The Trawler Gaul

Some comments on the loss of the trawler Gaul and the re-opened Formal Investigation

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Part I

1. The Formal Investigation:

In 1974, the UK Trawler Gaul, with 36 persons crew, was lost in the Barents Sea. All on board lost their lives in this tragedy. The vessel was two years old, well found and extremely seaworthy. During the 32 years that have passed since its loss there have been a number of theories put forward and much speculation in the press as to why and how such a vessel could have been lost.

A formal investigation into the cause of the loss was carried out in 1974 and this concluded that forces of nature had overwhelmed the vessel. However, the relatives of the deceased did not accept this result and, since that time, they have repeatedly requested the Government to establish the truth and facts of the case.

The wreck of the vessel was located on the sea bottom by an independent film maker in 1997 and this led to renewed calls for an investigation to be carried out. In 1998 and in 2002 the Marine Accident Investigation Branch (MAIB) carried out underwater surveys of the wreck, the survey carried out in 2002 was detailed and comprehensive.

In view of the new evidence that was revealed by these two surveys, the Government decided to re-open the formal investigation into the vessel's loss and this commenced in January and concluded in February 2004, with the report of the re-opened formal investigation being published on 17 December 2004.

The investigation found that the probable cause for the loss of the vessel was undetected flooding through two openings in the vessel's side (the duff and offal chute openings[1]), which caused the vessel to capsize and founder in a short period of time. In this situation there was insufficient time for the crew to raise an alarm or to escape from the vessel. The investigation also concluded that the closing arrangements, for these two chute openings, had not been adequately maintained and that a steel non-return flap, in each opening, had seized in the open position and, furthermore, that the vessel had set sail from Hull in this condition.

Additionally, the investigation concluded that at the time of the tragedy, the inner covers, for the two chute openings, had not been closed and secured by members of the crew and that this had contributed to the vessel's loss.

With regard to blame, the inferences that can be drawn from the formal report are that:

- The vessel's owner and shore maintenance staff were at fault for not having an effective maintenance system in place that could prevent the closing arrangements, for these two hull openings, from deteriorating in service and malfunctioning.
- The crew were at fault because, either they did not notice that the non-return flaps were seized in the open position or, if they did notice, they took no action, and also because that they did not close and secure the inner covers to these two openings in the hull when they were not in use.

Following the publication of the 'Report of the re-opened Formal Investigation into the loss of the FV Gaul', in December 2004, a number of members of the Gaul families association branded the report a 'whitewash'.

[1] These are openings in the hull of a fishing vessel, which are used for the discharge of waste arising from fish processing operations. See pages 13 and 19 for technical details of the duff and offal chutes and their closing arrangements (as given in the report of the investigation)

The following pages offer some critical comments on the findings of the formal investigation and, in Part II (page 38), two alternative loss scenarios are put forward which suggest that a **design fault** was responsible for the vessel's loss. The points below and attached documents may also merit further consideration and discussion.

Points of Interest

1. The construction and arrangements of the duff and offal chutes and their means of closure warrant close and detailed examination. It is suggested that during the formal investigation such an examination was not carried out. It is also suggested that the arrangement of the duff and offal chutes, as provided onboard the Gaul, effectively formed a **design fault,** which had an adverse effect upon the watertight integrity of the Gaul's external hull envelope, and which ultimately led to its loss. See Part II (page 34) for details.
2. The Gaul tragedy bears many similarities with the 'Derbyshire' tragedy and, in this respect; Appendix 1 may be of interest (article from the Internet).
3. An important factor following any maritime disaster is the financial security of the relatives and dependents of the deceased. *Appendix 2* may be of interest (current UK legislation).
4. The government is responsible for certain contingent liabilities, which arise from the former nationalised shipyards of the UK (British Shipbuilders). The Gaul was built by Brooke Marine who were nationalised in 1977, re-privatised in 1985 and wound up in 1993. See *Appendix 3* (download from the Internet).
5. Whilst the investigation has covered a number of pertinent issues and considered many diverse questions, sometimes in great depth, there are a number of elements within the formal report (particularly relating to the technical characteristics of the duff and offal chutes and their means of closure), which are clearly incorrect. Bearing in mind the fact that the adequacy and functioning of these ship's fittings was central to the investigation, it is considered that this has been a clear failing on the part of those concerned. See *Appendix 5* (contains extracts from the report of the formal investigation).
6. The objective of the formal investigation was to arrive at the facts behind the vessel's loss, to draw appropriate conclusions and to make recommendations. Whilst a great deal of information has undoubtedly been uncovered during the course of the recent investigation, it is suggested that further facts could yet be revealed and that these could have a significant impact on the conclusions and recommendations that made in the report of the re-opened formal investigation.
7. If it is decided that important new evidence has now been found, what should happen next? The 1995 Merchant Shipping Act indicates a possible way forward. See *Appendix 6*.

Appendix 1

Bibby article (http://www.red-duster.co.uk/BIBBY16.htm)

LIVERPOOL BRIDGE/DERBYSHIRE (4) was built in 1976 by Swan, Hunter Shipbuilders Ltd at Haverton-on-Hill with a tonnage of 91655grt, a length of 965ft 1in, a beam of 145ft 2in and a service speed of 15.5 knots. Launched on the 5th December 1975 she was the sixth and largest OBO built at Swan, Hunter's Haverton-on-Hill yard. When she was delivered to Bibby Tankers Ltd in the following June for charter to the Seabridge Consortium she was the largest ship ever owned by the Bibby Group. …….. Six hours after sending her position she reported, at 0930, that she was hove to in a severe storm and adding that she would be late arriving. She was never seen again and disappeared without trace with the loss of 42 crew members and 2 officers wives during typhoon 'Orchid'. On 24th October an empty lifeboat was spotted by the *Taiei Maru* 700 miles away in the Luzon Strait. The Derbyshire became the largest British built and owned ship to be lost at sea. The subsequent enquiry blamed 'Orchid' but the families of the victims and the Trade Union believed that a design fault caused the ship to break in half before an SOS could be sent especially in view of the fact that a smaller ship, the *Alrai*, formerly *Athelmonarch*, had survived the typhoon. They based their belief on the fact that cracks had been found at Frame 65 in five similar bulk carriers built by Swan, Hunter and cited the fate of the ill fated *Kowloon Bridge,* formerly the *English Bridge*, which broke her back after drifting ashore in Eire. If it could be proved that the *Derbyshire* was lost due to a design weakness rather than an 'Act of God' then a claim for compensation, estimated at £60,000,000, could be lodged. In October 1987 a second enquiry declined to examine the design fault thesis as there was no evidence and no one had survived to testify as to what had happened. On 23rd January 1989 following a House of Lords decision the Wreck Commissioner issued a statement saying that the loss was unexplained and that there was no specific reason for the loss. However, the families of the victims and the Unions were not satisfied and in 1994 the International Transport Workers Federation financed an expedition which eventually found the wreck lying some 2.5 miles deep, 400 miles east of Okinawa. The Department of Transport appointed Lord Donaldson to review the new development and he concluded that a detailed underwater survey would cost around £2,000,000. Funded partly by Britain and partly by the European Union the survey was conducted in two phases during 1997 and 1998 during which 153,774 electronic stills and some 200 hours of high definition film was taken. By pasting together the individual photographs it was possible to produce, as a single picture, large expanses of the wreck in clear black and white images. With the new evidence to hand and in view of certain allegations made against the crew in the first enquiry the Deputy Prime Minister ordered, in December 1998, a full reopening of the formal enquiry in the High Court. The hearing commenced on 5th April 2000 and continued for 54 days during which time the evidence was fully examined.. ……....

……..No blame was attached to the crew for the loss of the ship.

"Bulk Carrier Derbyshire sank in 1980 with the loss of 44 lives:

Leading Article: Probe for truth

Monday March 08 1999 Lloyds' List

THE year was 1980. Blondie was at number one and Margaret Thatcher was in Number Ten. John Lennon was gunned down in New York while the US boycotted the Moscow Olympics in protest against Soviet involvement in Afghanistan. Solidarnosc was emerging in Poland, and Iraqi dictator Saddam Hussein declared war on Iran.

How much our uncertain world has changed since then. So what possible good can come of reopening the formal inquiry into a British flag vessel that sunk 19 years ago? The short answer is, the official explanation proffered by the last inquiry into the loss of the Derbyshire - itself a long time ago in 1989 - still does not convince everybody.

Neither the Derbyshire Family Association nor a number of independent experts accept that she was simply 'overwhelmed by the forces of nature'. They believe the design of the vessel itself may have been an important contributory factor, or even the primary cause.

In particularly, the problems experienced by sister ships with cracking in the Frame 65 area give at least potential credence to the alternative theory of catastrophic structural failure. Much new evidence has come to light since then, not least that provided by two surveys of the wreck.

The Hon Mr Justice Colman was last week appointed to preside over a fresh look at the case. Bulk carrier safety is not an issue that has gone away in the last two decades. If the structural failure argument is indeed proven - and of course that cannot be prejudged - it will be his task to apportion guilt.

Should that attach to operators or the builders, so be it. That may pave the way to substantial compensation claims.

So it is worth noting here that the builders were the late nationalised British Shipbuilders combine.

Liability for any compensation bill would thus be footed by the government. That knowledge makes it all the more commendable that this administration has had the courage to order the Colman inquiry, rather than duck the issue as its predecessor did."

Appendix 2

STATUTORY INSTRUMENTS

1998 No. 1258
MERCHANT SHIPPING
The Merchant Shipping (Convention on Limitation of Liability for Maritime Claims) (Amendment) Order 1998

Made *19th May 1998*

Coming into force in accordance with Article 1

At the Court of Buckingham Palace, the 19th day of May 1998
Present,
The Queen's Most Excellent Majesty in Council

Whereas a draft of this Order has, in pursuance of section 185(5) of the Merchant Shipping Act 1995[1], been laid before Parliament and approved by a resolution of each House of Parliament:

Now, therefore, Her Majesty, by virtue and in exercise of the powers conferred on her by section 185(2A) of the Merchant Shipping Act 1995, is pleased, by and with the advice of Her Privy Council, to order, and it is hereby ordered, as follows:

Citation and commencement

1. This Order may be cited as the Merchant Shipping (Convention on Limitation of Liability for Maritime Claims) (Amendment) Order 1998 and shall come into force on the date, to be notified in the London, Edinburgh and Belfast Gazettes, on which the Protocol of 1996 to amend the Convention on Limitation of Liability for Maritime Claims 1976[2] enters into force in respect of the United Kingdom.

Interpretation

2. In this Order, unless the context otherwise requires -

"the Act" means the Merchant Shipping Act 1995;
"the Convention" means the Convention on Limitation of Liability for Maritime Claims, 1976[3].

Claims excepted from limitation

3. In the text of the Convention as set out in Part I of Schedule 7 to the Act, in Chapter I, for paragraph (a) of Article 3 there shall be substituted -

" (a) claims for salvage, including, if applicable, any claim for special compensation under Article 14 of the International Convention on Salvage 1989[4], as amended, or contribution in general average;".

Limits of Liability

4. In the text of the Convention as set out in Part I of Schedule 7 to the Act, in Chapter II -

(a) for paragraph 1 of Article 6 there shall be substituted -

" 1. The limits of liability for claims other than those mentioned in Article 7, arising on any distinct occasion, shall be calculated as follows:

(a) in respect of claims for loss of life or personal injury,

(i) 2 million Units of Account for a ship with a tonnage not exceeding 2,000 tons,

(ii) for a ship with a tonnage in excess thereof, the following amount in addition to that mentioned in (i):

for each ton from 2,001 to 30,000 tons, 800 Units of Account;

for each ton from 30,001 to 70,000 tons, 600 Units of Account; and

for each ton in excess of 70,000 tons, 400 Units of Account,

(b) in respect of any other claims,

(i) 1 million Units of Account for a ship with a tonnage not exceeding 2,000 tons,

(ii) for a ship with a tonnage in excess thereof the following amount in addition to that mentioned in (i):

for each ton from 2,001 to 30,000 tons, 400 Units of Account;

for each ton from 30,001 to 70,000 tons, 300 Units of Account; and

for each ton in excess of 70,000 tons, 200 Units of Account."; and

(b) for paragraph 1 of Article 7 there shall be substituted -

" 1. In respect of claims arising on any distinct occasion for loss of life or personal injury to passengers of ship, the limit of liability of the shipowner thereof shall be an amount of 175,000 Units of Account multiplied by the……

Units of account = Special Drawing Rights (SDR)

December 21, 2005
1 SDR = **1.43423 USD**

Appendix 3

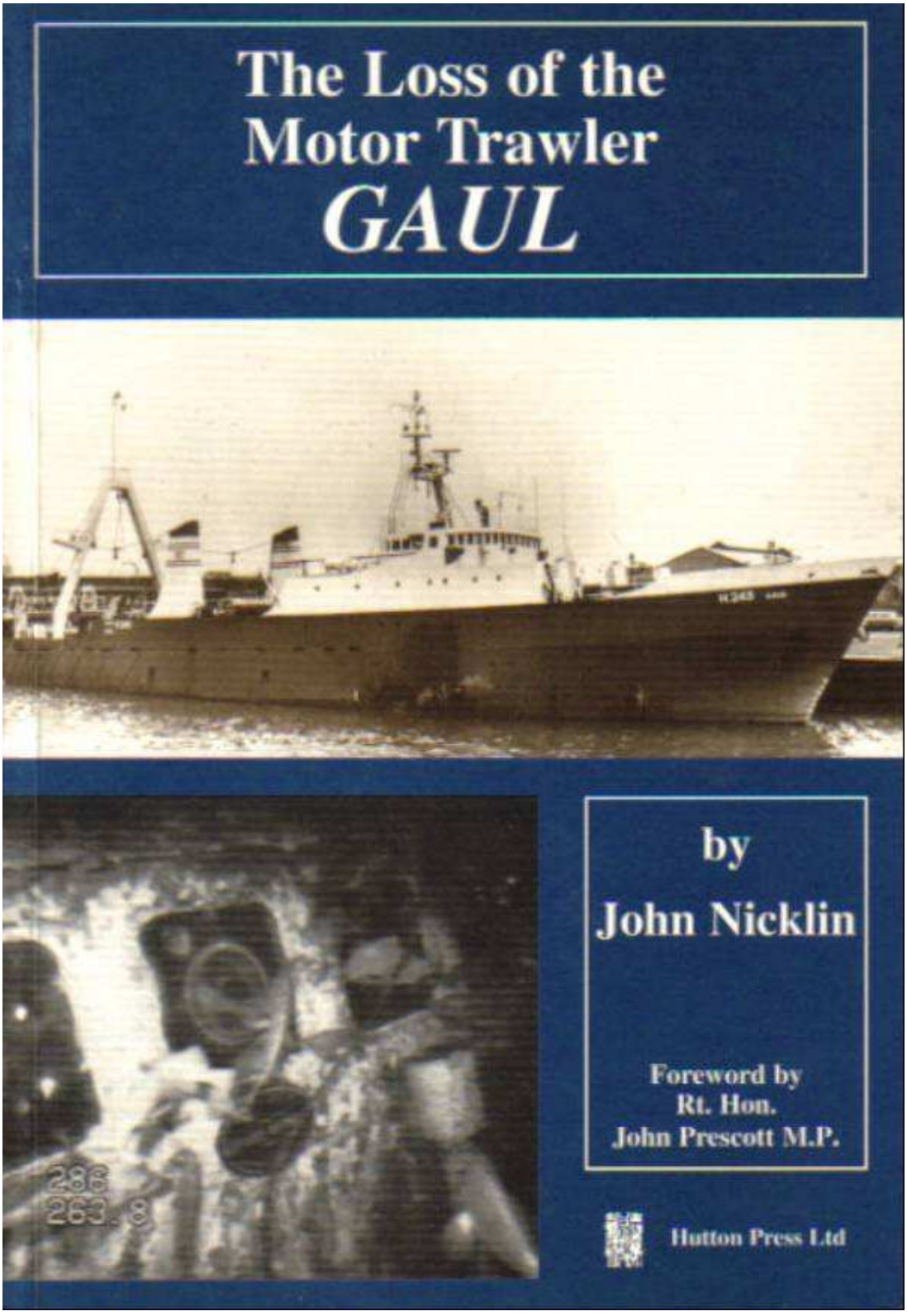
Figure 20.5: British Coal Corporation expenditure (£ million)[10]

	2001–02 Outturn	2002–03 Working Provision	2003–04 Plans	2004–05 Plans	2005–06 Plans
British Coal Corporation external finance	**(0.1)**	**0.4**	–	–	–
Movement in Provision	0.0	0.2	–	–	–
Increase/(decrease) in Provision	0.0	0.0	–	–	–
Cost of Capital	-0.1	0.2	–	–	–
Cash Expenditure (excluded from resource cost)	0.0	0.0	–	–	–

British Shipbuilders

20.17 British Shipbuilders (BS) continues to exist, under statute, as a public corporation responsible for commitments and liabilities arising from its former manufacture of ships and marine engines. Its only remaining assets are in cash and its primary remaining liability is in respect of employer liability. During 2002, management of the corporation's affairs was brought within the Department, with the appointment of DTI staff as Chairman and Directors, but BS remains a separate entity. (It is expected that it will be dissolved as soon as is practicable.) Settlements were reached during the year in respect of certain categories of health claims and these will be beneficial to both the corporation and claimants in terms of reducing uncertainty, speeding up claims processing, and managing BS cash assets prudently.

Appendix 4


The Loss of the
Motor Trawler
GAUL
by
John Nicklin
Foreword by
Rt. Hon.
John Prescott M.P.
Hutton Press Ltd

CHAPTER 8

THE LEGAL BATTLE

Early in 1979 there was an attempt in Hull to raise the money to mount an underwater search for the wreck of the GAUL and Mrs Shiela Doone, widow of Gaul's wireless operator, and other dependants, wrote to Hellyer Bros. on the 13th May 1979 asking the Company to make a donation towards this fund. On 18th May Mr. G.A. Hartley, a trawler manager employed by Hellyer Bros. Ltd.

.....

embedded in his trawl door (the GAUL's hull was painted blue), and a Norwegian Skipper believes he found the wreck of the GAUL and has a recording of it on sonar recording paper. In a another letter to Mrs Doone commenting on the later case, Mr. Hartley wrote ".... other people think the recording showed fish, not a vessel. We are unable to verify the skipper's assessment." The truth of the matter is that finding the GAUL would not have presented too many problems. Collecting the positions of the trawler skippers' reported findings would have limited the search area and once found on sonar it would have been a simple matter to get a camera down to verify the wreck. Look at what was done in the case of the TITANIC where the wreck was in really deep water, and how the wreck of the DERBYSHIRE was found, again in much deeper water than the GAUL is presumed to lie in. I sincerely believe I could have found the GAUL in a month. All that was required was the will and the financial backing. But as I propose to show, the last thing the GAUL's owners wanted at this time was the wreck on camera for fear of what the pictures would show.

In 1978, or sooner, a group of the dependants consulted Graham and Rosen, a firm of Hull solicitors who were specialists in marine law, with a view to suing the owners of the GAUL for compensation on the grounds of negligence. An application for legal aid was made and granted. Subsequently a writ was served to Hellyer Bros. and naming the GAUL's builders, Brooke Marine Ltd., as second defendants, who passed it on to U.K. Trawlers Mutual Insurance Company Ltd., the vessel's underwriters. Solicitors for the Insurance Company, A.M.Jackson & Co., engaged Michael Thomas QC and David Steel to advise on the defence to the negligence charge. In order to prove negligence the plaintiffs would presumably have to cast doubts on the findings of the Court of Inquiry into the loss, and this led to intensive investigation into the GAUL's stability. Rosen engaged Dr. Corlett of Burnet Corlett Partners Ltd., a firm of marine consultants to look at the GAUL's design and stability. Dr. Corlett's initial line of attack was to attempt to show that the arrangement of scuppers on the GAUL's trawl deck was inadequate or wrongly positioned to allow water from this deck to escape, that in bad weather it could be expected that a large amount of water would be continuously on this deck, and that the effective area of these scuppers did not comply with regulations in force at the time.

B.U.T engaged the services of Alan William Gilfillan, head of the naval architecture section of Y-ARD, a Glasgow firm of marine consultants, and John Andreas Tvedt, a naval architect. Brooke Marine called on the services of Laurence Draper, a weather and wave expert on the staff of the Institute of Oceanographic Sciences, and George Donaldson, their own chief naval architect. Between them they had little difficulty in refuting Dr. Corlett's assumptions, and Michael Thomas was of the opinion that the defence had a good case. However, while this battle was going on, the Department of Trade and Industry instructed the National Marine Institute to investigate fully the seaway stability of Gaul. N.M.I. carried out extensive tank tests and model experiments in the Solent simulating various sea conditions, some worse than were likely to have been encountered by the GAUL, and sea tests on the ARAB,

Lost at sea. amid secrecy and lies - sinking of the Hull, England-based fishing trawler Gaul

New Statesman, August 21, 1998 by John Gilbert

John Gilbert on the strange case of the Gaul, into whose loss John Prescott has just set up an inquiry

……..The Gaul was a 216ft long-stern factory freezer, a supertrawler built to the highest Lloyd's standards for operation in Atlantic and Arctic waters. She sailed on her last voyage from Hull in late January 1974 and made for the fishing grounds on the North Cape Bank in the Barents Sea. She was last seen on the morning of 8 February by the mate of another British trawler. The wind was gale force nine, the seas were rough, the waves over 40ft high. Twice that morning, the Gaul had reported in by radio in line with routine safety procedures. Later she sent off two personal telegrams from crewmen. Then she vanished without one nanosecond of a mayday signal or alarm.

……But it had been in the owners' interests to frustrate any attempts to find and examine their vessel. In 1978 bereaved relatives had moved to sue them for compensation, citing negligence. They got legal aid, writs were served.

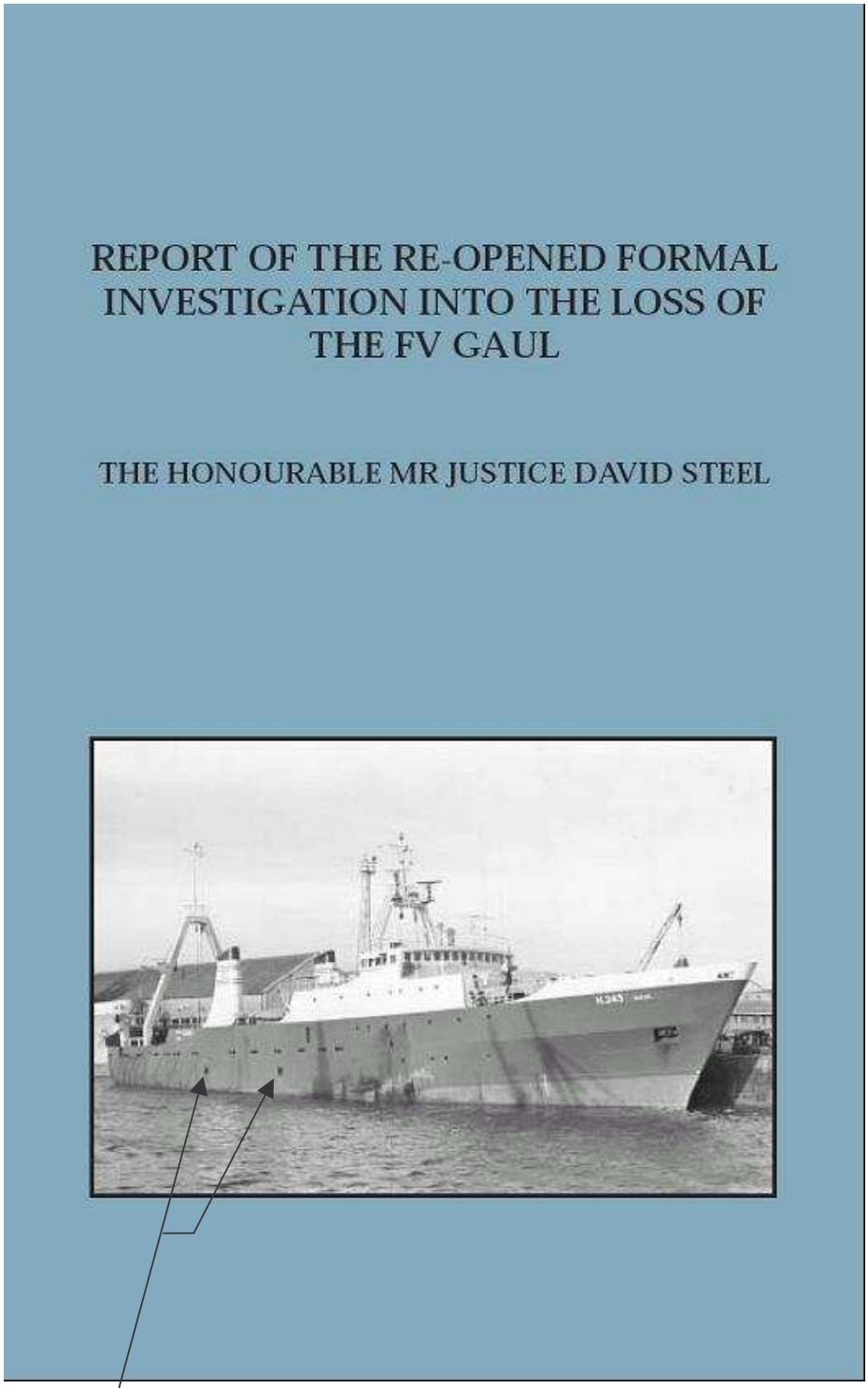
Then lawyers for the insurers got hold of a report by the National Marine Institute, which provided fresh grounds for negligence claims: the Gaul could not have foundered, it said, unless alarge amount of water had got into her hull and her supposedly watertight integrity thus breached. Relatives were never informed that such a document existed. The story was revealed a few weeks ago by John Nicklin, a former trawler and merchant navy skipper in his book, The Loss of the Motor Trawler Gaul (Hutton Press).

The lawyers advised an out-of-court offer to the dependants' families. It was made and refused. Legal aid was then withdrawn. Finally, [pounds]41,000 was accepted, of which more than half went on the costs of the dependants' lawyers. It has been calculated that each of the crew's 58 dependants (including the 37 children) received no more than [pounds]4,500, and much of that came from special appeal funds.

……Nicklin's book, however, develops a detailed argument based on 44 years of sea-going, latterly as the chief navigating officer on Hydrographic Survey vessels. He argues that the disaster was caused by a design fault in the ship, bad weather and negligence. Water got down to the ship's factory deck in large quantities probably because a weather deck door had been left open. Or it poured in through offal chutes and ventilators as the ship rolled in heavy seas. Reports from the official survey vessel sent out this month - that two hatches and a door were found open - appear to support this theory.

……."Politicians and others owe us a right to the truth. Doesn't John Prescott after all these years realise how mistrustful we all are? We've been lied to and conned for nearly a quarter of a century."

Appendix 5 (extracts from the report of the formal investigation together with critical comments)



Full information on the formal investigation (pdf. copies of the report and transcripts of evidence) available at www.fv-gaul.org.uk (all Crown Copyright)

FORMAL INVESTIGATION REPORT

THE MERCHANT SHIPPING ACT 1995

FV GAUL

RE-OPENED FORMAL INVESTIGATION

The Hon Mr Justice David Steel

The Assessors:

Dr David Aldwinckle

Peter Craven

Alan Hopper

LONDON: TSO

Extracts from report

GLOSSARY OF TERMINOLOGY

A-Frame – the frame structure, located above the fish loading hatches, so called because it is shaped like a capital letter A.

.....

centripetal – force acting equal and opposite to the centrifugal force but not necessarily in the same line but parallel

Class/classification – Ship classification covers the development and worldwide implementation of published Rules and Regulations which will provide for:- 1. the structural strength and scantlings of all essential parts of the hull and its appendages; 2. the propulsion and steering systems; and 3. the effectiveness of those other features and auxilliary systems, e.g. anchors and cables. The term is also sometimes used to denote that the vessel currently meets the above requirements, i.e. "the vessel is in Class".

– a small rigid open boat with a transom stern for general and emergency use

.....

Comment:

See "3.3.1 Classification service" in the IACS document, which is copied in **Annex 2,** page 32 below**,** and which defines the scope of ship classification (Of note here is the omission within this definition of Class' responsibility for watertight integrity)

watertight – impervious to the passage of water, as applied to ship's structure, closures and joints. A watertight opening is so constructed that when closed, it will prevent water under pressure from passing through, and normally incorporates a gasket

watertight integrity – closures and features that prevent the ingress of water or flooding from any source to certain compartments which are all essential to the safety of the vessel

weather deck – a deck exposed to the elements

weathertight – capable of being sealed to exclude water in normal sea conditions. A weathertight opening is typically designed to keep out rain and spray only

Comments: ***The definitions for watertight and weathertight given above are incorrect***

Watertight and **weathertight** are terms that have agreed International definitions such that items which are categorised and accepted as **watertight** or **weathertight** need to meet strict requirements for construction, strength, material thickness, gasketing, hinges and securing clips (these are generally set by National or International standard). Of note here is the fact that the inner covers of the Gaul's duff and offal chutes have been categorised throughout this report as being of a **'watertight'** standard, whilst in reality the construction, strength and arrangement of these two sets of covers would not meet the requirements that would be expected for '**weathertight**' closures. The principle shortfall of the chute's inner covers is related to their direction of opening when considered in conjunction with external sea pressure loading (*full sea loading on the covers would only be resisted by 3 butterfly nuts, instead of the overlapped gasketed steel plating arrangement that is normally associated with a weathertight joint).* For further information on this point see the comments and sketches which follow overleaf. For details of the correct definitions, *see Annex 1 on pages 26-30 below*

Comments continued:

Weathertight and watertight fittings on ships

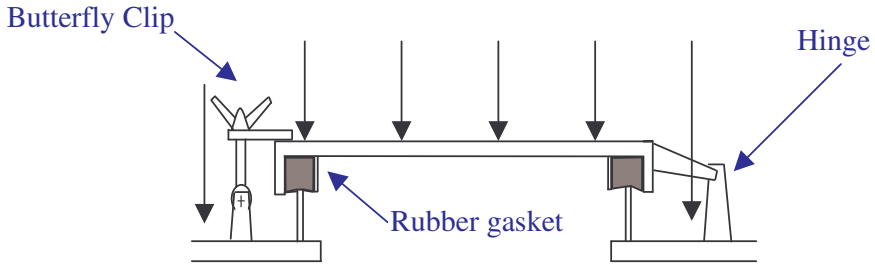
On ships there are various fittings attached to openings in the structure, which, when closed, are designed to prevent passage of water from one space to another or to prevent the ingress of seawater into the vessel's hull.

The technical standard that these fittings must meet is determined by International Legislation (The 1966 Load line Convention, the SOLAS Convention or the Torremolinos Convention as appropriate).

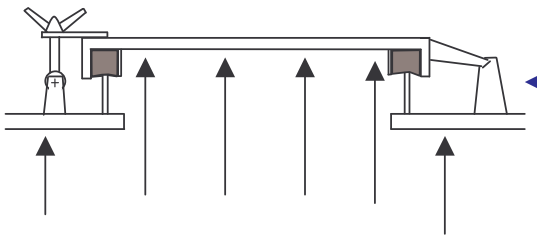
The fittings are classified as weathertight or watertight and the usage of these fittings is dependent upon the function that they are required to fulfil onboard the vessel. A watertight fitting must, when closed, prevent the passage of water through an opening no matter which side is under pressure. A weathertight fitting is designed to withstand water pressure and prevent the passage of water from one side only.

Watertight and weathertight fittings generally make use of rubber gaskets and clips (or bolts) to seal steel-to-steel joints and prevent the passage of water. Watertight fittings need many more bolts/clips than weathertight fittings.

Weathertight fitting: In the sketch below, water pressure tends to force the gasketed steel plate into the closed position and this compresses the gasket and prevents leakage. The fitting's clips and hinges are somewhat redundant when the fitting is loaded in this way. The fitting is strong and resistant to water pressure loads from the outside:



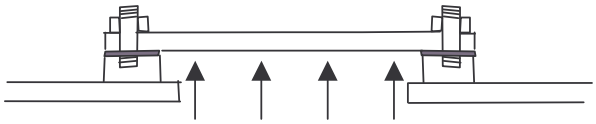
If the pressure is reversed on this same fitting, the gasketed plate will tend to lift and allow water leakage. The fitting's clips and hinges will also take the full force of the water pressure loading. The fitting is relatively weak when faced with water pressure loads from the inside:



The inner covers for the duff and offal chutes on the Gaul would be subject to loading in this manner, thus, by themselves, they could neither be regarded as weathertight nor as watertight.

The duff and offal chute openings in the hull of the the Gaul were provided with a two-barrier system (the outer flap and inner cover) which were required to maintain the hull's **watertight** integrity against ingress of water from the sea. However, for this to be effective and weathertight in rough seas, both barriers had to be closed and secured correctly.

Watertight fittings:



Typically, the joints in a **watertight** fitting would need to be provided with a gasket and closely spaced stud bolts and nuts. (if required to withstand water pressure loading other than nominal).

Extracts from report continued:

> *"Whereas on or about the 8th day of February 1974 the motor trawler GAUL, registered at Hull the official number H243, sank on the north Cape to the North of Norway with the loss of 36 lives and whereas a shipping casualty has occurred; and whereas a formal investigation was held into the said casualty, pursuant to an order of the Secretary of State; and whereas the Wreck Commissioner made a report to the Secretary of State by reported Court No: S493; and whereas the Secretary of State is satisfied that new and important evidence which could not be produced until the wreck had been discovered; now the Secretary of State for the Department of the Environment Transport and The Regions in pursuant of the powers conferred by Section 269 of the Merchant Shipping Act 1995 hereby orders that the whole of the case shall be re-heard by a Wreck Commissioner".*

1.6 In due course I, Mr Justice David Steel, was appointed Wreck Commissioner for the re-opened formal investigation ("RFI"). As specified by Section 268 of the Merchant Shipping Act 1995, the appointment of one or more assessors was required. I have had the inestimable advantage of having three assessors, Dr David Aldwinckle, Mr Peter Craven and Mr Alan Hopper. Dr Aldwinckle is a Chartered Engineer, a naval architect and former Senior Principal Surveyor to Lloyd's Register of Shipping. Mr Hopper is a naval architect and was formerly Technical Director of the Sea Fish Industry Authority. Mr Craven is an experienced former trawler skipper. Where appropriate those assessors and myself are collectively referred to as "we" in this report.

1.7 At a preliminary meeting on the 6 June 2000 I made a recommendation that an intrusive manned dive should be undertaken on the wreck of GAUL, a proposal supported by the Attorney General, whose Department was to conduct the Inquiry. The Secretary of State considered the recommendation but came to the conclusion that the risks of injury associated with a manned dive were unacceptable. A proposal for an intrusive examination with small remotely operated vehicles was put forward as a possible alternative. Whilst pursuit of

Duff and offal chutes

2.40 The vessel was equipped with refuse chutes located on the starboard side of the factory deck between frames 22 & 23 and 39 & 40 respectively. [The position given in the GA plan is inaccurate] Their purpose was to provide a means of disposing of waste material from the factory deck which could not be usefully converted into fishmeal. This would include stones, seabed rubbish, fish and parts of fish spilled from the processing irons and duffs. [see drawing at 2.47 below]

2.41 Duffs are a sponge like organism found over wide areas of the sub-arctic and particularly in the Barents Sea. Large quantities of duffs are a considerable nuisance to trawlers as they clog up the trawl. It is a time consuming task to clear them. Most are about the size of a football some are much larger, up to one metre in diameter, and have to be chopped up for disposal.

2.42 Although the after chute was designated a duff chute, it could have been used for any rubbish from the factory deck. The hopper on top of the duff chute was slightly smaller than the offal chute for no obvious reason except that the density of duffs is greater than that of fish offal. The forward chute was intended for the disposal of offal that would have been fed into the hopper above the chute by a conveyor from the fish processing machinery. By definition this chute was only needed when for some reason the offal was not fed into the fishmeal plant for processing.

2.43 The relevant drawing of these chutes, revision A dated 23 September 1970 can be seen at Appendix 5. There is a stamp on the drawing, presumably placed by Lloyd's Register which reads: "*the arrangements shown in this plan have been examined for compliance with the requirements of the 1930/1966 Load Line Conventions.*" There is also a handwritten note on the drawing stating: "*covers to be secured shut except when in use.*"

26

See page 34

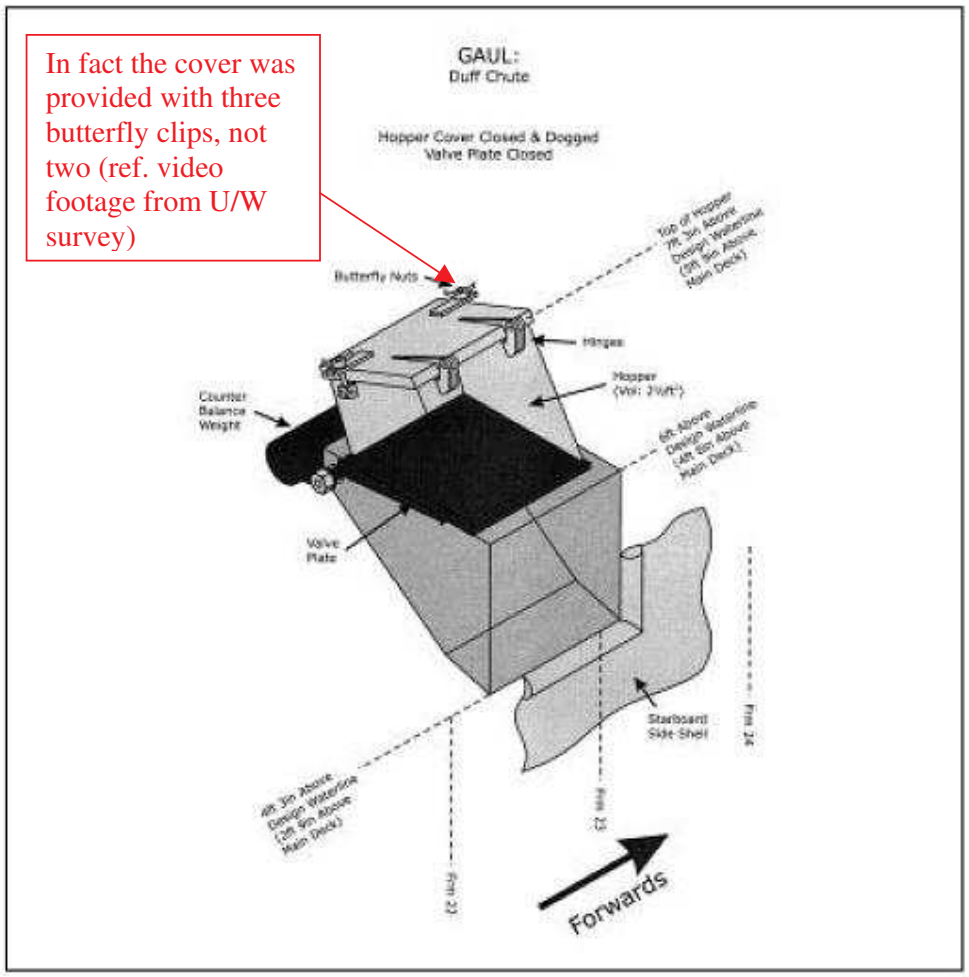
2.44 The principle of the design was a non-return valve constructed from steel in the shape of a wedge shaped box built into the side of the vessel, forming a sloped chute down to a square opening in the hull plating. One side was open to the sea and the top of the box open to the factory deck. There was a hopper fitted on the top of each wedge shaped box to collect waste material. In the case of the duff chute this was 2.5 cubic feet and the offal chute 3 cubic feet. The opening was closed by a flat steel valve plate with the plate counterbalanced by a cylindrical steel weight. Both the plate and the counter balance pivoted on a spindle mounted on the upper inboard edge of the box. The hoppers were above this and were provided with steel hinged lids. In the case of the duff chute this was a single lid hinged out toward the ship's side. In the case of the offal chute, it had a split lid with the two halves hinged forward and aft. A drawing of the duff chute is shown on the next page.

2.45 The draftsman had put the following note on the drawing with reference to the weight of material in the hopper which would open the hinge flap by overcoming the effect of the counter balance weight: "*Theory. Anticipated full load in discharge hopper 130 lbs at stowage rate at 45 cubic feet per ton. Considered working load 113 lbs, counter balanced weight being 162 lbs. By moments 113 lbs at 10 inches lever = 162 lbs at 7 inches lever*". In fact the draftsman's calculations were incorrect in that they took no account of the weight of the valve plate.

2.46 During the RFI, an attempt was made to correct the calculations by accounting for the weight of the valve plate, albeit no clear dimensions of the valve plate could be found. The conclusion was that, ignoring any friction on the hinge, the approximate weight required in the hopper to open the valve plate would have been about 35 lbs which is about 0.5 cubic feet of waste.

2.47 Fish waste and other material would be collected in plastic 84 lb baskets from the deck, Turo pump sumps and from the sorting conveyor. Duffs would be

In fact the cover was provided with three butterfly clips, not two (ref. video footage from U/W survey)



chopped up by a shovel and collected in similar baskets. This material would then be dumped from time to time though the chutes.

2.48 The design was apparently simple and use of the hoppers should have been straightforward (albeit that the height of the rim of the hopper at 5 ft 10 inches above the deck might have been somewhat high). But an annotation on the drawing states that the design of the watertight hopper hatch cover was "too fiddly". This view was shared by the expert in this field, Mr Tanton.

2.49 In his view, the primary difficulty was that the design of the hinge was too elaborate for the purpose of operating the valve plate. The square machine

sections of the spindle, and the corresponding square holes in the support arms attached to the underside of the valve plate and in the balance weight connecting arms, would eventually wear round due to the repeated impact of the valve plate with the lower part of the chute, effectively disconnecting the balance weight from the valve plate. In any event, it was notable that there was no grease nipple. Yet the use of mild steel for the hinge spindle in a highly corrosive atmosphere would have inevitably resulted in corrosion within the brass gland. Furthermore, it is not clear how the spindle could have been repaired or replaced should the need arise without burning off the balance weight from the connecting arms (something that was found to have been done on the sister vessel Kappin [formally Arab] by representatives from the Inquiry when inspected in 2003).

Comment

In fact sintered bronze 'oilite' (oil impregnated) bearings were provided

Comment

The construction drawings for the duff and offal chutes, show quite clearly that the hinge, spindle, balance weight and connecting arms can be readily dismantled for maintenance, repairs or replacements. The balance weights were bolted to the connecting arms and bolted access plates were provided within the chute's trunk plating, which allowed access to the securing nuts at the end of each spindle

18. Maintenance

18.1 This topic leads to a final issue, namely how the duff and offal chutes came to be seized in the open position despite such maintenance and repair work as was performed by the owners, their shore staff and the crew.

18.2 So far as the structure of the owning company was concerned, the OFI was provided with an organogram of B.U.T. Mr Hellyer was Chairman and Managing Director. (He did not give evidence at the OFI.) Reporting directly to him was Mr Oswald, the Freezer Trawler Manager and Director and Mr

.....

that he never looked at the duff and offal chutes on the GAUL or any other vessel because there was nothing really to go wrong with them [RFI Day 7 p.78].

18.22 The fact that the duff and offal chutes were found seized in the open position on the seabed obviously gives rise to the inevitable inference that they were not properly inspected or maintained prior to the vessel departing from Hull on her final voyage. We recognise that the vessel was less than 18 months old. We also recognise that she had undergone an annual survey by her Classification Society in May 1973. At that time, the chutes were said to be in good condition. However, Councillor Clark gave evidence related to his work on the Kurd and the Kelt in 1974 when he was employed by Humber St Andrews Engineering Company. He agreed that soon after an inspection or survey of a watertight door, which had been found to be in a good condition, it could within days, after being well oiled, rust and be in a bad condition again, especially if it rained (RFI Day 10 p.93-101). In other words, these weathertight and watertight items could become inoperative long before the next annual survey was due by Class,

Comments

During the course of the investigation it (apparently) became an established fact that the non-return flaps within the duff and offal chutes were found, during the underwater survey, to be seized in the open position.

The only fact, however, that can be stated with certainty is that during the underwater survey, the two non-return flaps were found to be open.

The reason why they were open (due to damage, corrosion/seizure of the flap bearings or some other cause) was not determined during the course of the investigation.

21. Answers to the questions

21.1 What was or were the probable cause or causes of the loss of the GAUL?

A sudden and rapid accumulation of water on the factory deck, which when the officer of the watch realised the situation, he applied full port helm and full pitch to try to get out of trouble. The water almost certainly came through the open duff and offal chutes, when the vessel was proceeding on a southerly course probably towards the Norwegian Coast for a lee shore. Some additional water may have been present from internal flooding due to hoses and machinery being left running or from the trawl deck through the open door to the factory deck. The water rapidly built up to 100 tons at which point it started to flood the liver plant further increasing the angle of heel. At worst the flooding through the duff and offal chutes could have taken the ship from a safe to critical scenario in 20 minutes. The combination of excessive water on the factory deck and the forces due to turning simply forced the vessel past the point of no return.

21.2 What possible causes can be eliminated by the evidence which is now available?

All other causes including, seizure, scuttling, fire, collision, explosion, missile attack, torpedo attack, striking a mine, icing, cargo shift, structural failure, grounding, snagging a seabed cable or a submarine.

21.3 What other possible causes remain open?

None.

21.4 Was the design and construction of the duff and offal chutes satisfactory to prevent the ingress of seawater onto the factory deck?

Yes. The duff and offal chutes were fitted with a self closing non-return flap and watertight covers. The design of the non-return flap was liable

See comments at foot of following page

to seize over time and had no real means whereby it could be maintained. Proper use of the watertight covers would however prevent water ingress.

21.5 At the time of the loss, were the duff and offal chutes closed and secured so as to prevent ingress of water onto the factory deck?

No.

21.6 When the vessel sailed from Hull on her last voyage, were the closing arrangements of the duff and offal chutes in a fit and proper condition to prevent the ingress of seawater onto the factory deck?

See first paragraph on page 38

Not in so far as the self-closing non-return flap is concerned, which was seized in the open position. Yes, as far as the watertight covers were concerned.

21.7 At the time of the loss, could the duff and offal chutes have been closed to prevent seawater ingress of water onto the factory deck?

Yes. There was no physical reason why the watertight covers could not have been closed and secured.

21.8 Was the GAUL fishing at the time of her loss?

No.

21.9 What steps should be taken to avoid a similar loss in the future?

(i) Clear instructions to crews that openings in the ship's sides should be secured closed when not in use, together with further education of fishing vessel officers as to the importance of ensuring that no water accumulates on the factory deck.

(ii) Fitting of automatic pumping arrangements in the factory decks of trawlers;

Comments:

As previously explained, the use of the term "watertight" in descriptions for the chute's inner covers is incorrect. (See pages 16 and 17)

Similarly, the design and construction of the closing arrangements for the duff and offal chute openings were clearly not satisfactory for preventing the ingress of water onto the factory deck. If they had been satisfactory, the vessel would not have sunk!

Annex 1

1974 SOLAS convention as amended:

SOLAS

Consolidated Edition, 2002

Consolidated text of
the International Convention for
the Safety of Life at Sea, 1974,
and its Protocol of 1988:
articles, annexes and certificates

Incorporating all amendments
in effect from 1 July 2002

International Maritime Organization
London, 2002

11 *Weathertight* means that in any sea conditions water will not penetrate into the ship.

12 An *oil tanker* is the oil tanker defined in regulation 1 of Annex I of the Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships, 1973.

13 *Ro–ro passenger ship* means a passenger ship with ro–ro cargo spaces or special category spaces as defined in regulation II-2/3.

Regulation 3
Definitions relating to parts C, D and E

For the purpose of parts C, D and E, unless expressly provided otherwise:

1966 Load Line Convention as amended:

RESOLUTION MSC.143(77)
(adopted on 5 June 2003)

ADOPTION OF AMENDMENTS TO THE PROTOCOL OF 1988 RELATING TO THE INTERNATIONAL CONVENTION ON LOAD LINES, 1966

(12) *Flush deck ship*. A flush deck ship is one which has no superstructure on the freeboard deck.

(13) *Weathertight*. Weathertight means that in any sea conditions water will not penetrate into the ship.

(14) *Watertight*. Watertight means capable of preventing the passage of water through the structure in either direction with a proper margin of resistance under the pressure due to the maximum head of water which it might have to sustain.

(15) *Well*. A well is any area on the deck exposed to the weather, where water may be entrapped. Wells are considered to be deck areas bounded on two or more sides by deck structures.

Regulation 4
Deck line

The deck line is a horizontal line 300 mm in length and 25 mm in breadth. It shall be marked amidships on each side of the ship, and its upper edge shall normally pass through the point where the continuation outwards of the upper surface of the freeboard deck intersects the outer surface of the shell (as illustrated in figure 4.1), provided that the deck

1977 Torremolinos convention for the safety of Fishing Vessels:

TORREMOLINOS INTERNATIONAL CONVENTION FOR THE SAFETY OF FISHING VESSELS, 1977, being the PROTOCOL OF 1993 together with the Regulations Annexed to the Convention as modified by the Annex to the Protocol

REGULATIONS FOR THE CONSTRUCTION AND EQUIPMENT OF FISHING VESSELS

CHAPTER I

GENERAL PROVISIONS

Regulation 1

Application

Unless expressly provided otherwise, the provisions of this Annex shall apply to new vessels.

Regulation 2

Definitions

(1) "New vessel" is a vessel for which, on or after the date of entry into force of the present Protocol:

(a) the building or major conversion contract is placed; or

(b) the building or major conversion contract has been placed before the date of entry into force of the present Protocol, and which is delivered three years or more after the date of such entry into force; or

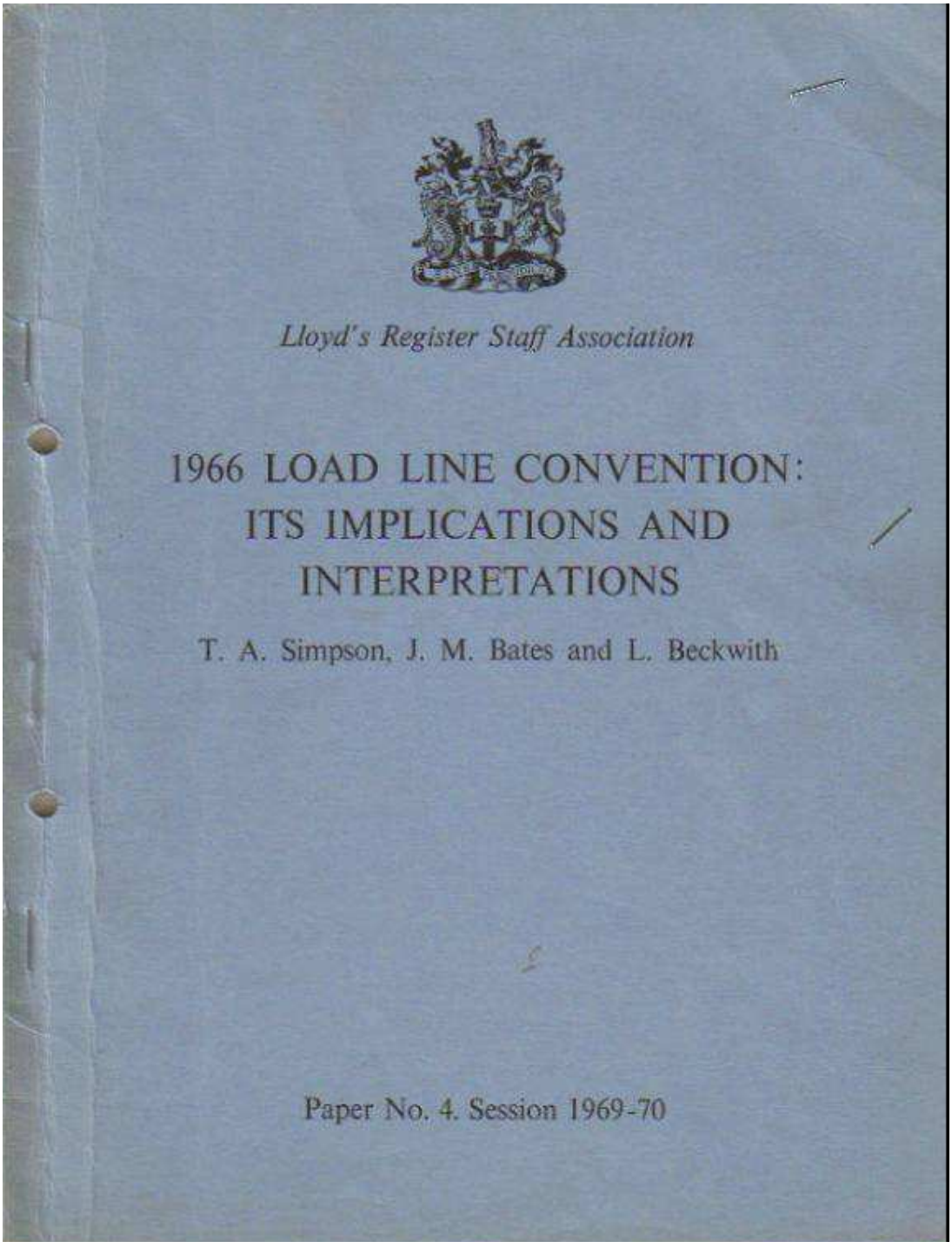
.....

(19) "Height of a superstructure or other erection" is the least vertical distance measured at side from the top of the deck beams of a superstructure or an erection to the top of the working deck beams.

(20) "Weathertight" means that in any sea conditions water will not penetrate into the vessel.

(21) "Watertight" means capable of preventing the passage of water through the structure in any direction under a head of water for which the surrounding structure is designed.

Lloyd's Register's interpretations of the 1966 Load Line Convention:



Lloyd's Register Staff Association

1966 LOAD LINE CONVENTION:
ITS IMPLICATIONS AND
INTERPRETATIONS

T. A. Simpson, J. M. Bates and L. Beckwith

Paper No. 4. Session 1969-70

(11) *Flush Deck Ship*—A flush deck ship is one without superstructures on the freeboard deck and one in which the freeboard deck is not stepped at any point throughout the length.

(12) *Weathertight*—"Weathertight" means that in any sea conditions, water will not penetrate into the ship, interpreted generally as indicating that watertightness is required from the outside only, as against "watertight" indicating ability to withstand water pressure from either inside or outside.

Weathertightness of hatches and doors can usually be obtained by the use of gaskets and toggles or bolts at a reasonable pitch, so as to ensure that water will not penetrate from the outside as a result of a searching hose test of such a nature as to give the same effect as the Convention requirement of "any sea conditions".

REGULATION 4

DECK LINE

The deck line is a horizontal line 300 millimetres (12 inches) in length and 25 millimetres (1 inch) in breadth. It is marked at amidships on each side of the ship with the upper edge normally in line with the point where the continuation outwards of the upper surface of the freeboard deck, or of any wood sheathing on that deck, intersects the outer surface of the shell.

The deck line, however, may be placed with reference to any other fixed predetermined point on the ship's side, due to such circumstances as radiused gunwale or welded corner connection of sheerstrake and stringer, on condition that the freeboard is correspondingly corrected. Some such conditions are indicated in Fig. 9. The fixed point should be as near as practicable to the position described above in this Regulation.

The deck line should also be kept clear of any "E" quality plating wherever possible. If this is impracticable the deck line should be cut in on a separate plate of suitable size of "A" quality material welded to the shell, or marked by bead welding on the shell plate itself. In either case the "E" quality plating should be preheated and the electrodes used should have a low hydrogen content. Surveyors may, however, taking into account climatic conditions and accepted local practices, use their discretion in adopting other methods of marking. The location of the deck line and the identification of the freeboard deck in all cases will be indicated on the Load Line Certificate when issued.

REGULATION 5

LOAD LINE MARK

The Load Line Mark is to consist of a ring 300 millimetres (12 inches) outside diameter and 25 millimetres (1 inch) wide, intersected by a horizontal line 450 millimetres (18 inches) in length and 25 millimetres (1 inch) in breadth, the upper edge of which passes through the centre of the ring. The centre of the ring is placed amidships and at a distance equal to the assigned summer freeboard measured vertically below the upper edge of the deck line (Fig. 10).

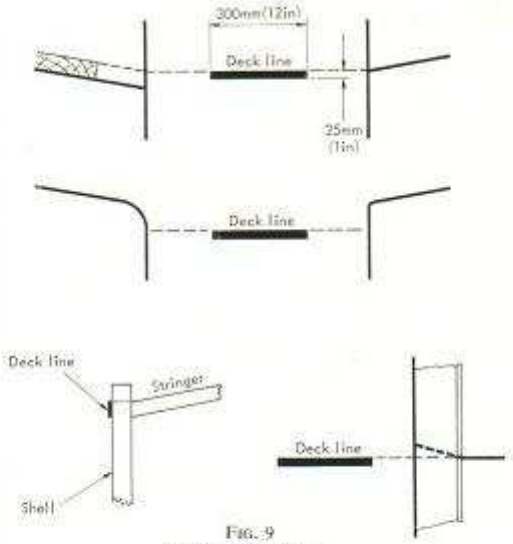


FIG. 9

Position of deck line.

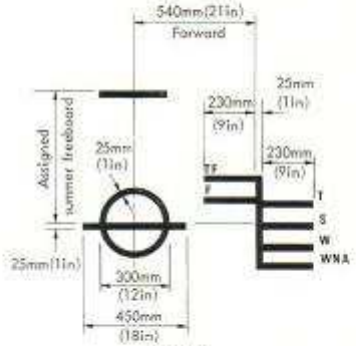


FIG. 10

Load line marks.

REGULATION 6

LINES TO BE USED WITH THE LOAD LINE MARK

The text of the English version of the International Conference on Load Lines is reproduced hereafter, slightly amended where considered expedient:—

(1) The lines which indicate the load line assigned in accordance with these Regulations are to be horizontal lines 230 millimetres (9 inches) in length and 25 millimetres (1 inch) in breadth which extend forward of, unless expressly provided otherwise, and at right angles to, a vertical line 25 millimetres (1 inch) in breadth marked at a distance 540 millimetres (21 inches) forward of the centre of the ring as illustrated in Fig. 10.

Annex 2

I A C S

International Association of Classification Societies

Quality System Certification Scheme

Quality Management System Requirements

APPROVED BY IACS COUNCIL NOVEMBER 2001

2 Normative reference

The following normative documents contain provisions which, through reference in this text, constitute provisions of these requirements. For undated references, the latest edition of the normative document referred to applies. Members of IEC, ISO, IACS, IMO or national Administrations maintain registers of currently valid international standards:

- ISO 9000:2000 Quality Management Systems - Fundamentals and vocabulary,
- EN 45004:1995, (ISO/IEC 17020:1998) General criteria for the operation of various types of bodies performing inspection,
- International Maritime Organization Resolution A.739(18), Guidelines for the authorisation of organizations acting on behalf of the Administration,
- International Maritime Organization Resolution A.789(19) Specifications on the survey and certification functions of recognised organizations acting on behalf of the Administration,
- IACS Code of Ethics,
- IACS Procedural Requirements.

3 Terms and definitions

For the purposes of these QSCS Requirements the following terminology applies in addition or in substitution of the Terms and Definitions of ISO 9000:2000 para 2 where these are not adequate for the work of Classification Societies.

3.1 Society

An organization, as defined in ISO 9000:2000, providing classification and statutory certification of ships and offshore installations and relevant services and products.

3.2 Product

The result of Society's activities.

The product(s) of a Classification Society is(are) usually of the following generic categories:

- Services (see 3.3)
- Information services (e.g. access to Society's Class database)
- Software (e.g. calculation programs related to classification/statutory compliance process developed by the Society either for internal use or made available to the public)
- Hardware (e.g. Documentation, Publications).

3.3 Services

3.3.1 Classification service

The results generated by classification activities at the interface between the Classification Society and the customer and the Classification Society's internal activities to meet customer needs.

Classification, as a minimum, is to be regarded as the development and worldwide implementation of published Rules and Regulations to provide for:

a) the structural strength of (and where necessary the watertight integrity of) all essential parts of the exterior boundaries of the ship or offshore installation and its appendages,

b) the safety and reliability of the propulsion and steering systems, and those other features and auxiliary systems which have been built into the ship or offshore installation in order to establish and maintain basic conditions on board,

thereby enabling the ship or offshore installation to operate its intended service.

Appendix 6

Extract from 1995 Merchant Shipping Act:

Re-hearing of and appeal from investigations.

269.—(1) Where a formal investigation has been held under section 268 the Secretary of State may order the whole or part of the case to be re-heard, and shall do so—

(a) if new and important evidence which could not be produced at the investigation has been discovered; or

(b) if there appear to the Secretary of State to be other grounds for suspecting that a miscarriage of justice may have occurred.

(2) An order under subsection (1) above may provide for the re-hearing to be as follows—

(a) if the investigation was held in England, Wales or Northern Ireland, by a wreck commissioner or by the High Court;

(b) if it was held in Scotland, by the sheriff or by the Court of Session.

(3) Any re-hearing under this section which is not held by the High Court or the Court of Session shall be conducted in accordance with rules made under section 270(1); and section 268 shall apply in relation to a re-hearing of an investigation by a wreck commissioner or sheriff as it applies in relation to the holding of an investigation.

(4) Where the wreck commissioner or sheriff holding the investigation has decided to cancel or suspend the certificate of any person or has found any person at fault, then, if no application for an order under subsection (1) above has been made or such an application has been refused, that person or any other person who, having an interest in the investigation, has appeared at the hearing and is affected by the decision or finding, may appeal—

(a) to the High Court if the investigation was held in England, Wales or Northern Ireland;

(b) to the Court of Session if it was held in Scotland.

(5) Section 268(7) applies for the purposes of this section as it applies for the purposes of that section.

Part II

2. The Gaul's Duff and Offal chutes and their means of closure - a design fault from the time of build

The sketches below illustrate the arrangements of the duff and offal chutes on the Gaul and how they function when refuse is discharged overboard. They also illustrate that the arrangement of the outer flap is of defective design and that it could fail to work correctly during normal service (sketch 2.1.d).

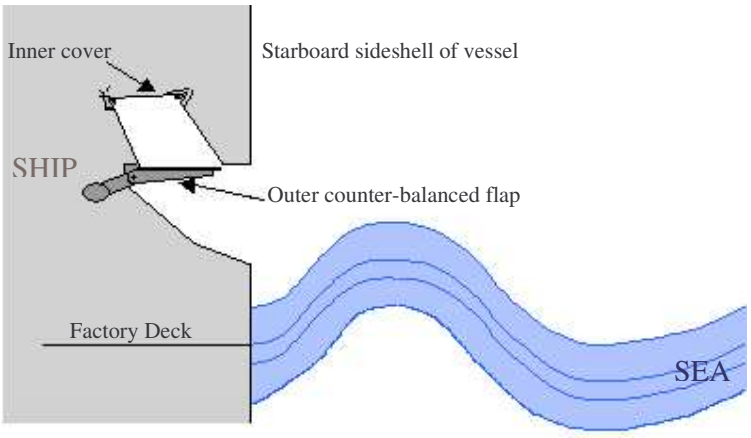
Sketches 2.2.a) and 2.2.b) below, show that with slightly different constructional arrangements (to those provided on the Gaul) the **design fault** would have been eliminated.

This **design fault** stems from the 'non-return'[2] function that the flap is required to perform whenever seawater (due to waves) seeks to flood into the ship through the chute's side openings. The inward flow of seawater should always force the flap into the closed position; it should not cause the flap to open (see sketch 2.1.d) below). Whilst the counterbalance weight arrangement that was provided on the Gaul obviously assists by promoting 'self closing' in addition to the 'non return' function, it is the orientation of the valve plate (when open) to fluid flow that is of paramount importance. It may be noted that the non-return functionality that the flap is required to possess is similar to that which is utilised routinely in some types of valves, which are used extensively in fluid piping systems.

> ***"Check Valves -*** *Check valves are automatic valves that open with forward flow and close against reverse flow. Check valves, also known as* ***non-return*** *valves, prevent return or reverse flow and maintain pressure. Check valves do not require an outside power supply or a signal to operate. In fact, a check valve's operation depends upon the direction in which the water is flowing. If the flow stops or if pressure conditions change so that flow begins to move backward, the check valve's closure element moves with the reverse flow until it is seated, preventing any backward flow. There are different types of check valves, but they all have the same operating principle." (Definition obtained from the Internet)*

2.1 Arrangements provided on the Gaul: cross-sections through the vessel's side in way of the duff/offal chute openings (looking forward) showing their design and operation during rubbish discharge:

a) Sketch showing the arrangement of the duff and offal chutes and their closing appliances: i.e. hinged inner cover with securing toggles and outer counter-balanced non-return flap both in their closed positions:

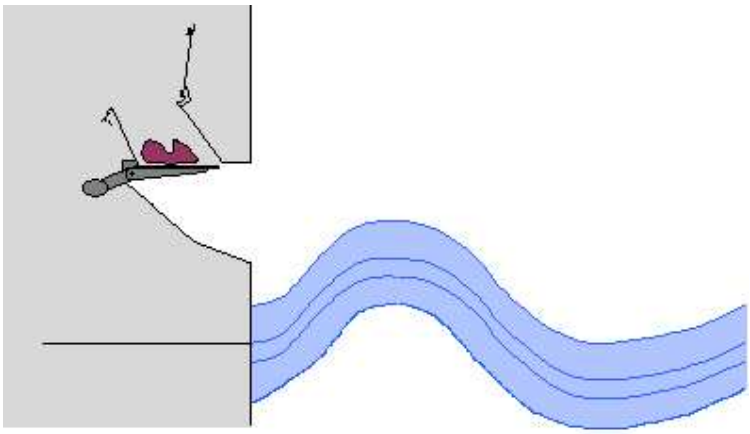


[2] See definition for 'non-return valve' on page xiv of the report of the re-opened formal investigation. See also para 2.44 on page 20 of this document.

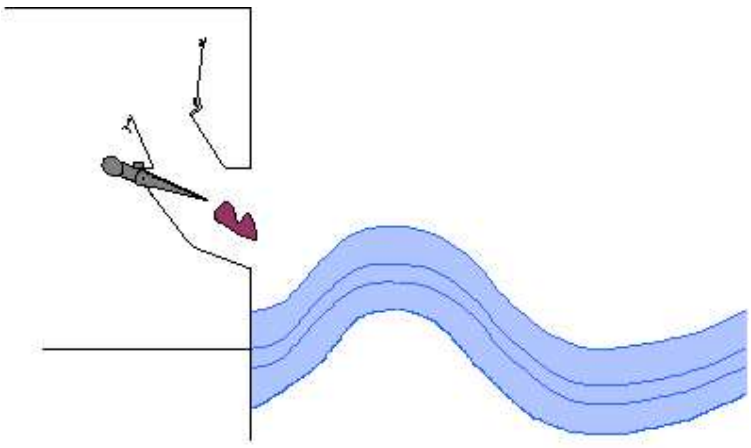
In the above arrangement, the outer counter-balanced flap provides the primary strength barrier (when it is closed) and this is capable of taking the full force of the sea. However, the non-return flap is not wholly weathertight and water can leak past this flap. The hinged inner cover, on the other hand, is not meant to take the full force of the sea (it is not strong enough) but it will prevent water that has leaked past the non-return flap from entering into the ship's factory space.

In order to assure the watertight integrity of the hull, it is necessary for both the non-return flap to be closed and for the inner cover to be closed and secured correctly.

b) Sketch showing the arrangement of the duff and offal chutes: the inner cover has been opened, the outer counter-balanced non-return flap remains in the closed position and rubbish has been placed in the chute 'hopper' space:



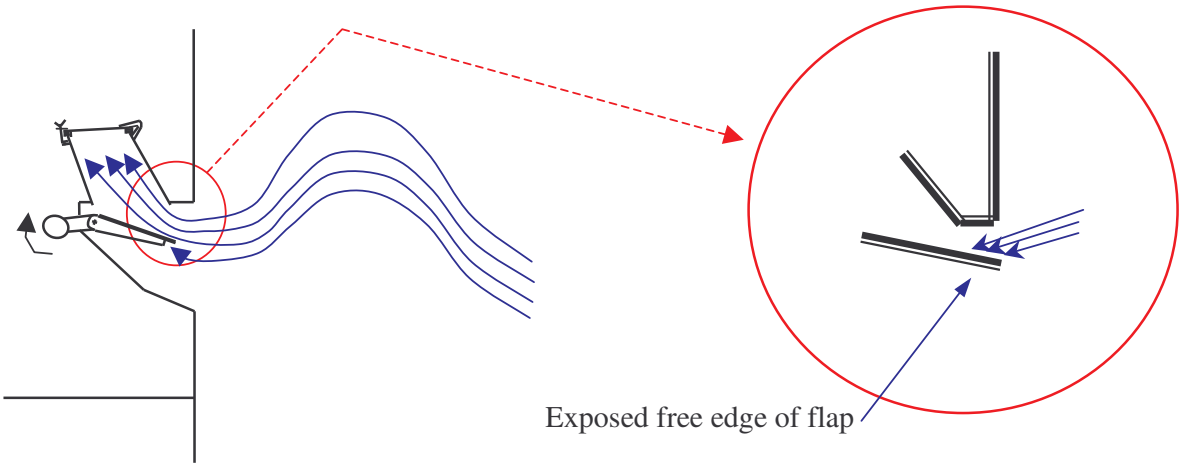
c) Sketch showing the arrangement of the duff and offal chutes: the inner cover is in the open position, the outer counter-balanced non-return flap has been opened and the rubbish is being discharged overboard:



d) Considering the non-return flap arrangement that was provided onboard the Gaul:

If, for any reason, the flap was not fully closed (e.g. if an accumulation of offal remnants or stiffness in the hinges had prevented it from closing completely), the sea could act directly on the exposed free edge of the flap and push it open.

In rough weather, this could subsequently allow the full force of the sea to impact on the relatively weak hinged inner cover.

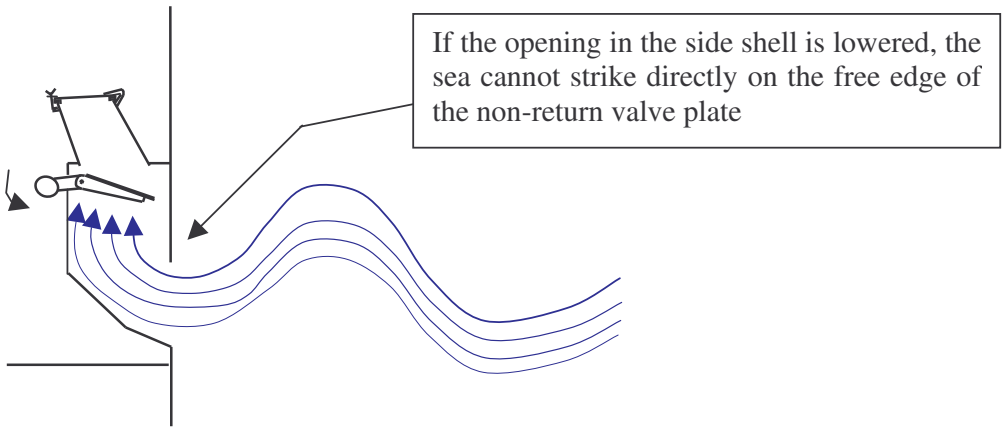


For correct 'non-return' operation, a flow of seawater into the chute should always force the non-return flap plate into the closed position. However this was not the case on the Gaul. The design of the non-return flap arrangement on the Gaul is therefore deficient and it could be expected to malfunction during normal service.

2.2 Considering two slightly different constructional arrangements for the duff and offal chutes, in which the design fault is not present and in which the non-return flap could be expected to function correctly:

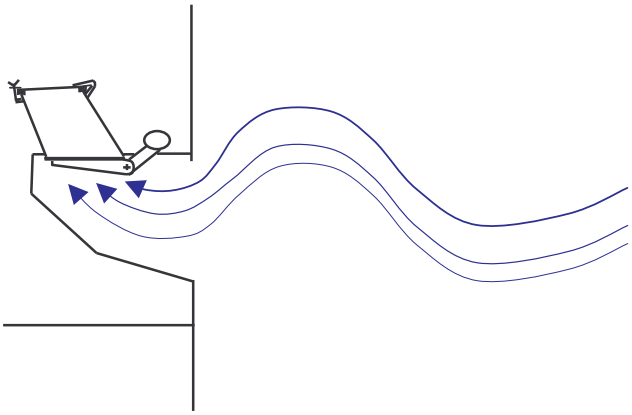
If the position of the opening in the side shell were lowered (or alternatively if the chute and hopper construction were raised inside the factory space) so that the free edge of the non-return flap was not exposed to direct wave impact then the non-return flap would function as required.

a) For the arrangement shown below, the action of the sea would always tend to close the non-return flap:



b) The more usual arrangement, however, and one which is commonly found within the fishing industry, is that where the orientation/direction of the opening for the flap is reversed.

In this case, again, the direct action of the sea will always tend to close the flap:



A further note:

The official investigation has suggested that, due to corrosion and the difficulties of maintaining the flap's hinges, it was inevitable that the duff and offal flaps would seize (fail) over time:

> "*The design of the non-return flap was liable to seize over time and had no real means whereby it could be maintained." ……(See Para 21.4 in the Formal report)*

If this were in fact correct, then this may also be viewed as a **design fault** (If something needs to be maintained throughout its service life but it is not provided with the means to allow such maintenance, then this is a fault in the design).

3. A Criticism of the findings of the investigation and two alternative loss scenarios

Whilst it would appear that the results from the 2002 underwater surveys support the findings of the formal investigation that are mentioned on page 3, it is suggested that it is unlikely that the non-return flaps for both the duff and offal chutes were seized in the open position at the time the vessel left port (see paragraph 21.6 on page 25). If the non-return flaps had been seized fully open during the **16 days** of its last voyage, then any crew members working within the factory space would have undoubtedly noted that seawater poured into their workspace whenever the weather was poor and the vessel's pitch and roll motions coincided with unfavourable external waves. After noting this, the crew would have, no doubt, made positive efforts to free the flaps in these two side openings.

It is therefore suggested that a slightly different sequence of events led up to the vessel's loss in 1974.

It is agreed that the major issues in this investigation are the facts that both the non-return flaps and the inner covers of the duff and offal chutes were found to be open during the underwater surveys in 2002, and that these two openings could have let in an amount of water that could bring about the vessel's loss.

That being said, if the closures to these two side openings were not left open by the crew, then some other event must have occurred, immediately prior to the vessel's loss, in which both the non-return flaps and the inner covers were moved from the 'closed' to the 'open' positions.

Two alternative loss scenarios[3] are outlined below:

> ***Scenario 1***. *During the course of the Gaul's last voyage, the non-return flaps on both the duff and offal chutes become stiff and eventually stick in the 'open' position. The crew, rather than spending valuable time in freeing these flaps, decide that, whenever they leave the factory space, the inner covers for both the duff and offal chutes will be closed and secured to prevent the ingress of any seawater. On the final day, however, when the crew have left the factory space, the weather deteriorates severely and a series of heavy seas bursts open the relatively weak inner covers of both the duff and offal chutes. Water then floods into the factory space and the vessel is lost.*

Although the quality of this image is poor, one of the forked lugs on the cover, which is used in conjunction with the butterfly securing toggles, appears to be damaged (slightly spread). This would be consistent with the cover bursting open after having been secured (with one toggle) by the crew.

See image 1 (page 5) in the report of the investigation

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[3] These two scenarios both result in the flaps and covers being in the 'open' position at the time that the vessel was lost and are at least as plausible as the one scenario that has been put forward by the formal investigation.

***Scenario 2**. During the Gaul's last voyage, the non-return flaps on the duff and offal chutes are functional but stiff to operate. They have not seized completely as the hinges contain **oilite** bearings and this, coupled with the fact that the non-return flaps are in continuous but intermittent use, has prevented the hinges from seizing solid. The hinges, whilst stiff, allow the flaps to operate from the fully closed to the fully open positions Nevertheless, while the flap is relatively free to travel over 80% of its operating range, it becomes stiff at the extremities of this range (i.e. when near to fully open and when near to fully closed). The crew are not unduly inconvenienced by this, as it helps them when they are discharging duff and offal refuse - they just have to open the flaps, throw out the rubbish and the flaps stay open until they decide to close them.*

Just prior to the loss, the crew have finished processing work on the factory deck and are told to close up as there is some bad weather ahead and this will give them some free time. The flaps in both the duff and offal chutes are then closed, but the inner covers are left open, the crew naturally assuming that no major ingress of water would take place with the non-return flaps in the closed position.

Unfortunately, due to the stiffness of the hinges, both flaps have not closed completely and the free edge of each flap is left exposed to the action of the waves. During the heavy weather that follows, the flaps are hit by a number of large breaking waves and this moves the flaps to their fully open position where they remain (because the hinges are stiff). Water then floods into the factory space and the vessel is lost.

Final Comments:

In each of the two scenarios that have been outlined above, it is not the crew, the vessel's owner or the shore maintenance staff, which are at fault; it is the poor design of the vessel's equipment that is to blame:

> ***Scenario 1. The fact that the flap's hinges were difficult to maintain, and also liable to seize over time due to corrosion, meant that the non-return flaps were not in place when they were needed as the vessel's primary barrier against the forces of the sea. The strength of the inner covers was insufficient to withstand the forces of the sea and in this scenario their subsequent failure led to the loss of the vessel.***
>
> ***Scenario 2. The fact that the flap's 'non-return' function was not totally effective, (unless the flaps were fully closed), meant that the flaps failed when they were needed most as the vessel's primary barrier against the forces of the sea, in this scenario their failure led to the loss of the vessel.***