

ZARGA MOORING DECK ACCIDENT LESSONS LEARNED

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in affiliation with the Marshall Islands Maritime & Corporate Administrators

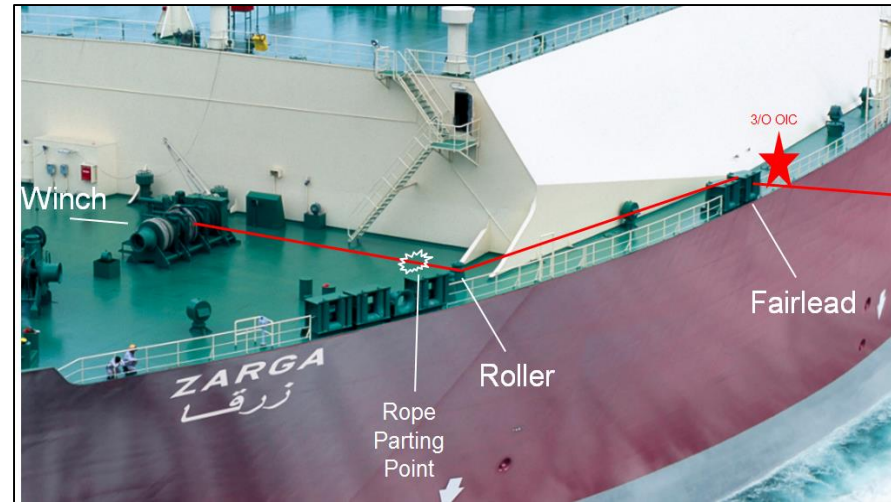
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ZARGA MOORING DECK ACCIDENT

- Occurred on 2 March 2015 at Milford Haven
- An ultra-high modulus polyethylene (UHMPE) fiber line fitted to a 22 meter (m) polyethylene tail failed while being tensioned to warp the vessel along the berth
- The Third Officer was seriously injured when struck by the failed line
- Joint investigation by the United Kingdom (UK) and the Republic of the Marshall Islands (RMI)
- Report available on the Marine Accident Investigation Branch (MAIB) website



FAILURE OF UHMPE FIBER MOORING LINE

- Loss of strength over time due to kink bands created by axial compression
 - Minimum breaking load of the line was 137 tons, failed at 24 tons
- Service related causes of axial compression include: twisting of the line, bending around improperly sized deck fittings, and cyclic loading
- Jacketed core prevented detection of damaged fibers
- Snap back underestimated



IMPROPERLY SIZED DECK FITTINGS

- Manufacturer's guidance stated the ratio of the diameter of the deck fittings to the diameter of the mooring line (D/d) was critical
- Minimum recommended D/d of 12:1 for lines on board ZARGA
 - Pedestal roller $D/d = 10.22$
 - Roller fairlead $D/d = 9.1$
- Factors related to mooring lines not taken into account when fittings were selected by the builder



SNAP BACK DURING DESTRUCTIVE TESTING



SNAP BACK ZONES - ORIGINAL



SNAP BACK ZONES - REVISED



SOME OF THE LESSONS LEARNED

- The potential for snap back due to the use of polyethylene tails was underestimated
- The arrangement of the mooring deck meant that the entire foredeck area and portions of the main deck adjacent to the cargo dome were a snap back zone
- The line manufacturer's guidance regarding minimum D/d ratio was not taken into account during the selection of deck fittings during new construction
- The potential for significant reductions in line strength due to axial compression was recognized by the line manufacturer
- The jacketed core construction rendered ship management's line inspection procedures ineffective



COORDINATION WITH INDUSTRY

- Throughout the marine safety investigation, there was good coordination between the investigating States, ship management, the line manufacturer, and the OCIMF
- This coordination has crossed over to participation in the ongoing work being done at the International Maritime Organization (IMO) related to mooring deck issues
- Focus has included:
 - Addressing seafarer safety when designing the layout of mooring decks
 - Ensuring mooring lines are considered, starting with the design phase, as part of a vessel's mooring system



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