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ANALYSIS OF POSSIBLE AVOIDANCE OF THE COLLISION BETWEEN M/V GOTLAND CAROLINA AND M/V CONTI HARMONY

ABSTRACT

The paper presents the results of collision situation simulations concerning the m/v Gotland Carolina and the m/v Conti Harmony. The simulation aimed at analyzing the causes of the collision and generating manoeuvres that would have resulted in the two ships passing each other. The analysis was made with the use of a Navigational Decision Support System (NDSS). The data to be supplied to NDSS are collected from a variety of sources of navigational information. Then they are processed by specialized computing algorithms and presented to the operator on a display in the alphanumeric and graphic forms. The data on the specific navigational situation from the Danish Maritime Administration (DMA) were used for the generation of signals transmitted to NDSS.

Keywords:
collision avoidance.

INTRODUCTION

The collision under consideration occurred on 19 April 2008 at 0926 local time, 22 nautical miles south of Ra's al Kuh (Iran) at daytime, in very good visibility. In the vicinity of the collision there were no navigational obstructions and dangers nor other ships that might have restricted possible anti-collision manoeuvres. Figure 1 presents the location of ships' collision.

Figure 2 presents the trajectories of ships' movements till the collision, as reconstructed by DMA inspectors.

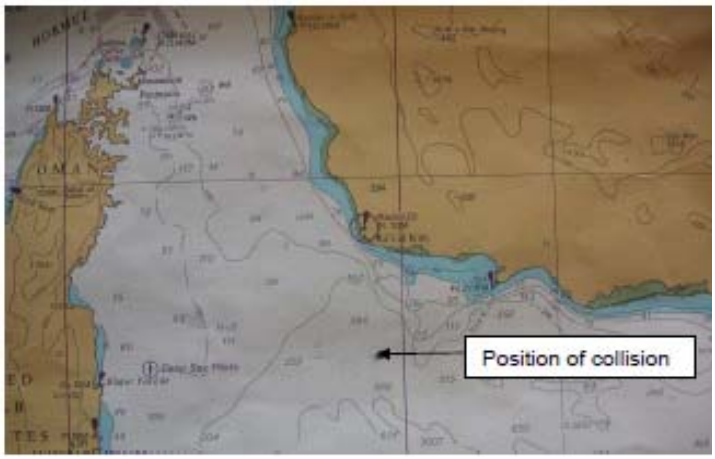

Fig. 1. Position of the collision [2]

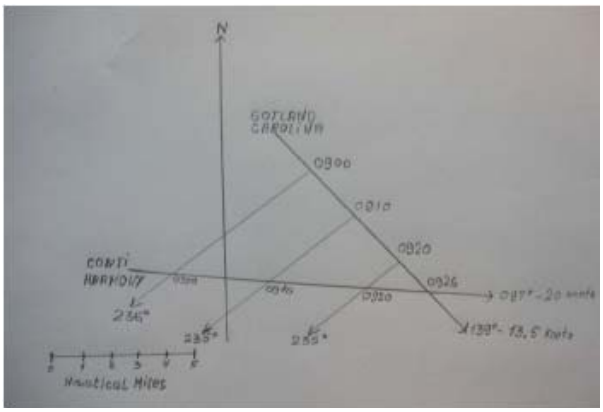

Fig. 2. Reconstructed trajectories of the ships [2]

ASSUMPTIONS FOR THE SIMULATION

All the information that was used for simulating an encounter situation of the ships is derived from a DMA report available on the website www.dma.dk [2].

From the positions of both ships and their movement parameters at 0900, the system qualified this encounter as crossing courses and pointed out Gotland Carolina as the give-way vessel, which is in compliance with Rule 15 of COLREGs. In this connection, a recommended manoeuvre was generated for the ship Gotland Carolina, with an assumption that the stand-on ship is actually maintaining its course and speed (Rule 17 of COLREGs). The procedure for identifying which ship has the right of way is precisely described in [6]. The following parameters were adopted for simulations:

— Closest Point of Approach CPA = 1852 m (1 nautical mile);
— good visibility;
— length overall of the Gotland Carolina — 183 m;
— length overall of Conti Harmony — 210 m;
— position of AIS/GPS antenna onboard Gotland Carolina — 153 m from the bow;
— position of AIS/GPS antenna onboard Conti Harmony — 180 m from the bow.

SIMULATION RESULTS

Based on the data included in the report [2], a simulation was made to determine parameters of the encounter and to generate possible anti-collision manoeuvres at certain moments of time. The solution does not account for manoeuvring components (kinematics equations). Figure 3 presents a reconstructed situation at 0900 hrs. The range of courses that assure safe passing (at the preset CPA or larger) is marked yellow on the circle. The recommended manoeuvre is indicated as 'NEW COURSE' and enables the ships to pass each other at the assumed CPA. The speed range satisfying the assumed criteria is marked green, and proceeding at 'NEW SPEED' will result in the ships' distance during passing being equal the assumed CPA. At operator's request, the system can display the recommended trajectory based on the generated solutions and the next waypoint (fig. 4).

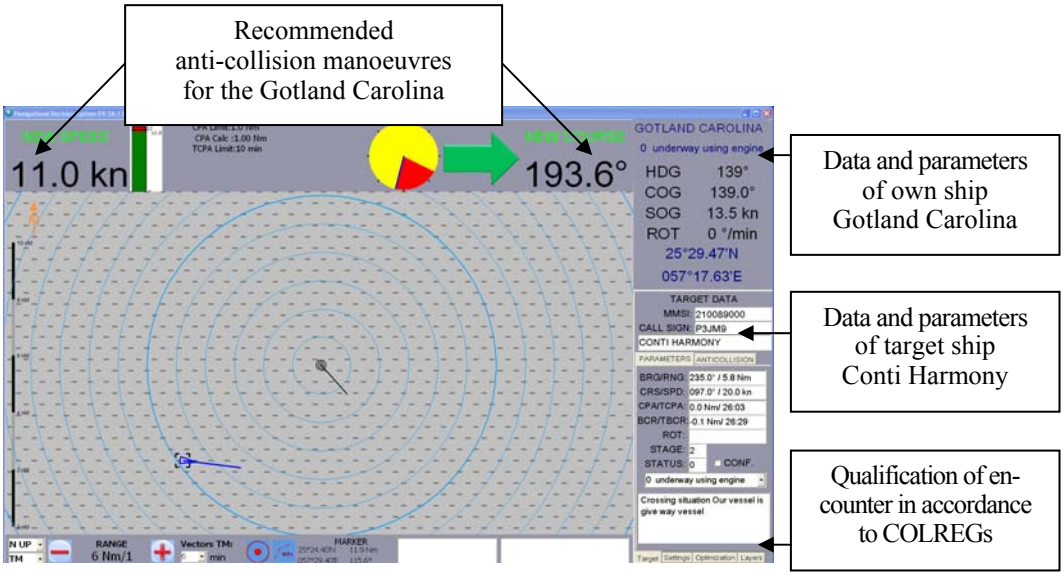

Fig. 3. Location of the ships at 0900 hrs

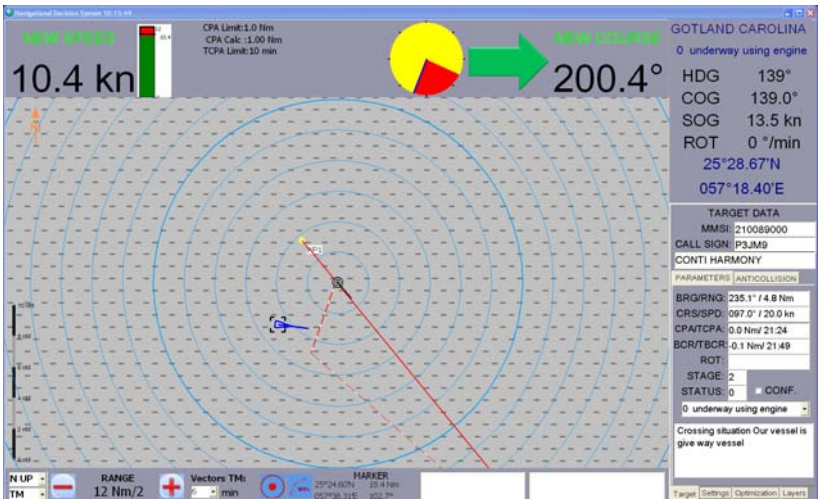

Fig. 4. The recommended trajectory

When the recommended manoeuvre is performed by own (system operator's) ship, the system assesses the situation as safe (green ship contour — figure 5), as all the criteria have been satisfied. At the same time, in line with COLREGs, the situation remains qualified as before, so our (operator's) ship is still the give-way vessel.

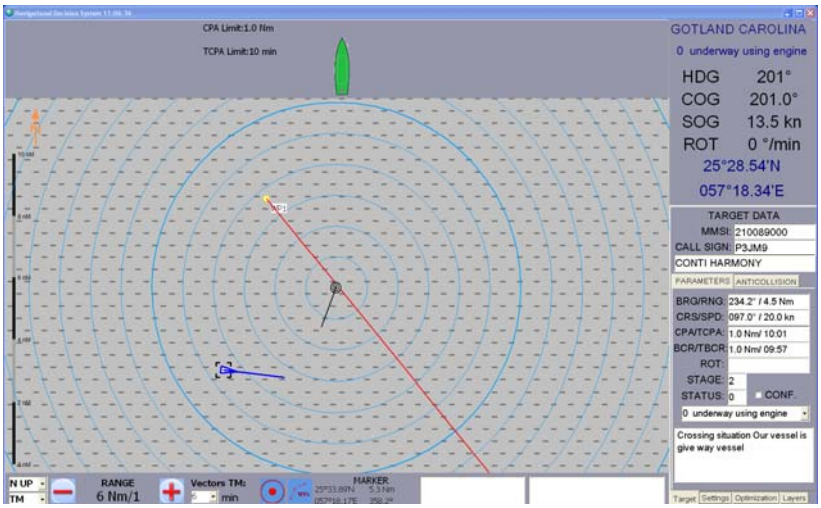

Fig. 5. Situation after an anti-collision manoeuvre

If the navigator does not take a preventive action, the system will continue to work out manoeuvres to be performed. If a collision cannot be avoided by altering course to starboard or by changing speed, proposed course alterations to port will be displayed (fig. 6).

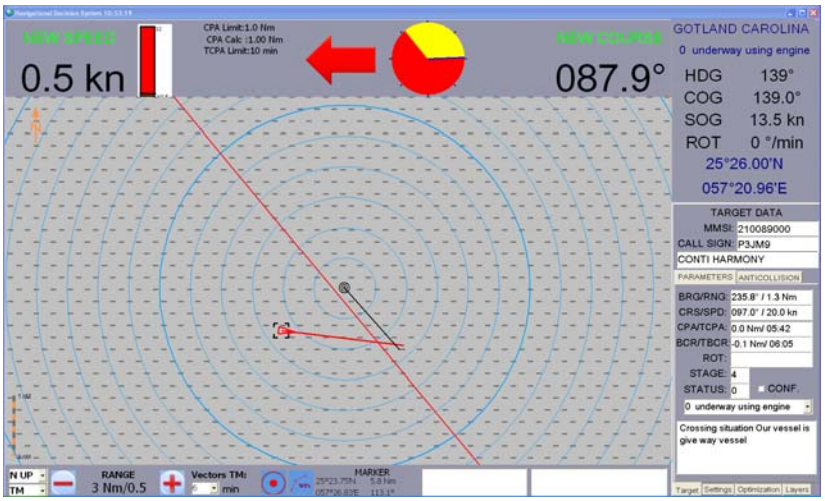

Fig. 6. Solutions to the collision situation by course alteration to port

At the time the ships come to a point where passing at distance of 1 Nm will not be possible, the system automatically reduces the assumed CPA by half. The new CPA taken into account while generating an anti-collision manoeuvre is displayed at the top screen denoted by CPA Calc (fig. 7).

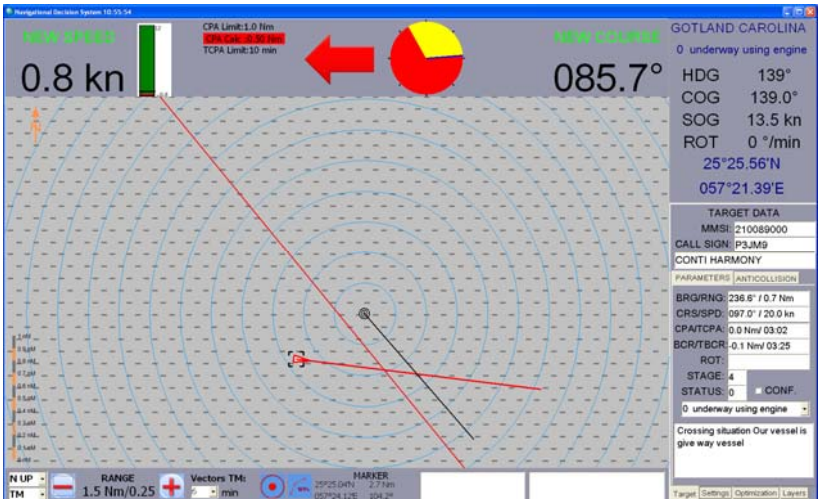

Fig. 7. The manoeuvre generated after a reduction of the assumed CPA

Failure to take a preventive action, which means failure to execute the action recommended by the system, will lead to a close quarter's situation. Then only a concerted action by the two ships may save them from a collision (fig. 8).

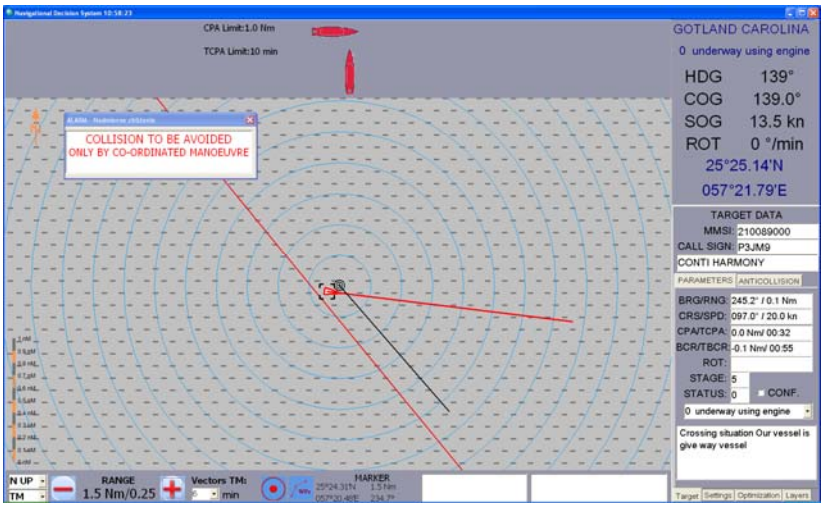

Fig. 8. A close quarters situation

ANALYSIS OF THE COLLISION

Over the time interval examined in this paper that is from 0900 hrs to the moment of collision at 0926 the bridge on each ship was manned exclusively by respective officers of the watch, which at daytime is a common practice in most shipping companies. The third officer of Conti Harmony had signed on one day before and it was his first independent bridge watch in his life. The third officer on the Gotland Carolina had held this position in the company from September 2007 and despite sea experience was not able to qualify the encounter situation correctly. He presumably made a mistake other navigators happen to make. It is authors' opinion that the navigator on board the Gotland Carolina had probably come to a conclusion that if a faster ship than his was located below his beam, then it was a case of overtaking (Rule 13). Consequently, he took no preventive action as prescribed by Rule 17 of COLREGs. The Conti Harmony was in fact faster and was approaching the Gotland Carolina from behind her beam (right course angle 0970), but the regulations specify that the limit between overtaking and crossing courses is set up on course angle 112.50, a fact navigators neglect only too often. The watch officer on the Gotland Carolina correctly qualified the situation and in the first stage of the encounter followed Rule 17. However, he did not take advantage of the possibility provided by paragraph a) ii), and the most importantly, he did not take action as prescribed by paragraph b) of the mentioned rule. What is most shocking in the event: neither of the vessels took any preventive action till the very moment of collision!

SUMMARY

At present there are no requirements obliging sea-going vessels to be equipped with a decision support system that would assist navigators in collision situations. Consequently, vessels do not carry such systems. Besides, manufacturers of navigational equipment and specialized software are not interested in developing and implementing decision support systems as ship owners show no demand for them. Unfortunately, most shipping companies share an opinion that if a device or software is not required by law, it will not be purchased.

In this connection, it seems purposeful to launch a widespread campaign aimed at decision makers promoting mandatory installation of a navigational decision support system. The navigator able to use a system that correctly qualifies a situation in compliance with the COLREGs and submits possible solutions would not make errors as was the case in the considered collision. It goes without saying that the implementation of such systems would enhance the safety of navigation.

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