aibn Accident Investigation Board Norway

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REPORT ON INVESTIGATION OF OCCUPATIONAL ACCIDENT ON BOARD MV NORDSTAR - LHXV NORTHWEST OF MÅLØY 7. OCTOBER 2008

Accident Investigation Board Norway • P.O. Box 213, N-2001 Lillestrøm, Norway • Phone: + 47 63 89 63 00 • Fax: + 47 63 89 63 01
www.aibn.no • post@aibn.no

Photo of ferry on the Norwegian west coast: Bente Amandussen

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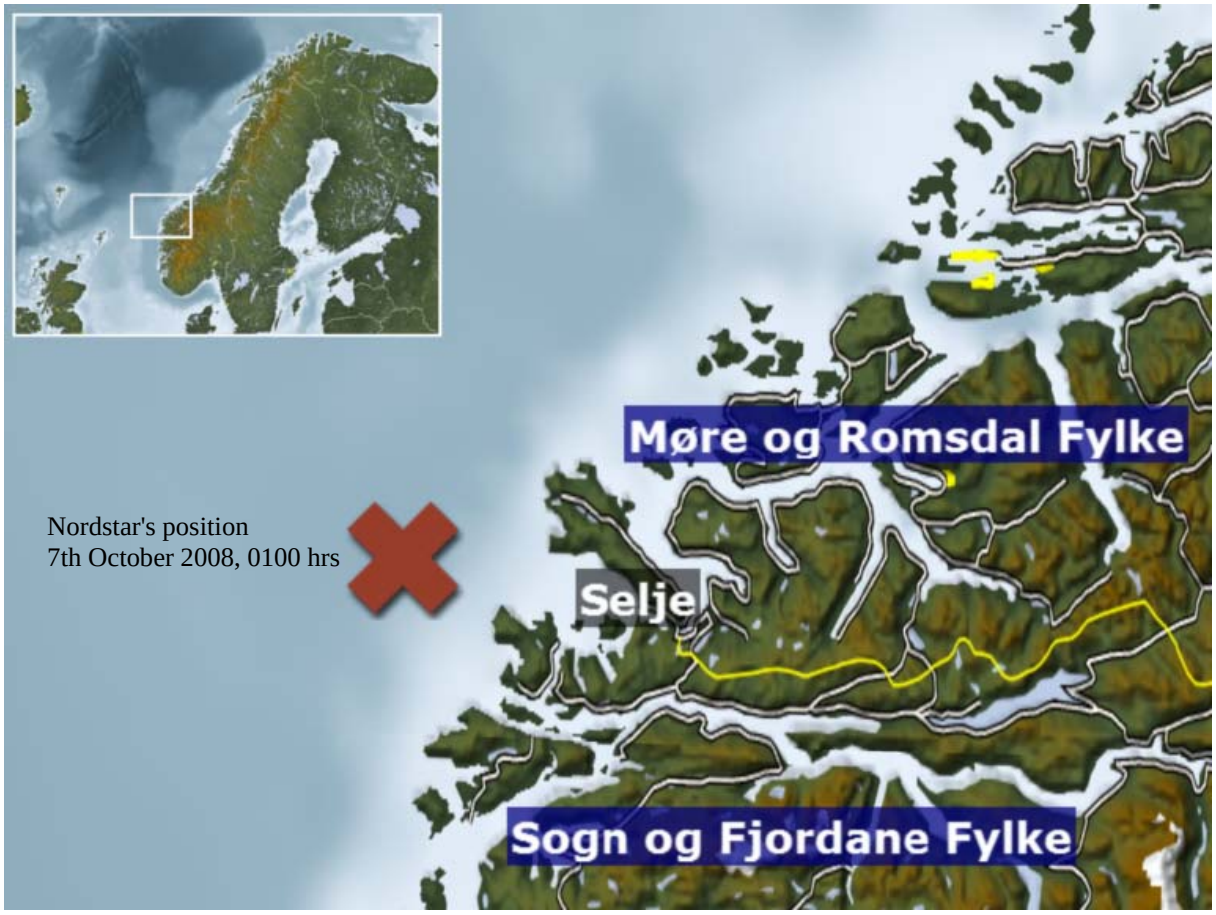
NOTIFICATION OF THE ACCIDENT

The accident occurred on 7 October 2008 at 0100 hrs. local time at the position N61º56 E004 º 36. Rescue services and Radio Medico were contacted for assistance. The police were notified at 1806 on the same day. Sunnmøre police district notified the Norwegian Maritime Directorate at 1253 on the following day. The Directorate conveyed the notification to AIBN by email at 1302 the same day, 8 October 2008. AIBN immediately decided to conduct a safety investigation.

Three inspectors from AIBN came on board the MV Nordstar in the afternoon of 8 October. The inspectors conducted an inspection on board the MV Nordstar and interviewed the people involved. Interviews with the injured personnel were conducted on 23 October 2008 by two inspectors from AIBN together with an interpreter.



1. FACTS

1.1 Details relating to the ship and the accident

Details relating to the vessel

Ship's name	:	MV Nordstar
Call sign	:	LHXV
IMO number	:	6920111
Owner / shipping company at the time of the accident	:	Ole Edvarsen AS Nordisgårdsgate 8, N-6002 Ålesund
Former and current owner	:	Nordnes AS Okseneset, N-6058 Valderøya
Ship's type	:	Factory trawler
Building year	:	1969 Rebuilt 1986, upgraded 96/97
Construction no./location	:	33 at Aker Aukra AS
Flag state	:	Norway
Classification society	:	Det Norske Veritas
Register	:	NOR
Insurance Crew/Vessel	:	AON Grieg AS / IF Skadeforsikring NUF
Home port	:	Ålesund
Hull material	:	Steel
Overall length	:	75.50 metres
Width	:	13.00 metres
Gross tonnage	:	2053
Enginetype	:	MaK 8M32
Engine power	:	3520kW
Trawl winch - type	:	1 Rapp Hydema 2 Brattvåg

MV Nordstar **Photo: Sigve Slagnes**

Details relating to the accident

Time and date	:	0100 LT, 7 October 2008
Location of the accident	:	N61º56 E004 º 36 (outside Måløy)
People on board	:	23 crew members
Personal injuries/fatalities	:	1 person seriously injured
Damage to the ship	:	Port crow's foot extension broke

1.2 Course of events

MV NORDSTAR conducted pelagic trawling[1] for Pollock and had finished a five weeks trip to the Egesund bank. The vessel was in transit along the coast north to Ålesund to land the haul. The deck hands spent their time doing maintenance on the trawler doors. The maintenance, which was conducted while the doors were placed on the deck, consisted of changing the trawl shoes on the doors and re-splicing the eyelet of the main cable on the port trawler door (ref. figure2).

In order to get the doors down from the gallows and onto the deck, the crow's foot extension is fixed to a cable (wire rope) on the vessel's Gilson winch[2] which pulls the trawler doors from the gallows and in through the slipway, at the same time as the trawl cable is slackened. The crow's foot extension is a wire rope (steel) of approx. 7-10 metres and with a diameter of 30 mm fixed to the crow's foot on the trawler door. The crow's foot extension enters via the slipway and crosses the inner rail, running in a slack curve forwards on the aft deck. It is fixed to an eyelet which is welded onto the inner rail of the starboard and port sides of the slip, respectively (see Figure 1).

The winches are operated from a panel aft in the wheelhouse in order for the operator to stay in visual contact with the deck chief on trawl deck, who takes part in and conducts the operation using signs. For personnel safety reasons, the deck crew stays on the starboard side when the port side trawler door is pulled in, and on the port side when the starboard door is pulled inn.

When work on changing the shoes on the port side trawler door was finished and the trawl door was hung in the gallow, the winch break was engaged. The crow's foot extension was then disconnected from the cable on the Gilson winch and fixed to the eye on the railing facing the trawl slip.

The crew was in the process of pulling in the starboard trawler door when the accident happened. The deck chief and two able seamen were staying aft on the deck on the port side of the trawl slip, while the skipper was in the wheelhouse operating the winches. When the starboard trawler door was over the stern roller, the crow's foot extension on the port side trawl door was tightened by a yank from the trawler door which had fallen into the sea. One of the crew stood between the

[1] Surface trawling, as opposed to bottom trawling.
[2] The Gilson winch is an auxiliary winch which, inter alia, is used to pull the trawl net/fishing gear onto the deck.

inner rail and the crow's foot extension, aft of the position where the crow's foot extension is fixed to the inner rail with a steel hook (see figure 1).

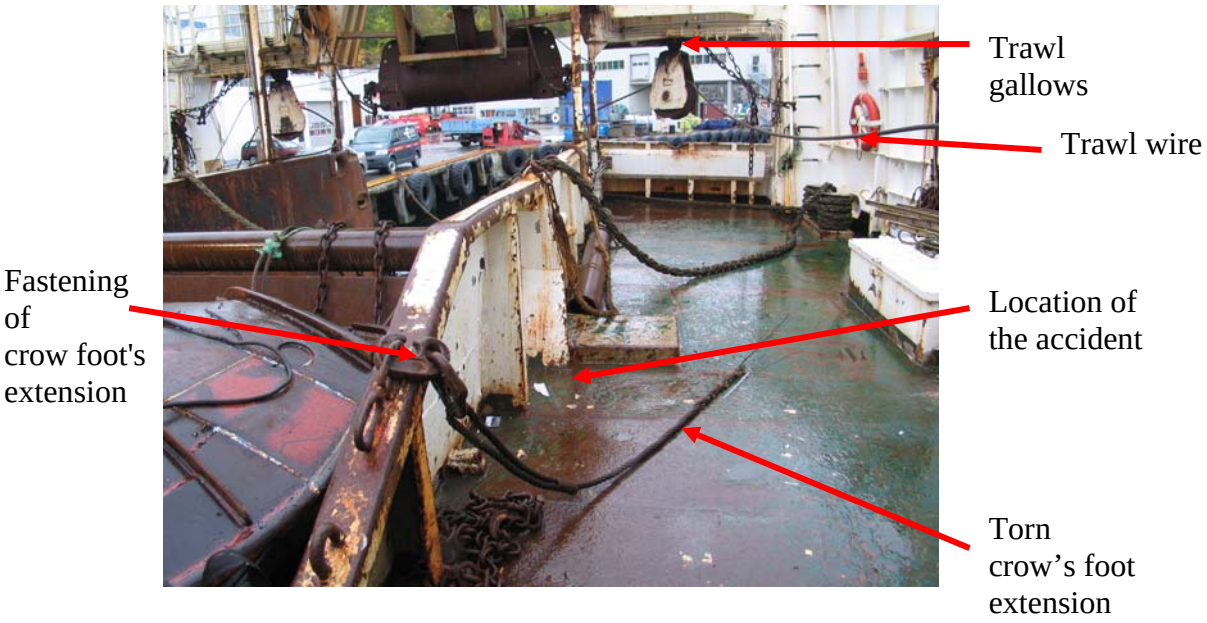


Figure 1: Port side of the trawler slip seen from the front.

When the crow's foot extension was tightened because the port side trawler door had fallen into the sea, one of the crew was squeezed between the crow's foot extension and the inner rail. However, he managed to get his right foot above the cable before his left leg was squeezed for a short time against the rail until the crow's foot extension broke. The deck chief managed to notify the skipper who stopped the starboard winch. The skipper understood that something was wrong, and saw that the trawler door had fallen overboard. He is of the opinion that he looked down on the control desk to see if the break was engaged. The skipper stopped the vessel and winched in the port side trawler door, before going down to the trawler deck. Here it was established that one of the crew was seriously injured in his left leg.

First aid was immediately performed on board. Via Florø radio the skipper contacted Radio Medico and the Main Rescue Coordination Centre for assistance. The vessel headed for Måløy which was the nearest harbour and met the rescue vessel with health personnel 1 hour and 45 minutes after the accident. The injured person was then transported to Haukeland hospital in Bergen by a medical helicopter, and here he underwent a 12-hour operation.

1.3 The shipping company

At the time of the accident MV Nordstar was formally owned by the shipping company Ole Edvardsen AS[3]. In addition to MV Nordstar, the shipping company owned "old" MS Langvin, which the company was planning to sell. Ole Edvardsen AS had imported a "new" trawler from Canada which was to take over the name Langvin. Old MS Langvin had not fished its entire cod quota, and the remainder of the quota could not be transferred to the new MS Langvin because this vessel was to be upgraded prior to being put in operation. In order to utilise the cod quota that

[3] Cf. information from the ships' register.

the shipping company was unable to fish with the old MS Langvin, Ole Edvardsen AS bought MV Nordstar for a limited period of time.

The trawler MV Nordstar has had several different owners since it was built in 1969. The shipping company Volstad AS bought the vessel in 2000, and resold it til Nordnes AS i 2005. In January 2007 the vessel was sold to the shipping company Sæviking AS, but Nordnes AS bought the vessel back in March 2007. In July 2008 MV Nordstar was taken over by the shipping company Ole Edvardsen AS. In the purchase contract dated 6 June 2008, reservations was made as to the Directorate of Fisheries' required acquisition permit, and that the directorate approved transfer of MS Langvin's trawler permits to the vessel.

Ole Edvardsen AS states that the skipper and most of the crew on board the MV Nordstar were retained upon the takeover in July 2008. Seven of the crew members were transferred from the "old" MS Langvin.

In connection with the investigation of the work accident on board MV Nordstar on 7 October 2008, the accident investigation board has experienced problems in getting access to the required information from the ship owners. Ole Edvardsen A/S has referred to Nordnes AS, stating that Nordnes AS is operating the vessel. Nordnes AS, on the other hand, has referred to Ole Edvardsen AS claiming that Ole Edvardsen AS owns the vessel.

1.4 The vessel

MV Nordstar is a trawler built in 1969 with an overall length of 75.50 metres and a width of 13.00 metres.. The vessel has later been rebuilt and upgraded. MV Nordstar is a conventional factory trawler which can operate both single and double trawls. Lately the vessel has just operated a single trawl.

The vessel has two continuous decks, main deck and shelter deck (trawl deck). The trawl deck is open astern and partly up to the wheelhouse, which is located in front of amidships. The trawl alley continues under the wheelhouse and in under the top-gallant forecastle.

MV Nordstar has a service certificate for the service area Deep-sea fishing II.[4] and a dispensation certificate regarding exemption from the radio telex requirement. The certificates were issued by the Norwegian Maritime Directorate on 23 December 2004, and are valid until 31 December 2008.

At the time of the accident, MV Nordstar was trawling for pollock based on fishing rights transferred from MS Langvin.

1.5 The crew

At the time of the accident MV Nordstar had a total crew of 23. The crew consisted of 10 people from Eastern Europe, mainly from Lithuania, and 13 from Norway. The vessel's officers were Norwegian.

[4] Fishing and catching in all waters, except waters with open or scattered drift ice concentration (40-60%) or higher outside 2000 km from the baseline,

The vessel operated on a normal two-shift watch system, where everyone on board is 6 hours on duty and 6 hours off. The changing of the watches were 0600, 1200, 1800 and 2400 respectively. On the bridge the captain and the mate shared the watches, and were in charge of both navigation and operation of the vessel's winches. The deck crew consisted of deck chief and three fishermen on each shift. During operation of the trawl equipment, all of them are working on deck. In periods when the trawl is out, the deck crew participates in the work in the fish factory.

All of those who were involved in the accident had long experience on board a trawler. The vessel's captain and the Russian deck chief had been trawling for more than 30 years. The injured person is a Russian national, 41 years old, who has been trawling for many years - the last five years on board Norwegian vessels. He was employed by Ole Edvardsen AS on board MS Langvin on 22 June 2004. He had been on board the MV Nordstar since 22 April, and was due to go on leave when MV Nordstar arrived in Ålesund. According to the plan he was going on vacation until the New Year.

In conversations with the Accident Investigation Board Norway after the accident, it appeared that he had not received any kind of training when he came on board the MV Nordstar. He was not familiar with the safety delegate scheme on board, and he did not know to whom he should turn if he had safety-related input regarding equipment or work procedures on board.

The injured person speaks only Russian. He neither speaks nor understands Norwegian, and his knowledge of English is limited. The Accident Investigation Board Norway was informed that this is also the fact for two of the other crew members who were on board at the time of the accident, while three others had some knowledge of English. None of these six spoke or understood Norwegian. The accident investigation board was informed by the shipping company that the working language on board is English.

1.6 Health, safety and environment

The MV Nordstar has a safety and training manual on board which was prepared by a consulting firm[5] in March 2004 while the vessel was owned by Volstad AS. The manual is only in Norwegian. The manual, which is based on the main elements of the ISM-code[6] is divided into 3 main parts. Part 1 is the vessel's safety manual, part 2 is the vessel's emergency preparedness manual and part 3 is the emergency preparedness manual for the ship owner’s office. As the manual has not been revised since it was prepared in 2004, it has only been adapted to the shipping company Volstad AS.

In addition to describing the crew's responsibilities and duties in general terms, the safety manual contains details of the organisation of work, as well as job descriptions for the various positions on board. Moreover the manual has instructions for training of the crew and for use of the equipment on board, including personal protection equipment.

[5] Nordvest Inspeksjon AS, N-6475 Midsund,
[6] International Safety Management Code (IMO Res. A 741(18))

In connection with the preparation of the safety and training manual in 2004, the consultant conducted risk analyses of all operations on board together with the management. Fourteen critical operations were identified, including the operation relating to lowering and hoisting the trawl and getting stuck during operation, which is described in more detail.

In the instruction describing lowering and hoisting of the trawl, extreme caution during work on deck, particularly during bad weather, is emphasised. If the trawl doors are brought on deck, this has to be done with extreme caution and under controlled conditions. When the trawl doors are on deck, they must be secured with chains before any work is carried out behind (the accident investigation board assumes that this means aft of) the trawl door. The manual contains no instructions as to how the trawl doors will be secured in the gallows.

Neither is stowing and fastening of the crow's foot extension to the rail of the trawl alley described in the manual, and no instructions have been given as to where the deck crew will or should stay during the various operations. It appears from the manual that the deck chief is the work supervisor on deck and that he is responsible for, inter alia, the maintenance work on the trawl doors.

The manual specifies that the vessel's management, safety delegate and the shipping company shall conduct new risk analyses when new work equipment, new technology or changes in the organization of the work which may have an impact on the employees' health and safety are introduced.

The safety and training manual describes the safety delegate and environment committee scheme. The safety delegate shall be elected by and amongst the people working on board in connection with ordinary operation of the vessel. There will be two safety delegates and one main safety delegate. The accident investigation board has been informed that there has been a safety delegate on board, but that the activity has been low over a longer period of time. Neither has the Norwegian Maritime Directorate received an annual report for 2007 from the working environment committee on board.

1.7 The trawl doors and crow's foot extensions

The vessel is equipped with two trawl doors. The doors cover an area of 9.5 m^2 and weigh 4.4 tonnes. Figure 2 shows the trawl doors lying in the trawl alley.

The trawl doors are used during fishing to stretch the trawl out horizontally. The trawl doors, which may be compared to airplane wings placed edgewise, utilises both the water flow and contact with the seabed to establish the required spreading force. Schematic illustration of how the trawl doors operate is shown in Appendix A.

When the vessel is not fishing, the trawl doors are normally suspended aft in the gallows. The trawl cables from which the doors hang, and which keep them in place, are coiled onto hydraulic trawl winches locked with pneumatic brakes. On board the MS Nordstar, the cable has a diameter of 30 mm. On the MV Nordstar, the crow's foot extension normally lies in a slack curve along the deck, and is fixed

in an eyelet welded onto the railing on the starboard and port sides of the slip, respectively (see figure 1).

The crow's foot extensions are used to connect trawl tools to the trawl doors, but also to bring the trawl doors onto the deck.

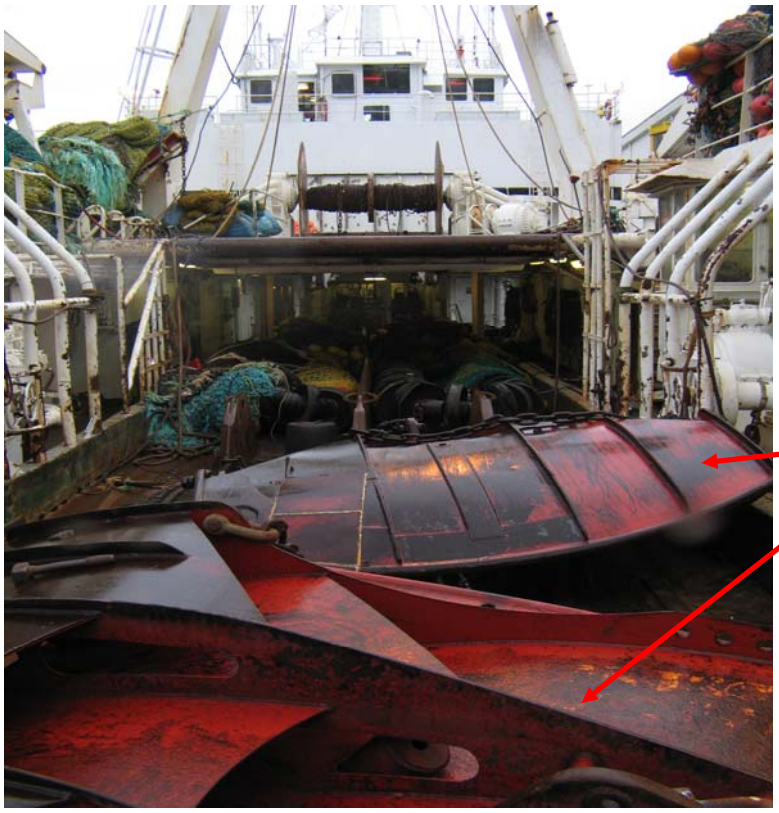


Figure 2: The trawl alley seen from the aft.

The trawl doors must be overhauled regularly, including by replacing the shoes[7] regularly. The doors then have to come down from the trawl gallows, and must be taken onto the deck. This operation is done be disconnecting the crow's foot extensions from the eyelet welded onto the rail facing the trawl alley, and connect them to the cable on one of the Gilson winches pulling the trawl door from the gallows onto the deck through the slipway, at the same time as slackening the trawl cable.

1.8 The winch equipment

The vessel is equipped with three trawl winches of the type Rapp Hedema (centre winch) and Brattvåg (starboard and port side winches), as well as two Gilson winches (starboard and port sides). Figure 3 shows the port side trawl winch seen from the aft.

[7] The shoes of the trawl doors are worn down by the scraping along the bottom, and have to be replaced regularly.

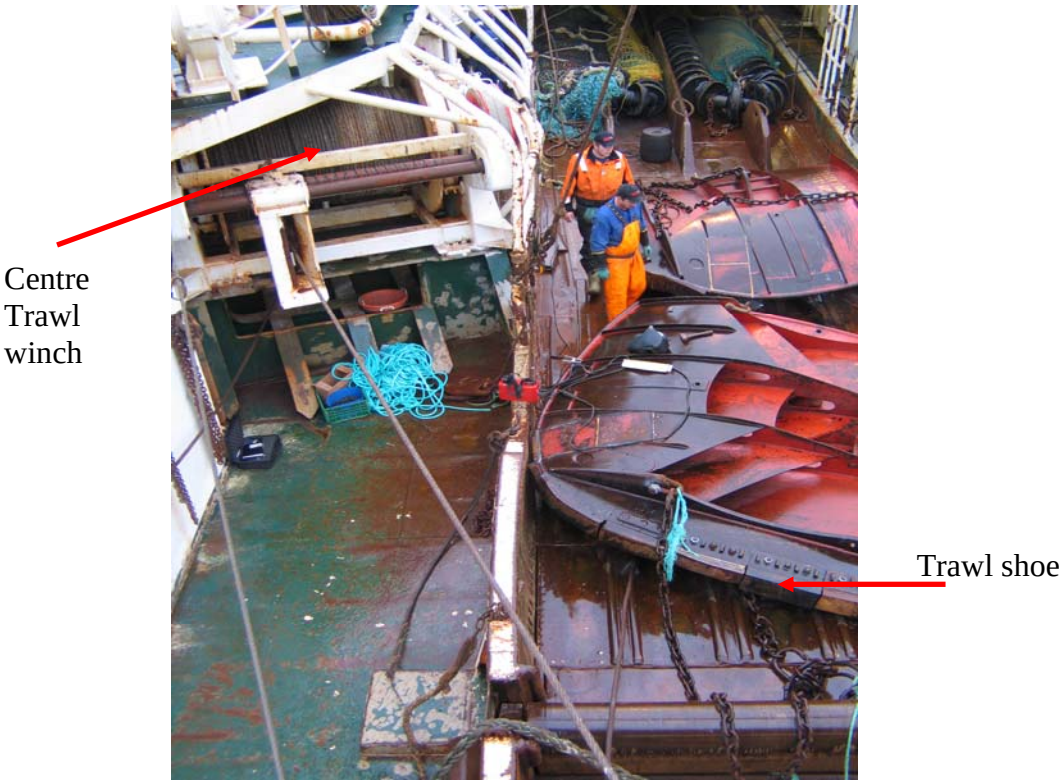


Figure 3: Port side centre trawl winch, Brattvåg type.

Figure 4: Port side trawl winch.

All the winches are operated from the same panel aft in the wheelhouse, see figure 4. The winch operator (normally the skipper/mate) has a good view astern from this position. Due to the location of the wheelhouse, however, it is not possible to see all parts of the quarterdeck from this position. The winch operator is therefore dependent on visual contact with the trawl boss down on the deck, who by using signs can assist in directing the operation.

Figure 5: Operation panel aft in the wheelhouse.

The winch operator stands in front of the control panel located against the aft bulkhead. The control buttons for the winches are clearly marked with SB, S and BB respectively. The control buttons on the panel are placed in such a way that the buttons for controlling the starboard winch is in fact located on the starboard side of the button which controls the port side winch, and vice versa. As the operator is facing astern, the control buttons for the port side winch will be placed to the right of the control button for the starboard winch, and vice versa. The control buttons are placed 5-7 cm apart.

Figure 6: Operation panel for winches.

The pneumatic brakes are operated by an off/on button for each winch. In addition, the pneumatic pressure in the brake system is adjusted on a scale from 0 to 10. The pressure in the brake system for the centre winch is set separately, while the pressure for the starboard and port side winches is set with a joint switch. See Figure 6.

The brakes of the trawl winches are arranged as a "fail to safe" system. The brakes are mechanically spring loaded, and are activated when the pneumatic pressure in

the brake system is reduced or drops, for instance as a result of an air leakage in the system. Consequently, the brakes are engaged when the pressure is reduced and disengaged when the pressure increases. The solenoid valves controlling the pressure in the brake bell is placed on the starboard side near starboard winch.

To prevent the winches from slackening again after a heave, it is common to put the brakes on *before* the heave/slack handle is disengaged. When the winches are not in use, the brakes are normally engaged - i.e. the pressure is reduced. This is done as an extra safety precaution to avoid that somebody accidentally touches the heave/slack handle, or that the winch is released or yields as a result of technical failure. The trawl winches are not strong enough to heave when the brakes are on.

In principle the trawl winches are set to work at a pulling power in the trawl cable equivalent to a hydraulic pressure of up to 35 bar. At 35 bar the winches cease to function. During trawling in normal, good weather each door provides a pull on the steel cable of 8.5 to 10.5 tons. In bad weather the pull may be as high as (the equivalent of) 35 bar. When the doors are hoisted up into the gallows, the tension on the wire rope is 5 to 6 tonnes. When the doors have been winched all the way up, it is normal to give an extra pull on the winch before setting the brakes.

The trawl winch brakes were overhauled in July 2008. This included changing the brake pads. The brakes were also inspected following the accident on 7 October 2008 by the engineer on board, and were found to be in order. The brake lining was sufficient and showed no indication of damage.

After the accident, but before the accident investigation board came aboard, the electrical brake control on the port winch was also inspected by an external electrical company[8]. In this connection, no faults were found in the electrical system, but the switch component was replaced "just to be on the safe side". The electrical company points out in its report that during testing, the brakes on the port winch disengaged much more slowly than the brakes on the starboard winch. The assessment of the electrical company was that this is due to the location of the valves on the starboard side near the starboard winch, and that the brakes engage when the air pressure in the enclosure is evacuated through the magnetic valves. During testing there was an exhaust noise at the starboard winch. Due to constriction in the pipe, which is mostly factory-clad, a steady blowing noise could be heard at the port winch, and the brakes engaged relatively slowly. An attempt was made to install a different valve, but this resulted in no change. In its report, the electrical company assumed that the evacuation valve should have been located closer to the brake.

1.9 Regulations relating to health, safety and the environment

MV Nordstar was built in 1969 and should in principle conform to the shipbuilding regulations of 1968[9]. In addition, the MV Nordstar must conform to the provisions

[8] Zenit Elektro AS
[9] Regulations of 2 October 1968, No. 8943 relating to the building of fishing and hunting vessels

in the shipbuilding regulations of 1991[10] and 2000[11] , respectively, which have been stipulated for existing vessels.

The building regulations of 1991 and 2000 contain provisions relating to arrangements for trawling. In addition to requirements related to dimensioning of equipment including foundations, winches for the trawl and similar equipment are required to be arranged so that the desired traction force may be set, such that the winch gives slack if the set traction force is exceeded. However, none of the building regulations contains detailed provisions relating to how the trawl doors are to be secured in the trawl gallows or how the crow's foot extension must be stowed and secured.

Conditions related to personal safety are otherwise regulated in the working environment, safety and health (ASH) regulations[12], which also applies to the MV Nordstar. The requirements made in the regulations include a requirement that hazards on board must be identified. When a hazard has been identified, the risk it poses must be evaluated. Such risk assessment must be undertaken on a continuous basis, and the results must be documented in writing. If risk to the employees' safety and health is identified, necessary measures must be implemented in order to remove or reduce the hazard.

The regulations also require that each individual employee be given the training necessary to perform their work in a safe manner. Training must be carried out before employees are given access to areas with serious or particular risk, and when introducing new technology.

Section 9-5 of the regulations contains provisions specifically directed at fishing and hunting vessels. In addition to requirements relating to personal safety and protective gear, one of the requirements is that warning signs must be set up in places where it is especially dangerous to be present. The regulations also contain provisions relating to manoeuvring arrangements for winches, seine rollers, dryer drums, power blocks and other lifting and/or hoisting devices. However, the ASH regulations contain no provisions as to how the trawl doors must be secured in the gallows or how the crow’s foot extension must be stowed and secured.

Both the building regulations and the ASH regulations were previously founded on the Seaworthiness Act[13]. The ASH regulations were also founded on the Seamen’s Act[14]. The Seaworthiness Act was superseded in 2007 by the Ship Safety Act[15]. In accordance with the Seaworthiness Act, the skipper/captain on board was defined as an obligated party, and thus responsible for compliance with the provisions. However, this principle was changed with the adoption of the Ship Safety Act, where a greater part of the responsibility has been transferred to the shipping

[10] Regulations of 15 October 1991, No. 712 relating to the building of fishing and hunting vessels with lengths of 15 m L_{OA} or more
[11] Regulations of 13 June 2000, No. 660 relating to construction, equipment, operation and inspections for fishing and hunting vessels with ??largest lengths of 15 metres or more
[12] Regulations of 1 January 2005, No. 8 relating to working environment, safety and health for employees on ships
[13] Act of 9 June 1903, No. 7 relating to Public control of the Seaworthiness of Ships, etc.,
[14] Seamen’s Act of 30 May 1975 no.18
[15] Act of 16 February 2007, No. 009 relating to ship safety

company and the onshore organization. The building regulations and the ASH regulations are now founded on the Ship Safety Act.

1.10 The regulations relating to resource management

At the time of the accident, the MV Nordstar was conducting pelagic trawling for Pollock south of the 62nd parallel. This fishing is regulated by regulations relating to Pollock fishing in the North Sea[16]. The regulation gives vessels that have a cod trawling permit and which are registered as factory trawlers the opportunity to fish and land up to 2588 tonnes (round weight) of cod, whereof a guaranteed quota of 875 tonnes (round weight) of Pollock.

The Directorate of Fisheries allocates quotas and maintains a register of who at any given time has the right to conduct commercial fishing with the individual vessel. The way the regulations are practised, it is relatively easy to get quotas transferred from one vessel to another within the same shipping company. The experience of the shipping companies is that the Directorate of Fisheries is very restrictive with regard to accepting the transfer of quotas from one shipping company to another.

1.11 The authorities' supervision of health, safety and the environment

The Norwegian Maritime Directorate carries out periodic main inspections of fishing and hunting vessels every 5 years. In addition, an intermediate inspection must be carried out. The inspection may take place within a period of three months before or after the second anniversary of the certificate, without changing the date of the next inspection. The Directorate also conducts unannounced inspections in addition to the periodic inspections.

In connection with these inspections, the inspectors use checklists. There are checklists for inspection of the condition of the vessel and the equipment. In addition, a separate checklist has been prepared for inspection of working and living conditions, including factors related to working environment, safety and health on board. This latter checklist has, however, not been introduced on fishing vessels. Conditions related to working and living conditions on fishing vessels are therefore checked in connection with the ordinary inspections.

Based on the main inspection on board the MV Nordstar on 23 December 2004, the Norwegian Maritime Directorate issued a maritime certificate for the service area "Havfiske II" (Deep sea fishing 2)[17] as well as a certificate of dispensation in connection with an exemption from the requirement for radio telex. The certificate was issued with validity until 31 December 2008, and the validity was conditional upon intermediate inspection being carried out during the period from 30 September 2006 through 30 March 2007.

At the request of the shipping company, the Norwegian Maritime Directorate carried out an intermediate inspection on 27 July 2007, that is, later than the specified deadline of 30 March 2007. The vessel was without a valid maritime

[16] Regulations of 14 December 2007, No. 1455 relating to the regulation of saithe fishing in the North Sea and Skagerak in 2008

[17] Fishing and hunting in all waters, except waters with open or scattered drift ice of concentration (4/10-6/10) or higher outside 200 nautical miles from the baseline,

certificate throughout this period. In connection with the inspection, it was noted, among other things, that a new safety delegate would be appointed before the vessel was put into operation.

At the time of the accident, the directorate had no outstanding orders issued against the vessel.

2. THE ASSESSMENTS OF THE ACCIDENT INVESTIGATION BOARD NORWAY

2.1 Introduction

The injured person was on the port side of the trawl deck, between the crow's foot extension and the railing toward the trawl alley, when the accident happened. Maintenance work on the port trawl door had been concluded and the port door had been winched up into place in the gallows. The starboard door was to come down from the gallows and onto the deck for corresponding maintenance, and during this work operation it was considered safe to be on the port side of the trawling alley.

It has not been possible to ascertain why the port trawl door wound up in the sea. A technical fault may have resulted in the failure of the brakes on the port side. Alternatively, an operator error at the manoeuvring panel may have resulted in the brakes not being engaged at the time the door went into the sea, possibly in combination with the port winch being activated.

When the port trawl door first got into the sea, this had serious consequences. This was due to the fact that the crow's foot extension which was fastened to the crow's foot on the trawl door had not been coiled up and placed clear astern on the deck, but was pulled forward and fastened to an eyelet on the railing toward the trawl alley. When the trawl door hit the sea, the crow's foot extension tightened up with severe force. On this background, it is the opinion of the Accident Investigation Board Norway that there is a need for closer attention to procedures for securing the trawl doors in the gallows, as well as arrangements and procedures for stowing and securing the crow's foot extension.

The presence of deck crew on the port side of the trawl deck, between the crow's foot extension and the railing toward the trawl alley, at just the moment the port trawl door went into the sea, indicates that there is reason to scrutinize the training, safety conditions and communication routines on board.

The analysis also includes an evaluation of whether the current regulations and supervisory arrangements are sufficient with regard to preventing this type of accident.

2.2 Technical and operational conditions on board

2.2.1 The trawl doors and the crow's foot extensions

When the vessel is not engaged in fishing, the trawl doors normally hang astern in the gallows. On the MV Nordstar, they hang exclusively from the winches. This

means that a technical failure or an operator error on the winches will lead to the doors being lowered and potentially going into the sea. The Accident Investigation Board Norway is of the opinion that the trawl doors must be secured in another manner when not in use and hanging in the gallows.

In order for it to be possible to take the trawl doors onto the deck, crow's foot extensions are normally fastened to the doors. On board the MV Nordstar the crow's foot extensions normally lie slightly curved forward on the deck, fastened to an eyelet which is welded onto the railings on the starboard and port sides of the slip, respectively (see Figure 1). If the trawl doors unintentionally go into the sea, the vessel's speed through the water along with gravity and the size of trawl door will lead to the crow's foot extension getting a powerful jerk, and this may represent a safety hazard for deck crew who are present in the vicinity. The Accident Investigation Board Norway is therefore of the opinion that the practice of bringing the crow's foot extensions forward on the deck and fastening the end to the railing toward the trawl alley may pose a safety hazard.

2.2.2 The winch equipment

The brakes on the winch were overhauled a short time before the accident. Both the mechanical and the electronic components were also inspected after the accident, and no faults were identified.

Since the braking systems had already been opened up for inspection by the engineer when the Accident Investigation Board Norway came aboard, it was not possible to observe how the brake band originally lay against the drum and thus, whether it was correctly adjusted at the time of the accident. If the brake band lies too tightly on the drum, this may result in the brake pads continuing to cause friction even though the pneumatic pressure is turned on to disengage the brakes. This will normally result in the drum rotating with small tugging and jerking motions when the winch is operated. Alternatively, if the brake band lies too loosely against the drum, the brake pads will not be able to restrain the drum. This may result in the drum continuing to rotate even after the brakes have been engaged. However, the crew on board had made no observations which could indicate that the brakes were too tight or too loose on the drum at the time of the accident.

The brakes on the trawl winches are arranged as a fail to safe system in that a mechanical spring activates the brakes when the pneumatic pressure in the braking system is reduced or drops altogether. After the accident, no damage to the braking system was observed which would have prevented the mechanical spring from activating the brakes. During conversations with the crew there have been no indications that the brakes did not function as they should.

The solenoid valves which govern the pressure in the brake bell are located on the starboard side near the starboard winch. The electrical company which inspected the winch brakes after the accident has pointed out in its report that the brakes on the port winch disengage much more slowly than the brakes on the starboard winch. This may be due to the fact that the pipes between the valves and the winch are longer for the port winch than for the starboard winch. The inertia in the braking system on the port winch may have led to the port trawl door slowly slipping down

toward the sea after it had been hung up in the gallows and the brakes engaged. However, none of the crew observed this.

The manoeuvring panel for the winches is located against the aft bulkhead in the wheelhouse. The operator stands in front of the panel facing aft with a good overview of the aft deck and the trawl alley. The operating levers for the winches are clearly marked SB, S and BB, respectively, see Figures 4 and 5. The operating levers on the panel are located so that the lever for operating the starboard winch is actually located to starboard of the lever for operating the port winch, and vice versa. Since the operator stands facing aft, the operating lever for the port winch will be located to the right of the operating lever for the starboard winch, and vice versa. The operating levers are located 5-7 cm from each other, which makes it possible to pull the wrong lever if one is inattentive.

2.3 Organisational conditions on board and in the shipping company

Ole Edvardsen AS bought the MV Nordstar from Nordnes AS in June 2008. This proceeds from the sales contract, and Ole Edvardsen AS was as of this point in time also registered as the owner in the Shipping register. In accordance with the Ship Safety Act Ole Edvardsen AS is defined as the shipping company and obligated party with regard to the law and associated regulations. The Accident Investigation Board Norway has however been informed that the MV Nordstar was sold back to Nordnes AS in November 2008.

Subsequent to the work accident of 7 October 2008, the Accident Investigation Board Norway has had problems including procuring information from the onshore organization. Ole Edvardsen AS has referred to Nordnes AS and Nordnes AS has referred to Ole Edvardsen AS. The Accident Investigation Board Norway's experience would indicate that in practice, it is Nordnes AS which has been in charge of the operation of MV Nordstar during the period from June to November 2008.

A safety and training manual has been prepared for vessel and shipping company. The manual was prepared by a consultancy firm in 2004, while the vessel was owned by Volstad AS shipping company. The manual, which is based on the main elements in the ISM codes, is divided into 3 main parts. Section 1 is the vessel's Safety Manual, section 2 is the vessel's emergency preparedness manual and Section 3 is the emergency preparedness manual for the shipping company.

Provided that the manual is adapted and implemented on board and in the onshore organization, it provides a good basis for HSE (ASH) work. The manual on board the MV Nordstar has however not been revised since it was prepared and adapted for the shipping company of Volstad AS in 2004. In the view of the Accident Investigation Board Norway, this confirms that the manual has not been implemented in the onshore organization of either Nordnes AS or Ole Edvardsen AS. The Accident Investigation Board Norway has also received acknowledgement that the manual and the HSE (ASH) work on board have not functioned as they should.

In conversations with the Accident Investigation Board Norway following the accident, it has emerged that the injured person did not receive any form of training

when he came aboard the MV Nordstar. He was not familiar with the personnel safety delegate arrangement on board, and he did not know who to approach if he hadde input of a safety-related nature with regard to equipment or work procedures on board.

According to the Norwegian Maritime Directorate, neither has the Annual report for 2007 from the Working Environment Committee on board been submitted. The safety and training manual describes an arrangement with a safety delegate and an environment committee. The safety delegate must be chosen by and from among those who work on board in connection with the ordinary operation of the vessel. There shall be two safety delegates as well as a head safety delegate. The Accident Investigation Board Norway has been informed that there has been a safety delegate on board, but that the activity has been minor or absent over a long period of time.

The injured person speaks Russian. He neither speaks nor understands Norwegian, and English only very poorly. The same applies to several of the crew on board the MV Nordstar, and according to the understanding of the Accident Investigation Board Norway, this poses special challenges which must be handled by management on board and in the onshore organization.

In principle, there is no requirement that one must prepare and implement a safety and training manual for the vessel and the onshore organisation. However, the safety and training manual which was prepared for the MV Nordstar contains many elements which according to the ASH regulations still must be handled by the vessel and the onshore organization.

2.4 The role of the authorities

Both the Norwegian Maritime Directorate and the Directorate of Fisheries have responsibilities in relation to the Norwegian fishing fleet. The Norwegian Maritime Directorate is responsible for developing standards for building and operating vessels relating to working environment, safety and health, as well as for supervision of compliance with these standards. The Directorate of Fisheries is responsible for developing standards to ensure prudent resource management, as well as for supervision of compliance with these standards. It is important that the two directorates have a certain level of cooperation.

2.4.1 The regulations relating to resource management

The Directorate of Fisheries' practise of the regulations which entails that it is relatively easy to get quotas transferred from one vessel to another within the same shipping company, whereas it is very difficult to get quotas transferred from one shipping company to another, may, in the view of the Accident Investigation Board Norway result in frequent, temporary changes of ownership for the purpose of achieving the maximum utilization of awarded quotas. It is the view of the Accident Investigation Board Norway that this practice may have negative consequences for maritime safety.

In this connection the Accident Investigation Board Norway would point out that following the adoption of the new Ship Safety Act it has become more important than previously that conditions are ordered such that the shipping company and the

onshore organization give maritime safety high priority. Previously, relevant safety provisions relating to building and operating fishing vessels were founded on the Seaworthiness Act. According to the Seaworthiness Act, the skipper / captain on board were responsible for compliance with the provisions. However, this principle was changed in 2007 with the adoption of the Ship Safety Act. According to the Ship Safety Act, a greater part of the responsibility for safety on board has been transferred to the shipping company. It is the view of the Accident Investigation Board Norway that a shipping company which out of commercial consideration buys a vessel to own and operate only for a short period may have less focus on maritime safety than if it were a long-term investment.

2.4.2 The regulations relating to health, safety and the environment

On the MV Nordstar the trawl doors hang solely on the winches. This means that a technical failure or an operator error on the winches will lead to the doors being lowered and potentially going into the sea. The Accident Investigation Board Norway is of the opinion that the trawl doors must be secured in another manner when not in use and hanging in the gallows.

As regards the crow's foot extensions on the MV Nordstar, these have been pulled forward on the deck and fastened to an eyelet on the railing toward the trawl alley. The Accident Investigation Board Norway deems on a general basis that this solution may constitute a risk to crew safety. However, the Accident Investigation Board Norway is of the opinion that it would be inexpedient both for the industry and for the supervisory bodies if the regulations were to be so detailed that stowing and securing of crow's foot extensions is regulated in regulations. The Board (AIBN) is of the opinion that these conditions must be evaluated in risk assessments and be dealt with in the HSE work on board.

2.4.3 The audit relating to health, safety and the environment

As detailed provisions for securing trawl doors in the gallows or arrangements for stowing crow's foot extensions have not been included (in the regulations) it is not to be expected that the audit should identify arrangements which can pose a risk. Neither can it be expected that the audit should have discovered faults or deficiencies in the winches when it has not been possible to identify such faults after the accident.

The Accident Investigation Board Norway is of the opinion that factors relating to personal safety on board must primarily be taken care of by the users, i.e. the crew and the shipping company through e.g. HSE work on board. However, it should be expected that the audit verifies that the main principles in the ASH regulations are complied with in the shipping company and on board.

The Norwegian Maritime Directorate has prepared a separate checklist [18] for inspection of working and living conditions, including factors related to working environment, safety and health on board ships. The checklist contains, among other things, a section on the prevention of accidents, where one of several important items is verification that documentation is available showing that risk assessments

[18] KS-0144-1B (10.2008 SDir) ILO-178 Checklist

are undertaken regularly. However, this checklist is not used on fishing vessels. Factors related to working and living conditions on fishing vessels are therefore checked in connection with the ordinary inspections, and this check is initially limited to qualifications, employment contracts, certificates/statements, safety training and safety delegate arrangements and safety and environment committees.

2.5 Measures implemented

The Accident Investigation Board Norway has been informed by Nordnes AS that following the work accident on 7 October 2008 they have initiated a process which entails a complete review of the HSE work in all parts of the organization. The objective of achieving good, active systems for HSE (ASH) work must be well-founded in all parts of the organization, on board the MV Nordstar as well as ashore. Both the command on board and the onshore management agree on this objective. It has been decided that dedicated HSE meetings will be held at each dockside stay, and these meetings are to ensure communication between the vessel and the onshore organisation.

Nordnes AS has also seen the need for, and has initiated, the work of translating the safety and training manual. Ongoing safety work has also been initiated on board the MV Nordstar which includes maintenance and renewal of the safety system.

3 SAFETY RECOMMENDATIONS

The investigation of this maritime accident has identified several areas in which the Accident Investigation Board Norway deems it necessary to issue safety recommendations with the objective of improving maritime safety. [19]

Maritime Safety Recommendation No. 2009/17T

During maintenance work on the starboard trawl door, the port trawl door unintentionally dropped into the sea, and the subsequent movement in the crow's foot extension led to the injury of one of the crew on the deck. On the MV Nordstar, the trawl doors hang exclusively from the winches when they are not in use. The Accident Investigation Board Norway recommends the shipping company to consider other technical solutions to secure the trawl doors in the gallows.

Maritime Safety Recommendation No. 2009/18T

When the port trawl door went into the sea, the crow's foot extension, which is fastened to the trawl door, tightened up with severe force so that one of the crew on the deck was injured. On the MV Nordstar, the crow's foot extensions lie forward on the deck, and are fastened to the railing toward the trawl alley. The Accident Investigation Board Norway recommends that the shipping company consider implementing risk analyses of the arrangement with the crow's foot extensions in relation to work operations on the aft deck.

[19] The investigation report will be submitted to the Ministry of Trade and Industry, which will implement the necessary measures to ensure that due consideration is given to the safety advisories.

Maritime Safety Recommendation No. 2009/19T

MV Nordstar has a safety and training manual on board which describes organisation, responsibilities and duties, work execution, training and use of risk assessments to evaluate critical operations, as well as procedures related to emergency preparedness. The investigation has revealed that the manual is not being followed in several important areas. The Accident Investigation Board Norway recommends that the shipping company consider implementing the manual in the onshore organization and on board the MV Nordstar to such an extent that the requirements in the ASH regulations are satisfied.

Maritime Safety Recommendation No. 2009/20T

The Directorate of Fisheries' practise of the regulations entails that it is very difficult to get quotas transferred from one vessel to another which is owned by another shipping company without resorting to purchase and sale of vessels. In the case of the MV Nordstar, this has resulted in frequent, temporary ownership changes, which can have negative consequences for maritime safety. The Accident Investigation Board Norway recommends that the Directorate of Fisheries reassess the current practice with regard to approving quota transfers between vessels, with the objective of arriving at arrangements which entail that it will be possible to maintain the current utilization of awarded quotas that stimulating short-term changes in ownership.

Maritime Safety Recommendation No. 2009/21T

The accident on board the MV Nordstar on 7 October 2008 shows that there may be serious consequences if a trawl door loosens from the gallows and falls in the sea. On the MV Nordstar the trawl doors hung exclusively from the winches. The Accident Investigation Board Norway recommends that the Norwegian Maritime Directorate consider including provisions for securing trawl doors in relevant regulations.

Maritime Safety Recommendation No. 2009/22T

The Norwegian Maritime Directorate has prepared a separate checklist for inspection of working and living conditions, but this is not used in audits of fishing vessels. In the case of the MV Nordstar, this entails that important provisions included in the ASH regulations have not been followed up in audits. The Accident Investigation Board Norway recommends on this background that the Norwegian Maritime Directorate consider introducing the check list which is already used on other types of ships for the inspection of working and living conditions, including factors related to working environment, safety and health, also on fishing vessels.

The Accident Investigation Board Norway

Lillestrøm, 20. juli 2009

APPENDIX

Appendix A. The trawl doors - mode of operation

Appendix B. Relevant abbreviations

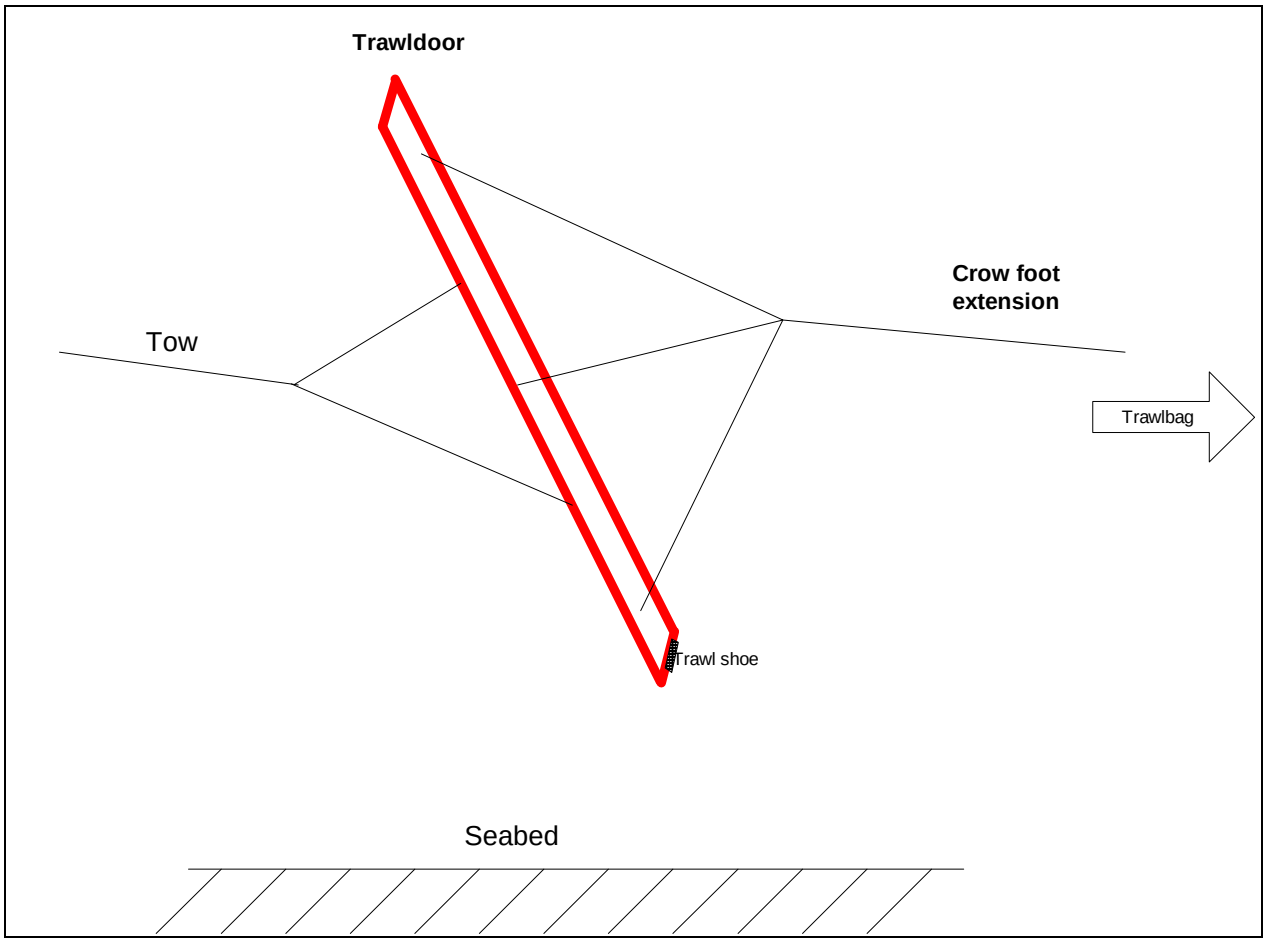
APPENDIX A

THE TRAWL DOORS – MODE OF OPERATION

The trawl doors are used to stretch the trawl out horizontally. The doors, which might be compared with airplane wings set on edge, utilize both the flow of water and their contact with the seafloor to set up the desired spreading force.

To adjust the spreading force, the position of the attachment point of the tow cable or sweep lines is adjusted. The balance point will then be changed, so that the angle between the flow of water and the trawl door sets up a different spreading force.

Such changes also influence the towing resistance to a large degree. In addition, the tilting of the trawl doors may also be affected. In bottom trawling this will have significance for the magnitude of the force between the trawl door and the seafloor. The sketch below describes schematically how the trawl doors function.



Sketch of trawl door with crow's foot.

APPENDIX B

RELEVANT ABBREVIATIONS

BHK	:	Brakes horsepower
DNV	:	Det norske Veritas
HSE		Health, Safety & Environment
IMO	:	International Maritime Organisation
ISM	:	International Safety Management
kW	:	Kilowatt
NHD	:	(Norwegian) Ministry of Trade and Industry
MV	:	Motor Vessel
AIBN	:	The Accident Investigation Board Norway
ASH	:	Working environment, safety and health