (MSC) meeting 63 in May 1994 to provide the industry with an international standard for DP systems on all types of vessels. From these

guidelines, classification societies create the rules with which DP vessels are designed and built.

IMO MSC/Circ.645 was updated in 2017 by **IMO MSC/Circ.1580** for new vessels and units with DP systems.

This new circular provides an amended standard reflecting the development in DP operation since 1994 and current DP technologies. For vessels and units constructed on or after 1 July 1994 but before 9 June 2017, the previous version of the guidelines (MSC/Circ.645) may continue to be applied, however it is recommended that section 4 (operational requirements) of the present guidelines be applied to all new and existing vessels and units, as appropriate.

The table below identifies the requirements of the two guidance documents with respect to PRSs and external sensors:

		IMO MSC Circular 645/IMO MSC Circular 1580 <i>MSC/Circ.645 6 June 1994 / MSC/Circ.1580 16 June 2017</i>		
Subsystem or Component		Minimum Requirements for Equipment Class		
		DP Class 1	DP Class 2	DP Class 3
Sensors	Position reference system (PRS)	2 ⁽¹⁺³⁾	3 ⁽¹⁾	3 ⁽¹⁾ 1 in alternate control centre
	External sensors	Wind	1	3 ⁽²⁾ 1 in alternate control centre
		Heading reference sensor	1	3 ⁽²⁾ 1 in alternate control centre
		Motion reference sensor	1	3 ⁽²⁾ 1 in alternate control centre
Comments: (1) Based on at least two different principles and suitable for the operating conditions (2) Based on three systems serving the same purpose (3) Only within MSC/Circ.1580 16 June 2017, otherwise not specified.				

There are some other specific functional requirements set out in the latest IMO guidance related to PRSs and external sensors as follows:

- The reference systems and sensors should be distributed on the UPSs in the same manner as the control systems they serve, so that any power failure will not cause loss of position keeping ability.
- New requirement for equipment Class 1 vessels:
 - For equipment class 1, at least two independent PRSs should be installed and simultaneously available to the DP control system during operation.
- Further emphasis of the isolation required for equipment class 3 vessels:
 - For equipment class 3, one of each type of sensor should be connected directly to the backup DP control system and should be separated by an A-60 class division from the other sensors. If the data from these sensors is passed to the main DP control system for their use, this system should be arranged so that a failure in the main DP control system cannot affect the integrity of the signals to the backup DP control system.

The IMO guidance document does not specifically address mission requirements. It is the responsibility of owners and operators of vessels to ensure that their vessels are equipped with the appropriate PRSs for the missions they intend to undertake.

The case studies and observations above have been compiled from information received by IMCA. All vessel, client, and operational data has been removed from the narrative to ensure anonymity. Case studies are not intended as guidance on the safe conduct of operations, but rather to assist vessel managers, DP operators, and technical crew.

IMCA makes every effort to ensure both the accuracy and reliability of the information, but it is not liable for any guidance and/or recommendation and/or statement herein contained.

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