



MINISTRY OF JUSTICE OF THE REPUBLIC OF LITHUANIA
TRANSPORT ACCIDENT AND INCIDENT INVESTIGATION DIVISION

Serious accident with Lithuanian flag
general cargo ship Klaipeda,
IMO 9106584,
occurred on 24 September 2018
in Riga Bay

SAFETY INVESTIGATION REPORT

No. (L-18/16) 1A-155
26 July 2019

FOREWORD

The safety investigation is conducted in accordance with Casualty Investigation Code, adopted by IMO resolution MSC.255(84), Commission Regulation (EU) No. 1286/2011 of 9 December 2011 adopting a common methodology for investigating marine casualties and incidents developed pursuant to Article 5(4) of Directive 2009/18/EC of the European Parliament and of the Council, Article 48 of Maritime Safety Law of the Republic of Lithuania and Description of the procedures for preparation and submission of marine accident and incident investigations, reports and safety recommendations, approved by the Order No. 1R-386 of the Minister of Justice of the Republic of Lithuania on 30 December, 2015.

The purpose of the safety investigation is to prevent the occurrence of accidents and incidents in the future, rather than establish blame or liability. The safety investigation is conducted independently of any judicial or administrative proceedings, has no aim to apportion blame or liability, is not related to them, and have no impact thereupon.

Each safety investigation shall be concluded with a report in a form appropriate to the type and seriousness of the accident or incident. The report shall contain, where appropriate, safety recommendations, which shall in no case create a presumption of blame or liability for accident or incident.

The safety investigation report shall not be used as evidence in a judicial or administrative process seeking to apportion blame or liability, because this was not established in the course of the safety investigation and it is not compatible with the objective of the safety investigation.

The information is published to inform the maritime industry and the public of the general circumstances of the accident or incident. Extracts may be published without specific permission providing that the source is duly acknowledged, the material is reproduced accurately and it is not used in a derogatory manner or in a misleading context.

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SUMMARY

Owner of seagoing ship	Aurora Shipping JSC
Operator of seagoing ship	Afalita Shipping JSC
Building yard of ship	Drobeta Turnu Severin, Romania
Name of ship	Klaipeda
Type of ship	General cargo
Flag of ship	Republic of Lithuania
IMO number	9106584
Place of the accident	Riga Bay 57° 15' North 023° 43' East
Date and time of the accident	24 September 2018 17:30 (15:30 UTC) ¹
Injuries/fatalities	None
Persons on board	Crew - 13 Passengers - -

Synopsis

On 24 September 2018, 15:20 Lithuanian flag general cargo ship Klaipeda unmoored and departed from Riga port, the Republic of Latvia, to Lubmin, the Federal Republic of Germany, loaded with rapeseeds in bulk. At 18:30, while ship was proceeding via Riga Bay, a fire alarm worked out. Engine room was full of smoke, oil was splashing from the main engine's 4th cylinder area. Crew decided to stop the main engine. The anchor was dropped, tugs ordered. Ship was towed back to Riga port for main engine repairs.

Safety Investigation

On 25 September 2018, 11:46 Lithuanian Transport Safety Administration notified Investigator-In-Charge of Maritime Accidents and Incidents, appointed by the Minister of Justice of the Republic of Lithuania, about the accident. On the same day, Investigator-In-Charge of Maritime Accidents and Incidents started a preliminary assessment, in order to decide whether to undertake a safety investigation of serious accident. On 11 October 2018, it was decided to

¹ Ship's time is used in the report.

carry out safety investigation of serious accident.

In accordance with the point 3.5 in Annex of the Commission Regulation (EU) No. 1286/2011 of 9 December 2011, adopting a common methodology for investigating marine casualties and incidents developed pursuant to Article 5(4) of Directive 2009/18/EC of the European Parliament and of the Council, that any ship involved in a marine casualty or incident should not be delayed more than is absolutely necessary by the need to gather evidence, and taking into account the severity of the consequences of the accident, it was decided not to delay the ship's main engine repair works and not to carry out the examination of the ship's main engine cylinder block. Against this background, the safety investigation was conducted on the basis of evidence gathered at the site.

1

FACTUAL INFORMATION

1.1. Narrative

The circumstances of the accident are described on the basis of the statements of the crew members, the ship's logbook and the Safe Sea Net system data. Ship's route is provided in Fig. 1.



Fig. 1. Ship's route (Safe Sea Net chart)

10:20 Ship's loading operations were finished in Riga port.

14:15 Pilot boarded the ship (position 1, Fig. 1).

14:20 Ship started unmooring operations.

15:30 Pilot left the ship (position 2, Fig. 1).

16:25 Ship left Riga vessel traffic control area.

17:30 Fire alarm in the ship's engine room automatically worked out (position 3, Fig. 1). Wind direction was North North West, speed about 13 m/s.

17:31 Chief engineer entered engine room to assess the situation. Engine room was full of smoke, oil was splashing from the main engine's 4th cylinder area.

17:34 Chief engineer decided to stop main engine, and reported it to the bridge.

17:35 Master gave permission to stop the main engine, the ship began to drift (position 4, Fig. 1).

17:40 Ship reported the accident to Riga vessel traffic service (hereinafter – VTS

RIGA) via radio channel 09.

20:45 VTS RIGA gave permission to the ship to drop the anchor (position 5, Fig. 1).

21:00 Ship dropped left anchor. Tugs were ordered to tow the ship to Riga port for repairs. Continuous contact with the crew of the tug was maintained, weather conditions were assessed and the start time of the towing operation has been coordinated.

On 26 of September, 02:40, ship was towed and moored in Riga port, alongside quay.

1.2. Shore authority involvement and emergency response

Not applicable.

1.3. Ship's particulars

Klaipeda (Fig. 2) particulars are provided in Table 1.



Fig. 2. Klaipeda (Photo provided by operator of seagoing ship)

Table 1. Klaipeda particulars

Flag, registration	Lithuanian flag. Registered in the Register of Seagoing Ships' of the Republic of Lithuania.
Classification society	Bureau Veritas (hereinafter - BV)
Identification	International Maritime Organisation (IMO) number: 9106584 Call sign LYSZ Maritime Mobile Service Identity (MMSI) number: 277391000
Main characteristics	Gross tonnage (GT): 2395 Length: 87,80 m Breadth: 12,30 m
Building yard of ship	Drobeta Turnu Severin, Romania
Year of build	1995
Minimum safe manning	Number of crew, indicated in minimum safe manning document - 13
Cargo allowed	General cargo

1.4. Data about the crew

On 6 August 2018, Lithuanian Transport Safety Administration issued Minimum safe manning document, which provides that ship's engine room team consist of chief engineer and motorman. There was no requirement for continuous watch in the engine room.

Chief engineer who was serving on board Klaipeda during main engine overhaul before the accident was STCW² III/2 qualified. He was serving on board Klaipeda from 2015 as chief engineer and had 4 years of experience as 2nd engineer on seagoing ships.

Chief engineer who was serving on board Klaipeda on the day of the accident was STCW III/2 qualified. He had experience as a chief engineer on different seagoing ships from 2010.

1.5. Data about main engine and its overhaul

1.5.1. Main engine

Ship's main engine – Stork-Wärtsilä 8FHD 240-G, manufactured by Stork-Wärtsilä Diesel B.V. It is non-reversible eight-cylinder four-stroke diesel, with turbo charging. The cylinders arranged in one row and numbered consecutively from 1 to 8. Diesel used as fuel. Rated engine power - 1445 kW, nominal speed - 850 rpm. The main engine connected with tail shaft by reverse-reductor.

Wärtsilä (hereinafter – engine manufacturer) is currently responsible for maintaining this type of engines. Main engine maintenance, servicing and repairs were carried out in accordance with main engine No. 70922 8FHD 240 manual (hereinafter – engine manual).

Pistons of the main engine were composed of steel top part of the piston (piston crown) and bottom part of the piston (piston skirt), Fig. 3. Piston crown and skirt are secured to each other by four bolts from the bottom side of the piston skirt. The cylinder liners installed in the cylinder block in dedicated bores (Fig. 4.).

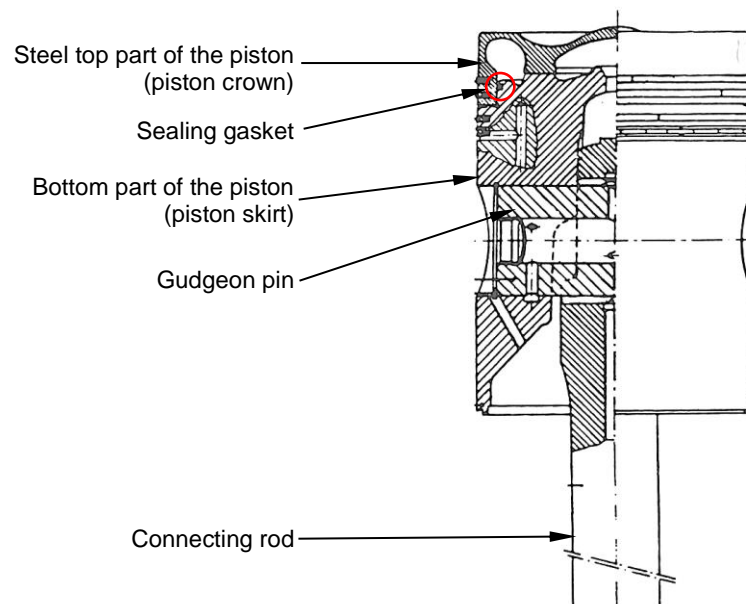


Fig. 3. Construction of the piston (engine manual)

² STCW – International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978 as amended.

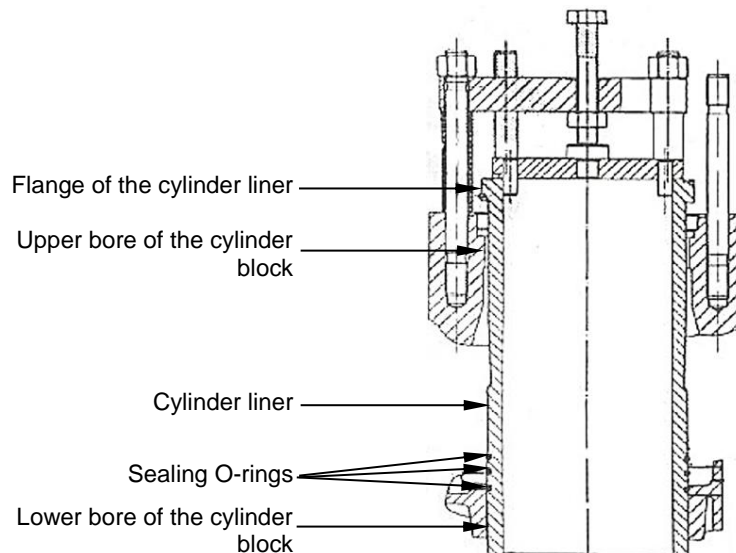


Fig. 4. Cylinder liner installation into cylinder block (engine manual)

1.5.2. Engine repair company

Main engine overhaul, except machining of new cylinder liners, was carried out by engine repair company Avangard Marine Group JSC (hereinafter – engine repair company). It was certified in accordance with the requirements of the ISO9001:2015 standard for repair and maintenance of ship's internal combustion engines, auxiliary machinery and equipment. The engine repair company was certified by classification society Registro Italiano Navale for Condition based maintenance of machinery systems. The engine repair company was certified by classification society Russian Maritime Register of Shipping for the following activities:

- '- Repair of internal combustion engines up to 15000kW.*
- Installation and repair of ship's auxiliary machinery and equipment.*
- Repair of steering and propulsion plants.*
- Repair of ship's system and pipefittings.'*

Operator of seagoing ship has applied to the engine repair company to carry out main engine overhaul. Overhaul was started on 31 July 2018 and completed on 31 August 2018. The main engine overhaul contract was not signed, although a draft contract was prepared.

1.5.3. Requirements for main engine overhaul

It is provided in the engine manual, that:

'The steel top part of the piston may not be removed other than in consultations with the Service Department of Wärtsilä. This means that piston heads³ must on no account be removed when a routine maintenance job is being effected.'

It is provided in the engine manual, that after every 20000 working hours, among others, the following inspection and maintenance works should be carried out:

- '- Inspection of contact surfaces of cylinder liner with cylinder block and cylinder head;*
- Machine-honing of the liner.'*

When checking the condition of the cylinder block and cylinder liners, the cylinder liners are removed from the cylinder block.

³ Steel top part of the piston (piston crown), Fig. 3.

It is provided in the engine manual, that when installing the cylinder liners into cylinder block, the following steps must be carried out:

*' - Clean the liner collar carefully inside and outside as well as the location of the O-ring seats (Fig. 4);
 - When fitting a cylinder liner, always use new O-rings. Fit the O-rings with silicone grease. Stretch the O-rings as little as possible;
 - Clean the supporting face and the lower and upper bores of the cylinder block. Check the supporting face and the bores for damage. The supporting face can be ground with the grinding ring.'*

There was no information provided in the engine manual about the actions in case the cylinder block bores' diameters are less than "no go" limit. However, according to information provided by the engine manufacturer to the safety investigation, in such cases mechanical repair - milling of bores of the cylinder block should be used.

1.5.4. Main engine overhaul

According to data, provided by operator of seagoing ship, a total running hours of main engine before overhaul on 31 July 2018 was 104370 hrs and main engine cylinder liner No. 4 has run total 16736 working hours.

Ship was in port of Riga during the main engine overhaul. The engine repair company disassembled main engine and transported its parts (cylinder liners, pistons, etc.) to the workshop situated in city of Klaipėda where these parts were inspected and repaired. Cylinder block was left on board and inspected.

Pistons were disassembled by unscrewing bolts, holding steel top parts (crowns). Pistons' components (Fig. 3) were cleaned and assembled back. According to witness statements, these works were carried out without consulting the engine manufacturer. The engine repair company had no required guidance containing requirements for attaching the steel top part of the piston to the piston skirt, including the bolts' tightening procedures. During the safety investigation, no data about the condition of these bolts was received and it is not known whether these bolts were renewed during the repair.

The engine repair company hoisted cylinder liners from the cylinder block and inspected them. Cracks were found in the flanges area of all cylinder liners. It was decided to replace all 8 cylinder liners by new ones.

The engine repair company measured cylinder bores of the cylinder block and in the technical act of 26 August 2018 stated that all 8 upper bores of the cylinder block were at "no-go" level – all measured diameters of upper bores were less than the "no-go" limit (the difference comparing to "no-go" limit varies from 0.05 to 0.1 mm).

According to witness statements, during previous operation, the ship's main engine was overheated and that could have affected possible damage to the cylinder block geometry. However, documents confirming these witness statements were not provided to the safety investigation.

According to witness statements, the engine repair company provided all information about the condition of the cylinder block to the operator of seagoing ship and recommended to carry out a thorough cylinder block geometry check and consult the engine manufacturer for further actions. The operator of seagoing ship has not performed a cylinder block check and has not consulted the engine manufacturer and classification society (BV) for further actions. To ensure smooth installation of new cylinder liners into the cylinder block, operator of seagoing ship, instead of repairing the cylinder block, decided to reduce the diameter of cylinder liners by machining its outside surface. The operator of

seagoing ship organised the machining cylinder liners in local ship repair yard in Riga. These works were not co-ordinated with classification society (BV) or the engine manufacturer. Installation of cylinder liners into the cylinder block was not running smoothly – installation succeeded only after several attempts when some of cylinder liners were machined several times.

After the main engine has been overhauled, the ship's main engine was operated for 273 hours before the accident.

1.5.5. Supervision by classification society

While ship was in the dry dock in Riga repair yard in August 2018, a classification society (BV) surveyor carried out, among others, a hull intermediate survey and a machinery annual survey on board the ship. A machinery occasional survey was also carried out in order to verify main and auxiliary engine overhaul. According to paragraph 6.1.2 of chapter 2(2) of part A of classification society's (BV) rules, occasional surveys are carried out at the time of, for example, repair or renewal work. No deficiency related to the condition of the main engine cylinder block, cylinder liners or pistons was reported to the classification society (BV) during the occasional survey, which was completed on 31 August 2018.

Paragraph 6.2.3 of chapter 2(2) of part A of classification society (BV) rules provides:

'During repairs or maintenance work, the Owner is to arrange so that any damage, defects or non-compliance with the rule requirements are reported to the Surveyor⁴ during his survey.'

Contract between classification society (BV) and the Operator of seagoing ship stipulates the following:

'The undersigned, being aware of and accepting the Bureau Veritas Rules and Regulations and the Marine & Offshore Division General Conditions given here above, declares to be willing to maintain the vessel in class with Bureau Veritas.'

According to information provided by classification society (BV), information about measurements taken on cylinder block in way of bores for the liners was reported neither in the main engine overhaul report from the engine repair company nor directly to the BV attending surveyor.

1.6. Data about the damages to the main engine

After the accident, valves' pushrods and their protecting pipes of cylinder No. 4 were found damaged (Fig. 5. and Fig. 6.).



Fig. 5. Bended pushrods of cylinder No. 4

⁴ Surveyor of the classification society (BV).

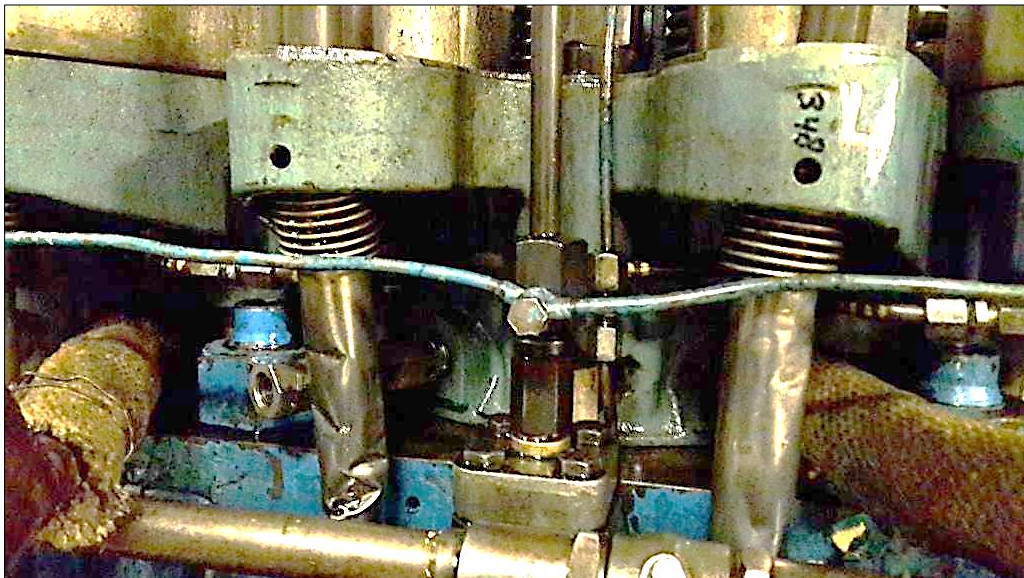


Fig. 6. Damaged pushrod protecting pipes of cylinder No. 4 (Photo provided by the operator of seagoing ship)

Steel top part of the piston (piston crown) No. 4 was found detached from the piston skirt (Fig. 7. and Fig. 8.). Bolts, holding steel top part of the piston were found broken (Fig. 8.). Piston rings were broken and stuck in piston ring grooves. The top surface of the steel top part of the piston had traces of touch with valves. Deep scratches on the piston skirt surface visible (Fig. 7.).

Dowel pin between steel top part of the piston and piston skirt was found broken off. No fretting signs were observed on the mating surfaces of the piston skirt top part and bottom side of the steel top part of the piston.



Fig. 7. Piston skirt



Fig. 8. Top steel part of the piston (bottom side) with broken holding bolts

Inner surface of cylinder liner No. 4 had scuffing surface and deep scratches in lower part (Fig. 9.). Inner surface of cylinder liner had ellipse geometry.



Fig. 9. Inner surface of cylinder No. 4 liner after the accident

The operator of seagoing ship hired a local repair company Antiks N Ltd in Riga to inspect and repair main engine after the accident. It is stated in the defect report, issued after the inspection on 3 October 2018, that: various components of cylinder head No. 4, valve lever shafts and bearings were damaged; connecting rod small end bearing of cylinder No. 4 and gudgeon pin were found with scratches; lower part of connecting rod had geo-deformation; cylinder No. 4 injector nozzle was found deformed.

1.7. Other findings established after the accident

It is stated in the defect report, issued on 3 October 2018 by Antiks N Ltd:

*'When the cylinder liner No 4 was hoisted from the cylinder block, the top sealing O-ring⁵ of the cylinder liner was found broken and pressed. <...>
Piston rubber gasket⁶ was missing in piston No 4. <...>
3 of 8 pistons were installed with a turn of 180° according to the marking.'*

1.8. Safety management system

The operator of seagoing ship has implemented a safety management system in accordance with the requirements of the ISM Code⁷. ISM Code provides:

*'10. Maintenance of the ship and equipment
10.1 The Company should establish procedures to ensure that the ship is maintained in conformity with the provisions of the relevant rules and regulations and with any additional requirements which may be established by the Company.'*

On 5 September 2013, the operator of seagoing ship approved Safety and Environmental Protection Policy, which specify the following:

*'The policy of the Company is based on the fulfilment of international and national standards with particular emphasis to ensure maritime safety, prevention of accidents, safety of life at sea and protection of environment.
The Company's goals are as follows:
- assurance of ship's operation safe practices and safe work and rest conditions for persons on board;
- assurance of protection from all detected risks, related to the operation of ships.'*

On 29 March 2017, the operator of seagoing ship issued third edition of Manual of Safety Department, which is integral part of Safety management system, implemented by the operator of seagoing ship. The manual provides:

*'9.6 Company's work with sub-contractors
In order to carry out specific functions, related to operation of ships in accident free and safe manner and to ensure pollution prevention, Company co-operates with a number of third parties – subcontractors.
The definition of subcontractor within the Company means the enterprise, organisation, legal entity or individual, which is recognised by the Company as being capable to carry out works and render services within full scope, on behalf or in the interests of the Company.
Company requires subcontractor to ensure, that quality of works or services are in full conformity with applicable rules and norms. Within the framework of implemented Safety Management System and with respect to implementation of requirements of ISM Code, the Company is fully responsible for actions taken by subcontractor and has the right to control actions of subcontractor.
Subcontractors are used by the Company to carry out works which cannot be performed by the Company itself <...>. For instance:*

⁵ See Fig. 4.

⁶ Sealing gasket, see Fig. 3. The purpose of the sealing gasket is to ensure the seal of the piston so that the circulating oil does not enter the outside of the piston.

⁷ International Management Code for the Safe Operation of Ships and for Pollution Prevention, adopted by International Maritime Organization by Resolution A.741(18).

<...>
For ship repair works;

<...>
Company's subcontractors shall be registered in the Company's subcontractors list.

<...>
Assessment of subcontractor
In the process of selection of subcontractors, Company prefers those candidates, which have implemented internal quality management system and certified it as compliant to standards of ISO 9000 series.
For documented assessment of the subcontractor candidate, the Company shall use Subcontractor candidate assessment list⁸.

Agreement with subcontractor
Basic form of cooperation between Company and subcontractor are agreements. Agreement between the Company and subcontractor can only be concluded after the assessment of subcontractor.'

Operator of the seagoing ship did not provided safety investigation with data that he assessed the engine repair company's, as subcontractor, suitability, and registered it in the subcontractors list.

1.9. Actions after the accident

The defect report, issued on 3 October 2018 by Antiks N Ltd, indicates:

'Defects found:
- Upper bore of cylinder No 4 of the cylinder block was less than "no-go" limit (less than Ø288 mm).
<...>.
Works to rectify defects:
- to carry out a repair of the upper bore No 4 of the cylinder block, to ensure 0,03-0,1 mm space between the block and the liner. <...>.
- Replace bolts, holding steel top part of pistons⁹ and sealing gaskets¹⁰.'

According to the data provided by the operator of seagoing ship, verification of the geometry of the main engine cylinder block and parameters of other cylinder bores was not carried out.

On 12 February 2019, the engine repair company informed that it has decided about the following:

'To refuse to carry out future repairs of engines with similar technical problems without the participation of the classification society and its approval for the performance of such work.'

On 14 February 2019, the operator of seagoing ship informed about the following actions:

'On 11 February 2019 it was held a meeting of the Company's management regarding the nearest planned repair of Company ships. In order to avoid repeating the performance of poor-quality repairs in result whose could be occurred any emergency cases, it was decided to take a more responsible action concerning selection of the contractor.'

⁸ Reference is given to the list.

⁹ On 1 October 2018, Engine manufacturer provided piston bolt tightening procedures.

¹⁰ See Fig. 3.

1.10. Similar serious accident

On 16 April 2018, 20:03 UTC the Lithuanian registered ro-ro cargo vessel Finlandia Seaways suffered a main engine failure and subsequent engine room fire while on passage 11 miles east of Lowestoft, United Kingdom. In the interim report on the safety investigation of the accident, issued on 16 April 2019 by United Kingdom Marine Accident Investigation Branch, is stated:

'The vessel's 12-cylinder MAN medium speed diesel engine suffered a connecting rod small-end failure that caused metal debris to be thrown through the crankcase entablature into the engine room. The third engineer, on duty in the engine room when the fire started, managed to escape, but suffered significant smoke-related lung, kidney and eye injuries.

The United Kingdom Marine Accident Investigation Branch investigation, which has been carried out with the close cooperation of the Lithuanian Transport Accident and Incident Investigation Division and the engine manufacturer, identified a procedural issue with the connecting rod refurbishment process employed by the vessel manager's engine maintenance contractor. It was concluded that damage caused during the maintenance process had initiated a fracture that led to the sudden and catastrophic failure of the main engine.

Other vessels that might have been affected by the working practices employed by the maintenance contractor have been identified and their engines have been surveyed.'

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ANALYSIS

2.1. Actions of crew during the accident

The decision of chief engineer to stop the main engine when fire alarm has been worked out was justified and timely, as the damages to the engine shows that further run of the engine could possibly caused more severe consequences.

2.2. Cause of the main engine failure

Marine accident occurred due to main engine failure, which was caused by its improper overhaul works.

While carrying out main engine overhaul, upper bore No. 4 of the cylinder block has not been repaired, although its dimensions were outside the “no-go” limit. While installing the cylinder liner No. 4 into the cylinder block, the top sealing O-ring of the cylinder liner has been broken and pressed. Also, taking into account the witness statements, doubts arise whether the geometry of the cylinder block was appropriate. The combination of these factors allows to state, that the cylinder liner No. 4, when installed in the cylinder block, was not in the required and secure position. Installed in such way cylinder liner No. 4 was subjected to horizontal forces, which caused the cylinder liner to acquire elliptical shape. This possibly led to the sticking of the piston in the liner during engine operation. As a result, the steel top part of the piston could have been ripped off and damaged other cylinder No. 4 components.

The steel top part of the piston (crown) could have been ripped off from the piston skirt also due to possibly unevenly tightened bolts, holding them attached. As there was no fretting observed on the top part of the piston skirt and the bottom of the piston crown (mating surfaces), it is assumed that the engine could not have been in operation for a longer time with loose bolts, holding piston crown. Absence of sealing gasket (Fig. 3) in piston No. 4 could not interfere with the release of the piston crown, since the sealing gasket is designed to ensure the piston is sealed so that the circulating oil does not enter the outside of the piston.

While overhauling main engine, all other cylinder liners were installed into the cylinder block using the same practice, which was not agreed with the engine manufacturer nor with classification society, and which involved the machining of the outer surfaces of the cylinder liners. Only cylinder bore No. 4 of the cylinder block has been repaired after the accident while all other cylinder bores were not, although their dimensions were outside the “no-go” limit. The cylinder block geometry, which could have been affected during previous operations due to the engine overheating, was not checked as well. For these reasons, a similar failure may occur in other main engine’s cylinders. Taking this into account:

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It is recommended to Afalita Shipping Ltd, in cooperation with the engine manufacturer Wärtsilä, to assess whether the cylinder block of the main engine of Klaipeda is fit for use and, if action is required, ensure suitability for use.

2.3. Main engine overhaul

2.3.1. Assessment of capabilities of sub-contractor

The operator of seagoing ship did not carried out an assessment of capabilities of subcontractor – the engine repair company. No contract between the operator of seagoing ship and the engine repair company was signed for the main engine overhaul, although these actions were required in the internal safety management system procedure. This indicates that the operator of seagoing ship has not complied with these procedures, engine overhaul was commenced without expressly agreeing with the engine repair company about the scope of the overhaul, quality and responsibility.

2.3.2. Organisation of main engine overhaul

The engine repair company, while carrying out main engine overhaul, informed the operator of seagoing ship about improper condition of the cylinder block. However, the operator of seagoing ship did not perform a cylinder block check and did not consult the engine manufacturer for further actions. According to the information provided by the engine manufacturer, if the diameters of the upper cylinder bores of the cylinder block are found to be less than “no-go” limit, the cylinder block should be repaired by milling the cylinder bores. The operator of seagoing ship, however, without consulting the engine manufacturer, has decided to machine the outside surface of the main engine’s cylinder liners. This was not reported to the classification society (BV).

The engine repair company’s decision to remove steel top parts of pistons (crowns) by unscrewing bolts was taken without consultation with the engine manufacturer, although the engine manual provides, that pistons shall not be disassembled during routine maintenance job. The engine repair company, while assembling pistons, did not have the required guidance containing requirements for attaching piston crown to the piston skirt, including the bolts’ tightening procedures.

2.3.3. Compliance monitoring

Chapter 10.1 of the ISM Code provides that Company should establish procedures to ensure that the ship is maintained in conformity with the provisions of the relevant rules and regulations. The classification society (BV) rules require that Company is to arrange so that any damage, defects or non-compliance with the rule requirements are reported to the surveyor during his survey. Therefore the operator of seagoing ship was obliged to notify the classification society surveyor about the condition of the cylinder block, identified during the overhaul, and the proposal to machine the cylinder liners should have been reviewed by the classification society (BV).

The operator of seagoing ship did not inform the classification society (BV) about the condition of the cylinder block as it was identified during the overhaul, the decision to machine cylinder liners was not agreed with the latter as well.

In order to ensure that the operator of seagoing ship properly implements these ISM Code requirements and also internal requirements regarding the assessment, selection and use of sub-contractor, the Lithuanian Transport Safety Administration could check how they have been implemented and how the operator of seagoing ship is complying with them.

3

CONCLUSIONS

3.1. Cause of the accident

The serious accident occurred due to main engine failure, caused by improperly carried overhaul.

3.2. Safety deficiencies and safety issues

1. Before hiring the engine repair company for main engine overhaul, the operator of seagoing ship did not carry out an assessment of capabilities of the latter, although this is required by the internal safety management procedure.

2. The contract between the operator of seagoing ship and the engine repair company was not signed for the main engine overhaul, although this is required by the internal safety management procedure.

3. Prior to the accident, while overhauling the main engine, it was established that the parameters of cylinder block bores were outside “no-go” limit. The operator of seagoing ship decided not to repair the cylinder block, and in order to install the cylinder liners into it, machined the outside surface of the latter.

4. Neither the engine repair company nor the operator of seagoing ship did not inform the classification society about the “no-go” parameters of the cylinder block bores, as it was identified during the overhaul. The decision of the operator of seagoing ship to machine cylinder liners was not agreed with the classification society.

5. The engine repair company’s decision to disassemble main engine’s pistons was taken without consultation with the engine manufacturer, although such actions are not allowed in the engine manual.

6. While assembling main engine’s pistons, the engine repair company did not have the required guidance including bolt tightening procedures for these works.

7. While overhauling main engine, the sealing ring between steel top part of the piston No. 4 and piston skirt (Fig. 3) was not installed.

8. While installing the cylinder liner No. 4 into the cylinder block, the top sealing O-ring (Fig. 4) of the cylinder liner has been broken and pressed.

9. While overhauling main engine, 3 of 8 pistons were installed with a turn of 180° according to the marking.

10. The ship is still in service without checking that all cylinder liners are properly installed and that the cylinder block of the main engine is suitable for use.

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SAFETY RECOMMENDATIONS

Safety recommendation means a proposal of a safety investigation authority, based on information derived from a safety investigation or other sources such as safety studies, made with the intention of preventing accidents and incidents

Safety recommendations shall in no case create a presumption of blame or liability for an accident or incident.

SR-2019-L-02

It is recommended to Afalita Shipping Ltd, in cooperation with the engine manufacturer Wärtsilä, to assess whether the cylinder block of the main engine of Klaipeda is fit for use and if action is required, ensure suitability for use.

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