

Leeson Lane, Dublin 2, Ireland.  
Tel: +353 1 678 2460.  
Fax: +353 1 678 2159.  
Freefone: 1800 202614.



**REPORT OF THE  
INVESTIGATION INTO  
THE SINKING OF THE M.V.  
"CLIPPER CHEYENNE" AT  
FOYNES ON THE 3RD JUNE  
2002.**

**The Marine Casualty Investigation Board was established on the 5<sup>th</sup>, June 2002 under The Merchant Shipping (Investigation of Marine Casualties) Act 2000**

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## 1. SYNOPSIS.

- 1.1 A roll-on/ roll-off heavy lift semi-submersible dock ship the "Clipper Cheyenne" sank while loading cargo in the semi-submersible mode, known as "float-in/ float-out" (flo-flo), mode in Foynes, Co. Limerick on the 3rd June 2002.
- 1.2 The vessel sank while ballasting down, it rolled to starboard, the bilge hit the bottom and the vessel came upright and rested on the seabed alongside the quay. Several crewmembers were thrown into the sea and port vessels rescued them. The remaining crewmembers left the vessel by means of a ladder onto the quay. One crewmember was hospitalised and was discharged the next day. There were no fatalities and no serious injuries.
- 1.3. The "Clipper Cheyenne" was salvaged several weeks later and towed to France.



## 2. FACTUAL INFORMATION

### 2.1 Description of the M.V. "Clipper Cheyenne"

Name:	Clipper Cheyenne
Port of Registry:	Nassau, Bahamas
IMO Number:	8500599
Length overall:	104.02m
Beam:	20.02m
Depth (moulded):	8.92m
Cranes:	Two x 200SWL Starboard Side
Class:	Lloyds Register +100A1 LMC UMS
Owners:	SNC transport Project Industriel 1 Rue de Paris 76600, Le Havre, France
Managers:	Compagnie de Management d'Orbigny Cours de Verdun - 33000 Bordeaux, France
Gross Tonnage:	5970
Net Tonnage:	2681

2.2 The "Clipper Cheyenne" is a Roll-on/Roll-off heavy lift semi submersible dock vessel fitted with twin screws and accommodation forward. The appendix contains a photograph showing the overall arrangement of the vessel. All vessel certificates were reviewed and found to be in order at the time of the incident.

### 3. EVENTS PRIOR TO THE INCIDENT

- 3.1 The "Clipper Cheyenne" was inward from Rotterdam on the 1st of June 2002 with a crew of fifteen. The vessel arrived in the port of Foynes, Shannon Estuary, Ireland to load by flo-flo operation a dredger M.V. "Quetzalcotal" for transportation to Algeciras, Spain. A photograph of this vessel is contained in Appendix 8.1. The location of the vessel is shown on the chart extract in Appendix 8.3. The operation of the vessel at the time of the incident involved lowering the stern door/ ramp and placing four of the vessel's thirteen 30 tonne pontoon hatch covers (each of 1m depth) on the main deck/ dock bottom. The remaining nine pontoon covers were stacked at the forward end of the main deck in two stacks of four and five respectively. The dredger draft was stated to be 2.30m. The intention was to ballast down the "Clipper Cheyenne" to achieve a depth over the dock bottom of 3.55m with zero trim and float the dredger in and raise the vessel by de-ballasting to the sea-going draft. The vessel is fitted with two 1000tonne/ hour-ballast pumps and the ballasting system comprises 600mm diameter electronically operated valves remotely controlled from the ballast control room located in the wheelhouse. The owner's Superintendent was onboard and the Master checked the plan. Final preparations for the flo-flo operation commenced at 0700hr BST on the 3rd of June 2002 with the vessel portside alongside No. 2 berth, the final operation being checked by the Chief Mate and the Chief Engineer.
- 3.2 Details of the ballasting sequence are given in Appendix 8.4. The ballast sequence shows the ballasting down to the loading draft and the subsequent de-ballasting operation during cargo loading and preparation for departure. The sequence shows the GM during each stage. It can be seen that this varies significantly due to rapid changes in the waterplane area.

## 4. THE INCIDENT

- 4.1 On the 3rd of June 2002 at 0700hr local time the ships crew commenced final preparations for flo-flo operations. At 07.35 all preparations were completed. The Chief Officer and the Chief Engineer inspected the readiness of the vessel for the flo-flo operations in accordance with the checklist. At 07.35 the stern ramp was opened and the draft forward was 4.40m fwd. and 4.95m aft. The weather report is contained in Appendix 8.5.
- 4.2 At 07.45 the ramp was fully opened and pumping of ballast commenced into tank No. 12 p/s and s/s were full. This was verified by overflow. Ballasting next commenced on No. 16p/s and s/s. At 08.35 ballast operations were stopped and some water was pumped out of tank No. 16 p/s and s/s to make the water level inside the hold 0.90m for cutting holes in the hatch covers stowed on the bottom of the hold. This was to prevent them from floating. At 09.30 holes were made and the ballasting resumed into tanks No 16 p/s and s/s as well as into the deep tank and fore peak. In addition, the pressure valves of No. 17 p/s and s/s were opened and closed from time to time to maintain zero list and an acceptable trim of the vessel. At 10.10 ballasting completed for tanks No. 16 p/s and s/s, deep tank and forepeak as they were full, which was verified by overflowing. The ballast pump was switched off and the valves of tanks No. 16 p/s and s/s and No. 17 p/s and s/s and forepeak and deeptank. The water level in the hold at this time was 3.25m forward and 3.60m aft and the ship had zero list.
- 4.3 At 10.13 ballasting commenced into tanks No. 11 p/s and s/s. When the levels of water inside the hold were 3.35m forward and 3.60m aft ballasting stopped to check the condition of the vessel. The valves of tanks No. 11 p/s and s/s were opened to reduce the vessel's trim. At 10.25 according to reports from the Chief Officer and Bo' sun the water level reached 3.50m forward and 3.60 aft. The ballast pumps were immediately switched off and the buttons for closing the valves were pushed. This time the readings were 110 tonnes each. A few seconds later the vessel suddenly took a list of 4 degrees to starboard and the draft forward rapidly increased. It is understood that the cargo Superintendent was on one of the bridge wings during this time. The Master opened the forward suction valves of tank No. 11 p/s and s/s and the valve of the deep tank and switched on the ballast pump for suction. The ship continued listing to starboard and going down by the bow. The Master opened the valve of tank No. 16 s/s for suction. The situation went beyond control and the ship continued listing and sinking by the bow. At 10.30 the upper deck on the starboard side went into the water. The ship's list increased sharply to 45 degrees to starboard and the vessel commenced sinking. The Master ordered the crew to abandon ship.

### 5. EVENTS FOLLOWING INCIDENT

- 5.1 As the ship sank the Master ordered the crew to abandon ship. However, the Chief Mate was on deck and was swept into the water. The heel only stopped when the vessel took the ground in way of the turn of bilge. Down flooding via now-immersed vents, trunks and accesses eventually brought the heel back to some 20 degrees with the vessel on the bottom. Appendices 8.6 and 8.7 contain photographs showing the vessel following the incident. All of the crew managed to get off without injury and the Chief Mate was picked up quickly. He was subsequently hospitalised for hypothermia.
- 5.2 Shannon Foynes Port Company (The Port Authority) placed oil pollution booms in place about the vessel and contained some four tonnes of HFO which emanated from the vessel. Leakage of oil was minimal. Local divers were engaged to commence sealing off the respective air pipes. Salvors were appointed. They subsequently raised the vessel and it has since been towed to France.

## 6. CONCLUSIONS AND FINDINGS

- 6.1 The vessel sank due to a progressive loss of buoyancy and inadequate righting moment. This probably was caused by the low stability of the vessel when in the submerged semi-submersible mode. The range of stability of the vessel at this stage would have been very low and the righting moment small. In addition at the deep float-in draft the down-flooding points could have been immersed at low angles of heel. Any down flooding would have reduced the stability of the vessel and thus lead to a progressive flooding of the vessel and consequent overturning and subsequent sinking. The stability of the flo-flo operation was assessed by means of GM alone. The range of stability was not assessed during the operation. The vessel could have a positive GM but a very low range of stability and therefore would not be able to withstand significant overturning moments.
- 6.2 It was fortunate that the flo-flo operation took place in shallow water as the vessel sat on the bottom when it sank and only one crewmember was hospitalised. If the operation had taken place in deeper water it is likely that there would have been a more serious outcome.

## 7. RECOMMENDATIONS

- 7.1 The Master of semi-submersible heavy lift dock ships should have documented competence in the operation of such a vessel.
- 7.2 Stability criteria for flo-flo operations should be developed and adhered to.
- 7.3 Stability approval should cover all phases of vessel operations including temporary phases and cargo operation.
- 7.4 Where possible such operations should be carried out at safe locations where the consequences of failure are mitigated either by shallow water or the readily availability of rescue.
- 7.5 Loading operations should be agreed with the Harbour Master or Competent Authority prior to the loading of any cargo.
- 7.6 There should be a clear understanding of the role of the Master and the Marine Superintendent/ outside expert during the loading process.
- 7.7 The design of semi-submersible vessels should be such that the development of free-surfaces is minimized in the ballast tanks of such vessels.

**8. APPENDICES**

- 8.1: Photograph of "Clipper Cheyenne".
- 8.2: Stern view of vessel.
- 8.3: Map of Foynes Island.
- 8.4: Water Specific Gravity Chart.
- 8.5: Met Eireann Weather Report.
- 8.6: Photographs of sunken vessel.

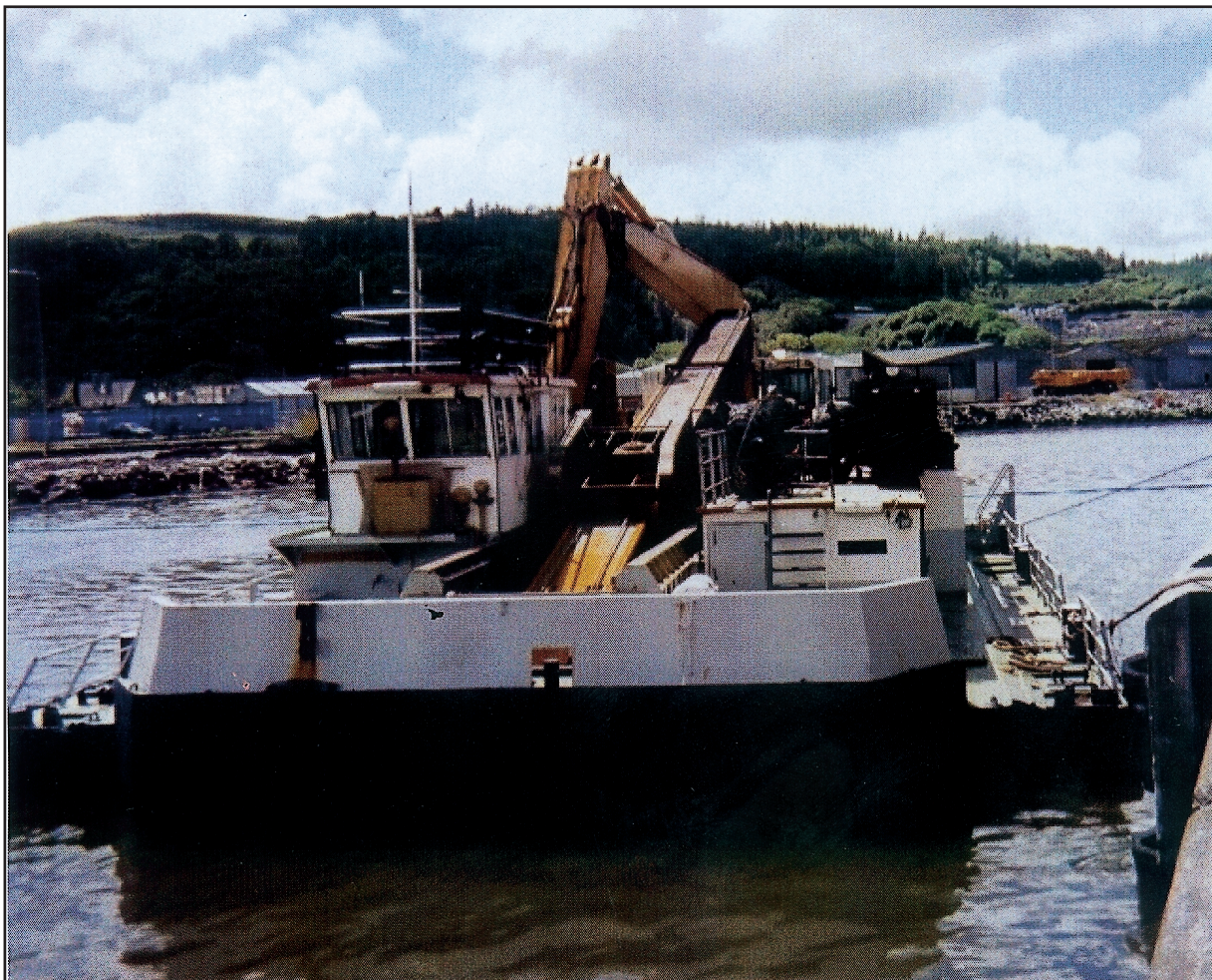
# APPENDIX 8.1

8.1: Photograph of "Clipper Cheyenne".



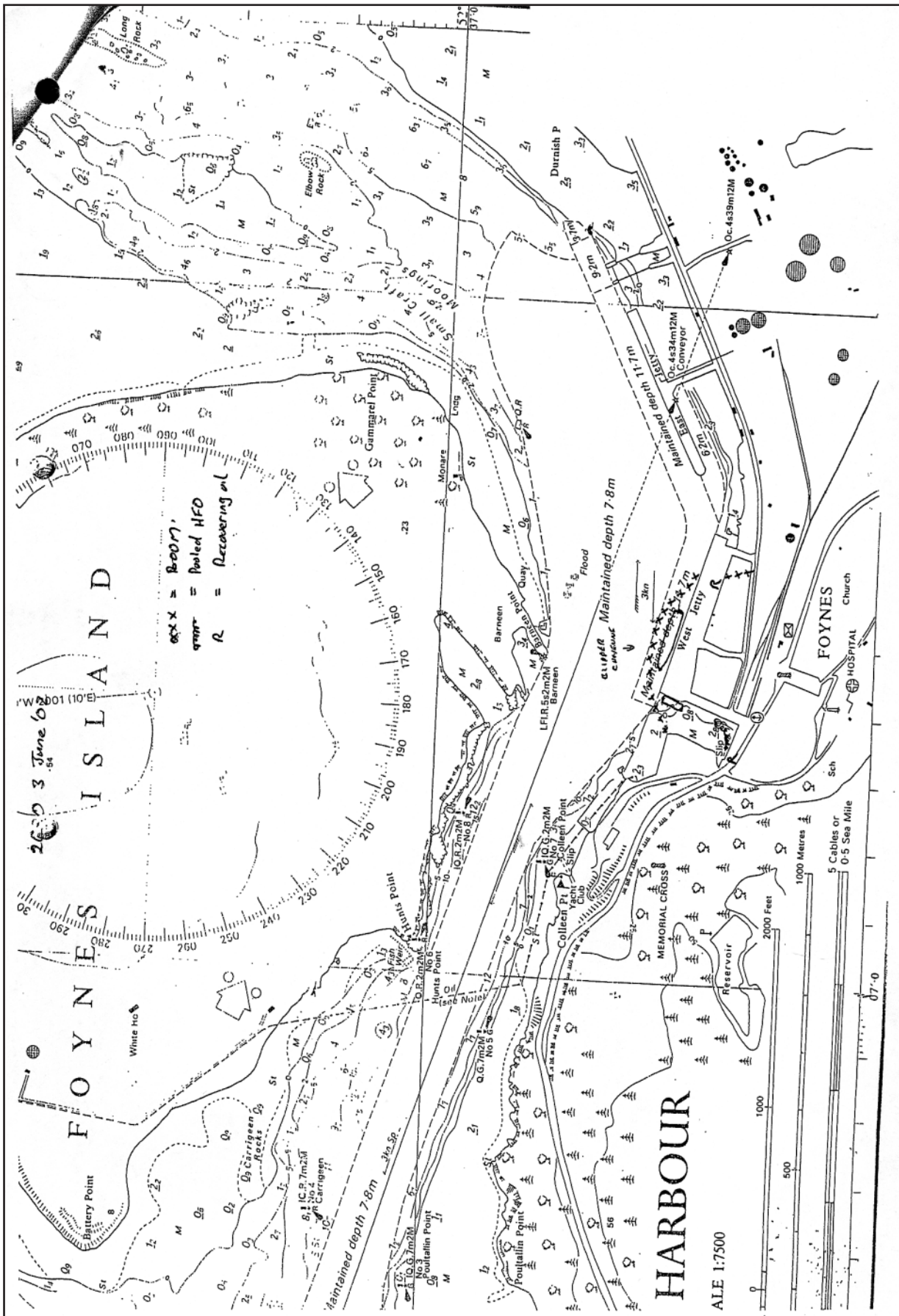


8.2: Stern view of vessel.



# APPENDIX 8.3

8.3: Map of Foynes Island.







# APPENDIX 8.4

CONTD.

MV CLIPPER CHEYENNE  
FOYNES / ALGECIRAS

FLOAT-IN OPERATION


(Tanks filling indications in percents)

BALLAST SEQUENCE

WATER SPECIFIC GRAVITY 1.025

Condition	A	DFT	F	DFT	GM'	FPK	DT1	2P	2S	5P	5S	9P	9S	11P	11S	12P	12S	13P	13S	14P	14S	15P	15S	16P	16S	17P	17S
C.1. Initial	8.30	8.30			2.03	100	100	100	100	100	100	100	100	80	80	100	100	100	100	100	100	40		100	100	70	84
C.2	7.92	7.92			1.98	100	100	100	100	100	100	100	100	55	55	100	100	100	100	100	100	40		100	100	63	73
C.3	7.25	7.25			2.21	100	100	100	100	100	100	100	100	0	0	100	100	100	100	100	100	40		100	100	12	25
C.4	6.40	6.45			1.91	100	100	100	100	100	100	100	100	0	0	100	100	100	0	0	100	40		100	100	12	14
C.5	5.92	5.92			1.55	100	100	100	100	100	100	100	100	0	0	100	100	100	0	0	100	40		31	43	10	12
C.6	5.40	4.90			0.80	31	84	100	100	100	100	100	100	0	0	100	100	100	0	0	100	40		0	6	4	12
C.7	5.10	4.65			2.18	25	60	100	100	100	100	100	100	0	0	100	100	100	0	0	100	27		0	0	0	0
C.8	4.90	4.75			3.76	25	60	100	100	100	100	90	90	0	0	100	100	100	0	0	100	27		0	0	0	0
C.9	4.50	4.40			4.45	25	60	100	100	100	100	50	50	0	0	30	30	30	0	0	100	40		0	0	0	0
DEPART.	4.45	4.45			3.75	25	60	10	10	12	12	35	35	60	60	60	60	30	30	100	34						

8.5: Met Eireann Weather Report.



**MET ÉIREANN**  
*The Irish Meteorological Service*

Glasnevin Hill,  
Dublin 9, Ireland.

Cnoc Ghlas Naíon,  
Baile Átha Cliath 9, Éire.  
www.met.ie

Tel: +353-1-806 4200  
Fax: +353-1-806 4247  
E-mail: met.eireann@met.ie

**Weather Report for the Foynes area  
on the 3<sup>rd</sup> June 2002  
between 9 and 12 hours**

**General Situation**  
A shallow low pressure area north of Ireland gave a mainly westerly airflow over the Country

**Details for Foynes**  
Winds: south-west to west Force 4  
Weather: bright spells and showers – light showers near the Foynes area.  
Visibility: good

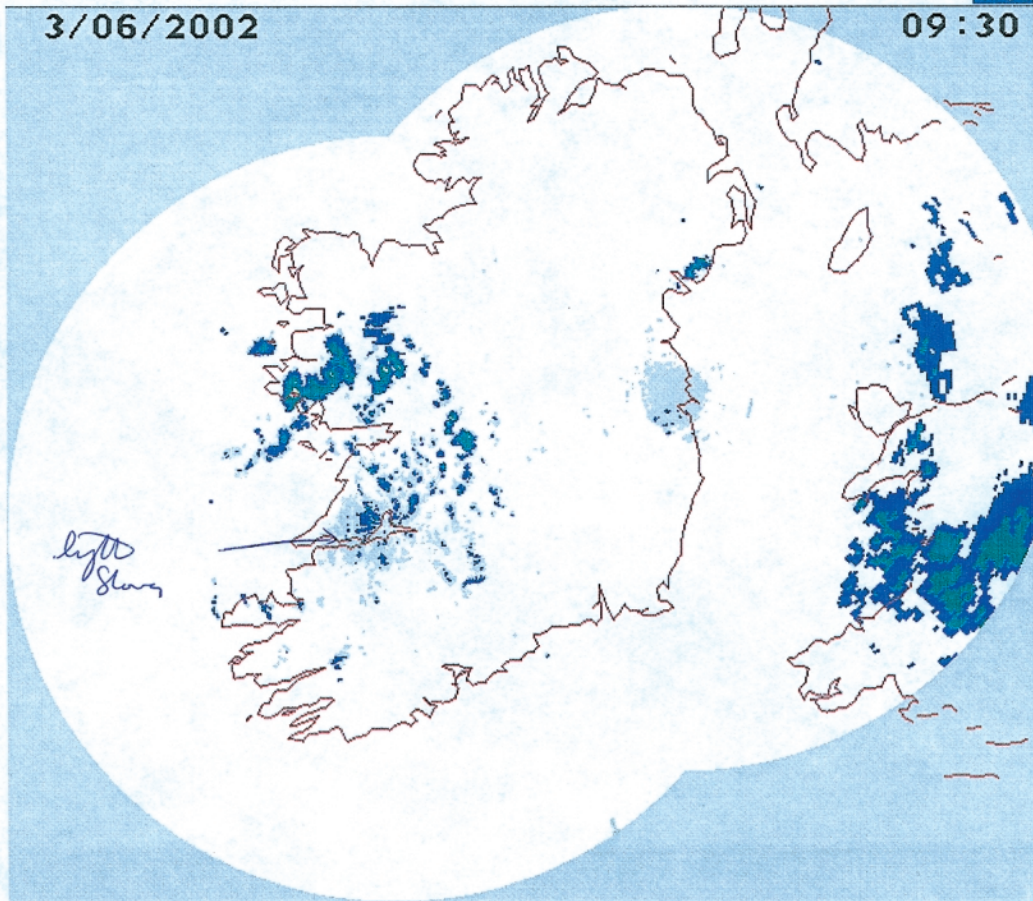
**Winds at Shannon Airport**  
9 hours GMT ( 10 hours local time) 200 degrees 14 knots  
10 hours GMT 210 degrees 13 knots  
11 hours GMT 200 degrees 11 knots



# APPENDIX 8.5

CONTD.

MET EIREANN RADAR PICTURE  
DATE: 3/06/2002 09:30:01  
PSEUDO CAPPI RAINFALL COMPOSITE  
RADAR: COMPOSITE  
SHANNON: SNN.PCZ  
DUBLIN : DUB.PCZ



T 0.1 0.2 0.6 1.5 3.7 9.2 22 56 >64mm/



8.6: Photographs of sunken vessel.



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Letter from MIT Chartering S.A.



MIT CHARTERING S.A.



**STRICTLY CONFIDENTIAL**

MARINE CASUALTY INVESTIGATION BOARD  
29-31 Adelaide Road  
DUBLIN 2.  
IRLANDE

**Letter with Acknowledge of Receipt**

**Subject** : MV CLIPPER CHEYENNE at Foynes on 03<sup>rd</sup> June 2002

**Your Réf.** : MCIB 16 – your letter dated 27<sup>th</sup> Feb. 03

**Versailles, Thursday, 20 March 2003**

Dear Sirs,

In reply of your letter above mentioned, we have asked to our superintendent :  
Mr D. SANDEVOIR to give us a reply, as he is the person in charge of this kind of matter for  
the MV CLIPPER CHEYENNE.

But as we learned from him that he was also in receipt of your above mentioned letter, he  
informed us that is going to mail to you his reply. Therefore, we are asking you to take MR  
SANDEVOIR's comments to your strictly confidential report as our reply to you.

We thank you for your attention in this matter,

Yours Faithfully,

Carole BOURGUIGNON p/o J.C. PATRICOT,  
MIT CHARTERING FOR ACCOUNT OF MV CLIPPER CHEYENNE's Owners

Letter from D.H. Sandevair

## D.H. SANDEVOIR

Capitaine au Long Cours

### CONSEIL & EXPERT MARITIME

(membre de l' Union Professionnelle des Experts Maritimes)



6 Rue des Peupliers  
F - 78960 VOISINS LE BRETONNEUX

Tél / Fax : 33(0)130 480 963

GSM : 33(0)617 623 154

E-mail : [dsandevair@aol.com](mailto:dsandevair@aol.com)

N° Siret : 402 642 870 00024  
N° TVA : FR 384 026 428 7 000 024

### MARINE CASUALTY INVESTIGATION BOARD

29-31 Adelaide Road

Dublin 2

Irlande



Voisins, 17<sup>th</sup> March 2003

Dear Sirs,

M.V. "Clipper Cheyenne" – capsizing at Foynes on 3<sup>rd</sup> June 2002  
Your reference MCIB 16 of 27<sup>th</sup> February 2003

Referring to your confidential mail of 27<sup>th</sup> February 2003, kindly find here-below a compiling of my reports and various addenda to Owners of the vessel and to Underwriters' Surveyor, issued since 6<sup>th</sup> June 2002, together with my conclusions :

On 3<sup>rd</sup> June 2002 by 07.00 hrs local time, I went on board to assist the Master for the float-in operation as per Transport de Projet Industriel's request and with reference to the convention dated 7<sup>th</sup> May 2002 between T.P.I. and myself. My portable computer was installed on the charts table next to the ballast control board in the wheel house. Autohydro program in action, loaded with the floppy-disk containing the stability conditions giving the ballast sequence and adjusted according to the bunkers situation given by Chief Engineer before commencing filling the dock.

The vessel was ready to commence by 07.30 hrs after the usual safety check-up procedure was completed under supervision of the Chief Engineer and the Chief Mate. Meanwhile the Master had finalised to ballast the ship at the adequate draughts, fore and aft, with a positive trim of about 55 centimetres as per the ballast procedure prepared beforehand. The stern door was open by 07.45 hrs and the dock filling procedure was performed according to the prepared sequence. During the whole filling operation, I remained near of the Master for checking the good order of each phase of the ballast sequence.

Filling was stopped between approximately 08.30 and 09.00 hrs to enable drilling holes in the middle of the top plates of four deck pontoons stowed on the dock deck in order to allow air contained underneath to vent while the pontoons were drowned by water. Then filling was resumed.

Just before 10.25 hrs, the water depths in the dock were reported to be 3.60 m aft and 3.50 m forward, heel being zero. The requested depth being reached, all valves were closed and the ballast pump switched off.

I received a phone call from the Dutch Charterers right after everything was stopped. Complain was brought that, with regard to an expected time of completion for filling the dock at 10.00 hrs, we were late. I just replied that the delay was about thirty minutes and it should be probably recovered during the reverse operation after getting the dredger inside. Another phone call followed from MIT Chartering confirming the Charterers' complain. As it was rather noisy inside the wheel house due to conversation on VHF, I went out to the port side wing and also replied that the delay was just



thirty minutes. I remained on the phone some 2 or 3 more minutes, then realised that the ship was slightly trimming by the bow. I switched off the phone and went immediately inside the wheel house. I asked the Master what was happening and recommended to pump out the forepeak. Of course, the Master was already trying to do something, but I did not know exactly what as the situation became suddenly drastic, the ship was quickly trimming by the bow, then took a list to starboard up to about 45/50 degrees, all this within a few seconds. At that time I looked at my watch and it was 10.34 hrs. I think it was about 10.40 hrs when I called the Owners on the mobile phone informing them about capsizing.

To the above statement, I have added the following comments a few days later :

1. On 2<sup>nd</sup> June by 19.00 hrs, I was still on board to remit to the Master the loading operation document including the ballast sequences for the float-in operation scheduled for the next day at 07.00 hrs, when the Electrician was requested by the Chief Engineer to start the check-up procedure of the ballast valves. This usually takes about 2 to 3 hours.
2. Before commencing opening the stern ramp and fill the dock, all openings that could lead to possible flooding were closed as per flo-flo procedure in force. It is to be especially noted that in the same way the access doors (fore and aft) to the winch compartments of both deck cranes were closed and that the crew remaining on deck for drafts control were all on port side as per flo-flo procedure.
3. At the end of the dock submersion operation by 10.25 hrs, all ballast tanks were full excepted central tanks 11 PS and SB partly filled, wing tank nr. 14SB empty, wing tanks nr. 15 PS partly filled and 15SB almost empty, wing tanks nr. 17 PS and SB partly filled, all valves were closed and ballast pumps stopped.
4. When the vessel commenced trimming by the bow for unknown reason, the Master and the Chief Engineer tried to face the situation by taking action on the central tanks nr. 11, the fore peak and the deep tank, the wing tanks 16SB and maybe 15PS, which explained that few valves that remained open as per Master's report of 6 June 2002.
5. With regard to timing, I can establish that, if the dock submersion operation was ended at 10.25 hrs (see Master's report), the time I was on the phone before I noticed beginning of trimming by the bow can be estimated to 4 or 5 minutes, so trimming by the bow began to be felt by 10.29/10.30 hrs. It was 10.34 hrs according to my watch when the ship had come to a list of about 45/50 degrees, so I can admit that the vessel came to capsizing in about 4 minutes.
6. The calculation shows that central tanks nr. 11 PS and SB should have been made willfully full and the wing tank nr. 17 PS empty to lead to a similar heeling situation : this would have bring the GM from 2 metres down to about 25 cm and let the vessel equilibrium under full effect of the weight of both cranes situated on starboard. Taking into account 800 cbm/hr as an effective rate of the ballast pump, it would have taken 15 minutes to shift 200 tons of water from 17PS to 11 PS and SB. As a fact, it took only approximately 4 minutes to reach the capsizing situation.
7. It has also to be noted that the Chief Mate and a deck man were staying at the stern on starboard side and were swept into the water when the ship capsized to starboard side. As, according to the procedure all crew members on deck are to remain on port side during float-in/float-out operation since both cranes accesses are shut watertightly, this means that they had time to come from the stern on portside to the stern on starboard side via the fore part of the vessel after opening the four access doors of the cranes, and rejoin their position for supervising cargo entrance into the dock by haulage. As the dock is 85 metres long, one can estimate that they had gone along a distance of  $(85m \times 2) + 18m$  width, i.e. 180 metres giving about a 3 to 4 minutes walk.
8. As it is now understood that the cranes access doors were open at the time of the incident (it is to be noted that each crane winch compartment has a capacity of about 60 cbm), taking into account a water depth of 3.5/3.6m in the dock, the flood point of same compartment is reached at about 4 degrees list on starboard. Due to trimming by bow, the winch compartment of the fore crane was first flooded, followed by flooding of the winch compartment of the aft crane and, later on, by flooding of the engine room via the starboard side emergency exit.. I can also point out that, with 4 degrees list on SB, the fluid GM was 1.14 metres yet while the range of stability was about 30 degrees. This also means that there was no capsizing situation if the cranes doors had been shut.

Therefore, the cause of capsizing has been due to a too important quantity of water in the fore part and on starboard side leading to flooding of the cranes winches compartments and engine room, which suddenly happened in a very short time, and putting the vessel from a stable situation to a sinking one.

The only reason which could be explained is an independent phenomenon to the vessel without the knowledge of Master and all parties concerned on board, such as grounding by the bow upon a heap of mud that became suddenly crumbled, or a restraint by the stern.

So, although the ship was getting deeper in the water, but going up vs. the quay level due to the high water tide in progress, the Master might have been misled in such a way that he would have filled more water into the central tanks nr. 11 and compensate the possible list by filling more water into the wing tank nr. 17 SB.

## Conclusion

After having received the Master's hypothesis statement dated 19.08.2002, the underwriters' surveyor, Captain Hemmer, has analysed each parameter recorded from the beginning and definitely admitted that the incident was due to an independent event out of the knowledge and beyond the control of the Master and the crew, and accepted Master's theory as the most probable reason of the incident, knowing that it is obviously impossible to bring evidence of that happening.

It is now admitted that the Master was misled by a phenomenon such as the portside part of the stern ramp stuck into a fender or a pile of the quay. As the vessel was going up with the tide, her stern looked as artificially deepening with list on portside, leading to compensate the trim by pumping more water than foreseen in the central tanks 11 PS and SB and to correct the artificial heeling to PS with the wing tank 17 SB. Reaching the depths of 3.5 /3.6 metres in the dock, all valves were closed and pumping stopped. Then the ramp began to disengage slowly from the fender until it became suddenly fully released.


A flo-flo operation is a delicate operation which requires accurate preparation and procedure, and evidences have been brought to the various parties concerned that preparation of the Foynes shipment was done with accuracy.

If the doors of both cranes had remained shut, or if, alternatively, the submersion of the dock had occurred at anchorage in deeper waters away from risks of grounding or getting engaged to a quay, capsizing could not have happened in the calculated ballast situation.

For your guidance, please find here-after the stability simulation and related R.A. curve corresponding to the moment when the crane nr. 1 compartment began to be flooded.

Hoping that the above comments answer to your expectation,

Yours Faithfully,



Captain Dominic H. Sandevoyr  
Marine Consultant and Surveyor

CAPSIZING AT FOYNES ON JUNE 3, 2002

HEEL ANGLE CALCULATION TO REACH FLOOD POINT OF CRANE NR. 1 WINCHES COMPARTMENT

Floting Status		Heel	stbd 4.12 deg.	GM(Solid)	1.439m
Draft FP	9.224m	Equil	Yes	F/S Corr	0.303m
Draft MS	8.351m	Wind	0.0 kn	GM(Fluid)	1.137m
Draft AP	7.479m	Wave	No	KMT	6.495 m
Trim	fwd 0.91 deg.	VCG	5.051 m	TPcm	5.04
LCG	43.940f				

Loading Summary

Item	Weight (MT)	LCG (m)	TCG (m)	VCG (m)
Light Ship	2 847.00	43.905f	1.403s	7.045
Deadweight	6 798.31	43.954f	0.168p	4.217
Displacement	9 645.31	43.940f	0.296s	5.051

Fixed Weight Status

Item	Weight (MT)	LCG (m)	TCG (m)	VCG (m)
LIGHT SHIP	2 847.00	43.905f	1.403s	7.045
CONSTANT	337.00	62.650f	0.000	5.000
DECK PONTOON 01	27.50	76.580f	0.331p	11.875
DECK PONTOON 02	30.50	70.030f	0.331p	11.875
DECK PONTOON 03	30.50	36.600f	2.000p	5.310
DECK PONTOON 04	30.50	70.030f	0.331p	12.700
DECK PONTOON 05	30.50	52.550f	2.000p	5.310
DECK PONTOON 06	30.50	76.580f	0.331p	12.700
DECK PONTOON 07	30.50	20.650f	2.000p	5.310
DECK PONTOON 08	30.50	76.580f	0.331p	15.160
DECK PONTOON 09	30.50	76.580f	0.331p	13.520
DECK PONTOON 10	30.50	76.580f	0.331p	14.340
DECK PONTOON 11	30.50	70.030f	0.331p	13.520
DECK PONTOON 12	30.50	70.030f	0.331p	14.340
DECK PONTOON 13	31.50	4.700f	2.000p	5.310
EQPT 200T LIFT BEAM 1	6.00	44.000f	9.600p	9.500
EQPT 200T LIFT BEAM 2	6.00	52.000f	9.600p	9.500
EQPT 250T LIFT BEAM	15.00	39.000f	9.200s	10.200
EQPT 350T LIFT BEAM	12.00	39.000f	9.200p	10.200
EQPT CREW PROVISIONS	7.00	85.880f	0.331p	11.000
EQPT DUNNAGE	20.00	31.600f	0.331p	9.500
EQPT LASHING	20.00	31.600f	0.331p	9.500
EQPT SPREADER 170T	3.00	35.000f	9.200s	10.500
EQPT STORES	10.00	48.510f	0.331p	12.350
JIB AFT	50.00	8.150f	5.140s	35.530
JIB FORE	50.00	54.250f	5.140s	35.530
STERN RAMP	70.50	11.680a	0.331p	4.570
Total Fixed	3 848.00	45.733f	1.058s	8.029

Tank Status

SALT WATER (SpGr 1.018)

Tank Name	Load (%)	Weight (MT)	LCG (m)	TCG (m)	VCG (m)	Perm
FOREPEAK	100.00%	99.32	92.103f	0.050s	4.844	0.985
BALDP1	100.00%	267.61	82.628f	0.048s	2.785	0.985
BALDB2S	100.00%	204.11	71.673f	4.269s	1.062	0.985
BALDB2P	100.00%	242.44	71.795f	3.594p	1.052	0.985
BALDB5S.S	100.00%	142.62	30.806f	3.952s	0.701	0.985
BALDB5P	100.00%	184.97	30.805f	3.631p	0.701	0.985
AFTPEAK9.S	100.00%	297.02	6.455f	3.531s	3.352	0.985
AFTPEAK9.P	100.00%	309.00	6.405f	4.052p	3.339	0.985
BALCNT11.S	65.98%	181.42	66.513f	4.080s	2.794	0.985
BALCNT11.P	65.98%	181.72	66.513f	4.481p	2.794	0.985
BALCNT12.S	100.00%	405.72	51.450f	3.953s	3.150	0.985
BALCNT12.P	100.00%	406.40	51.450f	4.608p	3.150	0.985
BALCNT13.S	100.00%	389.49	34.300f	3.953s	3.150	0.985
BALCNT13.P	100.00%	390.14	34.300f	4.608p	3.150	0.985
BALWG14.P	100.00%	257.12	68.067f	8.974p	5.630	0.985
BALWG15.S	25.96%	96.87	51.636f	8.461s	1.279	0.985

# CORRESPONDENCE

CONTD.

(8) CRANE 1 FWD DOOR	56.750f, 9.150s, 9.200	-0.027
(9) CRANE 1 AFT DOOR	51.750f, 9.150s, 9.200	0.052
(10) CRANE 2 FWD DOOR	10.650f, 9.150s, 9.200	0.703
(11) CRANE 2 AFT DOOR	5.650f, 9.150s, 9.200	0.782

Hydrostatic Properties with Stern Ramp open

Draft is from Baseline.

Trim: fwd 0.91 deg., heel: stbd 4.12 deg., VCG = 5.051

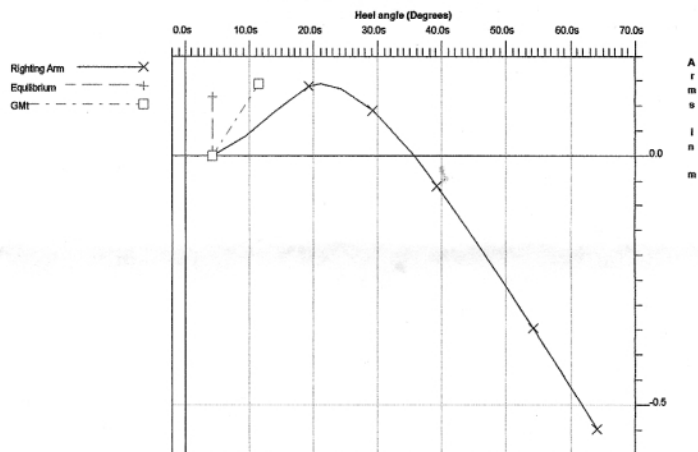
LCF Draft (m)	Displ (MT)	LCB (m)	VCB (m)	LCF (m)	TPcm (MT/cm)	MTCm (MT-m/deg)	GML (m)	GM(Fluid) (m)
8.438	9644.546	43.964f	3.480	48.491f	5.04	8960.11	53.224	1.137

Water Specific Gravity = 1.018 kg/L.

Righting Arms vs Heel Angle with Stern Ramp open

Heel Angle (deg)	Trim Angle (deg)	Origin Depth (m)	Righting Arm (m)
4.12s	0.91f	7.650	0.000
9.12s	0.78f	7.887	0.039
14.12s	0.70f	7.998	0.093
19.12s	0.69f	8.008	0.141
20.96s	0.67f	8.042	0.144
24.12s	0.61f	8.135	0.135
29.12s	0.48f	8.331	0.092
34.12s	0.32f	8.556	0.023
35.52s	0.27f	8.617	0.001
39.12s	0.15f	8.780	-0.059
44.12s	0.04a	9.000	-0.151
49.12s	0.21a	9.186	-0.247
54.12s	0.37a	9.339	-0.345
59.12s	0.51a	9.447	-0.446
64.12s	0.63a	9.508	-0.546

Righting Arms vs. Heel



**MCIB RESPONSE TO LETTER FROM D.H. SANDEVOIR**

The MCIB notes the comments in the above but would point out that there is apparently no evidence to support the contention in this letter.

