

**MAIB SAFETY BULLETIN 1/2009**

Catastrophic Failure of High Pressure  
Hydraulic Anchor Windlasses

Marine Accident Investigation Branch  
Mountbatten House  
Grosvenor House  
Southampton  
SO15 2JU

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This document, containing an urgent safety recommendation, has been produced for marine safety purposes only, on the basis of information available to date.

The Merchant Shipping (Accident Reporting and Investigation) Regulations 2005 provide for the Chief Inspector of Marine Accidents to make recommendations at any time during the course of an investigation if, in his opinion, it is necessary or desirable to do so.

This Safety Bulletin is issued to raise awareness of the potentially life threatening danger caused by a series of accidents involving hydraulic windlass motors, probably as a result of excessive tension being placed on the anchor chain. It recommends windlass manufacturer TTS Kocks GmbH immediately determines the technical causes for several recent catastrophic failures of its equipment and provide engineering and design solutions to prevent similar failures in the future.

The Safety Bulletin is published with the support of the Australian Transport Safety Bureau (ATSB), the German Federal Bureau of Maritime Casualty Investigation (BSU), and the Bahamas Maritime Authority (BMA).



Stephen Meyer  
Chief Inspector of Marine Accidents



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## BACKGROUND

Since 2007, the MAIB has been made aware of the catastrophic failure of a number of high pressure hydraulic anchor windlasses. Of those that have occurred, the following are particularly noteworthy:

- On 25 June 2007, the tanker *Young Lady* started to drag her anchor in Tees Bay, UK. The vessel was in ballast, the wind speed was in excess of 40 knots and there was a heavy northerly swell. The master decided to weigh anchor and depart, but during the operation the Nippon Pusnes windlass hydraulic motor suffered a catastrophic failure and the cable ran out to the bitter end. The vessel continued to drag her anchor until the anchor flukes snagged on a submerged gas pipeline (MAIB investigation report 3/2008).
- On 13 December 2008, the hydraulic motor casing of the TTS Kocks high pressure windlass on board the Hong Kong, China registered container ship *APL Sydney*, fractured as the vessel was heaving in her anchor in Port Philip Bay, Melbourne, shortly after the anchor had dragged in gale force winds and had ruptured a submerged gas pipeline. There were no injuries. This accident is being investigated by the Australian Transport Safety Bureau which also identified another failure of anchor windlass hydraulic motor while investigating the grounding of the Singapore registered woodchip carrier *Crimson Mars* in May 2006.
- On 23 March 2009, the hydraulic motor of the TTS Kocks high pressure windlass on board the Bahamas registered crude oil tanker *Stellar Voyager* exploded as the vessel attempted to weigh anchor in Tees Bay, UK. With the wind gusting up to 30 knots and a 2m swell, the anchor chain was under considerable tension. The windlass motor was in the 'heave' position but the anchor chain had started to render or pay out. When the windlass motor casing shattered, the windlass operator was seriously injured by debris, some of which was thrown as far as 40m. This accident is being investigated by the MAIB and the Bahamas Maritime Authority.

Preliminary findings of metallurgical examination of the failed components recovered from *Stellar Voyager* have identified:

- There is no evidence of damage caused by fatigue, metallurgical defects or impact.
- The toughened steel cylinder and pistons of the axial piston displacement motor had been subjected to extremely high internal pressures.
- Signs that the outer cast iron casing had fractured under extreme internal pressure and on impact with broken components of the hydraulic motor.



- On 19 May 2009, the hydraulic motor of the TTS Kocks high pressure windlass on board a German registered LPG vessel exploded as the vessel was heaving in her anchor off the coast of Florida, USA. The vessel was in ballast and the wind speed was up to 38 knots. The windlass operator was seriously injured by the flying debris. This accident is being investigated by the vessel's owners and her classification society.

## SAFETY ISSUES

The frequency and consequences of the catastrophic failures of high pressure windlass motors highlighted is a serious cause for concern. These and other similar accidents appear to have occurred when heaving in the anchor in adverse sea and weather conditions when the anchor chain has been tensioned beyond the intended safe loading of its windlass. This can be avoided by:

- Closely monitoring the predicted weather and sea conditions and ensuring that the anchor is recovered in good time, before the conditions make this difficult to achieve; and
- Using main engines to manoeuvre a vessel to relieve tension in the anchor chain before 'heaving in'. This also helps to prevent an anchor from 'breaking out' and dragging while weighing.

However, the risk of an anchor chain suddenly tensioning can never be fully eliminated. Therefore, until technical solutions are introduced by all windlass manufacturers that prevent the over-loading of high pressure windlasses resulting in their catastrophic failure, it is imperative that an anchor chain is closely monitored when weighing, and that 'heaving in' is stopped as soon as any significant tensioning is observed or difficulty is experienced.

## RECOMMENDATION

While it is recognised that in the longer term the risk of catastrophic failures to all windlass motors will need to be addressed by more stringent industry performance standards, in view of the recent accidents involving its equipment, TTS Kocks GmbH is recommended to expedite its action to:

**2009/140S            Identify the technical reasons for the catastrophic failures of its windlass motors and determine engineering and design solutions to prevent similar accidents on board vessels fitted with its equipment.**

## REQUEST FOR INFORMATION

To gain an accurate assessment of the incidence of the catastrophic failure of anchor windlasses, all ship owners, ship managers, windlass manufacturers, classification societies and marine accident investigation organisations are requested to forward details of any incidents which have resulted in the fracture of the windlass motor casing. All information, which ideally should include the date of the occurrence, the vessel's name, details of any injuries, and the manufacturer of the windlass, will be treated in confidence and only used for the purpose of accident investigation. Reports should be forwarded to [maib@dft.gsi.gov.uk](mailto:maib@dft.gsi.gov.uk) with the title '**windlass motor fractures**'.

**Issued August 2009**