International Union of Marine Insurance

Vancouver, 2008

MSC Napoli:

What are the lessons, can the industry respond?

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17th September, 2008

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MSC Napoli: What are the lessons, can the industry respond?
Introduction

- MSC Napoli suffered hull structural failure in bad weather in the Western Approaches in January, 2007
- The vessel was beached under the direction of the UK SOSRep. The containers and fluids were discharged under an LOF/SCOPIC agreement by a consortium of salvors.

MSC Napoli: What are the lessons, can the industry respond?
Introduction

- Salvage was "assisted" by local scavengers who successfully claimed "salvage" rights from the Receiver of Wrecks

MSC Napoli: What are the lessons, can the industry respond?
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- Napoli was refloated but found to be so damaged as to be unsuitable to tow. She was beached again.
- Explosives were used to separate the two sections. The forward section, including the cargo holds and primary area of damage, was refloated and taken to dry dock, where it was examined by experts
- The stern section remains in situ off Boscombe Beach

MSC Napoli: What are the lessons, can the industry respond?
Introduction

- The Marine Accident Investigation Branch (MAIB) investigated the incident.
- The scope of an MAIB investigation is to assess the cause and circumstances so as to prevent future accidents. It has no role in assessing liability or assigning blame.
- The MAIB terms of engagement are important for Insurance interests. Their report has expressly limited objectives. The report may be entered as evidence in subsequent enquiries, but at the time of publishing it has not be subject to peer review.
- The UK Government's report on the MSC Napoli is in many ways exemplary, but Flag State and Coastal State reports should not be read as proof of cause.

MSC Napoli: What are the lessons, can the industry respond?
Introduction

- At the request of the Chairman of the Liability Workshop, the presentation focuses only on the MAIB report and the lessons that can be learned. There will be some discussion, however, of the wider implications of the incident to the marine community and particularly insurance interests.

MSC Napoli: What are the lessons, can the industry respond?
The Report

- The MAIB investigation was thorough and professional.
- Analysis was performed by Bureau Veritas, with whom the vessel was classed at the time of the incident
- DNV performed an analysis, Napoli had been built under the requirements of their rules in 1991.
- Independent metallurgical reports were prepared after examination of the salvaged section in dry dock and a further dynamic analysis preformed by Southampton University. Compliance with the Society's rules for buckling was verified independently.

- All these analysis and checks pointed towards structural failure due to buckling in way of the engine room. The analysis appeared to confirm the actual failure mechanism.

MSC Napoli: What are the lessons, can the industry respond?
The Report

- The report drew 16 conclusions, identified three areas of action and made recommendations to IACS, the ICS and the ship's owners. The following observations can be drawn from the report.

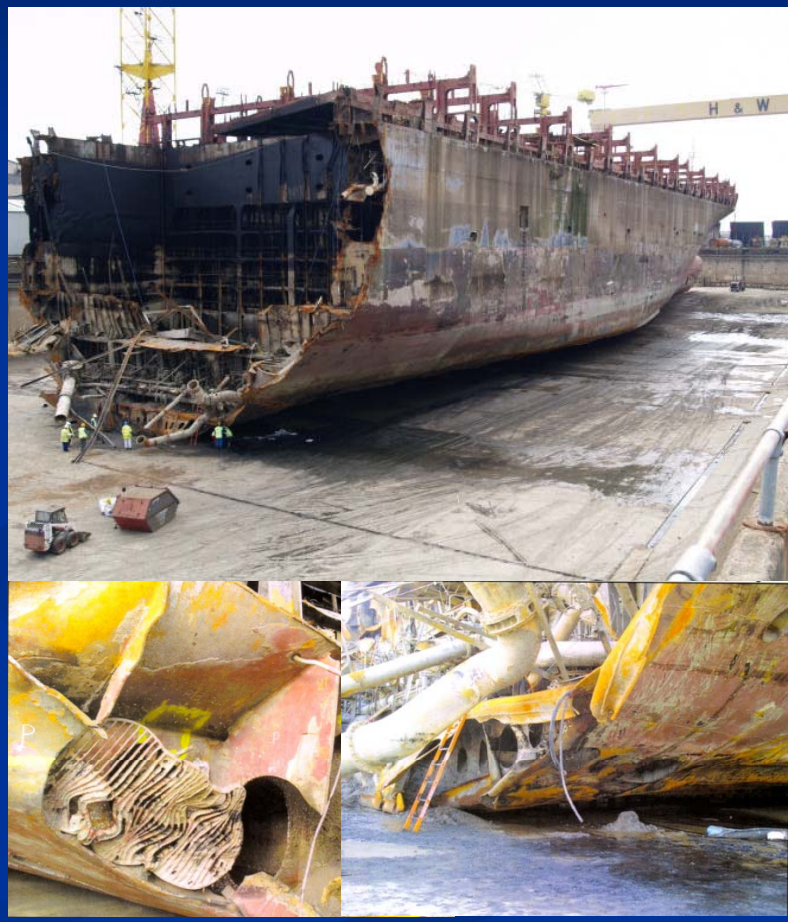
i) Major structural failure occurred in less than design conditions

ii) Localised failure could have been occurred by at lower load levels

iii) The analyses were equivocal at the conditions at failure

iv) Contributory pre-existing corrosion and fatigue damage was not identified

v) The action's of the master and immediate previous history were not contributory



MSC Napoli: What are the lessons, can the industry respond?
The Report

We are entitled to ask:

- What happened to the safety factor?
- Why hadn't failure occurred in the previous 16 years?
- What was different in Jan, 2007
- Is there something wrong with our ships or operational procedures?

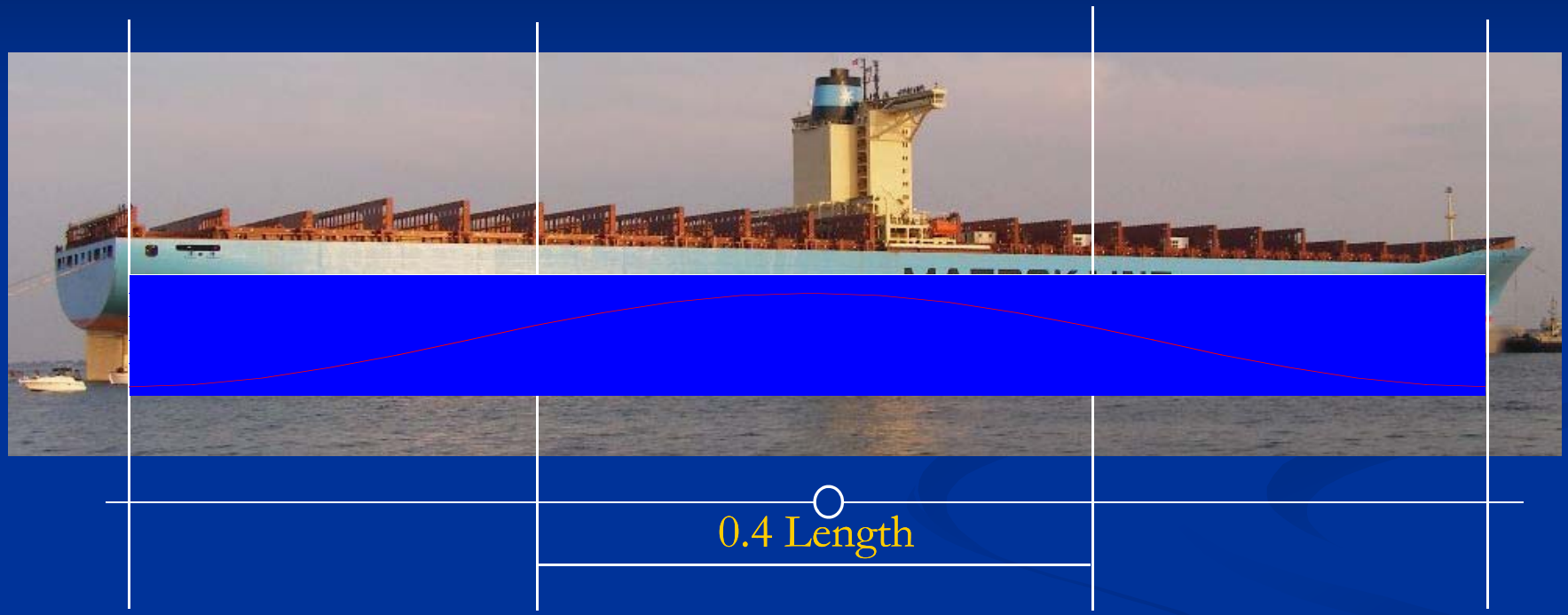
MSC Napoli: What are the lessons, can the industry respond?
What happened to the safety factor?

0.4L

Class approval based on calculations within 0.4L

although all construction drawings throughout ship would have been approved

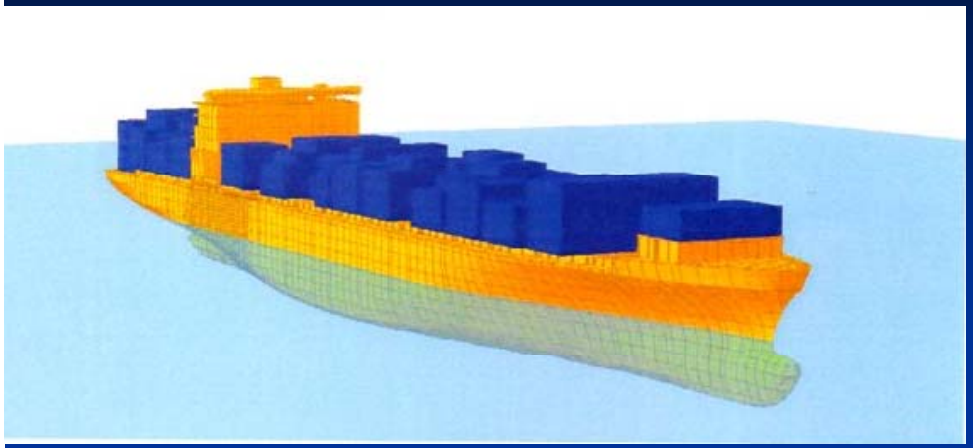
MSC Napoli: What are the lessons, can the industry respond?
What happened to the safety factor?



0.4 L

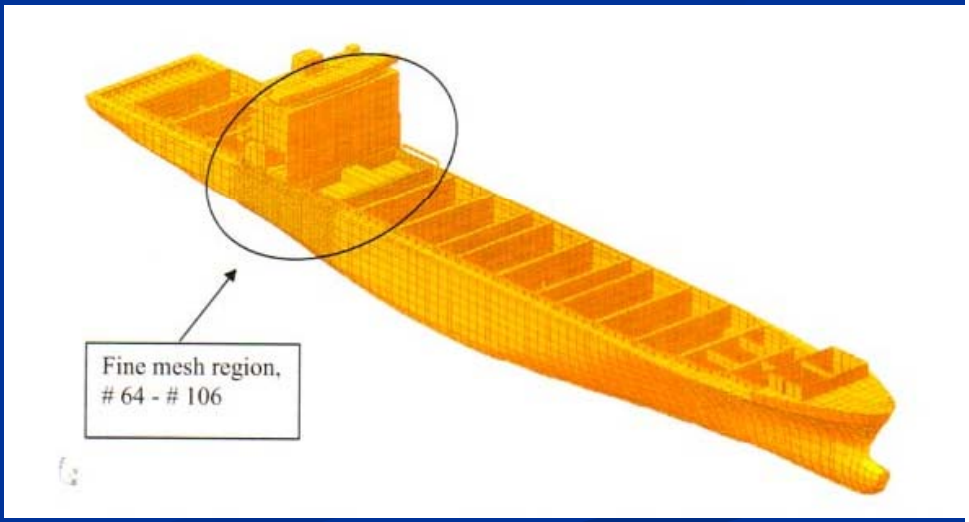
Wave loads over 0.4L are assumed a maximum amidships

MSC Napoli: What are the lessons, can the industry respond?
What happened to the safety factor?

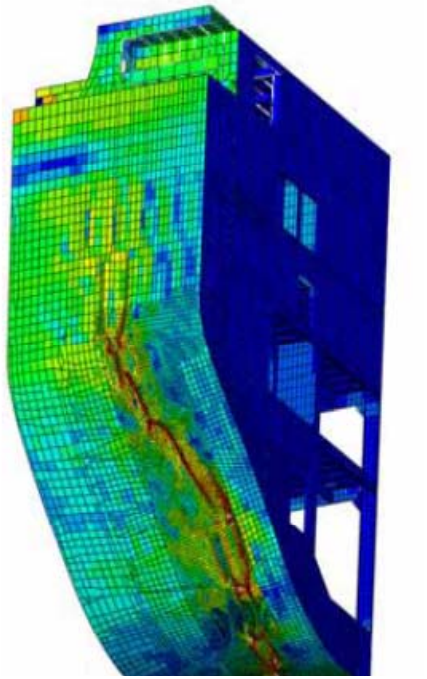


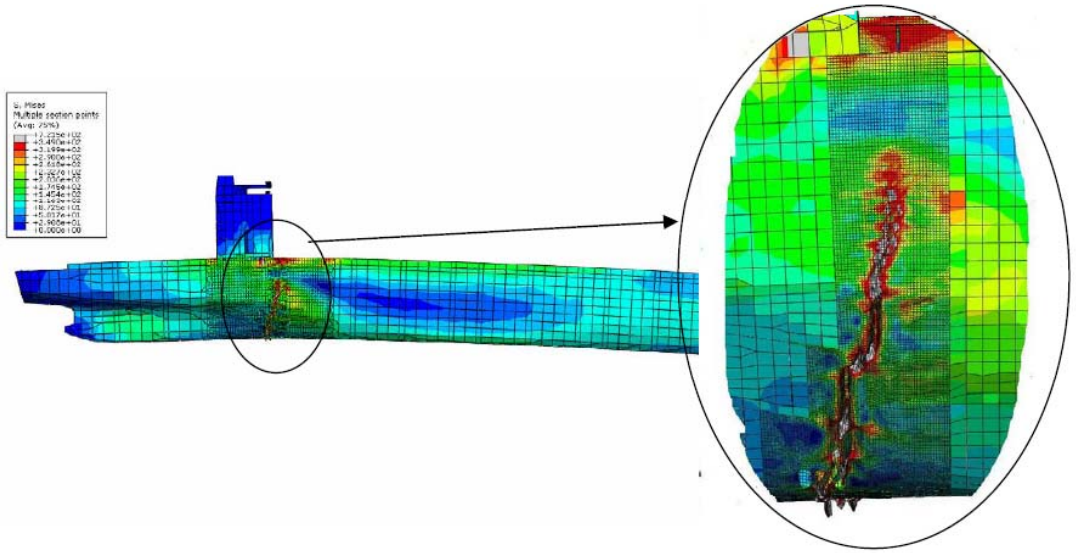
The failure was outside the 0.4L and coincided with a change in hull structure

The post casualty analyses were significantly more sophisticated than those undertaken at the design stage



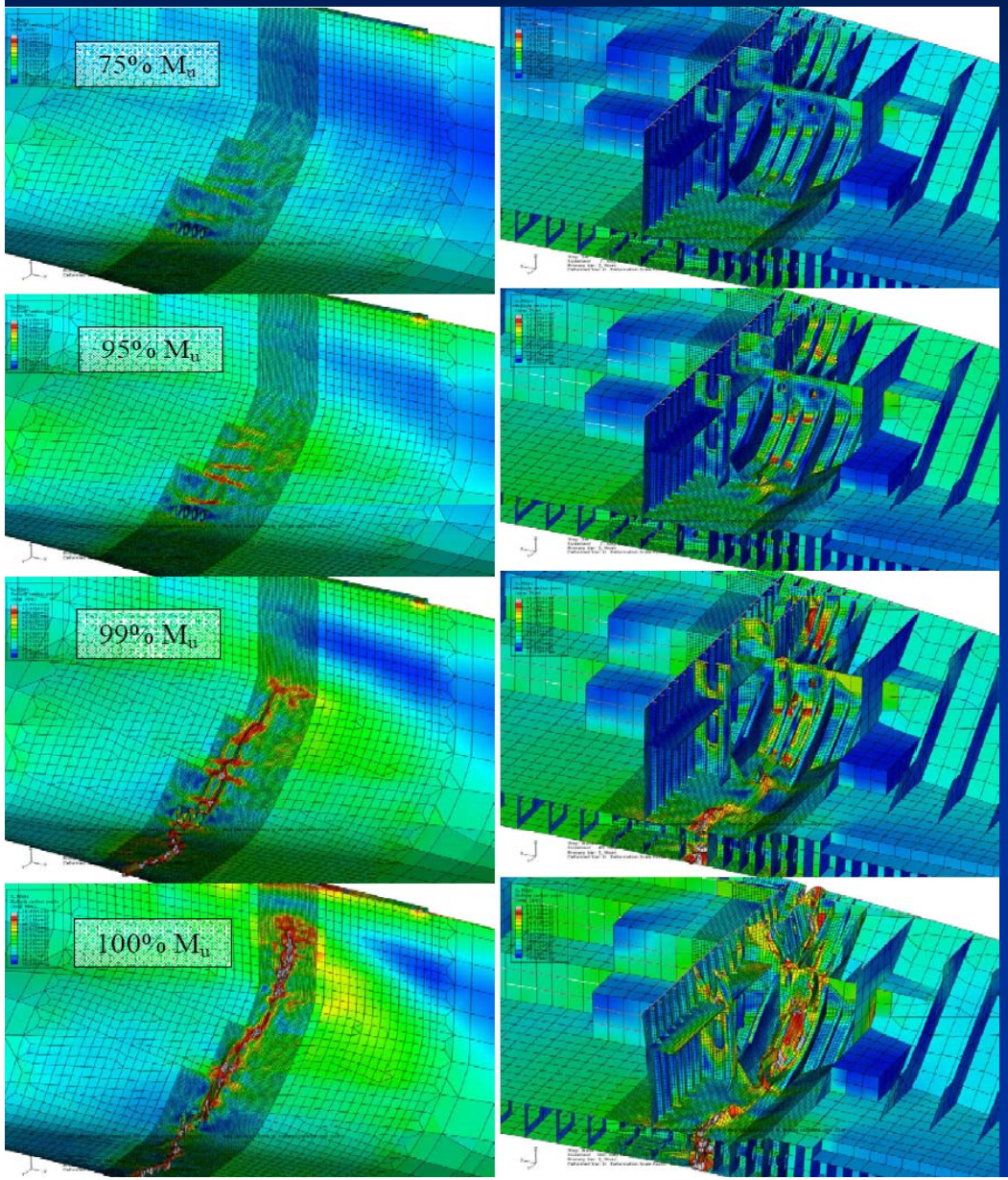
MSC Napoli: What are the lessons, can the industry respond? What happened to the safety factor?





Both the BV and dNV compare their FEA predictions with the visible damage.

MSC Napoli: What are the lessons, can the industry respond?
What happened to the safety factor?



From the dNV report:

Damage begins at 75% Mu and becomes significant at 95% Mu

The "permissible stress" for design purposes should not exceed 75% under the unified rules.

The MAIB concluded:

"In view of the importance of design safety factor in ensuring an acceptable level of safety, a more objective approach is warranted'

MSC Napoli: What are the lessons, can the industry respond?
Why hasn't it happened in the last 16 years?

The report noted pre-existing repairs in the areas of failure.

The material testing report concluded:

> *"The apparent widespread evidence of local repair welding, some of which was clearly demonstrably post build, would suggest that there had been earlier local structural integrity problems and issues of in respect of fillet weld integrity in particular."*

The MAIB report noted that

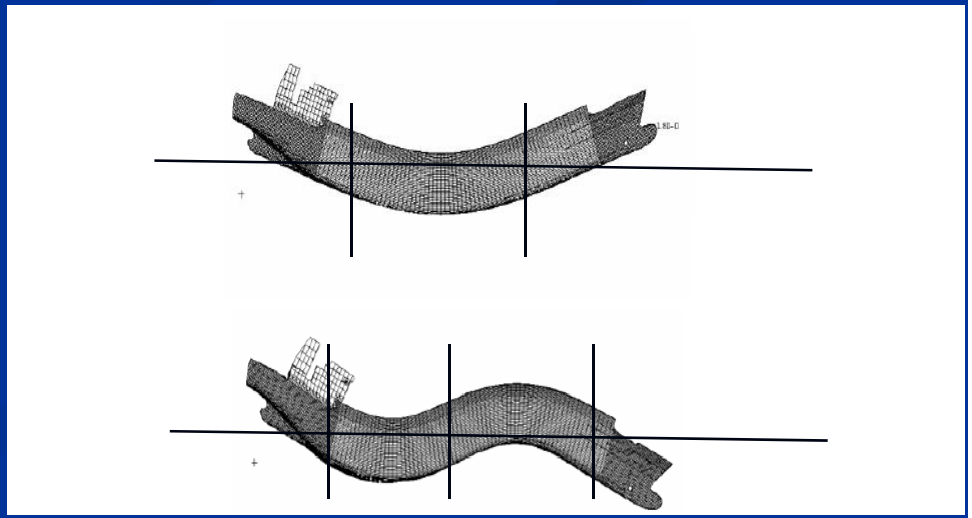
> *Fatigue cracking and welding repairs are not unusual in a vessel of MSC Napoli's age and the repair of fatigue cracks and welds by on board fitters or riding gangs in a common practice."*

There was no record of these repairs in the class record

MSC Napoli: What are the lessons, can the industry respond?
What was different on 7th January, 2008?

Slamming :
Initiates hull girder flexibility

The first two vertical modes of vibration (exaggerated)
The two types of analysis performed for the MAIB are not equivalent



MSC Napoli: What are the lessons, can the industry respond?
Is there something wrong with our ships or operational procedures?

a) the record of major hull failures suggests not
but, the report seems to accept that localised damage is common and inevitable. Since ship structural failure is an extreme event; is it acceptable that localised (unreported) damages are tolerated?

It would be reasonable to insist on a higher level of repair reporting. ISM enables a verifiable and auditable procedure.

IACS has been charged with review of specific unified rules. A wider commentary would be helpful.

b) the report discounted operational issues as contributing to cause
but, there were a number of factors that could have contributed where there is weak guidance to operators and the master.
There is clear scope for much better definition of the operational envelop of ships of all types and notably fine form "flexible: vessels.

The ICS has been charged with producing codes of practice.

MSC Napoli: What are the lessons, can the industry respond?

Is there something wrong with our ships or operational procedures?

a) the report called for a research into the provision of hull stress monitoring, to assist masters in operation, particularly the decision to reduce speed, but:

very few, if any, of the major structural failures, including MSC Carla, Erika, Prestige, Castor or indeed the MSC Napoli occurred in design conditions or failed in way of localised structure where stress monitoring would not have assisted the master.

There is very little full scale monitoring of ship structure. As a result the computational analysis on which we rely has poor validation.

A comprehensive in service record of how structures perform in service is necessary before any useful guide can be given to masters through stress monitoring.

GL has initiated a major and comprehensive research monitoring stress and accelerations on a container ship. This is an independent initiative that should be encouraged and extended for wider value.

MSC Napoli: What are the lessons, can the industry respond?
Conclusions

The MAIB report is comprehensive and sets a precedent for authoritative investigation.

It highlights developments in

i) analysis methods
ii) understanding of hull girder vibration
iii) weakness in operational procedures

MSC Napoli: What are the lessons, can the industry respond?
Conclusions

It calls for specific actions from the ICS and IACS as representatives for the industry. Both are responding with reports which are in preparation.

The results should be used as a trigger for a wider debate on the specification of operational envelops and understanding the development of new design methods.

Caution should be exercised in seeking a panacea for structural failures through the use of stress monitoring

MSC Napoli: What are the lessons, can the industry respond?
Finally

The MAIB did not discuss the salvage.

This was a major casualty conducted under the direction of the SOS Rep. Most notably, it involved the deliberate grounding of the vessel, twice, initially when carrying 3000 tonnes of fuel oil.

These were potentially contentious decisions against a background of litigation against the crew and owners in the event of pollution. The role of the SOS Rep and the success of the operation should be taken as model for handling incidents by coastal states.

Most importantly, the successful model of the SOS Rep relies on the competence and available technical advice and that he genuinely standards above political interference.