



SAFETY INVESTIGATION REPORT

202006/019

REPORT NO.: 14/2021

June 2021

The Merchant Shipping (Accident and Incident Safety Investigation) Regulations, 2011 prescribe that the sole objective of marine safety investigations carried out in accordance with the regulations, including analysis, conclusions, and recommendations, which either result from them or are part of the process thereof, shall be the prevention of future marine accidents and incidents through the ascertainment of causes, contributing factors and circumstances.

Moreover, it is not the purpose of marine safety investigations carried out in accordance with these regulations to apportion blame or determine civil and criminal liabilities.

NOTE

This report is not written with litigation in mind and pursuant to Regulation 13(7) of the Merchant Shipping (Accident and Incident Safety Investigation) Regulations, 2011, shall be inadmissible in any judicial proceedings whose purpose or one of whose purposes is to attribute or apportion liability or blame, unless, under prescribed conditions, a Court determines otherwise.

The report may therefore be misleading if used for purposes other than the promulgation of safety lessons.

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MV ALULA **Serious injury to crew member** **while operating a lathe machine** **in Qingdao anchorage area,** **10 June 2020**

SUMMARY

After the lunch break, the fitter was assigned by the second engineer to repair an old shaft using the lathe machine.

Considering the nature of task, no one was assigned to assist the fitter. Whilst working on another task, the second engineer visited the workshop and noticed that the lathe machine was in operation, with no one in attendance.

Inquiring further, he noticed the fitter lying in the workshop, and bleeding from under his head.

The safety investigation confirmed that the fitter's clothes and gloves had been caught in the rotating chuck of the lathe machine.

The MSIU has issued two recommendations to the Company intended to address safe operation of lathe machines.



FACTUAL INFORMATION

MV *Alula*

Alula, a 141,077 gt container ship, was built in 2012 by Samsung Heavy Industries Co. Ltd. and registered in Malta. She was owned by LS-Shipping Maritime Ltd., managed by United Arab Shipping Company (UASC) Limited Dubai Branch, United Arab Emirates, and was classed with Lloyd's Register of Shipping (LR). The vessel had a length overall of 366.06 m, a moulded breadth of 48.20 m, and a moulded depth of 29.80 m. *Alula* had a maximum container capacity of 13,500 TEU¹.

Propulsive power was provided by a 12-cylinder, two-stroke, low speed, MAN B&W 12K98ME7 marine internal combustion diesel engine, producing 71,770 kW at 97 rpm. This drove a single, fixed-pitch propeller to reach an estimated service speed of 26 knots.

Crew

Alula's Minimum Safe Manning Certificate stipulated a crew of 15. There were 24 crew members on board at the time of the accident. The crew members were nationals of Poland, Pakistan, Egypt, Russia and the Philippines.

The injured fitter was 39 years old and was from the Philippines. He had a total of five years of seagoing experience. He had obtained his STCW² III/5 qualification as an able seafarer engine in 2016, which was issued by MARINA, the Philippines. He had been sailing as a fitter for 16 months. In 2018, he had also obtained a certificate for working on lathe machines. The certificate was issued by a training company in the Philippines.

The fitter had embarked on *Alula* at the port of Suez, Egypt, on 18 November 2019. His record of hours of rest for the month of June indicated that his rest hours complied with the requirements of the MLC, 2006³.

Environment

The weather at the time of the accident was reportedly foggy with an estimated visibility of 0.5 nautical miles. A gentle breeze was blowing from a North Northeasterly direction. The swell was from the East, with an approximate height of 0.3 m. The air and water temperatures were recorded at 21 °C and 16 °C, respectively.

The lathe machine

The lathe machine on board *Alula* (Figures 1 & 2) was fitted at the centre of the engine-room workshop. An Instruction and Parts Manual was provided on board. The Manual included a section on operator safety guidance. The section listed several safety precautions and operation hazards.

A guard was fitted to the lathe machine's carriage⁴ (Figure 3).

¹ Twenty-foot Equivalent Unit.

² IMO. (2001). *The International convention on standards of training, certification and watchkeeping for seafarers, 1978, as amended in 1995 and 1997 (STCW Convention)*. London: Author.

³ ILO. (2006). *Maritime Labour Convention*. Genève: Author.

⁴ The carriage houses the saddle, the cross slide, and the apron. The main function of the carriage is to position the tool along the lathe bed.

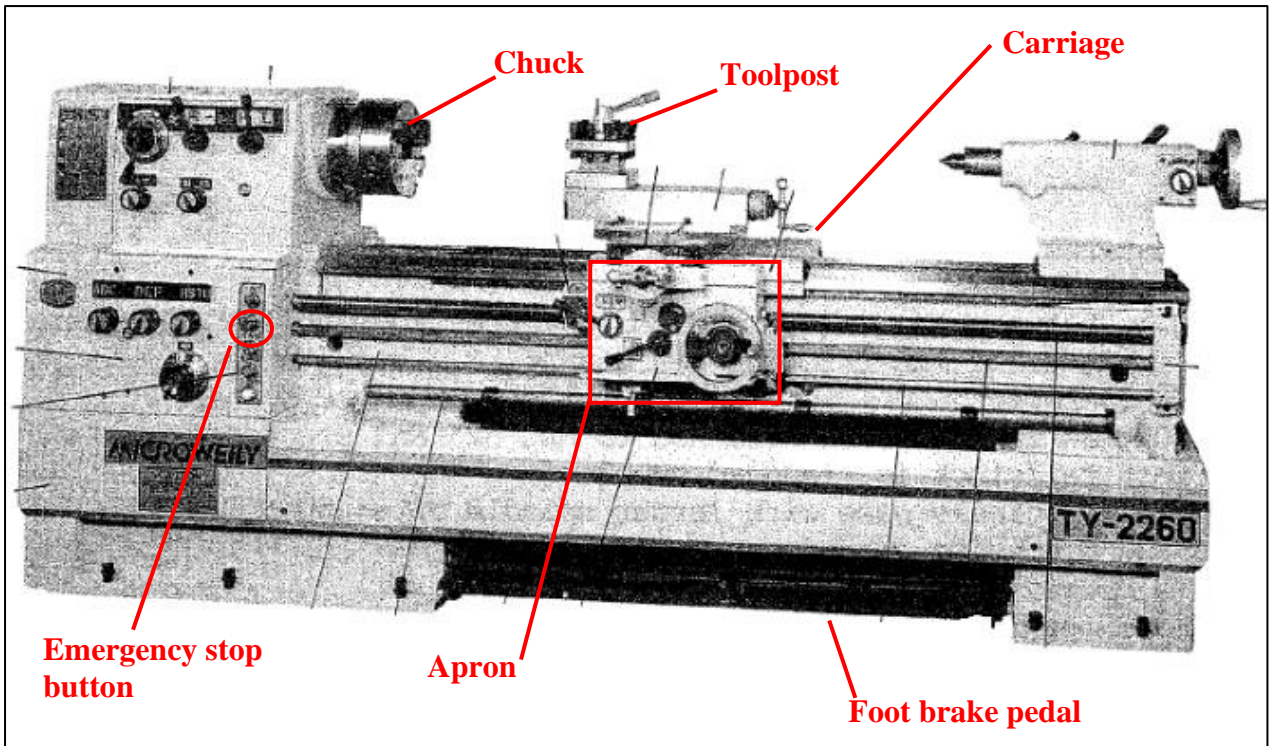


Figure 1: Diagram of the Lathe machine



Figure 2: Lathe machine on board Alula



Figure 3: Carriage guard

Narrative⁵

After the lunch break, on 10 June 2020, the second engineer assigned the fitter to repair an old shaft for the auxiliary boiler feed pump by welding and machine it on the lathe machine. This shaft measured approximately 300 mm in length and 25 mm in diameter (Figure 4). The fitter proceeded to the engine-room workshop to execute this task.



Figure 4: The shaft mounted on the chuck

Evidence indicated that the fitter was wearing coveralls, safety goggles, safety shoes and cotton gloves. At the time, there were no other crew members with him in the workshop.

At around 1430, the second engineer accessed the workshop and noticed that the lathe machine was running, with what appeared to him to be a rag attached to the chuck. Since he did not see anyone around, he approached the lathe machine to turn it off. At this point, he noticed the fitter lying on the workshop deck, with his upper body short of any clothing, bleeding from his head and face, and with his coveralls tied around his waist. The second engineer immediately alerted the chief engineer for assistance and then informed the navigational Officer of the Watch (OOW) of the accident.

The engineers who were in the control room, went to assist the fitter at once. The medical officer on board, also attended to the fitter

⁵ Unless otherwise specified, all times are local time (UTC + 8).

and, after a while, the fitter was transferred to the vessel's hospital.

The chief engineer noticed that rather than a rag, it was the fitter's working gloves, and his T-shirt reeled around the shaft secured to the lathe machine's chuck (Figure 5). Additionally, the fitter's safety goggles were found broken nearby. The chief engineer also observed that the control on the lathe machine's rpm were set on high.

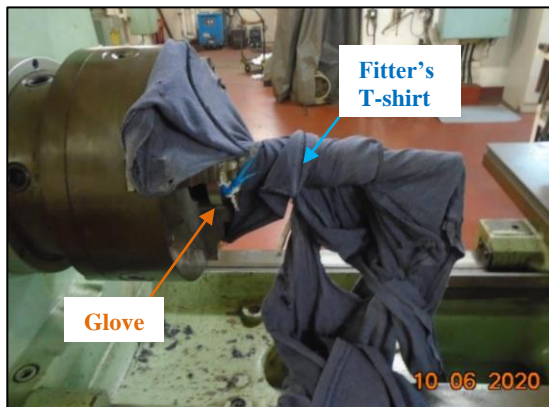


Figure 5: The lathe machine as found after the accident

The shaft was found to have been already machined at the time that the fitter was discovered. It was understood by the crew, that the fitter was in the process of cleaning the shaft with an emery cloth at the time of the accident.

Injuries suffered by the fitter

Once the master was notified of the seriousness of fitter's injuries, evacuation of the fitter was arranged with the local Chinese authorities. The vessel weighed her anchor and proceeded with full speed towards Qingdao Harbour, where an ambulance and paramedics were waiting to assist.

At around 1930, the fitter was transferred to an ambulance and taken to hospital, where it was certified that he had suffered from multiple facial fractures. It was also reported that he had sustained an epidural hematoma.

After recovery, the fitter stated that he had no recollection of the accident and he could only remember events which happened four days prior to the accident.

The fitter remained in hospital for four weeks. He was later repatriated, where he continued with necessary medical treatment.

Personal protective equipment (PPE) matrix

The vessel's SMS incorporated a tabular matrix as a guidance to crew members to identify which PPE was required for which task.

For works which involved the lathe machine, safety helmet, safety shoes, safety glasses, safety goggles, and ear defenders were listed as necessary PPE. The use of gloves was necessary, depending on the requirements of the task.

Industry guidelines

The Health and Safety Executive of the United Kingdom had published an information sheet on the use of emery cloth on metalworking lathes⁶. In particular, p. 2 stipulated that *[t]he use of gloves should be eliminated while using the methods specified in table 1⁷ or the use of emery cloth. Machine operators should also:*

- wear tight fitting overalls (preferably with elasticated cuffs);
- avoid loose, baggy clothing and ties;
- tie back long hair or wear an appropriate hair net; and
- remove rings, jewellery etc.

⁶ Health and Safety Executive. (1993). The use of emery cloth on metalworking lathes. (Engineering Information Sheet No 2 (Revision 1)). Retrieved from <https://www.hse.gov.uk/pubns/eis2.pdf>.

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⁷ Refers to the acceptable methods of applying the emery cloth *i.e.*, by using the toolpost or holding device combined with the toolpost.

ANALYSIS

Aim

The purpose of a marine safety investigation is to determine the circumstances and safety factors of the accident as a basis for making recommendations, and to prevent further marine casualties or incidents from occurring in the future.

Immediate cause of the accident

In the absence of any witnesses to this occurrence, it is probable that either the fitter's gloves or T-shirt got caught first in the rotating chuck while he was working on the shaft (Figure 6). This dragged the fitter into the hazardous zone, resulting in multiple injuries. It is also probable that once his T-shirt was completely stripped off him by the rotating chuck, the fitter fell backwards and away from the lathe machine.



Figure 6: Simulation of fitter's attire prior to accident

PPE

As mentioned elsewhere in this safety investigation report, the fitter was found by the second engineer on the engine-room workshop deck. He was found without a T-shirt and with the upper part of his coveralls tied to his waist.

Reportedly the senior officers on board did not notice the fitter wearing his coveralls around his waist prior to this accident, which

would suggest that the fitter removed the upper section of his coveralls shortly before commencement of this task.

While the safety investigation could not determine the reason why the fitter had tied the upper part of his coveralls to his waist, it was hypothesized that this might have been done to gain more freedom of movement while performing the task.

Additionally, the MSIU hypothesized that the fitter may have worn gloves to protect his hands from the swarf which would have been generated while machining the shaft. It was probable that following the machining, he may have considered that the gloves were still a necessity. It is also possible that he might have forgotten to remove the gloves prior to commencement of cleaning the shaft with an emery cloth; however, since he may not have seen it as a hindrance at that time, he may have opted to keep them on.

Perception of risk

A toolbox talk was reportedly carried out prior to the commencement of the task. The second engineer, in his statement, indicated that the risk associated with the task was very low. Consequently, the MSIU is of the opinion that a detailed discussion on safe practices was not warranted, considering also that the fitter was experienced and certified.

The MSIU was provided with two separate risk assessments which were related to working using the lathe and drill press and bench grinder, signed by different responsible persons and not specific to the date of occurrence. The safety investigation observed that none of these risk assessments identified the hazard of the operator being caught in the rotating lathe machine. Therefore, neither were mitigation measures nor additional control measures / safeguards identified.

Acceptance of risk

This safety investigation was informed that a holding device (tool bit holder) was available for the use of an emery cloth. The holding device was designed to clamp and hold a looped strip of emery cloth in place. The work piece was then placed in the centre of the loop and the device secured to the toolpost.

The fitter chose to hold the emery cloth in his hands to carry out this task. Considering the (small) size of the shaft, it was not excluded that the fitter may have assessed that the setting up of the holding device may have been unnecessary and unwarranted. The MSIU has investigated several casualties, whereby time and effort required for the task would be weighed against each other; and in this case, evidence suggested that the output was the dominant concern which based efficiency over thoroughness.

Lathe machine guards

The safety investigation revealed that the design of the lathe machine fitted on board *Alula* did not provide for a chuck guard. Instead, a carriage guard was fitted on the lathe machine's carriage. The carriage guard was not used since the fitter was using the emery cloth by hand.

In several lathe machine models, a micro-switch fitted to the chuck guard will prevent the lathe machine from starting. Additionally, the guard is permanently fixed to the headstock, therefore serving as a physical barrier between the operator and the hazard (rotating chuck). The carriage guard provided protection over the toolpost area and moved along with the toolpost. Therefore, in almost all instances, there would be times when the rotating chuck would be exposed.

As reported in one of The Nautical Institute's MARS Reports⁸, numerous lathe machine accidents, which have resulted in serious injuries have been traced to, amongst others:

- undone or loose-fitting cuffs; and
- oversize overalls.

The speed at which such accidents occur quickly disables the operator, without allowing enough time to access the emergency stop button.

In the case of *Alula*, the fitter was operating the lathe machine at a high speed and without a guard over the rotating chuck. The safety investigation believes that since the gloves had been caught on the (rotating) shaft, the fitter might have had his hands disabled and was unable to operate the emergency stop button. Furthermore, his T-shirt was also found wound around the shaft and chuck, suggesting that he must have been pulled towards the machine, finding himself unable to use the foot brake pedal.

CONCLUSIONS

1. The fitter's clothing and gloves were caught by the high-speed rotating chuck, inflicting serious injuries.
2. The safety investigation hypothesized that the fitter had tied the upper part of his overalls to his waist to obtain more freedom of movement while carrying out the task.
3. The fitter would have either considered that the gloves were still a necessity after machining the shaft, or he might have forgotten to remove the gloves prior to cleaning it with an emery cloth.
4. The risk associated with the task was considered very low. Consequently, the MSIU is of the opinion that a

⁸ MARS 201125 – Injuries to lathe operators; SEAWAYS edition April 2011.

detailed discussion on safe practices was not warranted, considering also that the fitter was experienced and certified.

5. The risk assessments in place were generic and did not assess the hazards imposed when using emery cloth.
6. An emery cloth holding device was available on board, but not used for this task. Considering the (small) size of the shaft, it was not excluded that the fitter may have assessed that the setting up of the holding device was unnecessary and unwarranted.
7. The lathe machine was not fitted with a chuck guard.

- Additional focus during audits and technical inspections was adopted as a continuous measure.

RECOMMENDATIONS

United Arab Shipping Company (UASC) Limited Dubai Branch is recommended to:

14/2021_R1 include in the applicable risk assessment the hazard of using emery cloth on the lathe machine.

14/2021_R2 install a guard over the chuck of the lathe machine and instruct the operators in its use.

SAFETY ACTIONS TAKEN DURING THE COURSE OF THE SAFETY INVESTIGATION⁹

During the safety investigation, United Arab Shipping Company Limited Dubai Branch executed the following actions:

- Information of the accident was shared immediately with its fleet;
- A follow-up Circular was promulgated amongst its fleet, detailing the accident and specifying safety measures to be taken while working on lathe machines, including, checks required prior to starting and during the work, the type of PPE to be worn (as well as not worn) and the correct manner in which the required PPE was to be worn;
- Related training was conducted on board all vessels within the Company;
- Available PPE on board all vessels was checked;
- Familiarisation process was reviewed;

⁹ Safety actions and recommendations shall not create a presumption of blame and / or liability.

SHIP PARTICULARS

Vessel Name:	<i>Alula</i>
Flag:	Malta
Classification Society:	Lloyd's Register of Shipping
IMO Number:	9525883
Type:	Container
Registered Owner:	LS-Shipping Maritime Ltd,
Managers:	UASC Limited Dubai Branch
Construction:	Steel
Length Overall:	366.06 m
Registered Length:	350.85 m
Gross Tonnage:	141,077
Minimum Safe Manning:	15
Authorised Cargo:	Containerised cargo

VOYAGE PARTICULARS

Port of Departure:	Yangshan, China
Port of Arrival:	Qingdao, China
Type of Voyage:	International voyage
Cargo Information:	29,203 mt of cargo in containers
Manning:	24

MARINE OCCURRENCE INFORMATION

Date and Time:	10 June 2020, at 1430 (LT)
Classification of Occurrence:	Serious Marine Casualty
Location of Occurrence:	35° 51' N 120° 58' E
Place on Board	Engine-room workshop
Injuries / Fatalities:	One serious injury
Damage / Environmental Impact:	None reported
Ship Operation:	At anchor
Voyage Segment:	Arrival
External & Internal Environment:	Wind: North Northeast, Beaufort Force 3. Foggy, with a visibility of 0.5 nm. Air temperature: 21 °C and sea temperature: 16 °C.
Persons on board:	24