

Paper for Consideration by NIPWG

Grounding of Bulk Carrier Muros—Lessons Learned from Improper Use of ECDIS

Submitted by:	United States (NGA)
Executive Summary:	A look at an “ECDIS-assisted” grounding and how it may affect NIPWG and Hydrographic Offices.
Related Documents:	United Kingdom Marine Accident Investigation Branch Report No. 22/2017 of 19 October 2017 (https://www.gov.uk/maib-reports/grounding-of-bulk-carrier-muros)
Related Projects:	None

Introduction/Background

On 2 December 2015 the 2,998 gross ton Spanish bulk carrier Muros (Figure 2), carrying a cargo of bulk fertilizer, was en route from Teesport (United Kingdom) to Rochefort (France). The vessel’s original Passage Plan had the vessel transiting through North Hinder Junction. During the watch handover from the Master to the Second Officer (2/O), occurring from 2350 (2 December 2016) to 0010 (3 December 2016), the Master ordered the 2/O to amend the Passage Plan to transit via the Sunk Traffic Separation Scheme (Figure 1). The vessel went aground on a falling tide on Haisborough Sand off the east coast of the United Kingdom in the early morning hours of 3 December 2016, about 2 hours after the watch handover. The vessel remained aground for 6 days before being refloated. Rudder damage required the vessel be towed to Rotterdam for repairs.

The United Kingdom Marine Accident Investigation Branch (MAIB) conducted an investigation into the grounding. The MAIB Report No. 22/2017 was released on 19 October 2017.

A timeline of the casualty can be found in the Annex to this paper.

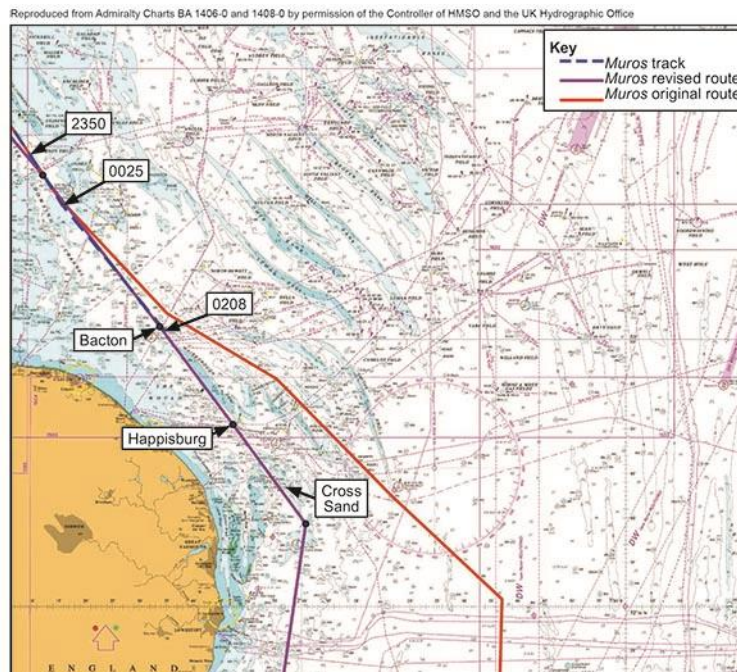


Figure 2—Comparison of Muros’ original Passage Plan and amended Passage Plan

Note: FOR REASONS OF ECONOMY, DELEGATES ARE KINDLY REQUESTED TO BRING THEIR OWN COPIES OF THE DOCUMENTS TO THE MEETING

Analysis/Discussion

Vessel parameters were, as follows:

1. Vessel name: Muros
2. Flag: Spain
3. Size: 2,998 gross tons
4. Length overall: 89.9 meters
5. Draft: 6.03 meters (forward) and 6.13 meters (aft)
6. Cargo: Bulk fertilizer
7. Crew: Nine
8. Last port: Teesport, United Kingdom
9. Next port: Rochefort, France



Figure 2—Bulk carrier Muros

The Muros had the following navigation systems on board at the time of the casualty:

1. ECDIS (Marine Navigation System AB Type ECDIS 900 (MARIS ECDIS900) Mk 10)—Functioning correctly (Figure 3).
2. Vessel navigated on Electronic Navigation Charts supplied by PRIMER, operated by the Norwegian Hydrographic Service.
3. The vessel did not carry paper charts.
4. Radar—Functioning correctly.
5. Bridge Navigational Watch Alarm System (BNWAS)—Functioning correctly. Set to alert at 3-minute intervals.
6. Echo sounder—Switched off after departing Teesport.

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Figure 3— Marine Navigation System AB Type ECDIS 900 (MARIS ECDIS900) Mk 10

Conclusions of the United Kingdom MAIB

The proximate cause of the grounding was an unsafe Passage Plan resulting from changing the vessel transit from via North Hinder Junction to via Sunk Traffic Separation Scheme.

1. Depth at LW = 5.0 meters.
2. Depth at HW = 6.2 meters.
3. Vessel draft = 6.03 meters (forward) and 6.16 meters (aft).
4. Depth of water too shallow for transit.
5. At best, vessel had an underkeel clearance of 0.04 meters (1.6 inches) only during a very short time at maximum High Water.

Improper ECDIS procedures impacting safe vessel operation:

1. ECDIS system and procedural safeguards intended to prevent groundings overlooked, disabled, or ignored.
2. Visual check of amended Passage Plan by 2/O did not identify the unsafe track over Haisborough Sand.
3. The track of the amended Passage Plan not planned or checked on an appropriate scale chart.
4. The use of the “standard” chart view limited the display of information and allowed the reliance upon visual checks when passage planning to be prone to error.
5. Audible alarms were disabled and the guard zone removed.
6. The ECDIS not used as expected by the regulators or the equipment manufacturers

Human factors impacting safe vessel operation:

1. Amending the Passage Plan interfered with the watchkeeping duties of the 2/O.
2. Master did not check or approve the amended Passage Plan.
3. Time of day and fatigue may have reduced the effectiveness of the 2/O.

United Kingdom MAIB Action Item

Joint safety study to be conducted by the United Kingdom Marine Accident Investigation Branch and the Danish Maritime Accident Investigation Board with the following emphasis:

1. Why mariners use ECDIS in ways not in accordance with instructions and guidance provided by system manufacturers and regulators.
2. Provide comprehensive data to improve functionality of future ECDIS systems.
3. Use this data to encourage greater use of operator experience and human-centered design principles.

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Justification and Impacts

The Prudent Mariner.—“The Prudent Mariner will not rely solely on and single aid to navigation, particularly a floating aid. An aid to navigation also refers to devices or structures external to a vessel which are designed to assist in the determination of position, including celestial, terrestrial, and electronic means, including Global Position Systems (GPS) and Differential GPS (DGPS).” (*U.S. Special Paragraph No. 1 of 2018*)

1. ECDIS is one Aid to Navigation (ATON).
2. Echo sounder is a second ATON.
3. Echo sounder not being operated (based on MAIB Report).
4. **Critical** navigation safety information from a second ATON was **not** available to watchstanders.
5. Compare the results of a “soft grounding” at a speed approaching 0 knots with the “hard grounding” which began at a speed of 11.2 knots.

Heinrich’s Domino Theory.—“Accidents resulting from a chain of sequential events, metaphorically like a line of dominoes falling over. When one of the dominoes falls, it triggers the next one, and the next ... —but removing a key factor (such as an unsafe condition or an unsafe act) prevents the start of the chain reaction.” (*Disaster Management Institute, Bhopal*)

1. Big Domino #1—Amended Passage Plan:
 - Water depth = 5.0 to 6.2 meters.
 - Maximum draft = 6.16 meters.
 - Guaranteed grounding situation.
2. Big Domino #2—Process of amending the Passage Plan:
 - Occurred during and slightly after the watch handover.
 - Conflict between watchstanding duties and process of amending the Passage Plan.
 - Potential 2/O fatigue affecting procedures for amending the Passage Plan.

If proper ECDIS procedures were followed, resulting in the elimination of one of the “dominoes” described in the MAIB Report conclusions, the grounding could have been avoided.

Recommendations

The nautical information provided by HOs for display on an ECDIS (or in another other distribution method) must be accurate, timely, and relevant.

Providing accurate, timely, and relevant nautical information will lessen the chance of HO failures being one of the “falling dominoes.”

Action Required of NIPWG

The NIPWG is invited to note this paper.