ACCIDENT REPORT

Report on the investigation of

the fatal crush accident to a bosun during cargo

operations on board the roll-on/roll-off cargo vessel

Clipper Pennant

at Gladstone Dock, Liverpool, England

on 20 July 2021

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

VERY SERIOUS MARINE CASUALTY REPORT NO 16/2024 NOVEMBER 2024

The United Kingdom Merchant Shipping

(Accident Reporting and Investigation)

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Clipper Pennant

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

°	-	degrees
°C	-	degrees Celsius
3/O	-	third officer
AB	-	able-bodied seaman
ACOP	-	Approved Code of Practice
AED	-	automated external defibrillator
C/O	-	chief officer
CCR	-	cargo control room
CCTV	-	closed-circuit television
CEO	-	chief executive officer
cm	-	centimetre
UK COS	-	UK Chamber of Shipping
COSWP	-	Code of Safe Working Practices for Merchant Seafarers 2015 edition – Amendment 5, October 2020
CPR	-	cardiopulmonary resuscitation
CSM	-	cargo securing manual
CSS Code	-	Code of Safe Practice for Cargo Stowage and Securing, IMO Resolution A.714(17), adopted on 6 November 1991 and amended per MSC/Circ.664, MSC/Circ.691, MSC/Circ.740 and MSC/Circ.1026
DNV	-	Det Norske Veritas
DOC	-	Document of Compliance
DPA	-	Designated Person Ashore
GRA	-	generic risk assessment
HSE	-	Health and Safety Executive
ILO	-	International Labour Organization
IMO	-	International Maritime Organization
ISM Code	-	International Management Code for the Safe Operation of Ships and for Pollution Prevention (International Safety Management Code) 1994, as amended
m	-	metre
MAIC	-	Marine Accident and Incident Investigation Committee (Cyprus)
MCA	-	Maritime and Coastguard Agency

MCIB	-	Marine Casualty Investigation Board (Ireland)
MEPC	-	Marine Environment Protection Committee
MGN	-	Marine Guidance Note
mm	-	millimetre
MSC	-	Maritime Safety Committee
OS	-	ordinary seaman
P&O	-	P&O Ferries Limited
PO	-	petty officer
PSS	-	Port Skills and Safety Limited
RO	-	Recognised Organisation
ro-ro	-	roll-on/roll-off
Seatruck	-	Seatruck Ferries Limited
SiPs	-	Safety in Ports (guidance documents produced by PSS with the support of the HSE that are intended for companies operating in the UK ports industry)
SMC	-	Safety Management Certificate
SMS	-	safety management system
SOLAS	-	The International Convention for the Safety of Life at Sea 1974, as amended
SSW	-	safe system of work
SSW V28	-	P&O Ferries' *Stowage of Trailers on Ro/Ro Vessel*
STCW	-	The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended
t	-	tonne
UTC	-	universal time coordinated

TIMES: all times used in this report are UTC+1 unless otherwise stated.

SYNOPSIS

At 1353 on 20 July 2021, the bosun of the roll-on/roll-off cargo vessel *Clipper Pennant* was fatally crushed when he became trapped between a moving vehicle and the vessel's structure. *Clipper Pennant* was alongside in Liverpool, England, loading a cargo of semi-trailers. A tractor unit driver pushed a semi-trailer into a corner space, marshalled by the vessel's bosun in his assigned role as banksman. The driver then disconnected the tractor unit and drove away. Shortly afterwards, the bosun was found trapped between the rear of the semi-trailer and the vessel's structure, having sustained fatal injuries.

The accident happened because the tractor unit driver did not stop pushing the semi-trailer when they lost sight of the bosun during the manoeuvre. This was due to a procedural workaround that had become routine practice at the port, whereby the banksman was expected to move to an unsighted position behind a nearby semi-trailer. However, the bosun in this instance did not act as expected. He instead stood on a painted walkway located inside the vehicle lane to marshal the semi-trailer into the space, and so remained in its path as it approached. The semi-trailer had inadvertently been parked at an angle, encroaching the walkway and striking the bosun.

The investigation found that: the working practices on board *Clipper Pennant* did not reflect industry guidelines and company procedure; there was no documented procedure for stowing semi-trailers in the more hazardous corner stowage spaces, which led to the development of local workarounds that went unchallenged; and, organisational oversight was insufficiently effective, both in the approach of the vessel's operator, Seatruck Ferries Limited, to learning lessons from previous accidents and the management of the port and its tractor unit drivers by the vessel's charterer, P&O Ferries Limited.

Since the accident, Seatruck Ferries Limited has taken several actions to improve safety on its vehicle decks, including developing a new safe system of work that recognises dynamic danger zones and establishing standard loading procedures that better reflect the work performed. The company has also engaged with the industry to share its findings following several trials and tests of new procedures on company vessels and in various ports.

A safety recommendation has been made to industry bodies to develop a jointly agreed and consolidated industry Code of Practice for vehicle deck safety on roll-on/roll-off vessels. The Maritime and Coastguard Agency and Health and Safety Executive are recommended, subsequently, to amend their relevant codes and guidelines to reflect industry best practice. Recommendations have also been made to: P&O Ferries Limited to review how it achieves assurance that its ports adhere to its operational procedures and that a jointly agreed safe system of work is in place on chartered vessels; and, to CLdN RoRo Limited (formerly Seatruck Ferries Limited) to improve its organisational safety culture and ensure effective supervision of vehicle deck cargo loading operations.

SECTION 1 – FACTUAL INFORMATION

1.1 PARTICULARS OF *CLIPPER PENNANT* AND ACCIDENT

SHIP PARTICULARS	
Vessel's name	*Clipper Pennant*
Flag	Cyprus
Classification society	Det Norske Veritas
IMO number	9372688
Type	Roll-on/roll-off cargo (max 12 passengers)
Registered owner	Seatruck Pennant Limited
Manager(s)	Seatruck Ferries Limited[1]
Construction	Steel
Year of build	2009
Length overall	142.0m
Registered length	137.65m
Gross tonnage	14,759
Minimum safe manning	11
Authorised cargo	Freight vehicles

VOYAGE PARTICULARS	
Port of departure	Not applicable
Port of arrival	Liverpool, England
Type of voyage	International
Cargo information	Freight vehicles
Manning	22

MARINE CASUALTY INFORMATION	
Date and time	20 July 2021 at 1353
Type of marine casualty or incident	Very Serious Marine Casualty
Location of incident	Gladstone Dock, Liverpool, England
Place on board	Upper vehicle deck
Injuries/fatalities	1 fatality
Damage/environmental impact	None
Ship operation	Loading
Voyage segment	Alongside
External & internal environment	Sunny with a gentle breeze, air temperature 30°C
Persons on board	26

[1] Seatruck was acquired by CLdN in September 2022. The company name was formally changed to CLdN RoRo Limited in March 2024.

1.2 NARRATIVE

At 1130 on 20 July 2021, the roll-on/roll-off (ro-ro) cargo vessel *Clipper Pennant* berthed alongside the ro-ro ferry terminal at Gladstone Dock **(Figure 1)**, Liverpool, England following its passage from Dublin, Ireland. The vessel's stern ramps were lowered and cargo discharge started a few minutes later. The shoreside drivers employed by the operators of the ferry terminal used ro-ro tractor units[2] to unload the cargo of semi-trailers (see section 1.7.2) under the direction of *Clipper Pennant*'s deck crew.

Shortly after 1300, all cargo had been discharged and loading for the return voyage began. Semi-trailers were simultaneously loaded onto the main vehicle deck and the upper vehicle deck **(Figure 2)**. The bosun was in charge of the upper vehicle deck, assisted by two ordinary seamen (OS), hereafter referred to as OS1 and OS2. The bosun, OS1 and OS2 started loading cargo at the back of the deck before moving forward to load cargo beneath the vessel's accommodation.

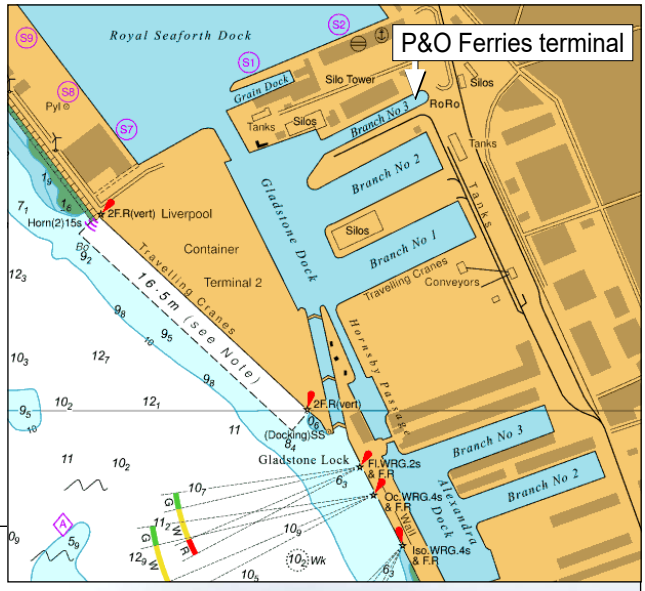

Figure 1: *Clipper Pennant* alongside at Gladstone Dock

The forward-most row was arranged to stow five semi-trailers, which were loaded across the vessel from starboard to port. Between 1344 and 1349, the first four semi-trailers in the row were loaded into stowage spaces 17 to 20 **(Figure 3)**. The bosun acted as the marshaller or banksman (see section 1.8.3) for each of these movements, directing the semi-trailers into their respective stowage spaces. OS1 inserted a trestle[3] and lashed the front of each semi-trailer when it was in position in its stowage space, while the bosun secured the rear. OS2 simultaneously prepared the chain lashings in the stowage space where the next semi-trailer was to be loaded.

[2] Vehicles designed specifically for moving semi-trailers onto and from ro-ro ferries. These units were locally referred to as 'tugmasters'.

[3] A support used to rest a semi-trailer without using its landing legs, which were not designed to withstand the pressure of the load and weight of a semi-trailer while on sea passage.

Base images courtesy of Astilleros de Huelva. S.A.

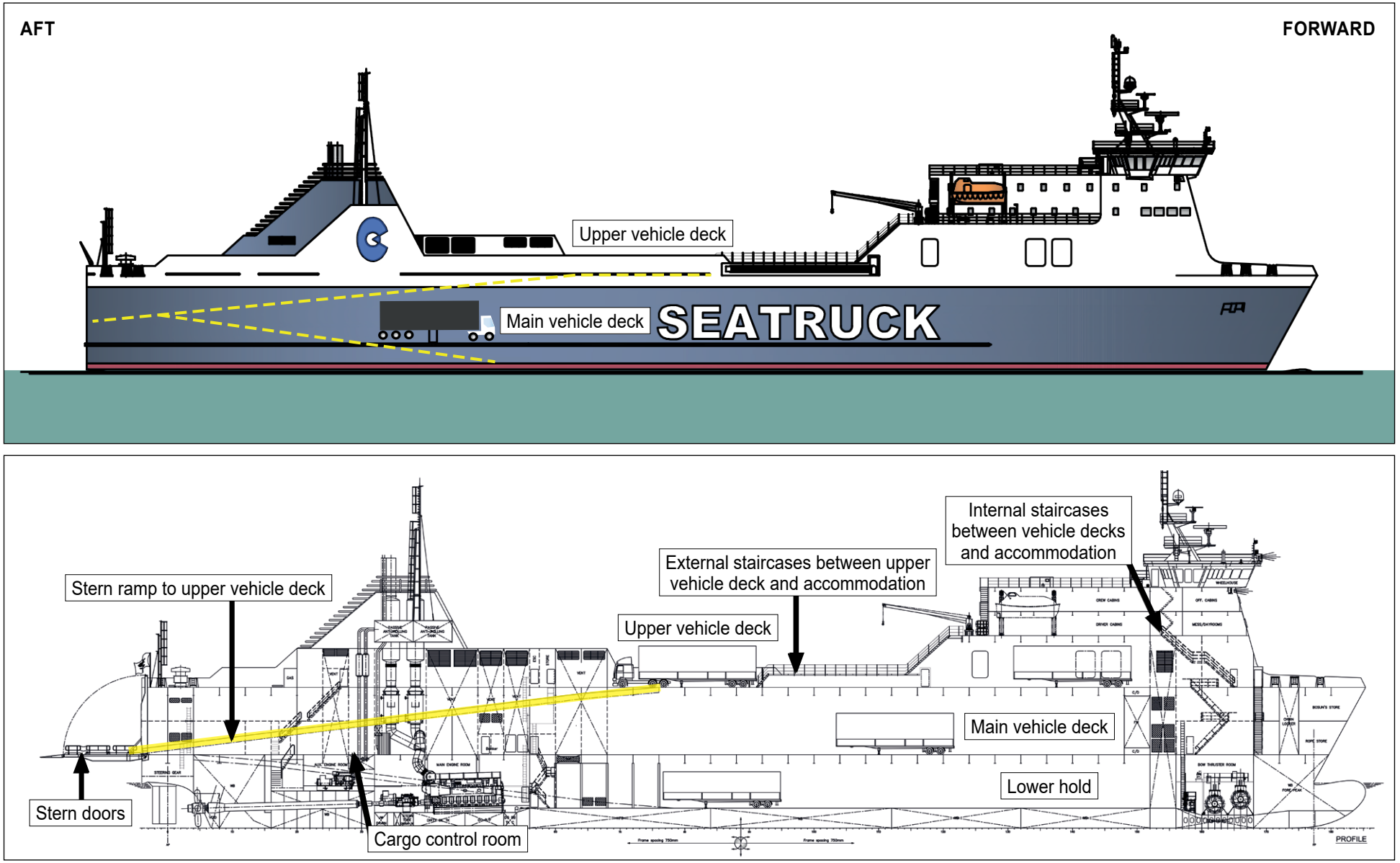

Figure 2: *Clipper Pennant*'s general arrangement

Base image courtesy of Astilleros de Huelva. S.A.

For illustrative purposes only: not to scale

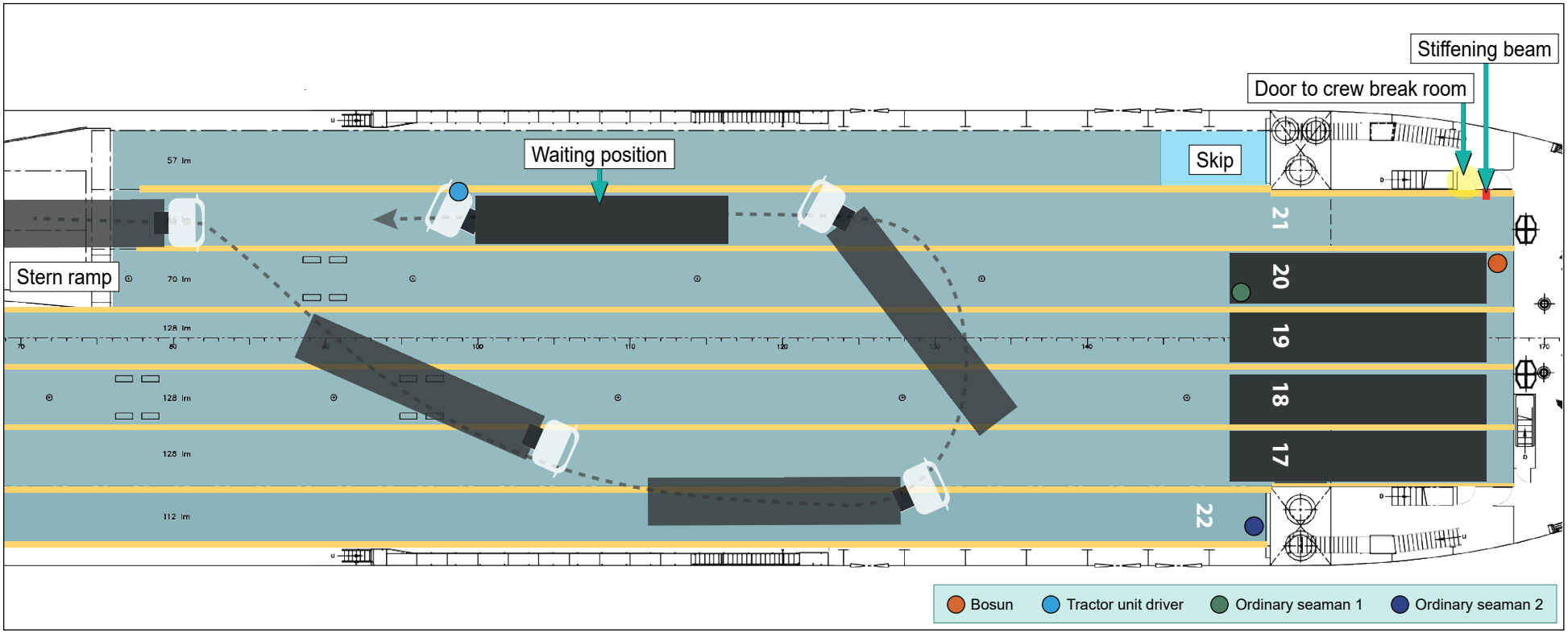

Figure 3: Plan view of the upper vehicle deck, showing the semi-trailer's manoeuvring sequence and the bosun's position in stowage space 20

At 1352, a tractor unit pulling a semi-trailer drove up the port ramp **(Figure 4a)** and onto the upper vehicle deck. In preparation to push the semi-trailer into stowage space 21, the tractor unit driver made an anticlockwise turn and aligned the semi-trailer with the appropriate lane **(**see **Figure 3)**. The driver then applied the handbrake and rotated the seat assembly by 180° to face the semi-trailer.

CCTV stills courtesy of Port of Liverpool Police

Figure 4: CCTV stills of the tractor unit and semi-trailer joining the loading queue (a) and manoeuvring into position on the upper vehicle deck (b)

The tractor unit remained stationary on the upper vehicle deck while the driver awaited further instructions from the bosun, who continued to act as banksman. The bosun was still lashing the rear chains of the adjacent semi-trailer in stowage space 20 and was not yet visible to the tractor unit driver. While waiting for the bosun to enter their line of sight the tractor unit driver removed the left side of their hearing protection to listen out for whistle signals[4]. Moments later, the bosun emerged from the rear of the adjacent semi-trailer and made his way over to the corner of the deck, where he was visible to the tractor unit driver. With the line of sight established, the bosun waved to the tractor unit driver to push the semi-trailer towards stowage space 21.

At 1353, the tractor unit driver started pushing the semi-trailer. Leaning out of the window and facing the direction of travel, the tractor unit driver guided the semi-trailer between the lane markings, using the tractor unit to pivot it into position **(Figures 4b** and **5)**. Within 30 seconds, the tractor unit driver heard a single whistle

[4] The deck crew wore a high-pitched whistle around their necks, which was used to direct tractor unit drivers during cargo operations.

blast and stopped the semi-trailer in stowage space 21 **(Figure 6)**. The tractor unit driver applied the handbrake and raised the semi-trailer so that OS1 could slide a trestle beneath it and lower it onto the trestle. The tractor unit driver disconnected the air brake system, rotated the seat assembly to face forwards and drove away to collect the next load.

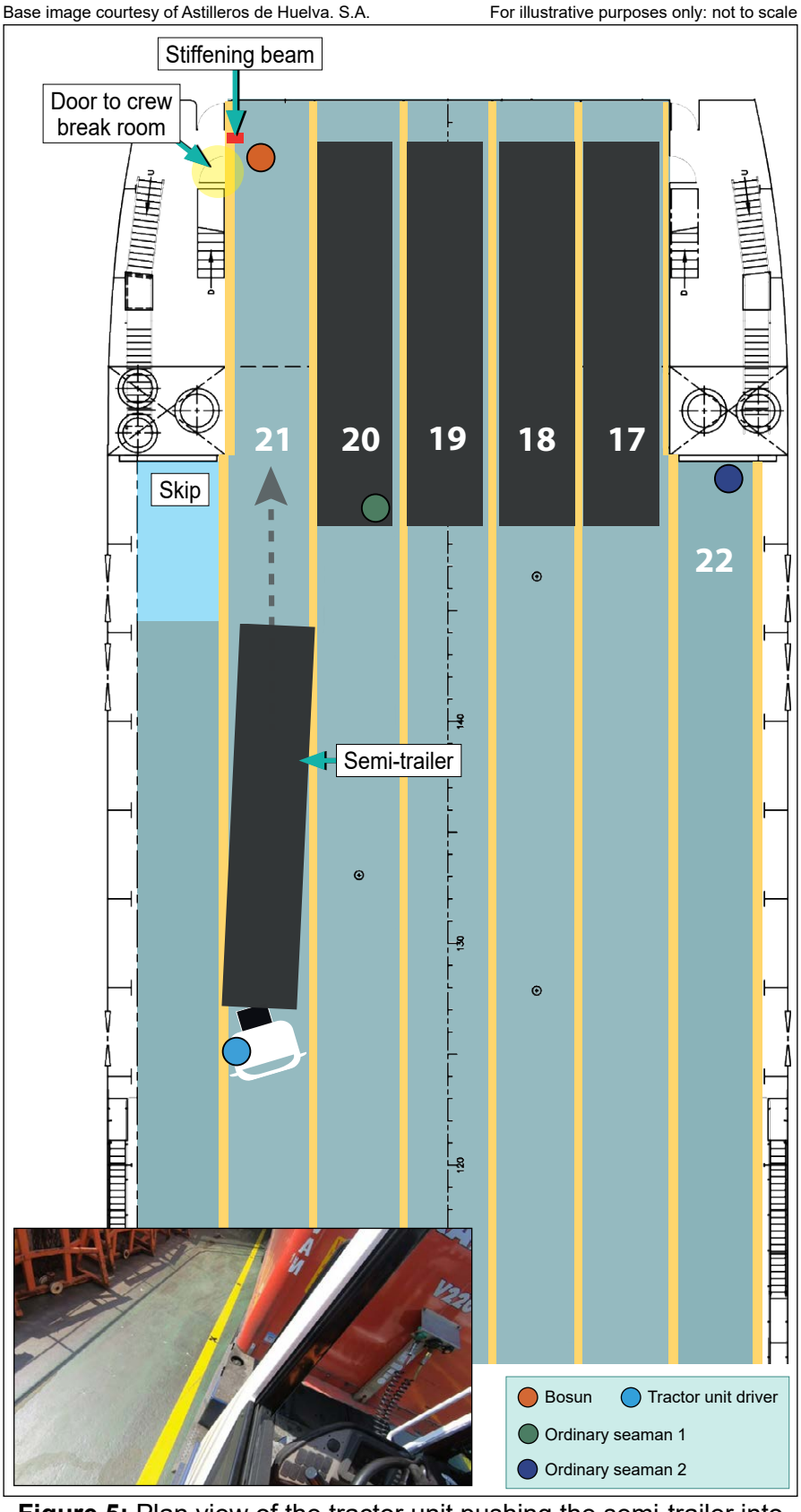

Figure 5: Plan view of the tractor unit pushing the semi-trailer into stowage space 21 and (inset) a reconstruction of the driver's view

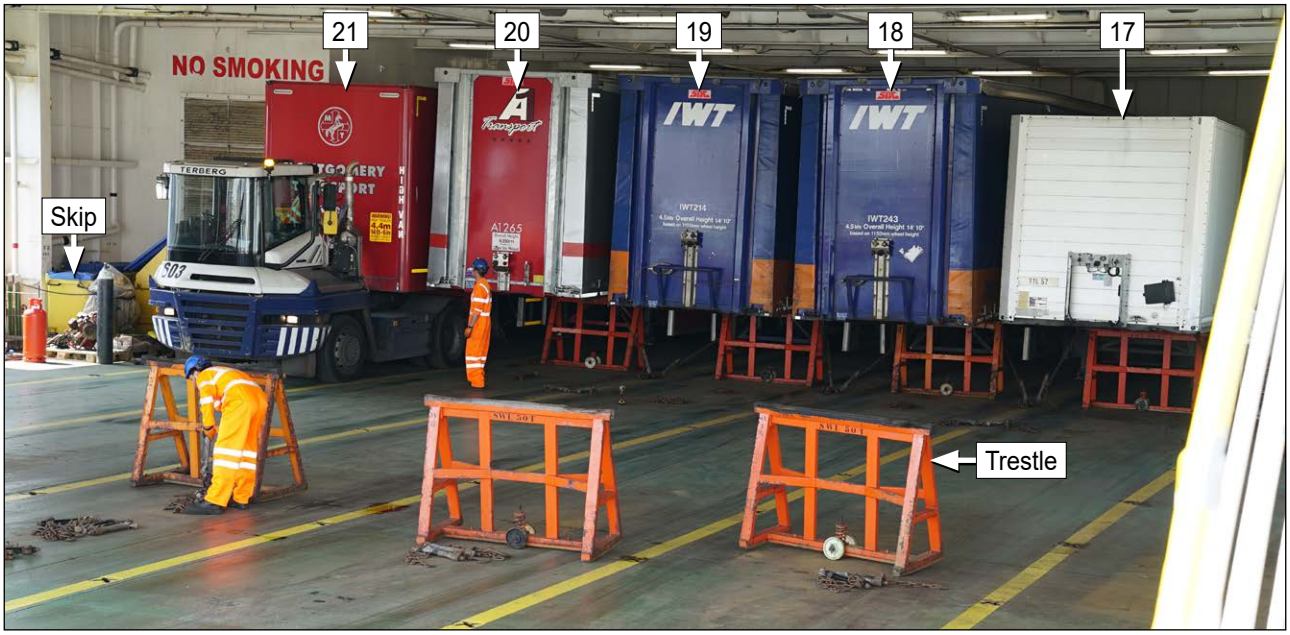

Figure 6: Reconstruction of a semi-trailer parked in stowage space 21

At 1355, OS1 secured the first chain in the process of lashing the front of the semi-trailer and then moved to the opposite side, near the port bulkhead. As OS1 attached the second chain they noticed that the semi-trailer had been parked with its rear right-hand side tyres resting on the painted yellow walkway. OS1 looked up and found the bosun trapped between the right-hand rear corner of the semi-trailer and a stiffening beam, which protruded from *Clipper Pennant*'s superstructure **(Figure 7)**.

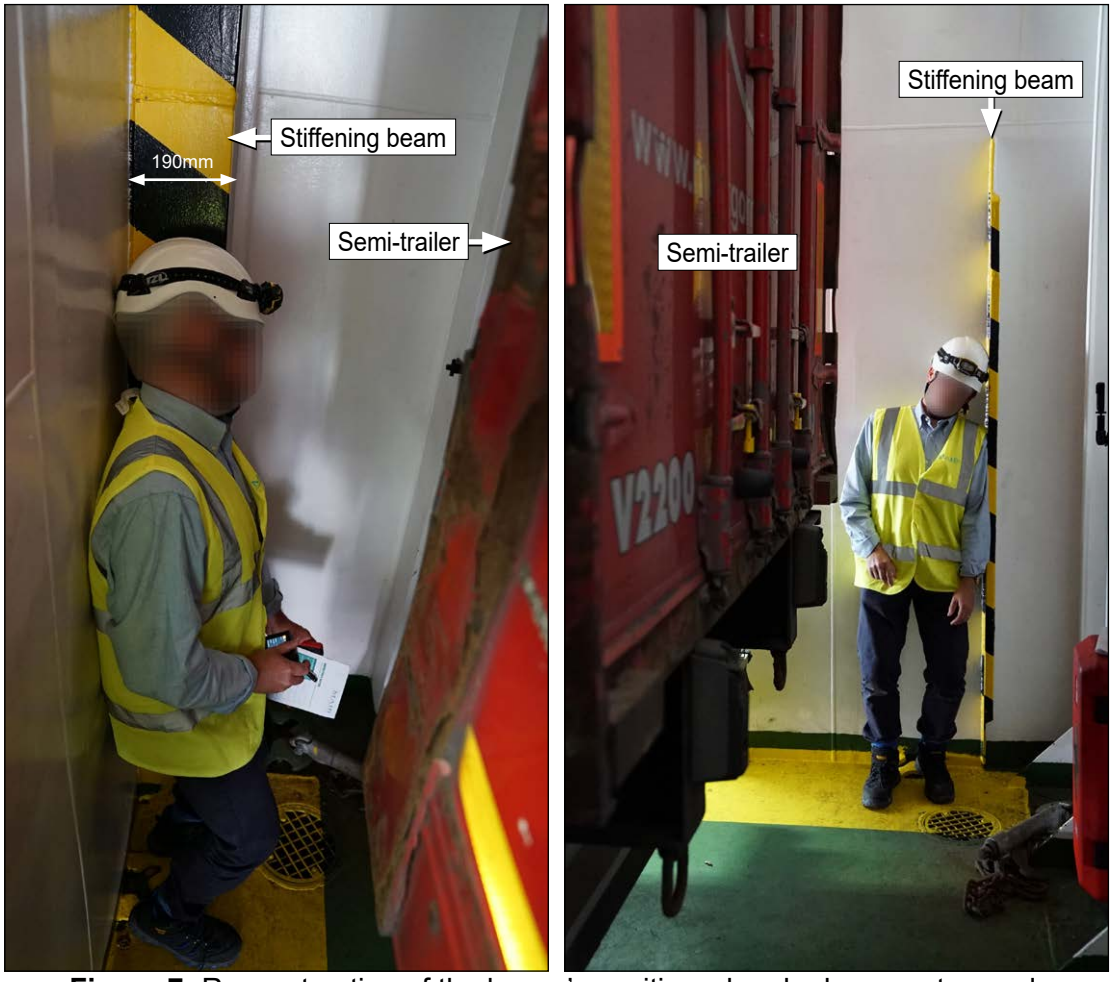

Figure 7: Reconstruction of the bosun's position when he became trapped

OS1 attempted to access the bosun via both sides of the semi-trailer but the gaps were too small. OS1 ran to the next available opening between the semi-trailers parked in spaces 19 and 20, moved through the gap and ran to the rear of the semi-trailers and along the forward bulkhead, where OS1 found the trapped bosun motionless.

OS1 realised that assistance was needed to help the bosun and ran over to stowage space 22, where OS2 was marshalling another semi-trailer into position. OS2 followed OS1 to the bosun's location to investigate and they were joined shortly afterwards by the tractor unit driver from stowage space 22, who had become concerned by their running and shouting. Recognising the bosun was trapped, and with no way to access him, the tractor unit driver and deck crew decided to move the semi-trailer forward to release him. Meanwhile, a watchman who had been tending to the forward mooring lines attempted to access the upper vehicle deck but was unable to do so because the position of the semi-trailer was blocking access to the deck through the crew break room (see section 1.4.6) access doorway **(**see **Figure 5)**.

At 1357, OS2 activated the nearby manual call point[5] to alert all crew to the emergency and shouted to another tractor unit driver, who had just driven up the stern ramp, to call the emergency services. The master and night master made their way to the bridge to respond to the alarm and then headed down to the upper vehicle deck to investigate the nature of the emergency. Meanwhile, OS1 used an ultrahigh frequency radio to call the chief officer (C/O) and third officer (3/O) for help. The C/O grabbed the trauma bag from the cargo control room (CCR) on the main deck **(**see **Figure 2)**, where they had been monitoring the vessel's stability, and proceeded to the upper deck with the 3/O.

OS2 returned to the semi-trailer in stowage space 21 and unlashed the front chains. At the same time, the tractor unit driver who had been loading stowage space 22 returned to their tractor unit, disconnected it from the semi-trailer and drove over to space 21. At 1358, OS2 removed the unlashed chains and, once the driver had connected the tractor unit and lifted the semi-trailer, removed the trestle. The tractor unit pulled the semi-trailer about 20m aft, allowing access to the bosun who had fallen to the deck.

The C/O arrived and found the bosun unconscious with significant crush injuries. Unable to find a pulse, the C/O immediately started cardiopulmonary resuscitation (CPR). The master and night master arrived moments later and assisted the C/O with first aid. The master took over CPR, and the night master fitted a face mask and started the medical oxygen supply. The 3/O retrieved the automated external defibrillator (AED) from the bridge. The C/O attempted to use the AED on the bosun, but the device could not find a pulse and recommended CPR.

At 1410, the ambulance arrived and paramedics took over the resuscitation attempts from the crew. Their efforts were unsuccessful, and the bosun was declared deceased at 1425.

[5] An accessible device that enables crew to trigger a fire alarm by pressing a breakable element to activate the alarm system.

1.3 SEATRUCK FERRIES LIMITED

Established in 1966, Seatruck Ferries Limited (Seatruck) was based in Heysham, north-west England. The company owned and managed a fleet of eight freight-only ferries that transported unaccompanied semi-trailers designed for Irish Sea freight services, with established routes between Heysham and Warrenpoint, Northern Ireland, and Liverpool and Dublin. The vessels were classed by Det Norske Veritas (DNV) and comprised two different designs:

- four identical Cyprus-registered P-Class vessels: *Clipper Pennant*, *Seatruck Pace*, *Seatruck Panorama* and *Clipper Point*; and

- four newer vessels registered in the Isle of Man.

On 20 September 2022, Seatruck was acquired by CLdN, a provider of short sea ro-ro connections across continental Europe, and its name was formally changed to CLdN RoRo Limited on 7 March 2024. The company is referred to as Seatruck for the purposes of this report.

1.4 *CLIPPER PENNANT*

1.4.1 Background information

Clipper Pennant was constructed by Astilleros De Huelva at its shipyard in Spain and delivered to Seatruck in 2009. The vessel comprised 1,830 lane metres[6] of freight capacity, equivalent to loading approximately 120 semi-trailers.

At the time of the accident, *Clipper Pennant* was on a time charter to P&O Ferries Limited (P&O) that began on 10 December 2019. The charter consisted of four round trips between Dublin and Liverpool per week, with a weekend layover in Liverpool. Seatruck considered this trade route one of the least intensive ferry routes on the Irish Sea; cargo utilisation averaged about 60% of the vessel's total capacity.

P&O rented the cargo-carrying capacity and was responsible for managing *Clipper Pennant*'s schedule. It also instructed the vessel's master on matters concerning cargo carriage and worked with the C/O on the cargo loading plans. Seatruck retained responsibility for *Clipper Pennant*'s safe operation; the vessel was staffed by Seatruck crew and operated under Seatruck's safety management system (SMS).

1.4.2 General arrangement

Clipper Pennant was equipped with three vehicle decks: the upper vehicle deck, main vehicle deck and the lower hold. Pedestrian access between the vehicle decks and the accommodation was via internal staircases. Two external staircases into the accommodation were located on the port and starboard sides of the upper vehicle deck **(**see **Figure 2)**.

Vehicle access from the quay to the upper and main vehicle decks was via fixed ramps at the stern, on the port and starboard sides respectively. An internal ramp provided access from the main vehicle deck to the lower hold when increased

[6] A unit of measurement used on board ro-ro ferries to describe the deck space available to load freight. One lane metre equates to a vehicle lane length of 1m. Longer vehicle lane lengths equate to a greater cargo-carrying capacity.

loading capacity was required. There was sufficient space on the vehicle decks for tractor units to be driven on board and turn the semi-trailers and push them into their stowage spaces **(**see **Figure 3)**.

1.4.3 Vehicle decks

Cargo securing points, referred to as 'elephant's feet', were welded into *Clipper Pennant*'s vehicle decks and comprised cross-shaped openings used to lash a vehicle to the deck; this was a standard, industry-wide securing method. One end of the lashing chain was connected to the undercarriage of the semi-trailer and the other end was inserted into the elephant's foot. The lashing chain turnbuckles were then tightened to avoid cargo movement when the vessel was underway **(Figure 8)**.

The elephant's feet were spaced evenly across *Clipper Pennant*'s vehicle decks, longitudinally and athwartships, to enable various vehicle loading configurations. Two types of elephant's feet were installed: flush-mounted, allowing semi-trailers to be stowed either side of the elephant's feet, which were fitted flush to the deck and measured 22.5cm in diameter at the deck's surface; and surface-mounted, which protruded from the deck's surface against bulkheads **(Figure 8)**.

Yellow lines were painted through the elephant's feet to denote the vehicle lanes. The lines provided a visual aid to help tractor unit drivers guide semi-trailers into their stowage spaces. Each painted yellow line measured around 18cm to 20cm wide and ran within the diameter of the elephant's feet. This resulted in a lane width of 3m.

Image courtesy of Seatruck Ferries

Figure 8: The elephant's feet securing arrangement

1.4.4 Upper deck layout

The upper vehicle deck was equipped with seven vehicle lanes across its breadth at midships, which were numbered from the port side (lane 1) to the starboard side (lane 7). Further aft, the number of vehicle lanes reduced to four (lane 4 to lane 7) due to the vehicle ramp on the port side.

The forward end of the upper vehicle deck was located beneath the accommodation **(Figure 9)**. The number of vehicle lanes reduced from seven to five in the forward-most row (lane 2 to lane 6), which was enclosed on three sides by a transverse bulkhead that separated the vehicle deck from the forward mooring deck and longitudinal bulkheads on either side. The accommodation was located forward of lane 1 and lane 7 and housed the vessel's ventilation units **(Figure 9)**, which supplied air to the main deck below. These were kept running throughout cargo operations, increasing the background noise for anyone working in the area.

This accident happened at the forward end of lane 2, which ran alongside the longitudinal bulkhead from where there was access to the crew break room. A garbage skip was located at the forward end of lane 1, behind the accommodation block **(Figure 9)**.

1.4.5 Cargo securing manual

Clipper Pennant was provided with a cargo securing manual (CSM) that was used to ensure the proper stowage and securing of cargo units. The CSM had been prepared in accordance with the International Convention for the Safety of Life at Sea (SOLAS) Chapter VI – Carriage of Cargoes and Oil Fuels – and Chapter VII – Carriage of Dangerous Goods, and International Maritime Organization (IMO) Maritime Safety Committee (MSC) Circular MSC/Circ.745[7]. The CSM had been approved by Det Norske Veritas (DNV), the vessel's Recognised Organisation (RO), on behalf of the flag state, as complying with DNV's class rules and the requirements of the IMO Code of Safe Practice for Cargo Stowage and Securing (CSS Code).

The CSM illustrated the typical positioning of a stowed and secured semi-trailer with a width of 2500mm fitted inside an athwartships stowage space of 3000mm between elephant's feet **(Figure 10)**. When the semi-trailer was positioned centrally in the stowage space there was a gap of 250mm between the side of the semi-trailer and the centre of an elephant's foot.

[7] Guidelines for the Preparation of the Cargo Securing Manual, superseded in 2010 by MSC.1/Circ.1353 – Revised Guidelines for the Preparation of the Cargo Securing Manual.

Image courtesy of Seatruck Ferries

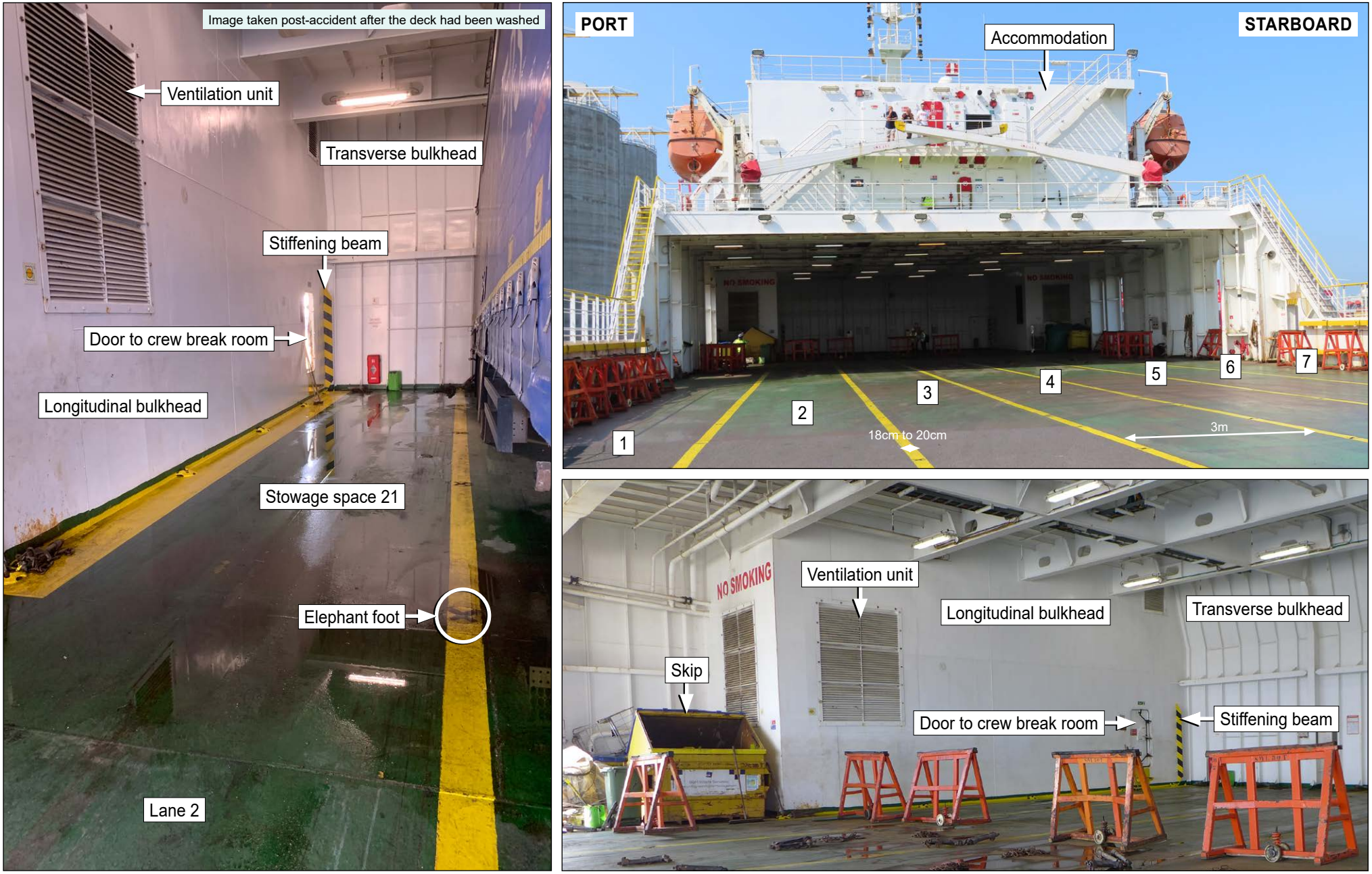

Figure 9: The accident location, showing the vehicle lane dimensions and elephant's feet positions

Image courtesy of Seatruck Ferries

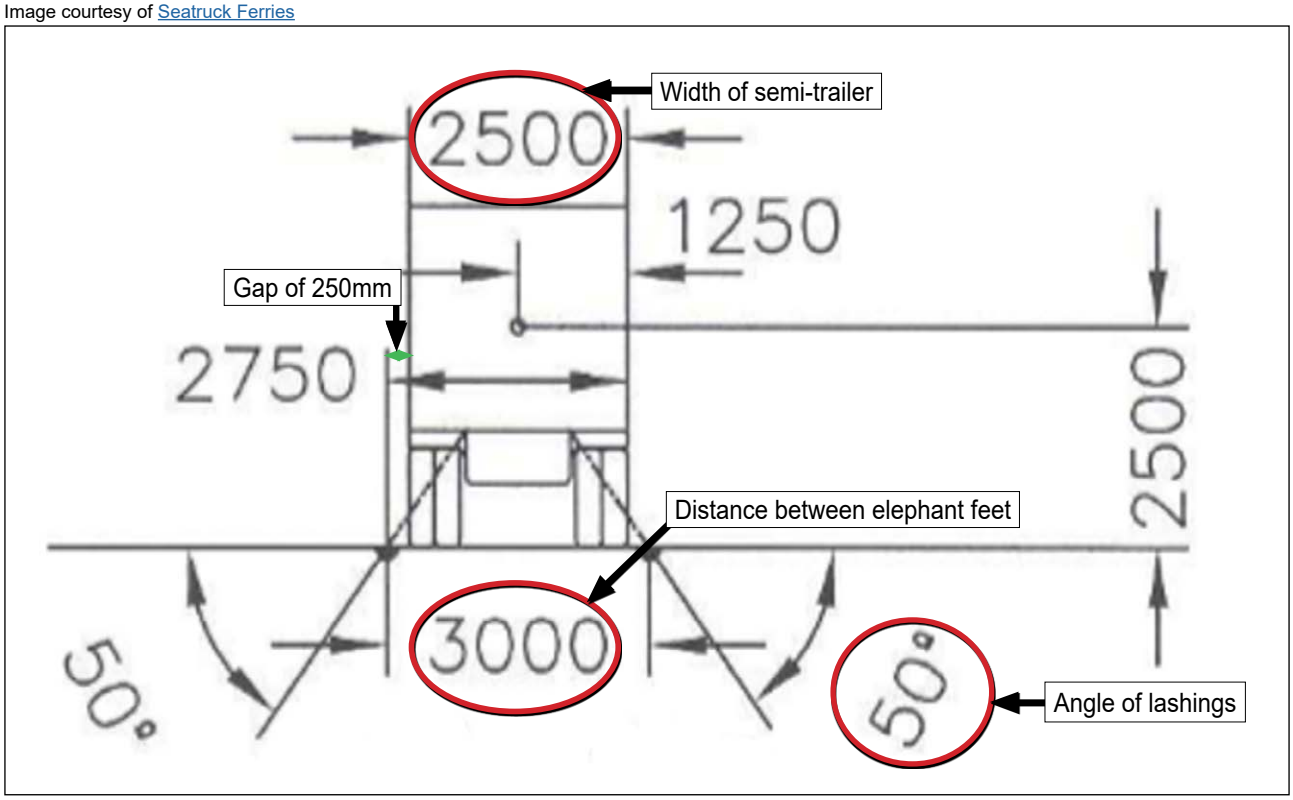

Figure 10: CSM extract, showing the semi-trailer and elephant's feet dimensions

1.4.6 Crew break room

The crew break room was located in an internal staircase landing in the accommodation block on the port side of the upper vehicle deck. The deck crew had modified the space for use during mooring, maintenance and cargo operations, to store safety gear, and to meet and take breaks. The crew break room was reached via the internal accommodation staircase, providing direct access to the forward mooring deck and the vehicle decks. The vessel's safety plans identified the door adjacent to stowage space 21 as a primary escape route to the muster station and emergency exit signage was posted on both sides of the door.

The deck crew regularly transited the crew break room as it was the shortest route from the upper vehicle deck into the accommodation or onto the forward mooring deck. An alternative up-and-over route was available, but it required passage via the upper deck's external staircase, through the accommodation and back down via the internal accommodation staircase.

1.4.7 Stiffening beam

The bosun was crushed against a stiffening beam welded to the longitudinal bulkhead during the vessel's construction. The beam protruded 190mm from the bulkhead, and a flat reinforcing bulb painted with black and yellow stripes ran along its outer edge **(Figure 7)**.

1.4.8 Walkway

In June 2021, the crew painted a broader yellow line along the accommodation bulkhead. This increased the width of the lane marking, which was originally the width of the elephant's feet, to approximately 53cm to create a walkway **(Figure 11)**. The bosun wanted to improve access to the crew break room and was strict about keeping the walkway clear in the weeks before his death.

The walkway reduced the effective vehicle lane width in stowage space 21 from the inside of the yellow lines to between 2.35m and 2.41m[8]. The athwartships distance between the fixed elephant's feet on either side of the stowage space remained 3m **(Figure 11)**. When a semi-trailer was secured, the lashings crossed the walkway and connected to the elephant's feet running along the bulkhead.

Image courtesy of Seatruck Ferries

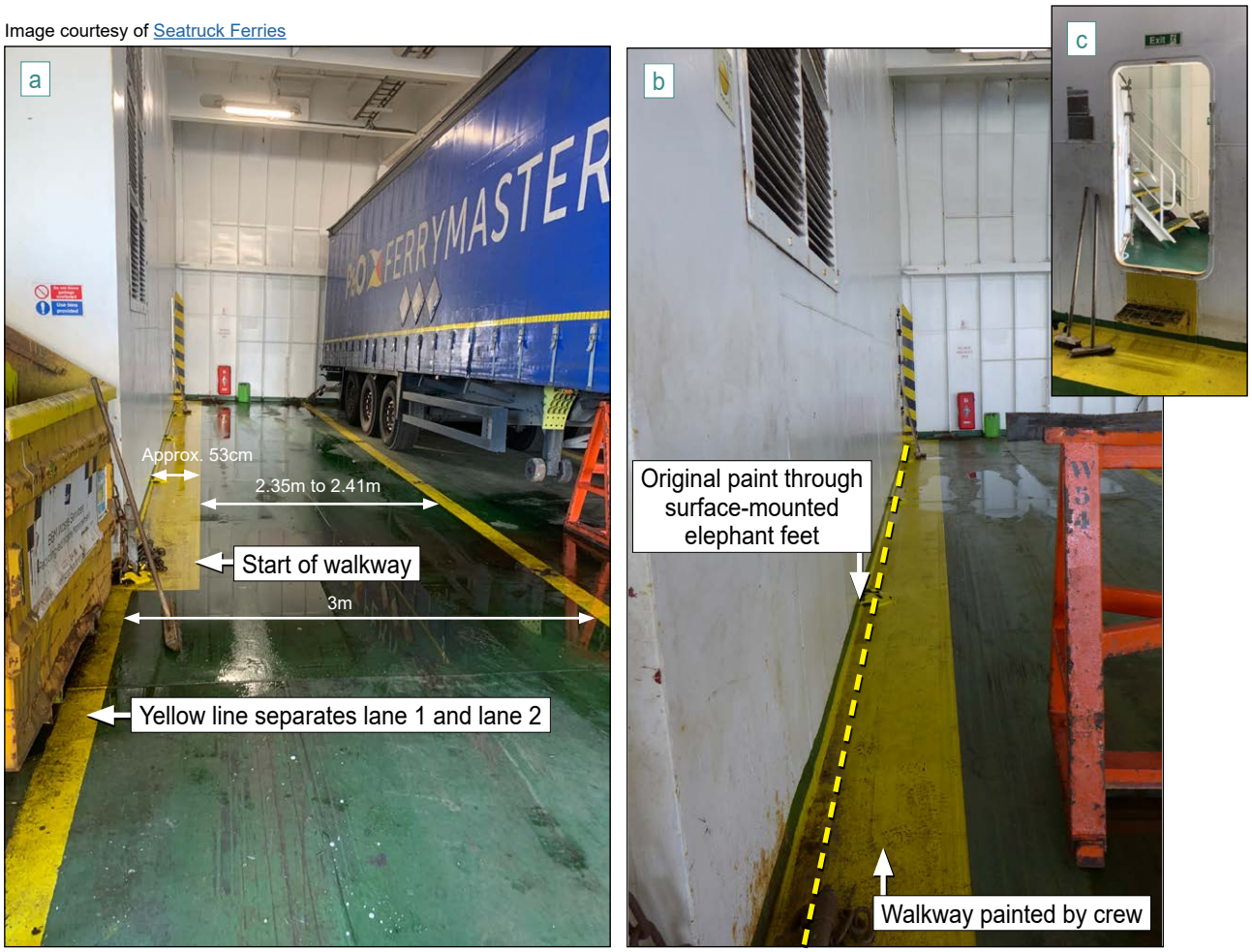

Figure 11: The painted yellow line separating lane 1 and lane 2 (a), a close-up of the painted walkway (b), and a close-up of the crew break room access door (c)

A yellow walkway was painted onto the same area of the vehicle deck on each of the P-Class vessels, with the following variations:

- *Clipper Point* used dashed white lines to mark the vehicle lane;
- *Seatruck Panorama* used solid white lines to mark the vehicle lane; and
- *Seatruck Pace* extended the painted walkway past the bulkhead and along the open deck towards the stern ramp. Solid white lines marked the vehicle lanes **(Figure 12)**.

These modifications to the vehicle deck were neither formally approved by shoreside management nor recognised as designated walkways to the means of escape[9].

[8] The walkway's width varied marginally due to the straightness of the painted lines on deck.

[9] SOLAS chapter 6, regulation 13 outlined the requirements for means of escape, which included the need for a 600m wide designated walkway from special category and open ro-ro spaces on passenger ships. This requirement did not apply to vehicle decks on ro-ro cargo vessels.

Images courtesy of Seatruck Ferries

Figure 12: Comparison of the painted walkways on the P-Class ferries

1.5 CREW

1.5.1 Overview

Clipper Pennant had a crew of 22, including a Polish day master, an Estonian night master and a British C/O. The remainder were Polish nationals.

The day master and night master alternated command to ensure hours of work and rest compliance with the Maritime Labour Convention. The C/O was head of the deck department, which included two deck officers, a bosun, a petty officer (PO), two able-bodied seamen (AB) and four OS. The C/O also acted as the vessel's safety officer.

1.5.2 The bosun

Kazimierz Ptak was a 67-year-old Polish national who held an STCW[10] II/5 Able Seafarer Deck certificate. He joined Seatruck as an AB in October 2013 and became a regular crew member on board *Clipper Pennant* in April 2014, working a pattern of 8 weeks on and 4 weeks off. He was promoted to bosun in December 2020 and had completed two contracts in the role. His resulting performance appraisals described him as reliable and respectful, with high levels of seamanship. He had completed 6 weeks of his latest 8-week cycle, having joined *Clipper Pennant* on 5 June 2021.

The bosun had completed familiarisation training in accordance with Seatruck's SMS. He held a valid medical certificate that declared him fit for duty as a deck rating without limitations or restrictions.

The bosun was responsible for directing the deck ratings in their duties, which included cargo work, bridge watchkeeping and maintenance.

At the time of the accident, the bosun was wearing high-visibility clothing, safety boots, a blue safety helmet, a pair of gloves and a whistle on a lanyard around his neck.

The postmortem report identified that the bosun had suffered severe trauma to his upper body, particularly around his shoulders and chest, and two wounds to his head. There was no evidence of injuries to his arms, hands or legs and the cause of death was recorded as multiple traumas caused by a crush injury.

There was no indication that the bosun had any health issues that may have contributed to the accident and toxicological analysis showed no signs of the use of alcohol or drugs.

1.5.3 The upper deck crew

OS1 and OS2 each held an STCW II/4 Rating Forming Part of a Navigational Watch certificate. OS1 had joined Seatruck in 2020, having served on passenger ferries for several years. OS2 had joined Seatruck in March 2021 and was on their second contract, having previously served as a cadet on general cargo vessels and as an OS on cargo ferries.

[10] International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended.

OS1 and OS2 had completed new joiner and refresher training required by Seatruck's SMS. The new joiner familiarisation form included numerous safety-related items and a single check box for cargo operations; this had been completed for OS2 but left blank for OS1. Seatruck's familiarisation form for returning crew members did not include cargo operations.

One of the remaining two OS on duty was the designated watchman, responsible for routine safety and security checks and supporting the on-duty deck officer as required. The watchman was tending to the mooring lines on the forward mooring deck at the time of the accident.

1.6 P&O FERRIES LIMITED

1.6.1 General

P&O was based in Dover, England and managed a fleet of more than twenty vessels transporting passengers and cargo across the English Channel, the Irish Sea and the North Sea. Company-owned vessels operated under P&O policies and procedures. P&O Ferries was acquired by DP World[11] in 2019.

P&O retained local management responsibilities at its major ports across the UK, Ireland and continental Europe. P&O owned some ports but acted as tenants or shared tenants in others, including Liverpool and Dublin. P&O did not audit its ports and allowed each port to operate to its own local practices, which had developed over many years of experience. P&O's head office provided its ports with some standard guidance, including a safe system of work (SSW) for cargo operations (see section 1.10.11), and relied on its port managers to implement and incorporate them into their safe operating systems. Tractor unit driver training and standards were developed locally and varied between ports.

1.6.2 P&O Ferries Liverpool

P&O's port management team in Liverpool was based in Bootle, England (P&O Ferries Liverpool) and was employed by P&O Ferries Limited. The port manager led the team and was responsible for all aspects of the operation, including site safety and regulatory compliance. P&O leased Gladstone Docks from Peel Ports, which owned the marine infrastructure in Liverpool.

The port operations manager reported directly to the port manager and was responsible for cargo operations, tractor unit drivers, occupational health and safety, training and vessel communications. The port operations manager oversaw the cargo operations for four P&O vessels; two of these were company-owned and two were chartered, including *Clipper Pennant*.

The port operations manager had 30 years of experience working at Liverpool dockyards, which included previous roles as a tractor unit driver, foreman, team leader and tractor unit driver trainer.

[11] A multinational logistics company based in Dubai, United Arab Emirates.

1.7 TRACTOR UNITS AND SEMI-TRAILERS

1.7.1 Roll-on/roll-off tractor units

The Terberg RT223 tractor units used to load and unload semi-trailers at Gladstone Dock were manufactured by Royal Terberg Group B.V. in the Netherlands. The units were designed for use at terminals and on board ro-ro freight ferries. Tractor units at the port were maintained by P&O staff. The tractor unit involved in the accident **(Figure 13)** had last been serviced in January 2021 and had no recorded defects that affected its drivability.

Image courtesy of Seatruck Ferries

Image courtesy of Wikipedia

The tractor unit transported semi-trailers using a fifth wheel coupling arrangement comprised of a horseshoe-shaped device bolted onto the tractor unit's rear and a kingpin[12] that protruded from the undercarriage. Once connected, the semi-trailer rested and pivoted on the tractor unit's fifth wheel, allowing the semi-trailer to be pushed or pulled.

Figure 13: The Terberg RT223 tractor unit and Krone semi-trailer involved in the accident

[12] A vertical steel pin that acts as the pivot point between the tractor unit and semi-trailer.

Tractor unit drivers faced forward to pull a semi-trailer and had an unrestricted view ahead. For pushing, the cab was designed with an offset and a driver's seat and steering console that could be rotated through 180°. To start pushing a semi-trailer, tractor unit drivers turned their seat assembly to face the front end of the semi-trailer. The tractor unit driver's view in this position was restricted by the semi-trailer and they would therefore lean their head out of the window to achieve visibility down the semi-trailer's right side (offside for UK road vehicles). The tractor units were fitted with wing mirrors on the opposite side to enable the drivers to achieve visibility down the semi-trailer's left side (nearside for UK road vehicles) **(Figures 14** and **19)**.

Driver facing forwards in tractor unit, pulling a semi-trailer

Driver leaning out of the window, facing rearwards, in tractor unit, pushing a semi-trailer

Figure 14: Reconstruction of the tractor unit driver positions when pulling and pushing a semi-trailer

1.7.2 Semi-trailers

Semi-trailers were trailers without a front axle designed to be pushed or pulled by a vehicle such as a tractor unit. When coupled, two air lines were connected from the tractor unit to the semi-trailer to enable the tractor unit driver to operate the semi-trailer's braking system. A trestle was used to support a semi-trailer before it was uncoupled from a tractor unit.

The semi-trailer that struck the bosun was a standard curtain-sided trailer manufactured by Krone GmbH[13] and measured 13.86m in length and 2.55m in width at the sides, reducing to 2.425m at the wheels **(**see **Figure 13)**.

1.7.3 Road vehicle dimensions

In 1984, the Council of the European Communities published Council Directive 85/3/EEC[14] to harmonise the weights and dimensions of certain road vehicles across member states. The directive covered vehicles intended to be used on the road for the carriage of goods, including semi-trailers, and set the maximum width for all vehicles as 2.5m in line with the UK maximum width dimension defined in The Road Vehicles (Construction and Use) Regulations 1986.

In 1996, the Council of the European Union published a revised directive[15] that reflected the changes in commercial vehicles since 1984, increasing the maximum width of vehicles intended to carry goods to 2.55m. This was mirrored in the relevant national legislation, including The Road Vehicles (Construction and Use) (Amendment) (No. 6) Regulations 1995, that were in force at the time of the accident.

1.7.4 Tractor unit driver employment

Tractor unit drivers were recruited and supplied to P&O Ferries Liverpool by two local employment agencies, Carlisle Support Services (Carlisle) and Stafforce. The agencies managed the drivers' employment terms. The drivers were considered to be P&O staff and therefore required to follow the company's policies and procedures when they entered the port and started work. Typically, five to eight drivers were assigned to each vessel for cargo operations.

P&O policy preferred tractor unit drivers to hold a heavy goods vehicle class 1 driving licence, but it was not mandated. Drivers undertook a training programme on joining, which was overseen by the port operations manager and comprised health and safety, tractor unit driving, mooring and manual handling. The drivers also joined a vehicle deck familiarisation session when a vessel docked in Liverpool for the first time. Drivers were not required to undertake further or refresher tractor unit driving training.

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[13] Gesellschaft mit beschränkter Haftung, denoting a German limited liability company.

[14] Council Directive 85/3/EEC of 19 December 1984 on the weights, dimensions and certain other technical characteristics of certain road vehicles.

[15] Council Directive 96/53/EC of 25 July 1996 laying down for certain road vehicles circulating within the Community the maximum authorized dimensions in national and international traffic and the maximum authorized weights in international traffic.

P&O Ferries Liverpool required tractor unit drivers to undergo an annual assessment of various aspects of their driving skills with a score out of five. The operations manager assessed the drivers and remedial training was required if they scored less than three out of five for any individual skill.

Tractor unit drivers regularly worked on each of the four P&O ferries operating from Liverpool, two company-owned and two chartered. Tractor unit drivers were expected to follow P&O's SSW, which was also used by the crew on board the two company-owned vessels (see section 1.10.1). The drivers, including the driver involved in this accident, were unaware of any vessel-specific SSW or accompanying safe working practice in use on board *Clipper Pennant*.

1.7.5 The tractor unit driver involved in the accident

The tractor unit driver was 66 years old and held a valid full UK driving licence with no endorsements for offences or points. The driver was entitled to drive Category B vehicles[16] without any restrictions.

The tractor unit driver had worked at the Port of Liverpool for about 14 years and was an experienced foreman and tractor unit driver. The driver began part-time employment with Stafforce on 7 July 2021, having previously been employed by Carlisle.

The tractor unit driver had completed Stafforce's pre-employment health questionnaire, which did not indicate any health issues that would affect their ability to drive a vehicle. The driver did not require corrective lenses for driving and tested negative for drugs and alcohol following the accident.

The port operations manager had trained the tractor unit driver when they first started working in the port. There was no record of any further training. The driver's last annual driving assessment in August 2019 had assessed their driving standard as satisfactory or above for each criterion **(Annex A)** with no recommendations. Due to the coronavirus pandemic, the tractor unit driver was not reassessed in 2020 or 2021.

The tractor unit driver carried a four-page pamphlet produced by P&O titled *Stowage of Trailers on Ro/Ro Vessel* that had been derived from the SSW (see section 1.10.1). The pamphlet contained diagrams of safe zones, danger zones **(Figure 15)**, hand signals used by banksman and a table to record training, which was blank for the tractor unit driver.

[16] A vehicle and trailer combination up to 8,250kg maximum authorised mass for drivers who passed their test before 1 January 1997.

Images courtesy of P&O Ferries

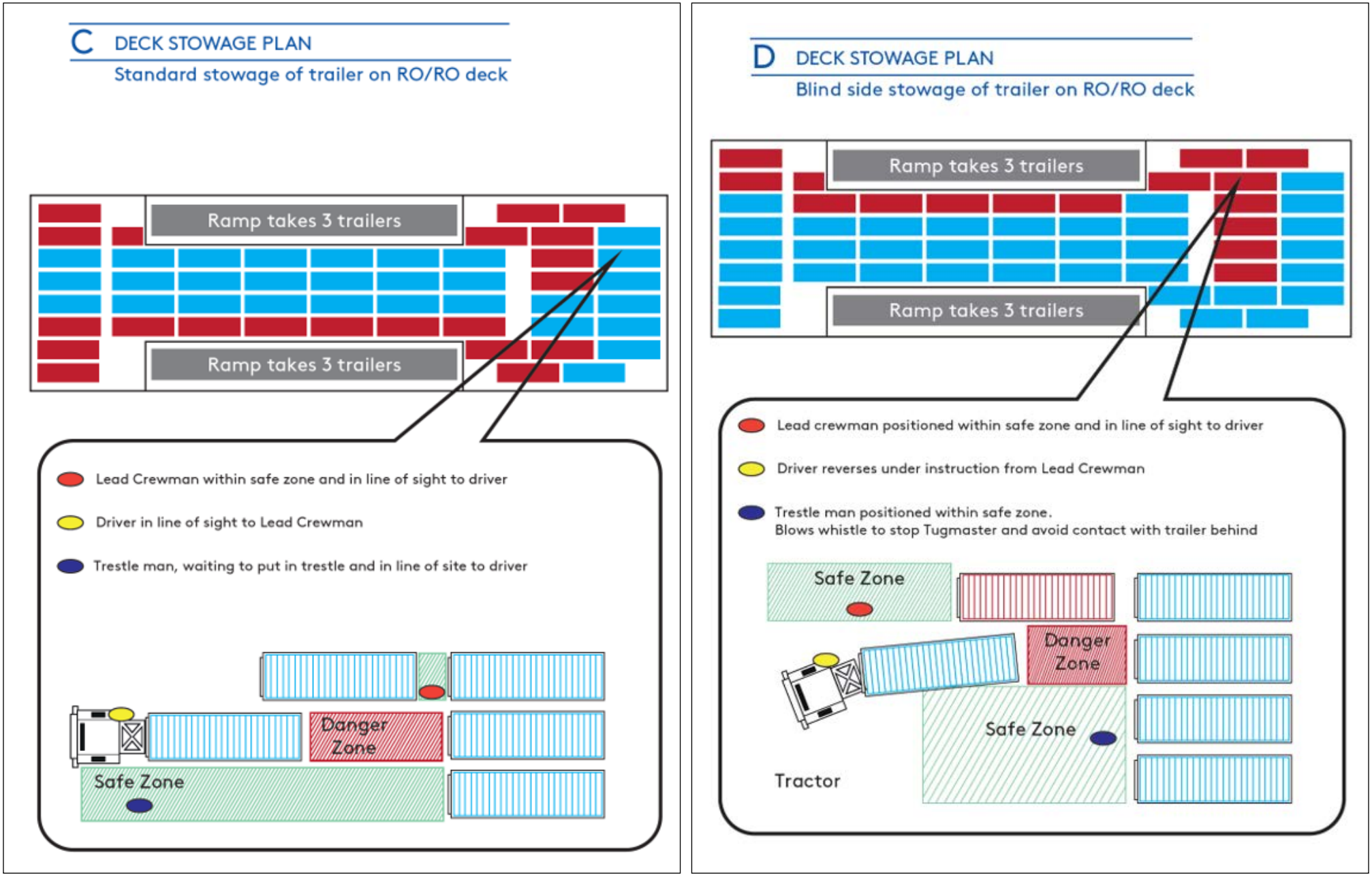

Figure 15: Extracts from P&O *Stowage of Trailers on Ro/Ro Vessel* pamphlet and P&O SSW, showing safe zones and danger zones during semi-trailer loading

1.8 CARGO OPERATIONS

1.8.1 Crew responsibilities

Cargo operations on board *Clipper Pennant* were directed by the deck department. The C/O had overall responsibility for cargo operations, including oversight, distribution, securing the load and stability. The responsibility for stability required the C/O to constantly monitor ballasting from the CCR during cargo operations, assisted by either the second officer or 3/O who acted as the duty deck officer and supervised the discharge and loading of the main vehicle deck. The bosun was tasked to do the same on the upper vehicle deck.

At least two of the deck ratings were assigned to each vehicle deck. When loading, the ratings assisted with the marshalling of semi-trailers and were responsible for inserting and removing the trestles. The deck ratings were also responsible for mooring operations and, on completion of cargo operations, would proceed directly to the mooring decks to start letting go the mooring ropes.

1.8.2 Discharge and loading sequence

The cargo discharge and loading operation for *Clipper Pennant* followed a routine sequence in both Liverpool and Dublin. On arrival, the ferry was secured to the berth, the stern ramps were lowered, the cargo was discharged and simultaneous loading of both decks began shortly afterwards. On the upper vehicle deck, the aft stowage spaces were loaded first, followed by the forward section and then the midship area.

The semi-trailers were usually loaded row-by-row from starboard to port, in the order the semi-trailers ascended the stern ramp. The semi-trailers carrying dangerous or abnormal loads were the only ones assigned a specific stowage space in the vessel's loading plan.

1.8.3 The role of the banksman

Each semi-trailer was pushed into its stowage space under the direction of a banksman during loading. This role was assigned to the most senior crew member on the deck and only one crew member acted as a banksman at any one time. The bosun was assigned the role of banksman on *Clipper Pennant*'s upper vehicle deck. It was customary for the banksman to lash the rear of the semi-trailers while the assisting deck ratings positioned the trestles, secured the front of the semi-trailers and prepared the lashings in the next stowage space.

1.8.4 Signalling

Whistles were used by the crew for signalling and provided a high-pitched sound that could be heard from a distance, and above the background noise, by those on deck and by tractor unit drivers.

1.9 VESSEL SAFETY MANAGEMENT

1.9.1 Seatruck marine safety organisation

Seatruck's shore safety team comprised two marine superintendents and two technical superintendents, reporting directly to the chief operating officer, who were responsible for safe fleet operations and direct communication with the vessels.

The marine superintendents also acted as the company's Designated Person Ashore (DPA) and deputy DPA and were responsible for the company's marine SMS. Their duties included auditing, ensuring that accidents and incidents were properly investigated, issuing fleet notices and safety flashes, reviewing new regulations or guidelines, liaising with the flag state and RO and reviewing shipboard safety committee meeting minutes.

Seatruck complied with the requirements of the International Safety Management Code for the Safe Operation of Ships and for Pollution Prevention (ISM Code). DNV issued a Document of Compliance (DOC) to Seatruck on 10 June 2021.

Seatruck vessels, including *Clipper Pennant*, were issued with the company SMS that contained generic procedures and guidelines applicable across the fleet and included vessel-specific requirements and checklists as annexes. The SMS documented Seatruck's policies and procedures on safety, quality management, environmental protection, the roles and responsibilities of ship and shore-based staff and processes for analysing incidents and developing risk assessments. The DPA had direct access to the chief executive officer (CEO) to ensure adequate resources and shore-based support were available to develop, implement and maintain the SMS.

1.9.2 *Clipper Pennant* external audit

In January 2020, DNV audited *Clipper Pennant*; no non-conformances were identified and the vessel was issued with a Safety Management Certificate (SMC). This was valid for 5 years and verified that the SMS conformed to the ISM Code.

1.9.3 *Clipper Pennant* internal audit

On 28 June 2021, an internal ISM audit of *Clipper Pennant* was completed by both marine superintendents and a technical superintendent. The findings included an observation that risk assessments had not been adapted for vessel-specific work activities and that crew were routinely using generic risk assessments (GRAs).

1.9.4 Risk assessment process

Seatruck's SMS risk assessment guidance was based on hazard identification, risk evaluation and action plans for control measures. Seatruck had issued multiple GRAs, including for cargo operations, which were available on board its vessels and used by the crew. In line with the Code of Safe Working Practices for Merchant Seafarers 2015 Edition – Amendment 5, October 2020 (COSWP), Seatruck shore management expected crew to revise and adapt the company's GRAs to reflect vessel or task-specific activities. The company also required crew to conduct toolbox talks before starting high-risk tasks. The SMS stated that the most effective way to reduce risk was to eliminate a hazard and, where this was not possible, control measures were required to minimise the risk.

Seatruck masters were required to notify the company of any accidents or near accidents[17] involving a vessel or its crew. Crews were expected to report accidents and incidents to their head of department or to the safety officer, who was required to undertake 'root cause analysis' to identify specific failures or deficiencies and recommend corrective action to prevent a recurrence. The DPAs were responsible for assessing the reports and taking appropriate action.

The SMS required the root cause analysis of an incident investigation to be discussed at quarterly management review meetings attended by shoreside senior management to ensure appropriate corrective action had been implemented.

1.9.5 Safety committee

Clipper Pennant's master chaired monthly safety committee meetings attended by the safety officer, chief engineer and departmental safety representatives, including the bosun. The standard agenda included reviews of previous accidents and near accidents, new company instructions and safety procedures, drills and training and feedback from the crew.

The meeting minutes were forwarded to *Clipper Pennant*'s marine superintendent in line with the SMS. The minutes of the last six meetings before the accident referred to concerns about accident and near accident reporting. The minutes recorded that the safety officer recognised the importance of reporting near accidents and suggested that the crew be more active in identifying and reporting them.

The January 2021 minutes cited a company email about the *poor level of near accident reporting*, concluding that the crew perceived they would get into trouble for reporting incidents. The investigation found similar concerns about low reporting levels on other ferries within the Seatruck fleet.

1.9.6 Safety climate surveys

In September 2019, Seatruck commissioned a staff climate survey following the fatal accident on *Seatruck Pace* in December 2018 (see section 1.15.1) as a means of measuring the organisation's safety culture[18]. The Health and Safety Executive (HSE) Science and Research Centre (Health and Safety Laboratory) conducted the survey using its Safety Climate Tool to measure the attitudes and perceptions of Seatruck's workforce towards health and safety.

In November 2020, following a recommendation made as part of the MAIB's investigation of the fatal accident on *Seatruck Progress* in May 2019 (see section 1.15.2), Seatruck arranged a second climate survey using the same method to gauge any changes in the attitude towards safety.

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[17] Also referred to as a near miss, an incident that *could* have resulted in a loss.

[18] Safety climate and safety culture are often used interchangeably but have different meanings. The safety culture of an organisation is the product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine commitment to and style and proficiency of an organisation's safety management. A safety climate is a snapshot of an organisation's safety culture that focuses on employee perceptions and behaviours (HSE). A positive safety culture required several components (Reason, J. (1997), Managing the Risk of Organizational Accidents: Ashgate, London), including a: **reporting** culture, which enables and encourages people to report accidents and incidents; **learning** culture, where the organisation is able to interpret and act on its safety information; **just** culture, which avoids apportioning blame and instead focuses on systemic deficiencies rather than individual failings.

Both surveys identified concerns relating to procedures, including safety procedures not reflecting how jobs were done. The surveys also indicated that near misses were often not reported, although accidents were. About a third of the workforce agreed or strongly agreed that the company's accident investigations were primarily used to identify who was to blame.

1.9.7 Cargo procedures

Seatruck's SMS included a chapter on cargo operations, which stated that cargo must be stowed and secured in accordance with the vessel's approved CSM. It also stipulated that one of the C/O's responsibilities during cargo operations was to ensure that crew engaged in lashing worked in pairs or in sight of one another, with no lone working. It did not document the role or responsibilities of the banksman.

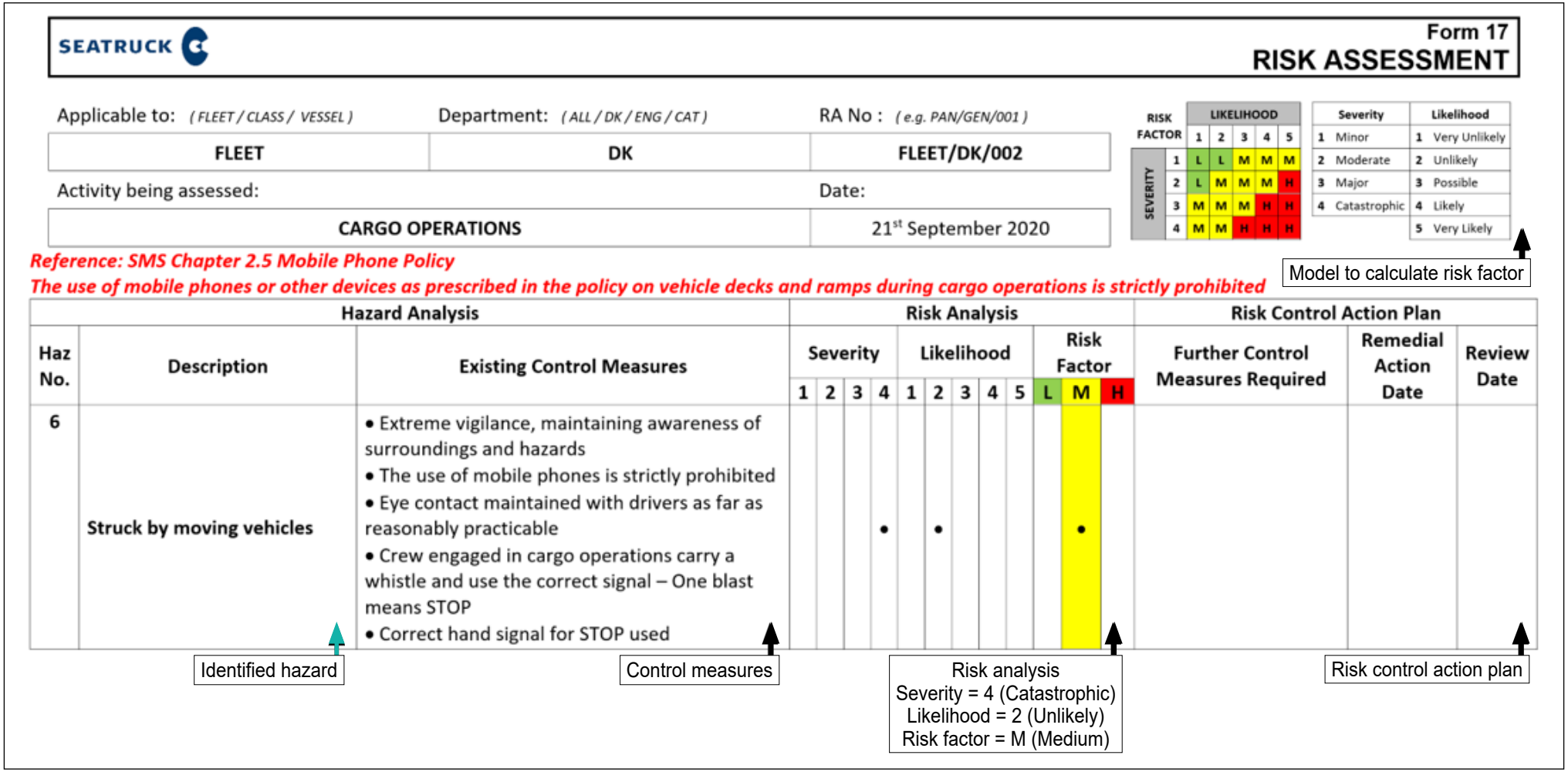
The procedures referred to the use of hand and whistle signals and stated that, *Only one whistle signal should be used* and *One blast means STOP! If necessary, and to prevent an accident occurring, a long blast on the whistle should be sounded*. The whistle was only to be used to stop the cargo operation.

The procedures referenced Maritime and Coastguard Agency (MCA) publications, including COSWP and the Roll-on/Roll-off Ships – Stowage and Securing of Cargo Code of Practice; the latter was revised and replaced in November 2019 with Marine Guidance Note (MGN) 621 (M+F) Roll-on/Roll-off ships – Guidance for the Stowage and Securing of Vehicles.

The only risk assessment for *Clipper Pennant*'s cargo operations was generic and identified the risk of being struck by a moving vehicle as a hazard, with several control measures **(Figure 16)**. The severity of the consequences was assessed as *catastrophic*[19] and the likelihood as *unlikely*, with a resultant risk factor of *medium*, meaning the risk was only tolerable when it had been reduced to a level *as low as reasonably practicable*. Seatruck required a risk control action plan in such circumstances, but the GRA did not list any further control measures.

[19] Defined in the SMS, in terms of personal harm, as *severe life shortening disease, acute fatal disease. Fatal injury, multiple permanent injuries*.

Image courtesy of Seatruck Ferries



SEATRUCK

Form 17
RISK ASSESSMENT

Applicable to: *(FLEET / CLASS / VESSEL)* | Department: *(ALL / DK / ENG / CAT)* | RA No : *(e.g. PAN/GEN/001)*

FLEET	DK	FLEET/DK/002

Activity being assessed: | Date:

CARGO OPERATIONS	21st September 2020

RISK FACTOR		LIKELIHOOD 1	2	3	4	5
SEVERITY	1	L	L	M	M	M
	2	L	M	M	M	H
	3	M	M	M	H	H
	4	M	M	H	H	H

Severity	Likelihood
1 Minor	1 Very Unlikely
2 Moderate	2 Unlikely
3 Major	3 Possible
4 Catastrophic	4 Likely
	5 Very Likely

Model to calculate risk factor

Reference: SMS Chapter 2.5 Mobile Phone Policy

The use of mobile phones or other devices as prescribed in the policy on vehicle decks and ramps during cargo operations is strictly prohibited

Hazard Analysis			Risk Analysis									Risk Control Action Plan		
Haz No.	Description	Existing Control Measures	Severity				Likelihood					Risk Factor			Further Control Measures Required	Remedial Action Date	Review Date
			1	2	3	4	1	2	3	4	5	L	M	H			
6	**Struck by moving vehicles**	• Extreme vigilance, maintaining awareness of surroundings and hazards • The use of mobile phones is strictly prohibited • Eye contact maintained with drivers as far as reasonably practicable • Crew engaged in cargo operations carry a whistle and use the correct signal – One blast means STOP • Correct hand signal for STOP used				•		•					•				

Identified hazard

Control measures

Risk analysis
Severity = 4 (Catastrophic)
Likelihood = 2 (Unlikely)
Risk factor = M (Medium)

Risk control action plan

Figure 16: Extract from Seatruck's generic risk assessment for cargo operations

1.9.8 Seatruck Deck Safety and Procedures Guide

Following an accident on board *Seatruck Progress* in 2019 (section 1.15.2), Seatruck identified the discharge and loading of semi-trailers as the company's most significant risk and introduced a Deck Safety and Procedures Guide in 2020 to mitigate the risk. The guide contained essential information to keep its crew safe during cargo operations, including the following deck safety instructions:

- *Visual contact must be maintained during manoeuvring* [between the tractor unit driver and the banksman].
- *In the event of loss of visual contact, manoeuvring must stop immediately.*
- *Never walk behind a moving vehicle to position yourself outside the sight of the tug driver.*
- *Safety barriers are located outside doors and access points onto vehicle decks.*
- *Always work in pairs when lashing or unlashing and remain in sight of one another.* [sic]

The guide illustrated the safe positions for crew to stand when loading a semi-trailer and highlighted the areas deemed unsafe and prohibited **(Figure 17)**. It did not contain specific information about the marking of vehicle decks, although an illustration of how to position safety barriers in the lower hold **(Figure 18)** used white lines to show lane markings and a thick yellow line to denote the walkway. The guide instructed that *Walkways must always be kept clear, position trestles and lashings so that they are not a tripping hazard*.

Image courtesy of Seatruck Ferries

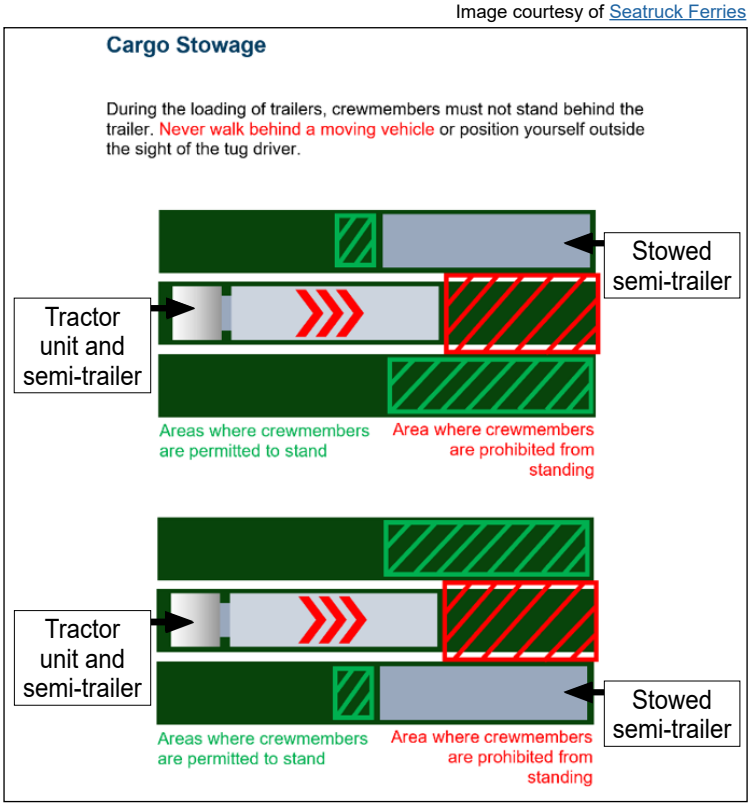


Figure 17: Extract from Seatruck's Deck and Safety Procedures Guide, showing safe and hazardous areas

The bosun was aware of the guide and familiar with its content. The guide was not shared with P&O Ferries Liverpool or its tractor unit drivers.

Image courtesy of Seatruck Ferries

Figure 18: Extract from Seatruck's Deck and Safety Procedures Guide, showing a lower hold designated walkway and lane makings

1.10 P&O SAFETY MANAGEMENT

1.10.1 P&O safe system of work

Following the fatal accident on board *European Endeavour* in June 2017 (see section 1.16.2), P&O worked with Ireland's Health and Safety Authority to produce an SSW for vehicle deck operations. In late 2017, after numerous iterations, both parties agreed on version 28, titled *Stowage of Trailers on Ro/Ro Vessel*, which P&O staff commonly referred to as *version 28* (SSW V28) and included the following instructions for tractor unit drivers:

- *If you lose sight of the Lead Crewman*[20] *who is directing, ALWAYS STOP.*
- *Maintain line-of-sight with Lead Crewman providing directions.*
- *Stop immediately when you hear whistle signal.*
- *Stop immediately when you lose line-of-sight with Lead Crewman directing you. Wait for instruction.* [sic]

On marshalling trailers, it provided the following guidance:

- *NEVER walk behind moving vehicle.*
- *Lead Crewman to maintain line-of-sight with Tugmaster driver when reversing.*
- *Lead Crewman. During stowage of trailer, if you lose sight of the Tugmaster driver sound whistle and STOP vehicle until eye contact is restored.*
- *Keep walkways clear at all times.*
- *Never work alone during loading operations.*

[20] P&O refer to the banksman, or signaller, as the lead crewman.

- *Never enter danger zone whilst vehicle is moving.*
- *Only one person, Lead Crewman, to direct a Tugmaster at any one time. Avoid confusion.* [sic]

Image courtesy of P&O Ferries

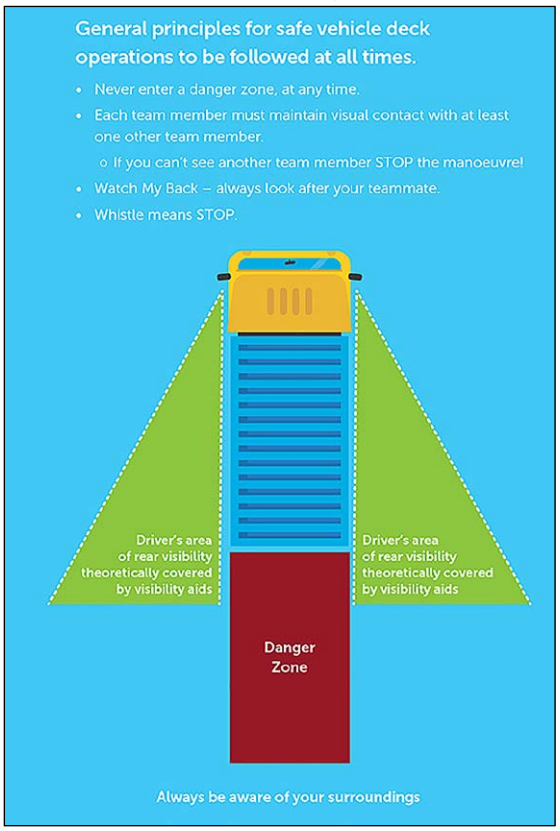


Figure 19: Extract from P&O's *Vehicle Deck Operations*, illustrating the general principles for safe vehicle deck operations

SSW V28 identified safe and dangerous zones where the banksman could stand, covering scenarios where line of sight was maintained with the driver and trestle man and times when there was a blind spot **(**see **Figure 15)**. It also detailed the various signalling methods permitted for the banksman to use. SSW V28 was accompanied by the four-page pamphlet *Stowage of Trailers on Ro/Ro Vessel* (see section 1.7.5).

P&O also published *Vehicle Deck Operations*, an additional guide for staff involved in cargo operations to be read in conjunction with SSW V28. This was aimed at anyone who went onto a vehicle deck and focused on the human factors involved in the operation. The guide recommended additional safety enhancements, including dedicated pedestrian walkways to segregate people from vehicles and crash barriers to provide refuge. It also provided further guidance on driver visibility and danger zones **(Figure 19)**.

P&O's procedure for the use of standard hand signals on vehicle decks was the same as Seatruck's, albeit with slight variations as P&O stated that an emergency stop was to be signalled by hand. P&O also stated that a whistle was only to be used to stop the cargo operation.

1.10.2 Port procedures

P&O issued SSW V28 and *Vehicle Deck Operations* to the ports under its control and expected crew and tractor unit drivers to be trained and familiar with their content. P&O Ferries Liverpool had received copies of the document but referred to a different document for vehicle deck safety titled *Stevedore Operation Loading/ Discharging Trailers* **(Annex B)**. This was an obsolete document, having been produced by P&O Irish Sea, a P&O trading name that ceased in 2010.

The investigation established that tractor unit drivers were unfamiliar with SSW V28 and could not recall undertaking formal training based on its content.

1.11 ALIGNMENT OF SEATRUCK AND P&O PROCEDURES

Before *Clipper Pennant*'s charter party agreement started in December 2019, Seatruck engaged with P&O to align the vehicle deck procedures and agree on the process for reporting accidents and near accidents and were provided with a copy of SSW V28.

Clipper Pennant's crew and the respective port managers met during the vessel's inaugural calls to Liverpool and Dublin to discuss the logistics of loading and discharging. The port management representatives determined that the Seatruck and P&O SMSs were broadly similar in terms of vehicle deck safety, and procedural alignment was not considered. On 22 January 2020, *Clipper Pennant*'s deck crew, including the bosun, received formal SSW V28 induction training from P&O staff in Dublin and a record of the training was held on board.

P&O Ferries Liverpool held no records of vehicle deck safety induction or refresher training for *Clipper Pennant*'s crew. There were no records of joint training sessions for crew and tractor unit drivers.

Port operation managers from Liverpool and Dublin attended a weekly meeting to discuss health and safety with the masters of its chartered vessels. Seatruck and P&O held separate safety meetings at their respective head offices and did not share accident and near accident data. P&O head office did not monitor the dialogue between its ports and chartered vessels, nor did it align health and safety standards with Seatruck.

1.12 INDUSTRY GUIDANCE AND BEST PRACTICE

1.12.1 Overview of vehicle deck safety guidance

The marshalling of semi-trailers was a routine operation for ro-ro cargo vessels and the risks were widely acknowledged; best practice guidelines had been provided by various organisations, including the MCA, the International Labour Organization (ILO), the HSE, Port Skills and Safety Limited[21] (PSS) and the UK Chamber of Shipping (UK COS). The fundamental principles of vehicle deck safety were consistent across the industry and included that the:

- banksman and driver must maintain a line of sight with one another
- driver must stop manoeuvring if the banksman leaves their field of vision
- crew must not enter a dangerous area (the path of a moving vehicle)
- crew should not position themselves towards the back of a vehicle
- crew should not work alone
- whistle means stop; there is danger
- banksman controls the operation, and the driver follows their direction.

[21] The UK's professional ports health and safety membership organisation, which aimed to make ports safer and more skilled by setting health and safety standards, developing a safety culture and sharing industry best practices.

Internationally, the ferry industry was represented by Interferry[22], a non-governmental organisation that had consultative status with IMO and provided support to its members on regulatory and policy matters.

1.12.2 MCA guidance

The COSWP advised crew members to exercise caution when supervising the driving, marshalling and stowing of vehicles to ensure no person was put at risk. This was reiterated in MGN 621 (M+F), which provided detailed information on the safe procedures to be followed during ro-ro operations, incorporating the relevant IMO standards (see section 1.13.2), and identified the principal sources of danger, including reversing vehicles and inadequate supervision of vehicle movements.

MGN 341 (M)[23] highlighted the dangers to passengers and crew from moving vehicles during cargo loading and discharging operations. Paragraphs 4.2 and 4.3 stated:

> *There have been accidents where seafarers have been killed or injured during cargo operations involving flat-bed trailers or similar being driven by shore-personnel, despite the presence of signallers and ship's staff.*
>
> *Many of the vehicles now being loaded on ships are larger than was envisaged when the ships were designed and built and are of such design that the view from the driving position, particularly when manoeuvering in reverse, is severely limited. This increases the hazards due to the limited walkway space available.* [sic]

MGN 341(M) also identified recommendations to reduce the risk to personnel on vehicle decks, including:

> *Personnel involved in controlling vehicles should avoid standing directly between the vehicle being moved and any obstruction. The position chosen should minimize the risk of being trapped between the moving vehicle and an obstruction. Safety will also be enhanced by remaining in the driver's line-of-sight having regard to the driving position of vehicles in different countries.* [sic]

1.12.3 Shoreside general guidance

The HSE's A Guide to Workplace Transport Safety[24] provided advice for employers on site safety, including safe driving. The guide stated that around 50 people were killed and more than 5000 people injured in workplace transport accidents every year; one of the most common causes was being struck by a vehicle. It noted that the use of a trained banksman might be appropriate where reversing could not be avoided, but only when there was no other way to control reversing risks. The guidance stated that the banksman must stand in a safe position to guide the

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[22] Interferry comprised more than 260 member companies from across the ferry industry, including: operators, shipbuilders and designers; equipment manufacturers and suppliers; naval architects and marine engineers; ship brokers and consultants; classification societies; publishers; and specialists in information technology, finance, insurance, crewing, and training.

[23] Ro-Ro Ships Vehicle Decks – Accidents to Personnel, Passenger Access and the Carriage of Motor Vehicles, published 30 May 2007.

[24] HSG136 (Third edition), published September 2014.

reversing vehicle and always be visible to the driver, who must stop immediately if they lost sight of the banksman. It also advised that portable radios or similar could be helpful.

Guidance provided by the HSE in its L148 Safety in Docks Approved Code of Practice (ACOP) and the ILO's Safety and Health in Ports code of practice (COP)[25] shared similar messages, reiterating that people should be separated from vehicles whenever practicable.

Seatruck and P&O were members of the PSS, which shared guidance with its members via publicly available Safety in Ports (SiPs) publications. SiP001[26] highlighted the importance of cooperation and coordination between shoreside and ship-based employers and the development of agreed SSWs with all parties. It also recommended a signed agreement or an agreed and recorded system of work with the master of each vessel.

SiP010[27] reported that being struck or crushed by moving vehicles was the top hazard associated with ro-ro operations and included a variety of risk controls. Further, SiP012[28] stated that segregating pedestrians and vehicles was a fundamental safety principle of ro-ro operations. The publication also noted that a designated signaller guiding a vehicle into a final position should ensure they communicate with the driver, either by being directly visible via vehicle mirrors or by a whistle. The designated signaller was to position themselves clear of the moving vehicle to avoid the risk of being trapped or crushed.

In January 2020, the UK COS published its Guidelines to Shipping Companies on Vehicle Deck Safety following several fatalities on vehicle decks. The UK COS identified vehicle decks as one of the most hazardous areas of a vessel. It recommended that ferry operators review their safety policies, procedures and management systems. Specific recommendations included:

- *Install crash barriers and protected safety zones.*
- *Tractor / tug drivers to hold appropriate licence; formalised specialist training and certification proposed.*
- *Annual review of tractor/ tug driver performance, perhaps in a simulator, to assess competence.*
- *Port and ship staff to train together.*
- *Whether the use of a whistle blow as a stop signal is appropriate. Would a routine stop be differentiated from emergency stop?* [sic]

[25] 2016 edition, updating the ILO Code of Practice Safety and Health in Ports, 2005 edition.

[26] SiP001 – Guidance on Workplace Transport Port and Terminal Planning, published September 2018.

[27] SiP010 – Guidance on Ro-Ro & Sto-Ro Operations, published March 2019.

[28] SiP012 – Guidance on Ro-Ro Passenger and Cruise Operations, issue 2, published June 2020.

1.12.4 Use of a banksman

HSE guidance[29] highlighted that *using banksmen to control reversing operations could put the Banksman in the potential danger area of a reversing vehicle. Every year, banksmen suffer serious and fatal injuries whilst at work*. The HSE suggested that banksmen must be trained to carry out their duties safely when used. Any SSW needed to ensure the banksman and driver were using standard signals, *so that they are easily understood*, and that the driver knew to *stop the vehicle immediately if the banksman disappears from view*.

1.12.5 Signalling

The use of hand signals and whistle signals on vehicle decks was standard across the ferry industry.

The COSWP defined standard hand signals and stated that an agreed signalling method should be established between the driver and the lashing crew, preferably by using a whistle or other distinct sound signal. MGN 621 (M+F) suggested that a high-pitched whistle was a valuable tool to alert personnel of potential danger. SiP010 recommended that the signals should be agreed and usually include either a loud, long blast on a whistle or a hand signal to indicate an emergency stop.

The UK COS guidance also suggested that a magnetic loop and headphones might be a preferred alternative means of communication to the use of whistles and hand signals.

1.12.6 Loading partially enclosed stowage spaces

A process for loading partially enclosed stowage spaces had been developed within the ferry industry, which comprised the following sequence:

1. Having rotated the tractor unit seat to face the front of the semi-trailer, the driver establishes visual contact with the banksman by looking down the right side (offside) of the semi-trailer;

2. On the banksman's signal, the tractor unit driver starts to push the semi-trailer towards its stowage space;

3. The banksman walks through the path of the moving semi-trailer and stands in a designated area at the rear of the adjacent parked semi-trailer;

4. The tractor unit driver continues the manoeuvre until the banksman blows their whistle **(Figure 20)**.

Seatruck and P&O were aware that these steps were widely used across their ferries, and P&O Ferries Liverpool verbally encouraged its tractor unit drivers to follow them. The loading sequence was not documented and there were no associated risk assessments.

[29] Banksman signals: https://www.hse.gov.uk/workplacetransport/safetysigns/banksman/index.htm

For illustrative purposes only: not to scale

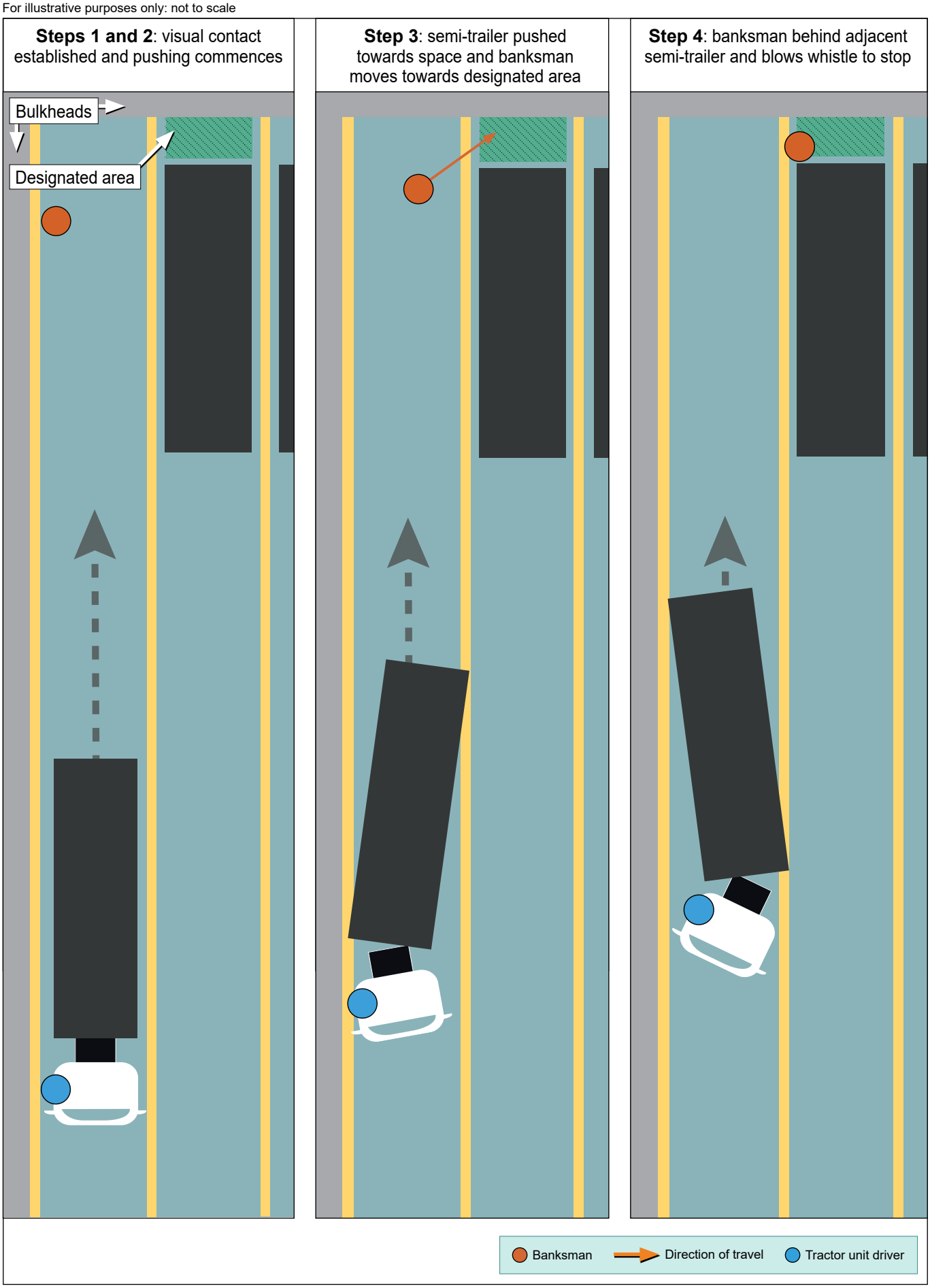

Figure 20: A representation of the undocumented sequence for loading a semi-trailer into a partially enclosed stowage space

1.12.7 Walkways

The COSWP and MGN 621 (M+F) advised that walkways be kept clear and that vehicles should not be parked on permanent walkways or obstruct emergency escapes. MGN 621 (M+F) suggested considering special measures near access doorways, such as raised kerbs and warning signs, to keep vehicles clear and alert drivers to the possible presence of pedestrians.

1.12.8 Tractor unit driving

The ILO's Safety and Health in Ports COP recommended refresher training in addition to initial training for tractor unit drivers and that training and competency records were maintained. The HSE's Safety in Docks ACOP recommended that drivers follow safe working practices, which their employers should monitor to ensure they remain fit and competent to carry out their tasks.

1.13 REGULATIONS

1.13.1 Company accident and incident reporting and investigation requirements

Section 9 of the ISM Code required accidents and hazardous occurrences[30] to be reported to the company, investigated, and analysed to improve safety. It further required the company to establish procedures for implementing corrective action and to prevent a recurrence. In 2008, the IMO published MSC-MEPC.7/Circular.7, which provided further guidance on near miss reporting and the barriers to reporting, including fear of blame, discipline, embarrassment or liability. The circular required companies to have a clear policy on near miss reporting and outlined that the benefits of reporting were only achievable if reporting near misses could not result in punitive measures.

Further, the circular recommended that companies adopt a *just culture* approach that *features an atmosphere of responsible behaviour and trust whereby people are encouraged to provide essential safety-related information without fear of retribution*. The IMO proposed several management initiatives, noting a near miss *report's recommendations should be disseminated widely*.

1.13.2 Cargo securing arrangements

Adopted by the IMO assembly in 1991, the CSS Code provided international guidelines for the safe stowage and securing of cargo to meet SOLAS requirements. It included specific details on stowage and securing arrangements for the transporting of road vehicles on board ro-ro vessels.

The CSS Code referred to IMO Resolution A.581(14)[31], *Guidelines for Securing Arrangements for the Transport of Road Vehicles on Ro-Ro Ships*, which provided design and construction recommendations and detailed guidance for cargo deck vehicle stowage.

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[30] MSC-Marine Environment Protection Committee (MEPC).7/Circular.7 defined hazardous occurrences as an alternative term for a near miss.

[31] In 2020, Resolution MSC.479(102), Revised Guidelines for the Securing Arrangements for the Transport of Road Vehicles on Ro-Ro Ships made several amendments to A.581(14). The athwartships spacing of the securing points was unchanged.

The resolution stated that the arrangements of deck securing points should be left to the discretion of the shipowner, provided the athwartship spacing of the securing points was between 2.8m and 3.0m (inclusive)[32].

1.14 POST-ACCIDENT INVESTIGATION

1.14.1 Accident reconstruction

On 26 July 2021, MAIB inspectors reconstructed the circumstances of the accident on *Clipper Pennant* to understand how the bosun may have become trapped. Two reconstructions were made in way of stowage space 21, with the semi-trailer:

1. pushed into a position parallel to the accommodation bulkhead;
2. parked at an angle with its rear portion extending over the walkway towards the stiffening beam.

Two cameras were fitted across the upper deck to record the reconstructions. An experienced tractor unit driver was selected to demonstrate the manoeuvre and was equipped with a head camera to capture their visual cues.

During the reconstructions, the tractor unit driver placed their head outside the cab window and looked down towards the offside (driver side) lane marking to orientate themselves and guide the semi-trailer into position **(Figure 21a)**. The tractor unit driver focused primarily on the lane marking and did not look in the tractor unit's mirrors to monitor the semi-trailer's nearside. The tractor unit driver did not observe the positioning of the trestle man or banksman. The banksman went unsighted throughout the manoeuvre, and only the legs of the trestle man could be seen after the semi-trailer was stopped **(Figure 21b)**. The first reconstruction showed that precision driving was required to keep the wheels between the lane markings as the semi-trailer approached its final position **(Figure 21c)**.

During both reconstructions, the banksman signalled the tractor unit to start pushing the semi-trailer before relocating to behind the adjacent semi-trailer **(Figure 21d)**. During the first reconstruction, the banksman did not make hand signals but, during the second, the banksman made a hand gesture for the semi-trailer to be manoeuvred away from the longitudinal bulkhead. As they were not in sight of one another, the banksman had to blow the whistle to gain the tractor unit driver's attention. The tractor unit driver continued pushing until the banksman gave a second whistle signal when the semi-trailer was in its final position.

When it was parked at an angle, the rear of the semi-trailer was positioned partially across the walkway. Consequently, the front of the semi-trailer was closer to the adjacent semi-trailer **(Figure 21e)**.

Further observations included:

- the walkway only became visible when the rear of the semi-trailer passed the point at which the lane marking widened into a walkway **(Figure 21f)**.

- the deck rating positioning the trestle did not monitor the position of the bosun during the manoeuvre **(Figure 21e)**.

- the whistle signal could be heard across the deck.

[32] Equivalent dimensions in *International Organization for Standardization 9367-2: Lashing and securing arrangements on road vehicles for sea transportation on Ro/Ro ships – General requirements – Part 2: Semi trailers*.

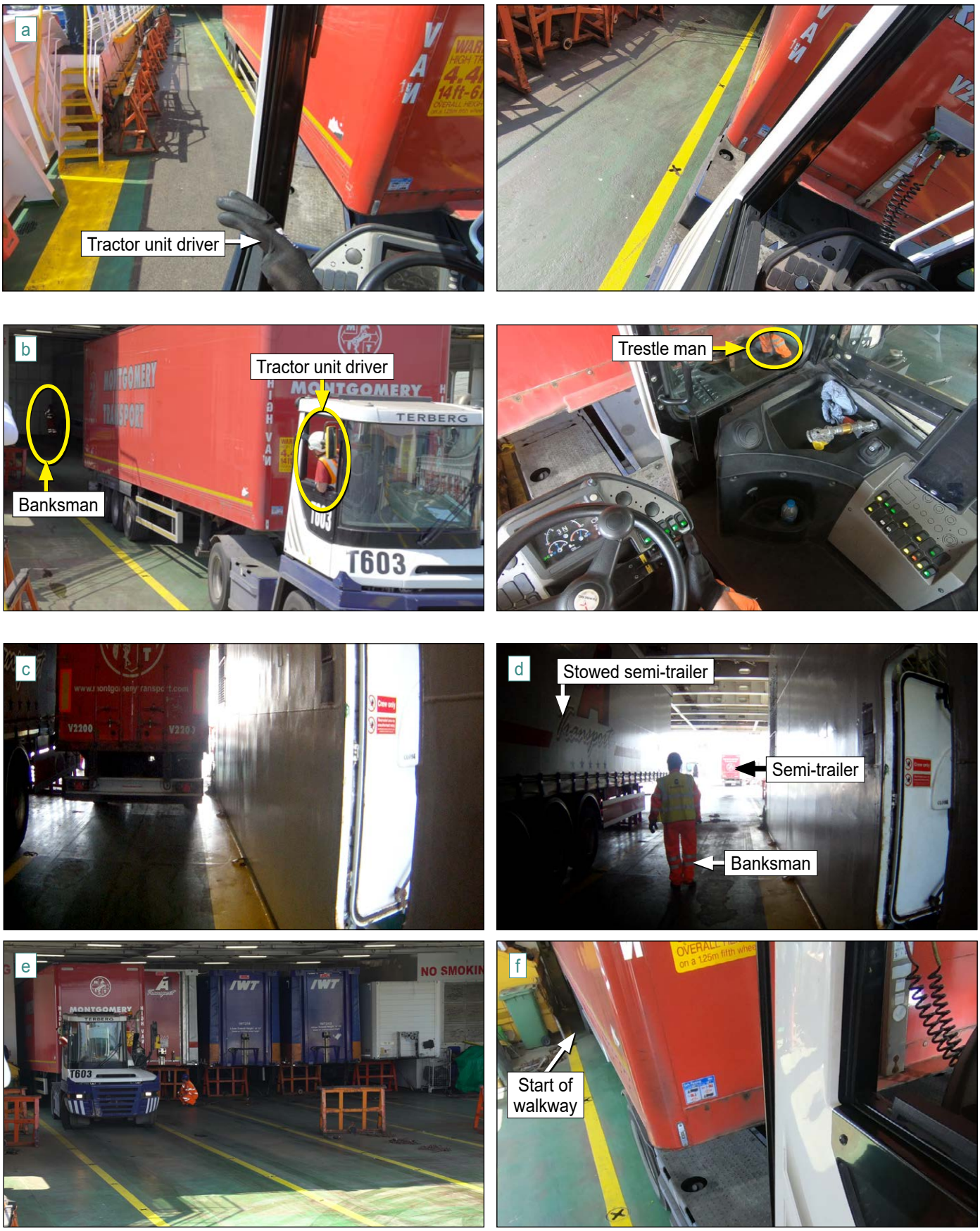

Figure 21: Stills from the MAIB reconstruction

1.14.2 Cargo operations

Following the accident MAIB inspectors boarded similar ferries to witness the loading of semi-trailers, observing that:

- visual contact between the tractor unit driver and banksman was habitually lost;
- tractor unit drivers routinely did not stop when they lost sight of the banksman;
- crew members regularly walked or stood in the path of moving semi-trailers and entered danger zones;
- on one occasion, the banksman stood in a walkway to maintain visual contact and signal the tractor unit driver. The walkway was neither separated nor segregated from the vehicle lane;
- loading sometimes involved more than one banksman for a single manoeuvre; and
- the whistle was occasionally used for purposes other than stopping a semi-trailer.

1.14.3 Seatruck internal investigation

Seatruck used root cause analysis to conduct an internal investigation into the circumstances of the accident. The company identified the root causes as the bosun's failure to comply with the company's Deck and Safety Procedures Guide, the tractor unit driver losing sight of the bosun and the tractor unit driver being unaware of where the bosun stood and not stopping. Seatruck concluded that the bosun stood in an unsafe position, and the tractor unit driver did not park the semi-trailer properly in the stowage space.

Seatruck's management did not make its investigation report available to its crews but the report contained a list of actions to be taken to improve vehicle deck safety that followed some immediate actions, including: recirculating Safety Flash 09-2020 – No Escape! to the fleet; and temporarily suspending loading in the space where the accident occurred, and similarly across the fleet, until their procedures had been reviewed and a new safe system of work had been developed (for further actions, see section 4).

1.15 PREVIOUS ACCIDENTS AND INCIDENTS INVOLVING SEATRUCK VESSELS

1.15.1 *Seatruck Pace* – fatal accident – December 2018

On 17 December 2018, the assistant bosun on board *Seatruck Pace* (MAIB report 9/2019[33]) died after falling through a hatch over the lower vehicle deck ramp. He was working alone and had crossed a temporary safety barrier guarding the edge of the open hatch. The MAIB investigation found that:

- *The assistant bosun…had probably taken similar action in the past, recognising and accepting the risk of falling...*

[33] https://www.gov.uk/maib-reports/fall-from-height-on-ro-ro-freight-vessel-seatruck-pace-with-loss-of-1-life

- *…a specific, task-based risk assessment, which could have identified the hazards involved and mitigation measures to be taken, was not completed.*

- *…the crew's adherence to the safety procedures was more a matter of routine and compliance, than of understanding and conviction.*

1.15.2 *Seatruck Progress* – fatal accident – May 2019

On 15 May 2019, the 3/O on board *Seatruck Progress* (MAIB report 10/2020[34]) was struck and fatally injured by a semi-trailer being unloaded on the ferry's stern ramp. The 3/O was talking on his mobile phone, facing away from the advancing semi-trailer, and was not visible to the tractor unit driver, whose view was obscured by the semi-trailer. As the semi-trailer approached the 3/O it was driven over a yellow walkway painted on the ramp.

The investigation highlighted vehicle deck safety as a critical concern in the ferry industry, concluding that:

- *The pedestrian walkway that was marked on the stern ramp by a yellow painted line was not…safe to use during cargo operations because it was not protected by a physical barrier and was frequently encroached upon by moving semi-trailers.*

- *Tractors pushing semi-trailers is…accompanied by increased risk and warrants the adoption of standard practices and agreed methods of control by terminal staff and ferry crews.*

- *…there is a divergence in some areas between onboard procedures and the way work is conducted.*

Following the accident, Seatruck started installing recording CCTV cameras on its vessels' vehicle decks to monitor whether onboard procedures were being followed. The procurement for the new CCTV system was ongoing during 2021 and it was not operational on board *Clipper Pennant* at the time of the accident.

A recommendation was made to Seatruck aimed at improving its safety culture, including a review of its 2019 climate survey results and recognising the importance of continuing to monitor the safety climate among its workforce. There was also a specific consideration for the company to review the requirements of COSWP, particularly the segregation of pedestrians and vehicles on stern ramps where a protected walkway could not be provided. Seatruck took several actions in response to the recommendation, which included:

- introducing a new accident and near miss reporting system;

- implementing 'safety flash' notices to promulgate urgent safety-related messages to the fleet; and

- engaging with other Irish Sea ferry operators to develop a united safety strategy for vessels and terminals.

[34] https://www.gov.uk/maib-reports/accident-on-the-stern-ramp-of-the-ro-ro-freight-ferry-seatruck-progress-with-loss-of-1-life

1.15.3 Seatruck grounding incidents – 2019 and 2020

The MAIB investigated two groundings involving Seatruck vessels, *Seatruck Performance* (MAIB report 4/2020[35]) in 2019 and *Arrow* (MAIB report 8/2021[36]) in 2020. The latter investigation found similarities between the two accidents and that the lessons from the previous accident had not been fully addressed.

1.15.4 *Clipper Pennant* – near accident – October 2020

In October 2020, the Dublin terminal loading officer[37] observed a crew member on board *Clipper Pennant* standing in a dangerous position in the path of a moving semi-trailer as it was being loaded into a stowage space that offered no escape **(Annex C)**. The incident was raised with the C/O, who created a near accident report that included a plan view of the incident.

Seatruck's DPA acknowledged the severity of the near accident and requested a root cause analysis, which determined that the crew member had been standing in the dangerous position to maintain visual contact with the tractor unit driver. The crew member had intended to relocate to the other side of the lane when the semi-trailer was 10m from its final position, but the loading officer intervened and stopped the manoeuvre.

The DPA identified several preventative measures, including:

- a risk assessment to identify the areas on vehicle decks where limited escape options exist when loading cargo;
- a plan to show where the hazards existed on each vehicle deck;
- signage/stencil/paint to clearly identify hazardous areas; and
- crew training on the recognition of hazardous areas and the application of the SSW in such circumstances.

The DPA subsequently requested that all crew be reminded of the content of the Deck Safety and Procedures guide (see section 1.9.8), and the permitted and prohibited standing areas.

Seatruck published Safety Flash 09-2020 – No Escape! **(Annex D)** to urgently share its findings fleetwide before the SMS was amended. The safety flash reiterated the DPA's preventative measures and assigned responsibility for the tasks to the C/O of each vessel. *Clipper Pennant*'s C/O identified and marked the hazardous areas on the cargo stowage plan as *dangerous – no escape areas* and sent photographs of each location to the DPA **(Annexes E** and **F)**.

The safety flash was added to the safety committee meeting agenda, and general toolbox talks were carried out to remind the crew of the cargo loading procedures. The toolbox talks on board *Clipper Pennant* included the bosun.

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[35] https://www.gov.uk/maib-reports/grounding-of-ro-ro-freight-vessel-seatruck-performance

[36] https://www.gov.uk/maib-reports/grounding-of-ro-ro-freight-ferry-arrow

[37] P&O staff in Dublin carried out regular vehicle deck inspections to observe the working practices of the drivers and crew loading cargo.

Clipper Pennant's C/O engaged with the DPA about the marking of the hazardous stowage spaces and requested signage. This action was not completed and no markings for the vehicle deck hazardous areas were evident following the accident; the near accident report was closed in January 2021.

Seatruck also shared its safety flash with stevedores in its ports to remind them to stop if they observed a crew member standing in a dangerous position. The safety flash and its findings were not shared with P&O.

A review of safety committee meeting minutes confirmed that the safety flash was discussed across the fleet and that the hazardous areas had been identified. There was no evidence of the agreed control measures having been implemented or positive confirmation of the actions taken by each vessel.

1.15.5 *Clipper Pennant* – near accident – June 2021

Seatruck raised a near accident report on 18 June 2021 after being notified by P&O of an incident involving the deceased bosun while *Clipper Pennant* was docked in Dublin. A tractor unit driver reported that the bosun had positioned himself in the path of a moving semi-trailer so he could start lashing the semi-trailer after it had stopped. P&O made a near miss report and relayed the incident to the vessel's C/O, who noted in their subsequent report to Seatruck that *this kind of action is strictly prohibited, and it carries with it the danger of being crushed by a trailer*.

The bosun was issued with a verbal warning and the deck crew were reminded of the company's cargo operations procedures.

1.16 PREVIOUS ACCIDENTS INVOLVING OTHER VESSELS

1.16.1 *Norsky* – fatal accident – January 2020

On 21 January 2020, a shoreside stevedore, who was acting as a banksman on board the ro-ro freight ferry *Norsky* alongside in Tilbury, England, walked into the path of a moving semi-trailer and was fatally crushed against a parked semi-trailer. There was evidence to suggest that the stevedore had previously walked in the path of moving semi-trailers.

P&O's investigation identified that:

- no single person was in overall control of deck operations;
- the roles and terms of lasher/deckhand, banksman, supervisor, and trestle man were used interchangeably with no defined assigned responsibilities;
- lashers were observed approaching a moving semi-trailer;
- the whistle was used for multiple reasons and not always distinguishable.

Following the accident P&O made recommendations that the stevedoring contractor responsible for loading and unloading the semi-trailers in Tilbury: assign one banksman only to each deck; and amend the banksman's role to focus on vehicle movements and oversight of the deck team's safety (and not other tasks such as lashing semi-trailers or moving trestles). P&O also made recommendations to its

management to: engage with PSS and UK COS and take an active role in improving vehicle deck safety within the industry, with a specific focus on the use of technology to reduce risk to personnel; ensure the roles and responsibilities of deck workers were clearly defined; and, ensure communication methods were outlined.

1.16.2 *European Endeavour* – fatal accident – June 2017

On 22 June 2017, a crew member died on board the P&O operated ro-ro freight ferry *European Endeavour* in Dublin while acting as the banksman for a semi-trailer being pushed into an upper deck stowage space.

The Marine Casualty Investigation Board (MCIB) investigation report (MCIB report 273 – 5/2018[38]) concluded that: the banksman moved into the semi-trailer's path and was crushed against a ventilation shaft; the tractor unit driver could not see the banksman and relied on whistle signals to guide them; and, the whistle system was ineffective because no whistle was heard, nor was the banksman in a position to blow the whistle.

1.16.3 *Isle of Inishmore* – fatal accident – March 2019

On 23 March 2019, an AB on board the Irish Ferries vessel *Isle of Inishmore* was fatally trapped between a parked semi-trailer and a semi-trailer being pushed by a tractor unit during loading in Rosslare, Ireland. The Cyprus Marine Accident and Incident Investigation Committee (MAIC) investigation (MAIC report 44E/2019[39]) concluded that the AB had walked into the path of a moving semi-trailer while acting as banksman and that the AB had lost visual contact with the tractor unit driver, who did not stop as required.

MAIC determined that the causes included inadequate implementation of the procedures; unrealistic risk assessment; and lack of supervision.

[38] https://www.mcib.ie/reports.7.html?p=1&s=european+endeavour

[39] http://www.maic.gov.cy/mcw/dms/maic/maic.nsf/All/622FCE7E312F1588C225851C002FC390?OpenDocument

SECTION 2 – ANALYSIS

2.1 AIM

The purpose of the analysis is to determine the causes and circumstances of the accident as a basis for making recommendations to prevent similar accidents from occurring in the future.

2.2 OVERVIEW

Clipper Pennant's bosun was fatally crushed when a semi-trailer struck him during cargo loading operations. The bosun had moved into a hazardous area and the driver of the tractor unit that was pushing the semi-trailer did not monitor the bosun's position. The rear of the semi-trailer had exited the lane and encroached the painted walkway where the bosun was standing, trapping and crushing him against a stiffening beam that protruded from the vessel's structure next to a corner stowage space on the upper vehicle deck.

This section of the report will discuss the factors contributing to the accident, including the on board working practices, vehicle deck hazards, deck design, SMS effectiveness, industry behaviours and company organisational factors.

2.3 THE ACCIDENT

The bosun was acting as a banksman, marshalling a semi-trailer into a corner space that was enclosed on three sides. As there was no empty lane nearby, the bosun had limited positions from which he could monitor the operation safely and had moved to an unsafe position near the crew break room access door in front of a stiffening beam. This placed him in the path of the approaching semi-trailer with limited escape options. The tractor unit driver did not see the bosun as he pushed the semi-trailer toward the space because the driver's attention switched to pivoting the semi-trailer within the vehicle lane. It was not unusual to lose sight of the banksman during such manoeuvres so the driver continued to push the semi-trailer into the space, expecting that the bosun would relocate to a designated safe area behind the adjacent semi-trailer.

An approximation of the semi-trailer's parked position **(Figure 22)** was based on measurements and photos of the scene, the postmortem report and post-accident reconstructions. Its final position could not be determined conclusively because it was moved to attend to the injured bosun; however, evidence indicated that it was parked approximately 1° off-centre compared to the vehicle lane lines, with its rear almost in line with the other semi-trailers in the row, and encroaching the walkway and blocking the watchman's access to the upper vehicle deck through the crew break room access door.

The bosun's exact movements during the loading of stowage space 21 could not be determined; however, he was seen near the accident location gesturing to the tractor unit driver to start pushing the semi-trailer less than 30 seconds before the accident. This suggests that either he did not move from this position near the stiffening beam as the semi-trailer approached or he briefly moved away then returned.

Base images courtesy of Astilleros de Huelva. S.A.

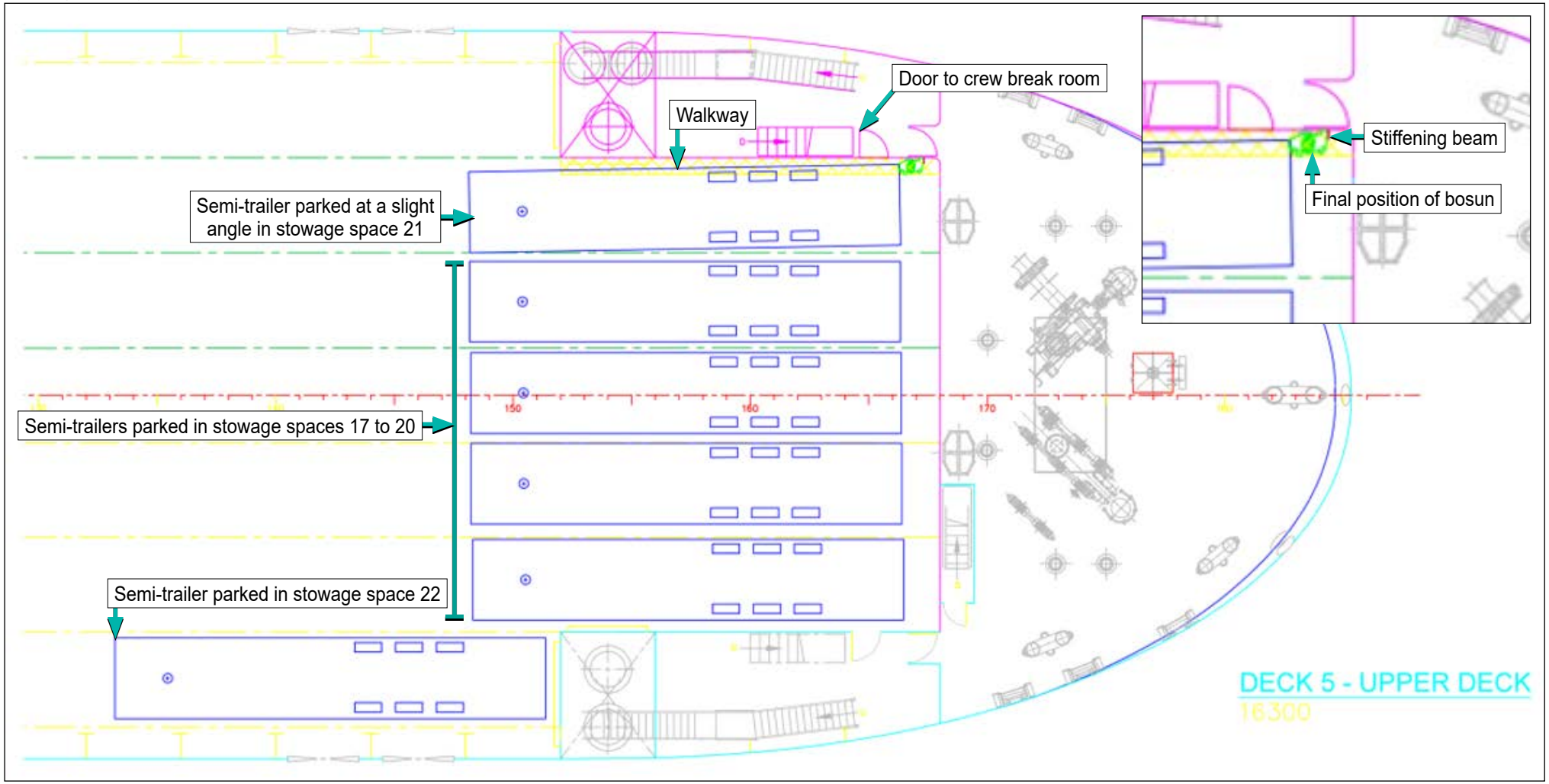


Figure 22: Post-accident plan view of the parked semi-trailer and (inset) the bosun's position

2.4 THE BOSUN'S LOADING PRACTICE

2.4.1 Walkway preservation

Painted yellow lane markings guided semi-trailer loading on the vehicle decks, including adjacent to the longitudinal bulkheads either side of the forward-most row of spaces. At around 20cm wide, these markings were too narrow to allow easy transit along the bulkhead when the adjacent spaces were loaded. *Clipper Pennant*'s crew had therefore painted an unofficial walkway to prevent vehicles from parking too close to the longitudinal bulkhead on the port side and facilitate access to the crew break room door, which was located in the forward port corner of the upper vehicle deck.

In the weeks before the accident the bosun had become strict about keeping semi-trailers off the walkway and monitored this by standing near the stiffening beam, where he could more easily control the positioning of an approaching semi-trailer and make signals. Although the walkway did not represent an emergency escape route, it was important to the crew that it was kept clear to enable access to the crew break room, which was the shortest route to the accommodation and the forward mooring deck.

The bosun may have considered himself protected by the painted walkway, believing he was outside the vehicle lane. This belief likely led to a false sense of security and underestimation of the risk. However, the painted deck markings offered no physical separation or segregation from the vehicle lane, which was also the case for the accident on board *Seatruck Progress* where a semi-trailer was pushed over a painted yellow walkway on the ramp and struck the 3/O.

There were no visible injuries to the bosun's arms and legs or other indications to suggest he attempted to protect himself or escape from the oncoming semi-trailer. The bosun likely expected it would remain clear of him, albeit passing very close by. This might explain why he did not take avoiding action by stepping into the crew break room or moving behind the stiffening beam for protection. The bosun probably assessed himself as not in danger, given that the semi-trailer had passed clear on previous occasions in similar circumstances and the investigation did not identify any personal factors that might have affected his judgement.

The bosun was experienced in and familiar with the upper vehicle deck's loading arrangements; however, his past behaviour, including the incident the month before the accident, indicated it was normal for him to stand in hazardous areas and the path of moving semi-trailers. After years of marshalling semi-trailers on *Clipper Pennant*'s vehicle decks, regularly acting as banksman, it became routine for the bosun to stand close to moving vehicles and even the verbal warning that he received the previous month did not influence his behaviour on the day of the accident.

The repeated exposure to close-approaching vehicles without consequence, notably when loading space 21, probably reduced the bosun's perception of risk and led him to stand in an unsafe area in the path of an approaching vehicle, likely in order to preserve access to the crew break room door.

2.4.2 Trading thoroughness for efficiency

Clipper Pennant's deck ratings did not monitor the bosun as the semi-trailer approached space 21; OS1 was focused on the trestle and cargo securing, while OS2 was single-handedly marshalling another semi-trailer. This was contrary to procedures, which required them to work in pairs and remain in sight of one another, and there was little opportunity for them to observe the unsafe positioning of the bosun. Over time the deck ratings had developed working practices that were more efficient, so they frequently worked independently to complete the work and it became normal not to see the bosun as he marshalled a semi-trailer.

Visual contact and teamwork were particularly important in the forward-most row of spaces, where communication was challenging because of the limited space and noise from the nearby ventilation. When crew separated to focus on their own responsibilities, thoroughness was traded for efficiency.

The bosun's position at the rear of the semi-trailer was locally rational to the crew because it was the most efficient place to monitor the semi-trailer as it entered into space 21 and to allow the banksman to immediately start to secure it. The written procedures required the banksman to wait in a safe but less convenient position until the manoeuvre was complete before relocating to the back of the semi-trailer. Given the tight stowage arrangement, where the gaps between semi-trailers were often minimal, this could cause delays when trying to pass between them.

2.4.3 Supervision

MGN 621 (M+F) highlighted inadequate supervision of vehicle movements as a principal source of danger during cargo operations and this was considered a contributory factor to the accidents on board *Isle of Inishmore* and *Norsky*. A crew member was also observed standing in a dangerous position in similar circumstances on board *Clipper Pennant* in October 2020, when a P&O terminal staff member intervened rather than the vessel's deck supervisor.

The bosun was responsible for supervising and monitoring crew safety on *Clipper Pennant*'s upper vehicle deck but faced a goal conflict due to his respective roles as banksman, lasher and supervisor. The bosun, effectively stopped acting in his supervisory capacity to achieve the other tasks. This partially resolved the goal conflict and allowed him to focus on the two prevailing tasks at the time. However, this meant that the upper deck operation was unsupervised, potentially allowing unsafe working practices to gradually develop.

It was a challenge for officers to supervise the upper deck cargo operations, which had no CCTV cameras fitted at the time of the accident. The C/O was busy with other responsibilities in the CCR and the duty deck officer was occupied with managing the main vehicle deck. Neither officer had the capacity to monitor the bosun and they relied on him to follow and implement the company's vehicle deck safety procedures, which meant they were unaware of his unsafe loading practices. Without supervision, unsafe working practices, such as standing in the walkway during vehicle movements, went unchecked.

2.5 VEHICLE DECK LAYOUT

2.5.1 Consequences of the painted walkway

The painted walkway on board *Clipper Pennant* was potentially dangerous because it was inside the vehicle lane. The modification placed crew in the direct path of an approaching vehicle when used for marshalling and posed a significant tripping hazard from lashings when a semi-trailer was stowed, contrary to Seatruck's procedures that required walkways to be kept clear. There was no vessel-specific onboard procedure for the safe use of the walkway, and no requirement for a physical barrier between the vehicle lane and the walkway.

The decision to paint a walkway to the crew break room access door made sense to the crew because it helped to ensure semi-trailers were parked away from the bulkhead. However, the unintended and unconsidered consequences of this were that the walkway was painted within the vehicle lane and reduced the marked width of the vehicle lane to less than that of a semi-trailer by up to 20cm **(Figure 11)**. This might have been invisible to the bosun or crew as the semi-trailer wheels could skirt the edges of the yellow painted markings when pushed parallel; however, the semi-trailer's outer curtains would overhang the edges of the lane, encroaching the walkway and posing a risk to anyone using it when trailers were being moved.

Accident reconstructions showed that it was difficult to see a semi-trailer's overhang with the naked eye. It is probable there was a natural tendency for the eye to be drawn to the wheels rather than the sides when aligning the trailer against the lane markings. However, this provided a false impression that the lane was still wide enough to load a semi-trailer safely.

The safety of anyone using the walkway during loading depended on the driver's awareness of the walkway and the resultant reduced width of the space. The reduction in effective lane width also increased the likelihood of a semi-trailer being parked at an angle within the lane, which would impinge on pedestrian access along the side of the semi-trailer.

2.5.2 Control of modifications

The crew had modified the vehicle deck on board *Clipper Pennant* without fully appreciating the risks or considering the safety issue raised following the similar fatality on *Seatruck Progress* in 2019. Vessel modifications require sufficient controls to assess the overall impact on operations. Without other measures to control pedestrian access and vehicles these painted walkways are unsafe. The similar painted walkways on each P-Class vessel indicated that the decision had been shared across the fleet, albeit with slightly different deck markings to those depicted in Seatruck's procedures. However, these dissimilarities, together with the *Seatruck Progress* accident, did not prompt a fleetwide response such as the introduction of signage or standardised deck markings; this indicated that Seatruck's SMS was ineffective in controlling hazards arising from the unsafe use of walkways or as a result of modifications.

2.5.3 Vehicle and lane widths

Clipper Pennant's 3m vehicle deck lane widths were dictated by the athwartship spacing of the elephant's feet securing points and as indicated in the CSM, and were in accordance with the CSS Code and IMO resolution guidelines. The CSS Code requirement was based on a semi-trailer width of 2.5m. Although this was increased to 2.55m five years after the code was published, the CSS Code's recommended spacing for securing points remained unchanged.

Clipper Pennant was delivered in 2009, 13 years after the maximum width of semi-trailers had increased, but the vessel's CSM was based on the original maximum semi-trailer width of 2.5m. The semi-trailer in stowage space 21 was 2.55m wide at the sides, and the cumulative effect of multiple semi-trailers wider than the original design intent reduced the gap between each semi-trailer and restricted the crew's ability to move between them. This was evident when OS1 could not move between the semi-trailers parked in stowage spaces 20 and 21 and would have also reduced the effective walkway width, further increasing the hazard to crew using it. A reduction of 5cm in lane width per semi-trailer might seem small; however, it critically eroded the margin for safety.

The updated IMO guidelines for vehicle deck securing arrangements in 2020 did not reflect the increase in the maximum width of road vehicles, with the requirements for athwartships securing point spacing remaining the same, probably because the increased vehicle width would have minimal impact on lashing angles.

2.6 THE TRACTOR UNIT DRIVER'S MANOEUVRE

2.6.1 Approach to the stowage space

Evidence gathered from observations of vehicle deck working practices and the accident reconstructions indicated that the tractor unit driver's view was severely obstructed when facing the semi-trailer and the driver had to place their head outside the cab window to see where the semi-trailer was going. The driver could not see what was in the semi-trailer's path and the offside mirrors offered limited visibility. The partially enclosed nature of stowage space 21 meant it was difficult for the driver either to identify whether crew members were standing in the area or to observe the bosun's movements in the path of the semi-trailer.

The partially enclosed stowage space was similar to countless others the driver had loaded during their 14-year career. The driver considered it normal to lose sight of the banksman while pushing the semi-trailer because the task was expected to continue despite the presence of an unseen crew member in the semi-trailer's path. This undocumented procedural workaround had become routine practice in Liverpool and was repeated multiple times a day without consequences. The driver continued the manoeuvre without stopping under the assumption that the bosun would keep out of the way and not move himself into a dangerous position.

Theoretically, the bosun should have been in the driver's field of view given his position in the walkway in front of the stiffening beam; however, the driver had no reason to look towards the beam as they expected the bosun to be standing out of their direct line of sight. Based on previous experience, there was no benefit to the driver relying on an unseen banksman standing on the nearside for hand signalling. The driver instead looked downwards and focused on the painted yellow lane

markings to continue pivoting the semi-trailer towards the stowage space and likely also used the alignment of the other trailers to judge when the semi-trailer was in position, further reducing the utility of a banksman when loading stowage space 21.

The reliance on a tractor unit driver's actions and situational awareness, particularly when pushing a semi-trailer with limited visibility, was inherently hazardous as it moved control of the operation away from the banksman.

Although a whistle signal was heard at around the same time the driver stopped, it is possible that their decision to stop pushing the semi-trailer was influenced by visual cues rather than reliance on the whistle. The driver was unaware of the bosun's perilous position and did not realise that he had been trapped and then crushed between the semi-trailer and the stiffening beam because they had not looked in that direction.

2.6.2 Semi-trailer positioning

Tractor unit drivers aimed to park semi-trailers centrally in designated stowage spaces. For the majority of spaces, drivers had some leeway in the manoeuvre because they could continuously pivot the semi-trailer into position while remaining between the lane markings. These small adjustments posed no additional risk because crew members were not expected to be standing inside the lane in use. This did not apply when loading stowage space 21 because the walkway had reduced the width of the lane and eroded the safety margin for pivoting, making it impossible for a semi-trailer to remain within the markings even with careful parallel positioning.

The parking angle might have been caused by the tractor unit driver's late awareness of the walkway, which came into view only after the semi-trailer's right rear wheels had passed over it, resulting in the driver rotating the front of the semi-trailer away from the walkway in reaction. Alternatively, and given the semi-trailer was determined to be as little as 1° off-centre, the angle was more likely the result of minor adjustments made by the tractor unit driver during the final positioning. Once the semi-trailer's rear wheels were over the walkway there was little room to correct the manoeuvre without pulling the semi-trailer forward and starting again. This did not happen, and the slight angle persisted.

The successful loading of stowage space 21 relied on the driver's skill and judgement for several reasons: the procedural workaround had negated the banksman's role; no physical barriers, such as a kerb, existed to alert the driver to an encroached walkway; and the bulkhead was the only visual cue to distinguish it from other spaces. The driver was unaware of the consequences of not parking the semi-trailer exactly parallel to the lane markings.

The driver assumed the bosun would automatically secure the rear of the semi-trailer, so there was no reason to communicate; it was not part of the procedure for the driver to obtain positive confirmation of the banksman's position once stopped. Further, there was no indication from OS1 that something had gone wrong and required the driver's attention. Furthermore, the whistle signal at around the same time as the driver stopped could have reinforced their belief that the bosun was safe.

2.7 VEHICLE DECK SAFETY BARRIERS

2.7.1 Overview

Working near moving vehicles is hazardous and established guidance showed that the most effective control measure is to separate people from vehicles. However, physical separation was often challenging to achieve on ro-ro decks and the ferry industry and regulators had outlined various procedural barriers to limit the hazards of crew interaction with moving vehicles.

This section analyses why procedural barriers were ineffective at protecting *Clipper Pennant*'s bosun and how the tractor unit driver's actions were an example of a wider safety issue. It also examines how safety management systems were unsuccessful in controlling the work and why such weaknesses might not have been limited to this accident.

2.7.2 Procedural workaround for loading partially enclosed stowage spaces

Both Seatruck and P&O had recently experienced fatal accidents on vehicle decks and had developed revised vehicle deck safety procedures. These included graphics to help workers understand the safe and unsafe areas during loading and depicted safe zones to the side of the loading space, outside the path of the semi-trailer being loaded.

However, the partially enclosed stowage space 21 involved in this accident did not have an empty vehicle lane adjacent to it and the risk of crushing had been identified as a hazard. The space was one of several that had been marked as dangerous on the vessel's loading plan and that could not be loaded in line with the graphics provided by either company because there was no identified safe area for the banksman to stand. In essence, the Seatruck and P&O procedures described a limited number of idealistic static scenarios and did not represent the dynamic nature of the vehicle deck operation, where the line of sight between the banksman and driver was often neither practical nor possible. In practice, the danger zones moved with the semi-trailer and were never fixed.

The absence of a proper, practical documented procedure for these higher-risk spaces resulted in tractor unit drivers and crew following an informal and unsafe procedural workaround that was common in the ferry industry. This required the banksman to leave the driver's line of sight and relocate to a designated area behind the adjacent semi-trailer without providing positive confirmation that they had reached the area.

Over time it had become normal for banksmen to walk into the path of a moving semi-trailer and those involved in loading the higher-risk stowage spaces no longer recognised the danger posed by being out of the driver's line of sight. Seatruck and P&O were aware of the procedural workaround used by the crew but did not intervene to stop the unsafe practice, for which neither a risk assessment nor SSW had been completed, despite it conflicting with each company's SMS. This was probably because a formal assessment of this workaround would have identified certain spaces that could not be loaded according to the procedures, which would have meant either removing the space from service or developing space-specific procedures.

2.7.3 Industry vehicle deck working practices

The investigation found that both crew and terminal staff across the industry deviated from expected safe working practices and crew members did not always stand in identified safe areas, regularly entering danger zones in the path of moving semi-trailers and appearing unaware of the risk. Although it was widely understood across the industry that drivers should immediately stop their vehicles whenever the banksman moved outside their field of vision, evidence suggested this was seldom the case, removing an important safety barrier necessary to protect vehicle deck crew.

The *Norsky*, *European Endeavour* and *Isle of Inishmore* accidents demonstrated on board working practices on vehicle decks that deviated from recognised procedures and guidelines, resulting in fatalities. High-risk operations can only be safely performed when people behave as expected, following agreed procedures and with appropriate training to ensure they have the necessary knowledge and skills. An SSW cannot achieve this aim if it does not reflect the work carried out and staff need to make local adjustments.

The PSS guidance conceded there may be occasions where the banksman was not always visible to the tractor unit driver due to semi-trailer positioning or the ship's structure and suggested that an SSW should be implemented to mitigate risk. Unfortunately, there was no evidence of such an SSW on board *Clipper Pennant*. This was possibly because the work was routine and repetitive and, over the years, it had become accepted practice for drivers to continue manoeuvring despite losing sight of the deck crew.

2.7.4 Whistle signals

A single whistle blast was heard by the tractor unit driver immediately before the bosun was struck. The source of the whistle blast could not be determined, nor was it possible to definitively ascertain the length of the whistle blast. If it did originate from the bosun it had not been sounded in sufficient time for the tractor unit driver to stop the semi-trailer and avoid the accident. Reliance on a whistle signal assumes that the banksman is in a safe location and capable of sounding it. However, a single audible signal was ineffective as a safety barrier without visual contact to confirm that the banksman was standing in a safe location. Seatruck's written procedures clearly required drivers to stop for any whistle signal; however, evidence suggested that not all drivers stopped for every whistle and instead used their judgement to consider whether it was necessary. Interpretation of the whistle signal had therefore become subjective and it was ineffective as a systemic control measure to protect the crew working on deck.

Whistle signals were widely used across the freight ferry industry to marshal semi-trailers and were considered by Seatruck and P&O to be one of the most effective accident prevention measures. The underlying principle across the industry was that a whistle blast meant stop, although the guidance did not unanimously agree on the use of a whistle signal or differentiate between routine and emergency signalling. The difference between the Seatruck and P&O procedures reflected this, with the latter additionally including the use of a long blast to distinguish an emergency stop. This aligned with the PSS guidelines and the UK COS guidelines recognised the potential confusion between a routine and emergency stop.

The P&O investigation into the *Norsky* accident found that whistle signals served multiple purposes and were not always distinguishable. The findings from the *Clipper Pennant* reconstructions and familiarisation visits reflected a similar variability in the use of whistle signals. The *European Endeavour* investigation similarly concluded that the whistle system was ineffective because either the driver had not heard a whistle or the banksman had been unable to blow it in time to avoid being struck.

The lack of an agreed and consistent signalling system across the freight industry indicated that reliance on whistle signals as a primary method of protecting people was hazardous. This was particularly true when crew members were out of sight of the tractor unit driver and so unable to use visual signalling methods.

2.7.5 Summary

The number and severity of similar previous accidents indicated that the procedural barriers prevalent in industry were ineffective at protecting ferry crews from the hazards of vehicle decks. The routine and widespread divergence from safe working practices demonstrated that the procedures and guidelines did not reflect how people actually worked and did not effectively control the risks.

A collaborative approach by ports and shipping companies to align, consolidate and implement practices that better reflect the reality of terminal staff and ferry crews working in tandem can help to reduce the gap between work as imagined and work as carried out.

Although an abundance of advice from various industry organisations existed for vehicle deck safety, this guidance was fragmented and disparate; the industry lacked an agreed and consolidated code of practice to address the normalised practices that had developed.

2.8 EFFECTIVENESS OF SEATRUCK'S SAFETY MANAGEMENT

2.8.1 Generic risk assessments

The MAIB investigation of the 2018 accident on board *Seatruck Pace* found that vessel-specific, task-based risk assessments had not been implemented on board to supplement the GRAs. Seatruck recognised the importance of specific risk assessments to improve safety and expected the crew to revise and adapt the company's GRAs in line with COSWP guidance. However, an internal ISM audit of *Clipper Pennant* in June 2021, 30 months after the *Seatruck Pace* fatality, observed that the crew were still routinely using GRAs rather than adapting them for specific work activities. The continued reliance on GRAs indicated that shoreside management had not taken sufficient action to ensure its crews recognised vessel-specific hazards and implemented appropriate mitigation measures.

It is unknown why *Clipper Pennant*'s crew had not implemented the process for adapting GRAs to form vessel and task-specific risk assessments. It is possible that the crew's adherence to safety procedures had become a matter of routine or the vessel's senior officers lacked the capacity to develop specific assessments; nevertheless, the situation was allowed to persist by management ashore, possibly because it lacked the resources or capacity to verify the process was being implemented. The opportunity to consider and implement more effective control measures was missed.

2.8.2 Learning and the implementation of controls

The October 2020 incident on board *Clipper Pennant* shared similarities with the circumstances of this accident. In both cases, the crew member was standing in a dangerous position with limited escape options, where it was possible to become trapped.

The DPA recognised the severity of the first incident and identified several preventative measures to address the perceived cause. The measures were recorded and shared with the fleet via a safety flash **(Annex D)**. The incident was added to the agenda of the ship safety committee meetings and toolbox talks were carried out. However, these were low-level control measures that did not address the specific risks. Seatruck's subsequent actions did not result in a long-term solution or change on board working practices to prevent the fatal accident 9 months later.

The DPA instructed the C/O of each vessel to conduct risk assessments of their vehicle decks, focusing on stowage spaces with limited escape options. *Clipper Pennant*'s C/O identified and marked the hazardous areas on the cargo stowage plan; however, they did not follow the risk assessment process in line with the company's SMS as the specific risks were not identified; appropriate control measures were not determined; and no formal risk assessment was documented.

Seatruck did not comprehensively follow up on the assigned actions to ensure the risk assessment process had been completed and control measures implemented. This might have been due to crew changeovers or a lack of crew resources. It possibly also reflected the crew's acceptance of risk to get the job done and the overall organisational safety culture, discussed further in section 2.8.5 below.

The safety flash required each C/O to remind crew to follow the Deck and Safety Procedures Guide. However, there was no management review to determine if there was a shortfall in the design of the procedures and the vessels' crews continued to deviate from them. Evidence indicated that unsafe crew positioning was not limited to the bosun. Other deck ratings would step in as banksman when the bosun was called away, and would stand behind the stiffening beam as protection from an oncoming vehicle rather than in front of it as the bosun did. This was precisely the risk the safety flash was designed to address but, because there was no official method for loading such stowage spaces, the deck ratings deferred to the seniority and experience of the bosun and followed his instructions.

The hazards of unsafe positioning had been identified, but the risk was not mitigated. Without a conclusive approach to safety management, Seatruck's response to the October 2020 incident did not result in the development of a suitable SSW or a decision to stop loading high-risk stowage spaces until after this fatal accident.

2.8.3 Accountability and responsibility

Publishing the safety flash ensured the fleet was aware of the hazard and encouraged crew involvement to find a workable solution. Responsibility for the individual risk assessments was passed to the C/O, as safety officer, to effect safety changes in response to the incident; however, it was unclear who was accountable for implementing a solution. The C/O was likely best placed to provide feedback on the issues identified, although greater authority would have been required to

implement changes that might affect the cargo stowage capacity or impact loading efficiency; given that *Clipper Pennant* was not operating at full capacity there was the opportunity to avoid using more hazardous spaces without impacting commercial activity, but this option was not considered. Regardless, in the absence of a unified approach, the potential existed for different solutions on each vessel, as evidenced in the variations between the P-Class walkways and vehicle lanes.

Clipper Pennant's C/O had engaged with the DPA about marking the hazardous stowage spaces and requested signage, but this was not implemented in the 9 months leading up to the accident. The C/O also suggested that the signage should be standardised across the fleet, but this was not followed through as shore management misunderstood the communications and believed the C/O would source the signage. This was misguided because the C/O could only implement the solution on one vessel, not fleetwide.

This lack of follow-up by Seatruck management was likely unintentional and could have been the result of insufficient capacity. Incident analysis was not the primary role of the marine superintendent, who had limited time and resources available to identify and implement change as part of their DPA responsibilities. Alternatively, shoreside management might not have been invested in the idea; it had deemed signage to be a less effective control measure, particularly in the dynamic working environment of the vehicle deck. However, this information was not relayed on board. This inaction was contrary to the ISM Code, which required organisations to follow through on near miss reports and widely disseminate any resulting decision, whether agreed or not.

Sustained learning goes beyond identifying change; it is achieved when a change is introduced, implemented and monitored. However, there was no conclusive evidence that appropriate actions had been taken in January 2021, when the report into the previous incident was closed. This represented a missed opportunity for lessons to be learned by those responsible and accountable for safety, reflecting an insufficiently robust approach to organisational learning and continuous improvement.

2.8.4 Incident reporting

Seatruck had a process to report accidents and near misses in accordance with the ISM Code. However, concerns over the lack of near accident reporting had repeatedly been raised in the monthly safety committee meetings.

The bosun was an elected safety representative and attended safety committee meetings, so would have been aware of the C/O's reporting concerns. However, ratings did not regularly and actively report near accidents and the bosun himself had been involved in one just a month before his fatal accident, and similar to the incident in October 2020, when terminal staff rather than a crew member had intervened. The evidence suggested that Seatruck crew might not have been able to identify near accidents or were either reluctant or uncomfortable to report them. The investigation also found that the issue of near accident reporting was not isolated to *Clipper Pennant* in the fleet.

Effective near miss reporting requires the crew to come forward with their observations, even if it might reflect adversely on their performance or that of another crew member. There was a sense, perceived or actual, that crew would get into trouble if such incidents were reported, particularly when reporting the unsafe practices of more senior colleagues. The opportunity to recognise and address accident precursors was reduced due to the absence of a supportive reporting culture on board *Clipper Pennant* and across the wider Seatruck fleet.

2.8.5 Organisational factors

The three fatalities and two groundings across the Seatruck fleet, as well as the near accident on *Clipper Pennant* in October 2020, indicated that organisational factors could have affected crew working practices and contributed to these accidents. This evidence suggested that Seatruck's SMS did not effectively control the hazards and the risk to life that these presented.

Seatruck had commissioned two safety climate surveys to baseline the behaviours influencing safety across the organisation, which was a proactive step towards a positive safety culture. However, the results of the surveys and the safety issues identified during previous MAIB investigations showed that Seatruck did not act conclusively on the findings. Further, issues such as learning from accidents, reluctance to report near incidents, usability of procedures and routine procedural adaptations by the workforce were similarly evidenced following the bosun's fatal accident.

Continuous SMS improvement through learning from previous accidents requires a systematic approach to: timely reporting; effective investigation to identify contributory factors; reviewing previous occurrences to identify themes; and taking action to prevent a recurrence.

Seatruck was able to recognise accidents and identify shortfalls in its operation and understand the benefits of improving safety; however, its approach to analysing incidents and learning from them did not enable the implementation of effective safety management changes to prevent another serious accident. This was because controls either were not followed through to a satisfactory conclusion or did not address the underlying safety issues. The organisation's focus was directed towards the crew and their working practices in response to previous accidents rather than systemic control measures to evaluate the system.

Seatruck's internal investigation report for this accident placed responsibility on the driver and crew, concluding that they did not follow the rules. The safety climate studies indicated that more than a third of Seatruck's workforce felt that accident investigations were used to apportion blame. Focusing on individual failure can create a culture of concealment that prevents learning, which reduces the likelihood of underlying causes being identified. Addressing learning and identifying sustainable and enduring changes requires a mature organisational culture.

2.9 PORT OPERATIONS

2.9.1 Oversight of tractor unit drivers

The investigation identified shortfalls in the operational and administrative aspects of tractor unit driving in the Port of Liverpool. It is likely that local management's perception of risk had degraded over time, resulting in a tacit acceptance of some unsafe acts and workarounds that had become 'normal' practice. In particular, the procedural workaround for loading partially enclosed stowage spaces using an undocumented system of work became so ingrained that it was believed to be formally documented in P&O's procedures. In reality, supervisors had not identified that the loading sequence was neither recorded nor risk assessed and resulted in unsafe acts.

The formal procedures were contained in SSW V28, which P&O had developed following the fatal accident on board *European Endeavour*. However, not all Port of Liverpool employees were familiar with SSW V28 or its associated guide. This included the tractor unit driver who, although they held a copy of the pamphlet indicating the danger zone areas, instead relied on experience and routine practices such as the procedural workaround rather than documented procedures.

ILO guidance recommended refresher training to ensure workers were aware of current working practices and reduce the risk of developing bad habits. Tractor unit drivers employed at Liverpool underwent initial training, but there were no records of further training, and some aspects of formal training could not be recalled following the accident. The annual assessments designed to evaluate driving ability did not address procedural compliance and SSW knowledge.

There was no national occupational driving standard for tractor unit drivers. Instead, the individual port management teams were responsible for developing their own tractor unit driver familiarisation, training, assessment and professional development training programmes. Further, P&O did not have central oversight of these processes and left them to be managed locally. This was because P&O did not have a consolidated SMS for its port operations as it did for the safety management of its vessels. While P&O had recognised the weak level of assurance this provided, it did not have the resources to implement a new SMS following the company's recent acquisition and the disruptions caused by the COVID-19 pandemic. In the interim, P&O continued to rely on the port's local management to implement SSWs and assumed that tractor unit drivers were following the appropriate procedures.

In the absence of an SMS, P&O ports' cargo operations were neither verified nor audited by the company's head office. Inevitably, this led to a mismatch in working practices between P&O Ferries Limited and P&O Ferries Liverpool, including the use of obsolete documentation. This lack of oversight meant the head office was unaware that unsafe operational practices had developed and did not have the processes in place to stop and correct such deviations.

2.9.2 Coordination and cooperation

Seatruck understood the benefits of aligning systems of work under its charter party agreement with P&O, especially those relating to vehicle deck safety procedures and the sharing of reported accidents and near misses. However, no agreed and recorded system of work was implemented for P&O and Seatruck crew to follow

during cargo operations and each organisation assumed its SMS would work in tandem with the other. Although this probably made sense to those involved, as the procedures were broadly similar, there were areas of divergence.

Although there had been initial positive interactions between *Clipper Pennant*'s crew and the P&O terminal staff at the start of the agreement 18 months before the accident, P&O were unable to verify the crew's familiarity with or adherence to SSW V28 because no follow-up or refresher training was provided and the crew's continued observance of Seatruck procedures went unnoticed despite the near accidents reported in October 2020 and June 2021. The tractor unit drivers handled several ships every day and had likely developed their own hybrid way of working outside the two sets of documented procedures. Practices became normalised, and it was difficult for those involved to recognise the differences between vessels and their associated hazards.

The importance of coordination between shoreside and ship-based employers and the need to develop an SSW in consultation with the workers involved was well understood within the ports industry. Ferry terminal operators were recommended by PSS to have a documented agreement or system of work in place with the master of each vessel, and the MAIB investigation into *Seatruck Progress* had also identified cooperation between the port and vessels as a safety issue and the need for the shore and vessel to adopt a shared risk control approach. However, despite this finding and the PSS recommendation, Seatruck and P&O had not formally aligned their procedures during the *Clipper Pennant* charter. A collaborative approach could have helped to identify gaps or conflicts in the respective procedures and establish further control measures.

SECTION 3 – CONCLUSIONS

3.1 SAFETY ISSUES DIRECTLY CONTRIBUTING TO THE ACCIDENT THAT HAVE BEEN ADDRESSED OR RESULTED IN RECOMMENDATIONS

1. *Clipper Pennant*'s bosun was fatally crushed when a semi-trailer struck and trapped him against a stiffening beam that protruded from the vessel's structure next to a corner stowage space on the upper vehicle deck. [2.2]

2. The bosun was acting as a banksman, standing near the stiffening beam on an unofficial painted walkway to allow him to marshal the semi-trailer into the space while also stopping it from encroaching into the walkway. However, this was an unsafe area to stand as it was in the path of the approaching semi-trailer with limited escape options. [2.3, 2.4.1]

3. The tractor unit driver was not monitoring the bosun as they pushed the semi-trailer toward the space because their attention was focused on pivoting the semi-trailer into position within the vehicle lane. The tractor unit driver did not stop when they lost sight of the banksman because they expected that the banksman would relocate to a designated safe area behind the adjacent semi-trailer. [2.3, 2.6.1]

4. *Clipper Pennant*'s crew had painted the unofficial walkway to help prevent vehicles from parking too close to the longitudinal bulkhead and to enable access to the crew break room door. [2.4.1]

5. The painted walkway was dangerous because it was inside the vehicle lane. The modification likely led to a false sense of security and placed the crew in the direct path of vehicles when the walkway was used for marshalling. [2.4.1, 2.5.1]

6. The reduction in the lane's marked width also eroded the safety margin for pivoting semi-trailers and increased the likelihood of a semi-trailer being parked at an angle within the lane and encroaching the walkway [2.5.1]

7. Seatruck's SMS was ineffective in controlling hazards arising from the unsafe use of walkways or modifications. Walkways had been painted across the fleet with insufficient controls, such as physical barriers. [2.5.2, 2.6.2]

8. The tractor unit driver did not stop when they lost sight of the bosun because of an undocumented procedural workaround that assumed the banksman would move to a safe area behind the adjacent semi-trailer. [2.6.1, 2.7.2]

9. The loading operation on the upper vehicle deck was unsupervised because the bosun had stopped acting in his supervisory capacity to focus on lashing and marshalling the semi-trailers; the deck officers were busy with other responsibilities; and the upper vehicle deck had no CCTV cameras fitted. [2.4.3]

10. The deck ratings did not monitor the bosun as the semi-trailer approached the corner space because they frequently worked independently and focused on their own tasks to ensure the efficient loading of cargo. [2.4.2]

11. The unsafe procedural workaround for loading partially enclosed spaces conflicted with the Seatruck and P&O SMSs and neither company had completed a risk assessment or SSW for the workaround. [2.7.2]

12. Seatruck and P&O did not stop the partially enclosed space procedural workaround because a formal assessment of the workaround would have probably led to either the affected spaces being removed from service or the need to develop space-specific procedures. [2.7.2]

13. There were shortfalls in the standards of tractor unit driving at the Port of Liverpool, likely because local management's perception of risk had degraded over time, resulting in a tacit acceptance of some unsafe acts and workarounds that had become 'normal' practice. [2.9.1]

14. There was routine and widespread divergence from safe working practices on vehicle decks in the industry because the procedures and guidelines did not reflect how people actually worked. [2.7.3, 2.7.5]

3.2 SAFETY ISSUES NOT DIRECTLY CONTRIBUTING TO THE ACCIDENT THAT HAVE BEEN ADDRESSED OR RESULTED IN RECOMMENDATIONS

1. Although a single whistle blast was heard by the tractor unit driver immediately before the bosun was struck it was not sounded in sufficient time for the driver to stop pushing the semi-trailer and prevent the accident. The reliance on whistle signals as a primary method of protecting people was hazardous. This was particularly true when crew members were out of sight of the tractor unit driver and unable to use visual signalling methods. [2.7.4]

2. The crew on board *Clipper Pennant* did not adopt vessel or task-based risk assessments, which was also identified as an issue following the fatal accident on *Seatruck Pace* in 2018. The opportunity to consider and implement more effective control measures was therefore missed. [2.8.1]

3. Although Seatruck expected that GRAs were to be revised and adapted with specific risk assessments, it had not taken sufficient action to ensure its crews recognised vessel-specific hazards and implemented appropriate mitigation measures. [2.8.1]

4. Although Seatruck issued a company safety flash following the similar near accident on board *Clipper Pennant* in October 2020, there was no management review of the procedures and the report was closed without evidence of appropriate follow-up actions being taken. [2.8.2]

5. The missed opportunity to learn the lessons from the previous similar incident indicated that Seatruck's incident analysis process was ineffective and reflected an insufficiently robust approach to organisational learning and continuous improvement. [2.8.3, 2.8.5]

6. The absence of a supportive reporting culture on board *Clipper Pennant* and across the wider Seatruck fleet reduced the opportunity to recognise and address accident precursors. [2.8.4]

7. P&O did not audit its ports to ensure company procedures were being implemented, which led to a mismatch in working practices and the use of obsolete documentation. [2.9.1]

8. P&O did not have a consolidated SMS for its port operations that contained standards for tractor unit driver training and assessment, nor was there a national occupational driving standard for them to follow. [2.9.1]

9. Contrary to PSS guidance, Seatruck and P&O had not formally aligned their procedures during the *Clipper Pennant* charter to identify gaps or conflicts and establish further control measures. This was because the procedures were broadly similar, and it was assumed both SMSs would work in tandem. [2.9.2]

3.3 OTHER SAFETY ISSUES NOT DIRECTLY CONTRIBUTING TO THE ACCIDENT

The IMO updated its guidelines for vehicle deck securing arrangements in 2020, but these did not reflect the increased maximum width of road vehicles and the athwartships securing point spacing requirement remained the same. [2.5.3]

SECTION 4 – ACTIONS TAKEN

4.1 MAIB ACTIONS

The **MAIB** has issued a safety bulletin **(Annex G)** advising operators to ensure that, where tractor units are being used to push semi-trailers, safety procedures must be in place to ensure deck crew are not standing in the vehicle's path. Operators were also advised to review their cargo handling procedures to identify the hazards associated with stowage spaces where there may be limited areas for escape and, where necessary, carry out specific risk assessments for such spaces.

4.2 ACTIONS TAKEN BY OTHER ORGANISATIONS

The **Maritime and Coastguard Agency** has updated Chapter 27.6 of the Code of Safe Working Practices for Merchant Seafarers[40] to include guidance on risk assessments for areas where staff could become trapped when vehicles are reversing during loading operations.

CLdN RoRo Limited has:

- Carried out an internal investigation to establish the root causes of the accident.
- Implemented a new safe system of work for vehicle deck operations across the CLdN fleet that establishes dynamic danger zones and stops crew from marshalling in the path of approaching semi-trailers. The procedures were developed through:
    - review of the company's existing vehicle deck procedures by an internal working group;
    - shoreside secondment of a C/O to work on the drafting and consultation of revised procedures;
    - trials conducted on board company vessels, including *Clipper Pennant*;
    - training days undertaken at various ports, attended by stevedores;
    - consultation with vessel crews and stevedores on the development of revised cargo handling procedures.
- Shared its new safe system of work with the industry to promote best practice and work towards standardised operating procedures.
- Introduced the role of fleet training officer, held by a senior deck officer on a rotational basis, operating across company vessels to observe working practices, train crew and provide feedback to the company, particularly on vehicle deck safety.
- Introduced the management role of fleet training superintendent to supervise the implementation of procedures and the fleet training officer role.

[40] 2015 edition – Amendment 7, published 24 October 2022.

- Introduced a cargo operations familiarisation form for deck officers and ratings to assess their proficiency and knowledge of cargo handling procedures, the cargo loading plan, hazardous areas on the vehicle deck and the associated risk assessments.

- Restructured the management team and created new senior roles, including a safety and operations director, fleet and crew director and fleet safety manager.

- Employed additional staff to help support the marine and technical superintendents.

- Implemented regular ship/shore meetings to bring together stevedores, crew and operational staff to discuss safety.

- Implemented regular ship/shore meetings with external charterers of company vessels to bring owners and charterers together with stevedores, crew, and operational staff to discuss safety.

- Attended and contributed to the regular vehicle deck safety meetings organised by the UK COS in conjunction with PSS.

- Enhanced internal audit processes with external support and audited the processes for assuring the effectiveness of ISM implementation.

- Fitted CCTV cameras to all Seatruck tractor units to assist drivers with blindside visibility and to support company investigation and training.

- Completed the installation of recording CCTV cameras on *Clipper Pennant*'s and other company vessels' vehicle decks. Shoreside CCTV has also been introduced.

- Commenced audits of vehicle deck procedures using the vessels' CCTV.

- Started investigating the use of technology to improve vehicle deck safety.

- Updated the SMS risk assessment form to include a direction to complete tailored task-specific risk assessments as part of permit to work requirements, including additional risks and control measures.

- Issued a fleet notice introducing the updated risk assessment form and further highlighting that the form should be used for developing task-specific risk assessments.

P&O Ferries Limited has:

- Issued a safety alert to its workers about the hazards of working with reversing trailers.

- Developed a vehicle deck operations training package for crew.

- Engaged with the UK COS and PSS to explore technical solutions to improve vehicle deck safety.

- Introduced a new shoreside SMS for its ports.
- Introduced a management of change procedure for chartering vessels in and out.
- Obtained ISO 45001:2018 (occupational health and safety management systems) certification for its shoreside operations.
- Recruited additional staff to support its port safety operations.
- Employed a health, safety and security director, and introduced a new role, safety manager – third parties, to oversee vessel operations involving other companies, such as charter parties.
- Reviewed how it uses deck markings to promote safety on the vehicle deck.

Port Skills and Safety Limited has:

- Organised health and safety workshops for ro-ro ferries. One of the events included a discussion of the *Clipper Pennant* accident and what actions the industry could take to stop a similar accident from happening again.
- Carried out a hazard and operability study to review ferry operations in collaboration with Seatruck and various port authorities across the UK.
- Shared a safety bulletin with its members, which included Seatruck's revised safe system of work for vehicle deck operations, with a view to industry-wide adoption in the future.

The **UK Chamber of Shipping** has:

- Collaborated with PSS and other ferry operators to create the 10 Golden Rules of Vehicle Deck Safety[41].

[41] https://www.ukchamberofshipping.com/latest/10-golden-rules-vehicle-deck-safety/

SECTION 5 – RECOMMENDATIONS

The **UK Chamber of Shipping** and **Port Skills and Safety Limited** are recommended to:

2024/148 Develop a jointly agreed and consolidated industry Code of Practice for vehicle deck safety on roll-on/roll-off vessels by consulting with the Maritime and Coastguard Agency, Health and Safety Executive, Interferry, and ro-ro ferry operators, considering existing best practice guidance and the lessons learned from this accident and other previous similar accidents. The guidelines should cover, inter alia:

- The role, responsibilities and positioning of banksman while marshalling on vehicle decks in or near the path of a moving vehicle;
- The dynamic nature of vehicle deck loading operation that reflects the moving danger zone around a semi-trailer;
- Identification and risk mitigation of vehicle stowage spaces with limited or obstructed areas for escape;
- Suitable control measures to reduce the risk to people working in close proximity to moving vehicles, including the development of cargo handling procedures and safe systems of work;
- Safe access arrangements for crew during and after cargo operations;
- An agreed industry standard for signalling and communication on vehicle decks; and
- The use of technology to improve safety on deck.

2024/149 Ensure that the consolidated industry Code of Practice for vehicle deck safety on roll-on/roll-off vessels developed in accordance with recommendation **2024/148** is effectively promulgated to the industry.

Port Skills and Safety Limited, in consultation with the **Health and Safety Executive**, is recommended to:

2024/150 Develop a national occupational driving standard for tractor unit drivers.

The **Maritime and Coastguard Agency** is recommended to:

2024/151 Consider the consolidated industry Code of Practice for vehicle deck safety on roll-on/roll-off vessels developed in accordance with recommendation **2024/148** and ensure that its related guidance documents are reviewed and, as appropriate, updated and aligned to reflect this industry best practice.

The **Health and Safety Executive** is recommended to:

2024/152 Consider the consolidated industry Code of Practice for vehicle deck safety on roll-on/roll-off vessels developed in accordance with recommendation **2024/148** and ensure that its related guidance documents are reviewed and, as appropriate, updated and aligned to reflect this industry best practice.

CLdN RoRo Limited is recommended to:

2024/153 Review the findings of its previous safety climate surveys and, with support from external sources, take further action to develop and implement a plan to encourage a positive organisational culture that supports learning from incidents and accidents and encourages reporting.

2024/154 Ensure the effective on board supervision of vehicle deck cargo loading operations on its vessels by considering the roles, responsibilities and allocation of resources and the use of technology to oversee and assure the safety of personnel working on deck at all times.

P&O Ferries Limited is recommended to:

2024/155 Introduce a program to verify that its ports consistently follow its vehicle deck safety procedures, specifically to ensure that tractor unit drivers understand and implement the company's safe systems of work.

2024/156 Implement a procedure for the effective engagement and liaison with the operators of vessels that it charters to ensure that:

- the safety management systems are aligned; and
- there is an agreed safe system of work for chartered vessels with appropriate training in place.

Annex A

Tractor unit driver’s 2019 annual driving assessment

Image courtesy of P&O Ferries

P&O Irish Sea

TUGMASTER SHIP & QUAY INCLUDING MAFFI SYSTEM

OPERATOR CERTIFICATE

THIS IS TO CERTIFY THAT

[redacted]

of
Carlisle Support

FROM [redacted]2019 TO [redacted]2019

And has passed the practical and written test

TUGMASTER SHIP & QUAY INCLUDING MAFFI SYSTEM

Date [redacted]2019 Instructor [redacted]

Cert No. [redacted] N.P.O.R.S. Reg No. [redacted]

Signed Instructor [redacted]

Image courtesy of P&O Ferries

Copies:
Local staff file

P&O Irish Sea
Tugmaster Driving Assessment Form

For completion by P&O Irish Sea Driving Assessor

Driving assessments are completed for Company internal information purposes only. The results do not constitute a legal driving test.

The Driving Assessor should complete and/or clearly mark "Yes" or "No" and/or the standard applicable, where appropriate in each grey box. The standards to be used are as follows:- 1=Unsatisfactory; 2=Poor; 3=Satisfactory; 4=Good; 5=Excellent.

General Details	
Location:	LIVERPOOL
Driver's full name:	[redacted]
Driver's I.D. number:	????
Driver's employer:	Carlisle Support
Date & time of assessment:	[redacted]/2019—20.30hrs
Weather conditions:	Dry
Make / model of tugmaster:	TERBERG----T305
Driver has a Certificate of Training?	(Yes) / No
Driver has a current valid driving licence?	(Yes) / No
Driver wears the correct PPE?	(Yes) / No

Details of assessment	
Tugmaster safety check	
Visual check for defects (e.g. tyres, wipers, windows, fire extinguisher, general bodywork, 5th wheel, etc)	1 / 2 / (3) / 4 / 5
Mount / dismount the tugmaster using standard procedure.	1 / 2 / (3) / 4 / 5
Check for loose / dangerous objects in the cab that could cause a hazard whilst driving.	1 / 2 / (3) / 4 / 5
Start and allow tugmaster engine to tick over without revving when cold.	1 / 2 / (3) / 4 / 5
Check oil pressure warning lights.	1 / 2 / (3) / 4 / 5
Notify defects to line management using proper procedures.	1 / 2 / 3 / (4) / 5
Trailer coupling & uncoupling	
Correct positioning of tugmaster & 5th wheel in relation to trailers being moved.	1 / 2 / 3 / (4) / 5
Accurately set height of 5th wheel using the tugmaster's lifting lever.	1 / 2 / 3 / (4) / 5
Use of appropriate speed when engaging with trailers.	1 / 2 / 3 / (4) / 5
Check engagement with trailers and 5th wheel jaws locked by pulling forward a little.	1 / 2 / 3 / (4) / 5
Check 5th wheel locked warning light.	1 / 2 / 3 / (4) / 5
Connect tugmaster's airlines correctly including use of airline taps.	1 / 2 / 3 / (4) / 5
Check location and operation of handbrakes on trailers/	1 / 2 / 3 / (4) / 5
Awareness of different types of trailer landing legs.	1 / 2 / 3 / (4) / 5
Operate trailer landing legs correctly.	1 / 2 / 3 / (4) / 5
Awareness of Maffi trailers.	1 / 2 / 3 / (4) / 5
Awareness of Maffi trailer couplings (e.g. gooseneck)	1 / 2 / 3 / (4) / 5

Image courtesy of P&O Ferries

Driving			
Proper precautions before starting?	1 / 2 / 3 / (4) / 5	Correctly action: Signage?	1 / 2 / 3 / (4) / 5
Proper use of: Controls?	1 / 2 / 3 / (4) / 5	Road markings?	1 / 2 / 3 / (4) / 5
Safety devices?	1 / 2 / 3 / (4) / 5	Marshall's signals?	1 / 2 / 3 / (4) / 5
Mirrors?	1 / 2 / 3 / (4) / 5	Third party signals?	1 / 2 / 3 / (4) / 5
Move off safely & under control?	1 / 2 / 3 / (4) / 5	Follow others at safe distance?	1 / 2 / 3 / (4) / 5
Stop safely & under control?	1 / 2 / 3 / (4) / 5	Drives courteously?	1 / 2 / 3 / (4) / 5
Reverse under control?	1 / 2 / 3 / (4) / 5	Couples & uncouples safely?	1 / 2 / 3 / (4) / 5
Give proper signals?	1 / 2 / 3 / (4) / 5	Good awareness of - other vehicles	1 / 2 / 3 / (4) / 5
Use appropriate speed?	1 / 2 / 3 / (4) / 5	- Pedestrians?	1 / 2 / 3 / (4) / 5

Quayside and on-board ship	
Obeys the traffic flow plan	1 / 2 / 3 / (4) / 5
Obeys the site speed limit	1 / 2 / 3 / (4) / 5
Parks in designated parking areas	1 / 2 / 3 / (4) / 5
Uncouples trailers on landing strips (where provided)	1 / 2 / 3 / (4) / 5
Familiar with HAZ signage	1 / 2 / 3 / (4) / 5
Familiar with hazardous load parking areas	1 / 2 / 3 / (4) / 5
Obeys Yard Marshall's or Loading Officer's signals	1 / 2 / 3 / (4) / 5
Reacts to Emergency Stop signal (whistle)	1 / 2 / 3 / (4) / 5

Assessors recommendations (required for all scores less than "satisfactory")

Signature			
Driving Assessor	Signature: [redacted]	Name:	[redacted]

Annex B

Extract from P&O Irish Sea Safe System of Work – *Stevedore Operation Loading/Discharging Trailers*

P&O Irish Sea

SAFE SYSTEMS OF WORK

STEVEDORE OPERATION LOADING / DISCHARGING TRAILERS

Image courtesy of P&O Ferries

P&O Irish Sea
SAFE SYSTEMS OF WORK

Reversing onto a ferry with trailers hitched:

- Always ensure your path is clear for reversing, if necessary obtain assistance
- Reversing bleeper should be used at all times.
- Long reversing runs should be made with the seat facing rear. (Tug fitted with swinging seats)
- Be aware of changing light contrasts between the ship & the quayside, slow down when crossing from the shore link span onto the vessel, allow your eyes time to adjust to the change in light.
- Observe any hand signals or whistle commands by crew members
- On approach to the parking bay /lane, slow down and pay attention to the crewmembers signals, a whistle command means **stop.**

Unhitching trailers – onboard a ferry:

- After instruction to stop by the crewmember, apply handbrake, raise the trailer to allow the trestle to be positioned.
- Wait till the crewmember gives the signal to lower the trailer onto the trestle, lower slowly till you feel the weight of the load going of the tug master.
- Disconnect airlines.
- Release trailer from fifth wheel plate, move forward slowly to ensure trestle have taken the trailer weight if satisfied trailer is stable & safe, proceed, checking around for other vehicles & crewmembers.

Annex C

P&O loading officer’s report on the vehicle deck inspection carried out in Dublin in October 2020

Image courtesy of P&O Ferries

P&O FERRIES

Joint Activity Inspection

[redacted]

DATE 25/11/20 VESSEL Clement PORT Dulk INSPECTORS

Ref	OBSERVATION	YES	NO	N/A	Action required	whom
	General					
1	Crew have appropriate PPE and in use?	✓				
2	Drivers have appropriate PPE and in use?	✓				
3	Control of vehicle movements on stern ramp?	✓				
	Specific					
1	Was standard stowage of trailer observed and correct?			✓	Crewman at the rear of trailer. Master informed	
2	Was standard stowage of trailer with no escape observed and correct?			✓		
3	Was jack knife manoeuvre of trailer observed and correct?	Did not see.				
	Cargo Care					
1	Adherence to legs up policy?	✓				
2	Space between sides of trailers?	✓				
3	Damage incidents witnessed reported?	✓				
4	Correct selection of cargo for deck (heights/ load contents)	✓				
	Cargo Deck operations					
1	Safe positioning of crew during trailer stowage?			✓	See above.	
2	Correct use of whistles during stowage of trailers?	✓				
3	Lead crewman in view during trailer stowage?			✓	See above.	
4	Clear instruction to given drivers?	✓				
5	Problem trailers clearly identified to drivers?	✓				
6	Uniform hand signals in use on decks? (stop/slow)	✓				

Image courtesy of P&O Ferries

		YES	NO	N/A	Action Required	Whom.
	Driver operation					
1	Correct 5th process wheel during trestle ops? Done before airlines	✓				
2	Correct 5th wheel use over ramps? Lift/lower/legs	✓				
3	Correct driver speed and 5th wheel height when turning?	✓				
4	Driver checking trestle and crew clear before moving off?	✓				
5	Push Pull Push carried out correctly during coupling?	✓				
6	Adequate speed of driving on decks? Consider conditions.	✓				
7	Drivers following crew instructions?	✓				
8	Correct use of chains on Maffies?	N/A				
9	Drivers stops if loses sight of lead crewman?	✓				
10	Driver stops on hearing whistle?	✓				
11	Drivers facing direction of travel?	✓				
	Vehicle deck condition and House keeping					
1	Clearance of chains on deck?	✓				
2	Dust on decks/housekeeping?	✓				
3	Adequate lighting on decks?	✓				
4	Clear lane markings on deck?	✓				
	Stowage and Securing of Cargo					
1	Crew walk behind moving trailer?	✓		See above		
2	Lead crewman positioned in safe area until trailer stowed?		✓	See above		
3	Lead crew remains visible during stowage manoeuvre		✓	See above		
4	Sufficient space between trailers?	✓				
5	Chains suitably attached securing points?	✓				
6	Clear signal given during trestle operation?	✓				
7	Clear hand signals during manoeuvre?	✓				
8	Correct use of lashing eyes on trailers?	✓				
9	Are chains only attached to trailer after tug detached?	✓				

Inspection Carried out by..... [redacted] .....

Seatruck Safety Flash 09-2020 – No Escape!

Image courtesy of Seatruck Ferries

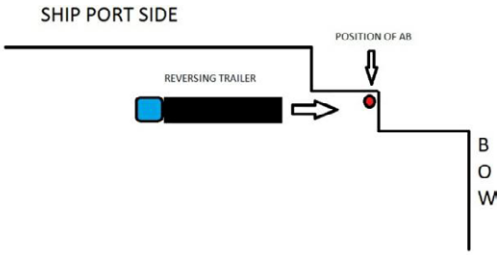
BE SAFE, BE SEEN, BE SEATRUCK

SAFETY FLASH 09-2020

NO ESCAPE!

Validity Area – All ships & All Ports

A recent Near Accident during loading involved a crew member, who while marshalling a trailer into position was stood behind the reversing trailer in an area with no escape.



The AB stated he was standing in this position to maintain visual contact with the Tug Master driver and when the trailer is at a safe distance of about 10 meters he goes to the other 'safe' side.

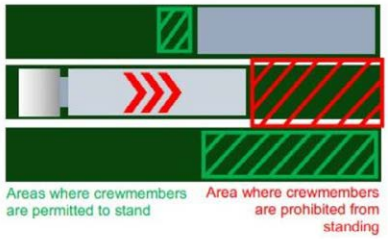
The AB should not be stood here at all and he should not cross behind a reversing trailer.

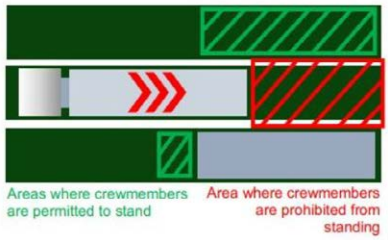
Preventative Measures

- The Chief Officer (CO) shall carry out a Risk Assessment to identify areas of similar hazard on each of the vehicle decks.
- The CO will produce a plan showing these areas of limited escape.
- These areas will be highlighted by means of signage or a warning painted on the bulkhead or deck instructing crew to NOT stand in those areas during cargo operations.
- Deck crew should be trained / familiarised in what those warnings mean, and why those areas present a significant hazard.
- All deck crew to be reminded of the following, on permitted/prohibited areas as explained in the deck procedures guide.

Cargo Stowage

During the loading of trailers, crewmembers must not stand behind the trailer. Never walk behind a moving vehicle or position yourself outside the sight of the tug driver.





- If a Stevedore observes a crewmember standing in a dangerous area, they should stop immediately and report to the Cargo Controller or Chief Officer. They should not resume movement until the crewmember is out of danger.

Issued 29th October 2020

Clipper Pennant's cargo stowage plan, with dangerous areas highlighted in red

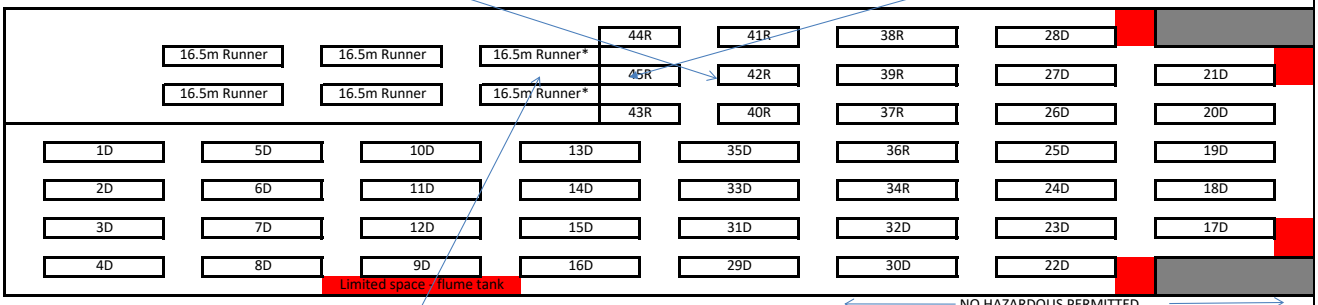
Image courtesy of Seatruck Ferries

CLIPPER PENNANT, CARGO STOWAGE PLAN

WEATHER DECK

(**TOTAL** 45 WITH LAST 6 TIPPERS, **42 WITH ALL STANDARDS**)

Can fit up to a14 Mtr hazardous Runner after 42 drops



*NOTE: SIX 16.5m RUNNERS ON RAMP ONLY POSSIBLE WHEN NO MORE THAN 42 DROPS UP
NO HAZARDOUS ALLOWED ON RAMP

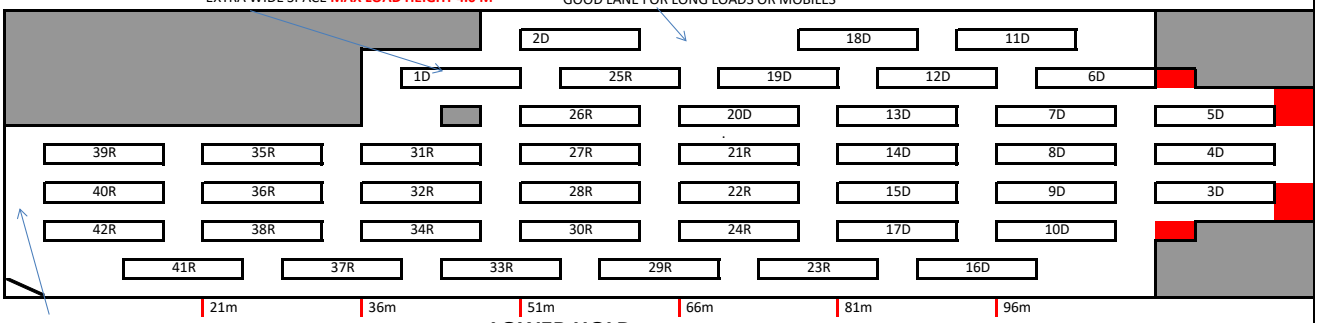
NO HAZARDOUS PERMITTED
UNDER ACCOMMODATION
(FIRST THREE ROWS)
NO RUNNING FRIDGES IN FIRST TWO ROWS

MAIN DECK

(**TOTAL** 46 DROPS WITH 8 TIPPERS, **42 WITH ALL STANDARDS**)

EXTRA WIDE SPACE **MAX LOAD HEIGHT 4.0 M**

GOOD LANE FOR LONG LOADS OR MOBILES



DEAD SPACE AFT. POSSIBLE TO FIT CARS, TRACTOR UNITS ETC.

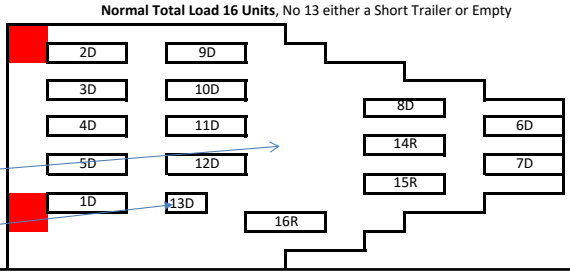
---> Dangerous - no escape areas

you can fit a 21 Mtr Runner in each of the last 4 drop positions main deck
For each additional 21 Mtr runner you lose 2 drops for the next 4 runners
for the second row of 4 runners you gain 30Mtr Room but only use 21Mtr so you have 9Mtr
So for the final 4 x 21 Mtr Runners you only need to lose 1 drop per 21Mtr Runner

ie 4 Runners = 4 drops lost
6 Runners = 8 drops lost
9 Runners = 13 drops lost
12 Runners = 16 drops lost

LOWER HOLD

Normal Total Load 16 Units, No 13 either a Short Trailer or Empty



LOT OF BROKEN SPACE IN CENTRE IDEAL FOR MOBILES

Position 13 either Empty or a Short Tank or Tipper

Photographs of the hazardous areas with no escape identified on board *Clipper Pennant*

Image courtesy of Seatruck Ferries

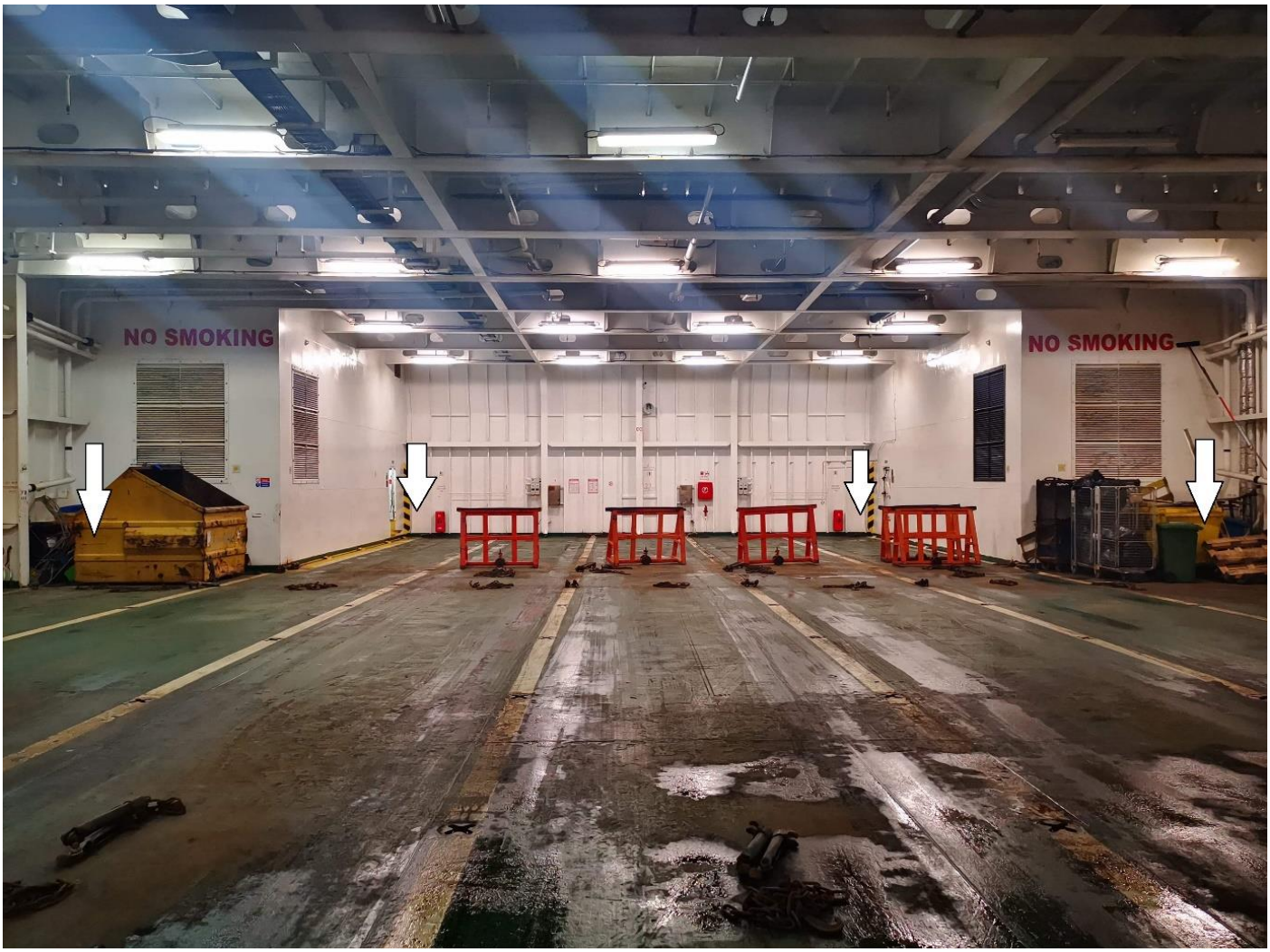
MAIN DECK

Image courtesy of Seatruck Ferries

LOWER HOLD

Image courtesy of Seatruck Ferries

WEATHER DECK



MAIB Safety Bulletin SB2/2021, issued November 2021

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

SAFETY BULLETIN

SB2/2021 NOVEMBER 2021

Extracts from The United Kingdom Merchant Shipping (Accident Reporting and Investigation) Regulations 2012 Regulation 5:
"The sole objective of a safety investigation into an accident under these Regulations shall be the prevention of future accidents through the ascertainment of its causes and circumstances. It shall not be the purpose of such an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame."

Regulation 16(1):
"The Chief Inspector may at any time make recommendations as to how future accidents may be prevented."

Press Enquiries:
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NOTE
This bulletin is not written with litigation in mind and, pursuant to Regulation 14(14) of the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012, shall be inadmissible in any judicial proceedings whose purpose, or one of whose purposes is to attribute or apportion liability or blame.

All bulletins can be found on our website:
https://www.gov.uk/maib

For all enquiries:
Email: maib@dft.gov.uk
Tel: +44 (0)23 8039 5500

Fatal crushing injury of a crewman on the upper vehicle deck of the roll-on roll-off ferry *Clipper Pennant* in Liverpool, England on 20 July 2021

Clipper Pennant

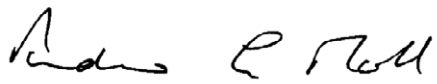
MAIB SAFETY BULLETIN 2/2021

This document, containing safety lessons, has been produced for marine safety purposes only, based on information available to date.

The Merchant Shipping (Accident Reporting and Investigation) Regulations 2012 provides for the Chief Inspector of Marine Accidents to make recommendations at any time during an investigation if, in his opinion, it is necessary or desirable to do so.

The Marine Accident Investigation Branch is carrying out an investigation into the fatal crushing of a crewman on the upper vehicle deck of the roll-on roll-off ferry *Clipper Pennant*.

The MAIB will publish a full report on completion of the investigation.



Andrew Moll
Chief Inspector of Marine Accidents

NOTE

This bulletin is not written with litigation in mind and, pursuant to Regulation 14(14) of the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012, shall not be admissible in any judicial proceedings whose purpose, or one of whose purposes, is to apportion liability or blame.

This bulletin is also available on our website: www.gov.uk/maib
Press Enquiries: 01932 440015 Out of hours: 0300 7777878
Public Enquiries: 0300 330 3000

BACKGROUND

At about 1400 on 20 July 2021, the bosun of the roll-on roll-off cargo ferry *Clipper Pennant* suffered fatal crushing injuries during cargo loading operations.

Clipper Pennant was in Liverpool and the bosun was working on the upper vehicle deck, marshalling[1] tractor unit drivers who were loading semi-trailers. Two other crew members were on the upper vehicle deck, assisting the bosun by locating the resting trestles and lashing the semi-trailers once in position.

The accident occurred after the bosun had directed a tractor unit driver to push a semi-trailer into its stowage location, between a semi-trailer that had already been lashed and the bulkhead at the port forward end of the upper vehicle deck **(Figures 1** and **2)**. As the semi-trailer was being manoeuvred, the bosun had positioned himself between the moving semi-trailer and the vessel's structure, resulting in the crushing accident.

GUIDANCE

The Maritime and Coastguard Agency's Code of Safe Working Practices for Merchant Seafarers (COSWP) provides guidance for safe operations on vehicle decks and Section 27.6.3 states that:

- *Personnel directing vehicles should keep out of the way of moving vehicles, particularly those that are reversing, by standing to the side, and where possible should remain within the driver's line of sight.*
- *Extra care should be taken at the 'ends' of the deck where vehicles may converge from both sides of the ship.*
- *Safe systems of work should be provided in order to ensure that all vehicle movements are directed by a competent person.*

Clipper Pennant's Deck Safety and Procedures Guide included instructions for deck crew, which stated that '*during the loading of trailers, crewmembers must not stand behind the trailer. Never walk behind a moving vehicle or position yourself outside the sight of the tug driver*'.

INITIAL FINDINGS

All aspects of this accident are under investigation by the MAIB and a full report explaining the causes and circumstances will be published in due course. Nevertheless, it is apparent from the initial evidence collected that there is an extreme risk of crushing injuries in stowage spaces adjacent to the vessel's structure, with limited areas to remain clear or escape.

[1] The marshaller, also referred to as the banksman, was responsible for supervising, controlling and directing vehicle movements, using hand, whistle or radio signals with tractor unit drivers and other crew members.

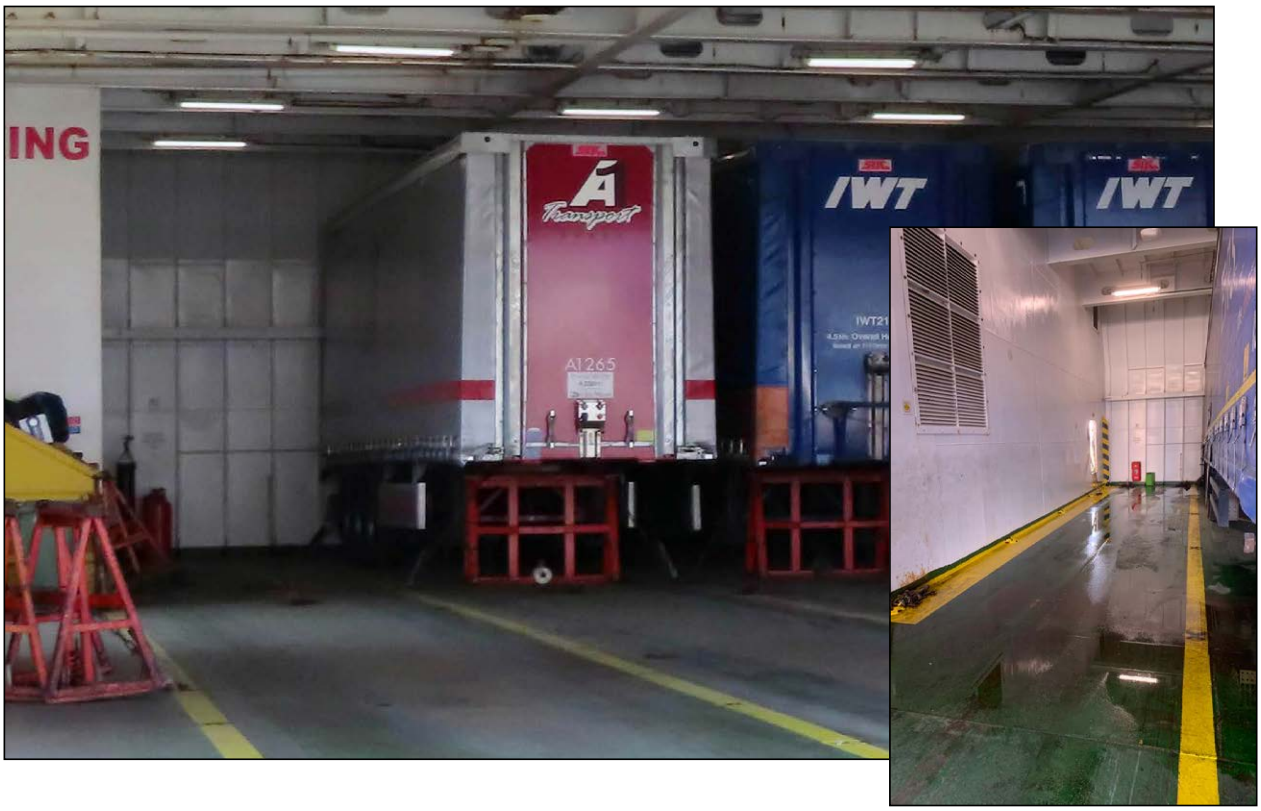


Figure 1: Reconstruction of the semi-trailer parking arrangement, with inset view of the space (post-accident)

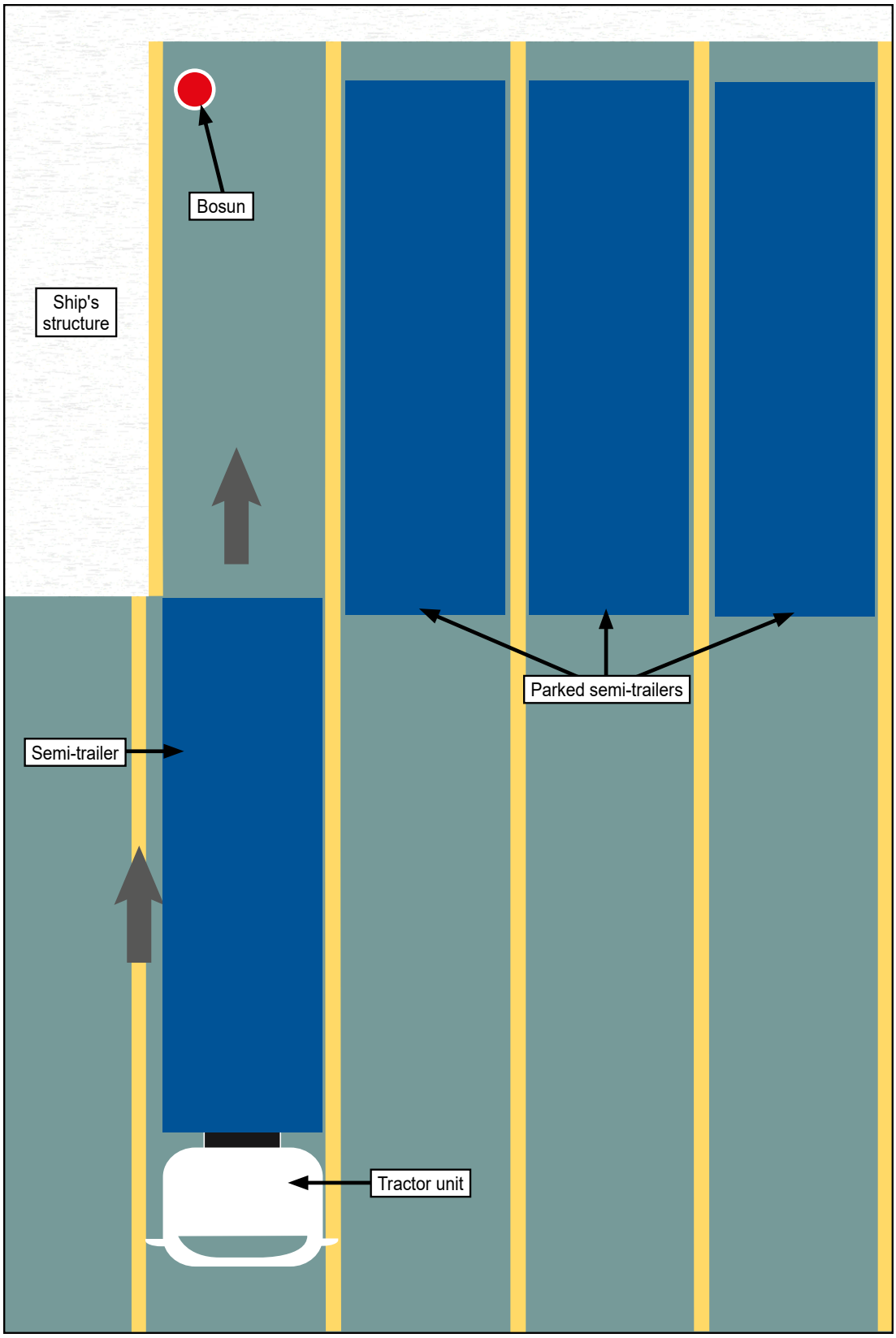


Figure 2: Graphic showing plan view of the semi-trailer's approach to the parking space

ACTIONS TAKEN

Use of the port forward cargo stowage spaces has been temporarily suspended by the vessel's operator, pending futher investigation and assessment.

SAFETY LESSON

Where tractor units are being used to push semi-trailers, safety procedures must be in place to ensure that deck crew are not standing in the vehicle's path.

Operators of vessels with roll-on roll-off vehicle decks are advised to:

- Review their cargo handling procedures to identify the hazards associated with stowage spaces where there may be limited areas for escape.
- Conduct a specific risk assessment for all such spaces. These spaces should then be marked and, unless appropriate mitigating measures can be put in place, not used.
- Ensure that onboard safety procedures and crew safety briefings reflect the guidance in COSWP Section 27.6.3.

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Marine Accident Report

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