Enhanced GNSS Differential Corrections for Dynamic Positioning (DP) Operations

Understanding the Role of GNSS in DP Operations

The Global Navigation Satellite System (GNSS) serves as a critical Position Reference System (PRS) in DP operations, primarily through acquiring differential corrections from diverse sources. This is particularly crucial when employing two GNSS PRSs for DP station keeping.

Introducing the Term 'Difflink'

The differential corrections subscription, the signal path, and related equipment is often called 'Difflink'.

Difflink in this context refers to the entire system encompassing differential corrections subscription, signal path, and related equipment. It spans from the onshore reference station to the quality control (QC) of the demodulator's output signal sent to the GNSS receiver. It is important to note that different providers might offer Difflink services under various names, raising the need for vigilance against common mode failures in the signal path.

In such high-precision applications, ensuring the reliability and accuracy of the Difflink system is crucial, as even minor errors in position data can lead to significant issues, particularly in sensitive operations such as DP.

The Importance of Redundancy

Drawing from extensive experience in the offshore DP industry, the best practice is to maintain at least two separate Difflink connections. This redundancy is a lesson learned from the history of GNSS in DP systems and aims to mitigate risks of common mode failures.

Recent Observations and Concerns

The IMCA Marine DP Committee has identified a significant issue: the assumed segregation of Difflink signal paths might not be as robust as DP crews believe. This is due to potential overlaps and commonalities in the GNSS differential correction signal paths.

Evolving Technology and Provider Landscape

Recent technological advancements and changes among satellite communication providers have altered the differential correction signal routes. These changes affect everything from the signal's origin to its final transmission to the GNSS receiver. For instance, shifts in satellite coverage and shared use of space vehicles but under a different 'brand' name or ground stations by various Difflink providers (albeit under different branding) exemplify these changes.

Actionable Recommendations

Map Out Difflink Signal Paths: We strongly encourage DP vessel owners, captains, and DP staff to comprehensively map out the Difflink signal paths for each system (e.g., Spotbeam, Satcom, IALA, Internet NTRIP). A single-line diagram can be an effective tool for this, ideally kept accessible at the DP console onboard.

Visual Aids: Use diagrams and flowcharts to understand complex signal paths and interconnections.

Regular Reviews: Periodically review and update these diagrams to reflect any changes in technology or service providers.

GNSS Difflink via Internet and NTRIP

Utilising Internet-Based Difflink (NTRIP): Networked Transport of RTCM via Internet Protocol (NTRIP) has become a common method to transmit GNSS differential corrections to offshore DP vessels. While valuable for surveying purposes, NTRIP poses cybersecurity risks and may not be ideal as the primary Difflink source for DP station keeping, especially in areas with satcom/satnav interference.

Cybersecurity and Reliability Concerns: Dual Independent Channels – in high-risk areas, it is advisable to use two independent NTRIP channels through separate signal paths and space vehicles.

Limited Primary Use: Avoid relying on NTRIP as the primary GNSS differential source during critical DP operations, due to potential jamming and interference.

Bandwidth Considerations: Remember, NTRIP requires significant satcom bandwidth, which may affect its feasibility.

Conclusion: Ensuring Reliable and Secure GNSS Data for DP Operations

Maintaining the integrity and security of GNSS differential corrections is paramount for safe and effective DP operations. By mapping signal paths, understanding the risks of shared technology and providers, and adopting a cautious approach towards internet-based Difflink systems, DP operators can better safeguard their operations against common mode failures and cybersecurity threats. Regular reviews and updates of these practices will further enhance the safety and reliability of DP operations in the ever-evolving technological landscape.

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Related Guidance

- IMCA M252 *Guidance on position reference systems and sensors for DP operations* – Subsection 3.1.2.1