Report of safety investigation

LIFEBOAT ACCIDENT

DURING A DRILL ABOARD THE CONTAINER CARRIER

CMA CGM

CHRISTOPHE COLOMB

ON 15 APRIL 2011

AT YANTIAN (CHINA)

(Two fatalities and one seriously injured)

Warning

This report has been drawn up according to the provisions of Clause III of Act No.2002-3 passed by the French government on 3rd January 2002 and to the decree of enforcement No.2004-85 passed on 26th January 2004 relating to technical investigations after marine casualties and terrestrial accidents or incidents and in compliance with the « Code for the Investigation of Marine Casualties and Accidents » laid out in Resolution MSC 255 (84) adopted by the International Maritime Organization (IMO) on 16 May 2008.

It sets out the conclusions reached by the investigators of the *BEA*mer on the circumstances and causes of the accident under investigation.

In compliance with the above mentioned provisions, the analysis of this incident has not been carried out in order to determine or apportion criminal responsibility nor to assess individual or collective liability. **Its sole purpose is to identify relevant safety issues and thereby prevent similar accidents in the future**. The use of this report for other purposes could therefore lead to erroneous interpretations.

CONTENTS

APPENDIX LIST

Abbreviation list

AB	:	Able bodied seaman
***BEA*mer**	:	*Bureau d'enquêtes sur les évènements de mer* (MAIB French counterpart)
CSN	:	*Centre de Sécurité des Navires* (Vessel Safety Survey Centre)
FPD	:	Fall Protection Device
IMO	:	International Maritime Organisation
ISM	:	International Safety Management
LSA	:	Life-Saving Appliances
MCA	:	Maritime and Coastguard Agency
MSC	:	Maritime Safety Committee
STCW	:	Standards of Training, Certification and Watch keeping
UTC	:	Universal Time Coordinated
VHF	:	Very High Frequency
VTS	:	Vessel Traffic Service

1 CIRCUMSTANCES

0n 15 April 2011, the container carrier *CMA CGM CHRISTOPHE COLOMB* was alongside in Yantian port (China). A test of the starboard lifeboat was organised with three men on board, an officer, a cadet and an AB. The test went on smoothly until the final phase of the hoisting : when the forward pulley block contacted the davit, the swivel broke away from the linking devices to the quick release hook.

The lifeboat tipped down ; simultaneously the part of the hull on which the base plate of the aft hook was bolted had been torn off. The lifeboat went down upside down after a 24 meter fall. The cadet had been thrown out under the impact ; the officer and the AB had been trapped inside the capsized boat.

The emergency procedure had been immediately initiated under the master's authority. The rescue team had been able to take the three men out of the water in a short time : unfortunately the officer died instantly and the cadet died shortly after he had been transferred to Shenzhen hospital ; the AB had been very seriously injured.

2 REGULATORY AND TECHNICAL BACKGROUND

2.1 IMO works

Extracts from circular MSC 1049 – 28 May 2002 :

The Maritime Safety Committee, at its seventy-fifth session (15 to 24 May 2002), considered the issue of the unacceptably high number of accidents with lifeboats that have been occurring over recent years and in which crew were being injured, sometimes fatally, while participating in lifeboat drills and/or inspections.

Pending further consideration of the problem, the Committee wishes to draw the attention of manufacturers, shipowners, crews and classification societies to the personal injury and loss of life that may follow inadequate attention to the design, construction, maintenance and operation of lifeboats, davits and associated equipment.

Member Governments are invited to :

§ 4.3.10 : the equipment is easily accessible for inspections and maintenance and is proven durable in harsh operational conditions, in addition to withstanding prototype tests;

Circular MSC 1206 – 11 June 2009 :

The IMO reminded the dispositions of the May 2002 circular and added detailed directions for periodic service and maintenance.

Extracts from the appendix 2, § 1.5.1 : *The 1974 SOLAS Convention requires that drills shall, as far as practicable, be conducted as if there was an actual emergency*. This means that the entire drill should, as far as possible, be carried out. The point is that, at the same time, it should be ensured that the drill can be carried out in such a way that it is safe in every respect. Consequently, elements of the drill that may involve unnecessary risks need special attention or may be excluded from the drill.* * Refer to SOLAS regulation III/19.3.1.

§1.5.4 : The lowering of a boat with its full complement of persons is an example of an element of a drill that may, depending on the circumstances, involve an unnecessary risk. Such drills should only be carried out if special precautions are observed.

2.2 Previous accident

Accident occurred aboard a sister ship in October 2009, Daewoo Shipyard in Okpo :

The accident occurred during a 110% load test in the shipyard with one of the lifeboat of hull n° 4157, a *CMA CGM CHRISTOPHE COLOMB* sister ship. The accident was caused by the breaking (itself caused by a faulty weld) of the long link connecting the swivel and the aft quick release hook. The long link had then been secured with a sling.

Since February 2011 the sling had been replaced with a nylon belt (Fall Prevention Device as recommended by the IMO, and resistant to six time the usual load – see picture Appendix B).

The scantling of the long link has not been strengthened (diameter kept equal to 22 mm), but the piece is subjected to weld control and service tests. Nevertheless it seems to be undersized compared to the shackle and to the swivel.

This corrective action had not been sufficient to reassure neither the crew that witnessed the accident nor the officers in charge of the tests onboard *CMA CGM CHRISTOPHE COLOMB*. As the lowering and hoisting operations of the lifeboat from and to the embarkation deck have to be carried out with men on board, launching test would be then suspended. Only the outreaching tests are carried out.

As a precaution, crews have implemented the IMO recommendation aiming to reduce risks that seem unnecessary (cf. MSC 1206 - 1.5.4)

2.3 Stand taken by the administrations

Maritime Coastguard Agency :

During joint safety inspections aboard car-ferries flying the French flag, at the same period, MCA, together with the French authorities was very reluctant to have men on board during lifeboat lowering and hoisting operations. The decision was then left to the inspected vessel master's discretion. Generally, the latter did not require the presence of crewmembers in the boats.

CSN (Vessel Safety Control Centre - French maritime administration)

25 to 29 April 2010 ISM audit carried out by the CSN Finistère Nord (France) :

The auditor noticed that the launching, releasing and manoeuvring drills, which should be done with a minimal quarterly periodicity, were not carried out, since the *CMA CGM CHRISTOPHE COLOMB* accident occurred. A non-compliance report had been sent.

September 2010 :

Following this non-compliance report, the lifeboat launching drills have been resumed. On 29 September, a port boat test with crew on board in presence with an engineer from the LP Marine Service company had been conducted.

3 VESSEL

3.1 *CMA CGM CHRISTOPHE COLOMB*

CMA CGM CHRISTOPHE COLOMB had been built in 2009 at Daewoo Shipyard in OKPO (South Korea). Her construction had been completed on 10 November 2009 ; She is the first of a 5 sister-ship class.

- Length overall : 365.50 m ;
- breadth : 51.20 m ;
- depth : 29.90 m ;
- freeboard : 1440 mm ;
- displacement : 157,138 metric tons ;
- Main engine : Sulzer 80.905 kW - 14 cylinders.

3.2 Lifeboats

The two lifeboats are identical (One on the portside, the other on the starboard side of the bridge at deck A), totally enclosed type; built by Hyundaï Lifeboats Co. Ltd (Korea). They are built and tested according to LSA code (Life-Saving Appliances) and Resolution MSC. 81(70).

- Length : 5.95 m ;
- Light displacement : 2.18 t ;
- Capacity : 40 persons (i.e. 3000 kg) ;
- Speed : 6 knots.

Each hook has a 4 metric ton strength

The release devices allow the hooks to be released on-load when the boat is not yet afloat or to be released without strain when the boat is afloat. In this case the release of the hooks is faster (2 operations to complete instead of 4 when on-load).

The davits, model HGD-073-30, are of a gravity type, built by Oriental Precision & Engineering (Korea), a specialist of means for lifting.

The two lifeboats had been surveyed by LP Marine Service Company during the annual visit on 29 September 2010. This contractor is certified by Oriental Precision & Engineering. No fault had been noticed on the starboard davit.

Before the accident, launching drills with crew aboard the starboard boat had been conducted in November 2010 and January 2011.

The service schedule is set by the MSC.1 - 1205 circular, taken up by the builder and enforced by the crew, under the responsibility of the chief officer : lubrication, wear and corrosion controls at each voyage and a weekly free movement survey. These operations were recorded in a maintenance record file.

Useful information about maintenance were entered in a data base (BASS software).

4 CREW

The French-Filipinos crew was made of 26 crew members among whom 2 cadets and a trainee.

Men aboard the lifeboat :

The French **officer in charge of safety**, **responsible for the test of the lifeboat**, was 30 year old. He was a certificated officer (July 2010) and held the required STCW titles, particularly the certificate of proficiency in survival craft (June 2007).

His sea-going service was of 31 months on board CMA CGM vessels, 71/2 months of which in an officer position. He is an experimented officer with a recognized expertise.

He had been on board *CMA CGM CHRISTOPHE COLOMB* since the 14 February 2011.

The **French cadet**, bowman during the lifeboat test was 24 year old. He was holding a first class training officer certificate (July 2010). His sea-going service was of 10 months, mainly aboard CMA CGM vessels. He should be promoted to officer soon.

He had been on board *CMA CGM CHRISTOPHE COLOMB* since the 14 February 2011.

The **Filipino helmsman AB**, bowman during the lifeboat test was 39 year old. He was on hire by CMA CGM through the manning company CAREER, based in Philippines.

He had been on board *CMA CGM CHRISTOPHE COLOMB* since the 11 July 2010.

5 SEQUENCE OF EVENTS

(time: UTC + 8)

This sequence of events has been established from the master's statement of facts.

On 15 April 2011-06-01

Weather conditions : south-easterly wind 3 to 4 knots. The current was setting towards the bow.

At **06:36 am** : *CMA CGM CHRISTOPHE COLOMB* was port side alongside at Yantian

At **06:45 am** : the vessel agent requested to the harbour master for lifeboat launching drill permission.

At **08:30 am** : permission granted

At **09:00 am** : beginning of the drill. The master, the chief officer, the bosun and one AB were on the deck of the starboard davit. Shenzen VTS had been contacted before the drill on VHF channel 74 as per instruction.

At **09:10 am** : boat and launching devices ready, FDP in place.

At **09:11 am** : empty lifeboat lowered to the deck U for safety tests.

At **09:15 am** : lifeboat hoisted back to the sea-position. All safety pins put back in position.

At **09:18 am** : 3 crew members embarked in the lifeboat : the safety officer, a cadet and the duty AB.

At **09:20 am** : *CMA CGM LA SCALA* was coming alongside ahead *CHRISTOPHE COLOMB*. The 3 crewmen leaved the lifeboat and stood by.

At **09:38 am** : *CMA CGM LA SCALA* clear from *CHRISTOPHE COLOMB* ; resumed drill.

From **09:39 to 09:43 am** : the three crewmen, properly equipped, came back into the boat and fastened their safety belt. The lifeboat was ready to be lowered.

At **09:45 am** : beginning of the lowering, monitored by the bosun from the control panel located on deck A.

At **09:46 am** : the lifeboat was in the water and the engine started.

At **09:48 am** : pins removed from release hook. Release handle unlocked.

At **09:50 am** : the cadet went to the bow to check the correct release of the hook. The AB went aft for the same operation. FPD in position.

At **09:52 am** : the release hooks were locked again and safety pins put back in position.

At **09:54 am** : the officer went to the bow then to the stern to check that the hooks were secured (position of the hook indicator). FPD were checked as well.

At **09:57 am** : the lifeboat was heaved 1 meter above the water.

At **10:01 am** : the officer went again to the bow then to the stern to check that the hooks were secured (position of the hook indicator) and checked as well that the position of the hydrostatic interlock lever was in the green part. He reported to the chief officer by talkie-walkie. The three crewmen were inside the lifeboat, safety belt fastened. The doors were closed.

At **10:04 am** : the chief officer began to heave the lifeboat. The bosun and one AB were at the davit level to monitor the correct winding of cable falls and of release wire cable on their respective drums.

At **10:06 am** : the upper part of the floating blocks began to touch their thrust.

The fore connection between the floating block and the shackle disconnected. The bow of the lifeboat felt; the counter stern structure immediately torn off. The lifeboat felt in the water from about 24 meters and capsized, then kept floating alongside the vessel.

At **10:07 am** : All crew members mustered. The bosun prepared the starboard pilot ladder, the chief officer was there on stand by and reported to the master. The cadet was found unconscious outside the lifeboat kept afloat by his life-jacket. The officer and the AB were still in the lifeboat.

At **10:08 am** : the master went to the bridge and called the harbour master. He requested a rescue boat and a medical assistance. Then he called the CMA CGM emergency phone number. The chief officer contacted the CMA CGM agent to confirm the master's request.

At **10:09 am** : the duty officer and an AB were preparing the starboard side accommodation gangway.

At **10:15 am** : the bosun and an AB were preparing the starboard side crane with a net and lowered it at water level. Immersion suit, harness and ropes were ready on the gangway.

At **10:18 am** : the medical team was ready on the gangway with a stretcher, a first aid kit, a resuscitator with an oxygen kit and neck collars.

At **10:20 am** : the chief officer equipped with an immersion suit and the master in swimming suit went into the water, swam to the lifeboat and tried to contact the two men supposed to be inside, but they got no answer.

At **10:22 am** : The master dived into the lifeboat assisted by the chief officer. He found the officer sat at the control position, safety belt fastened. The aft part of the lifeboat was torn and the control position was flooded. He did not see the AB.

At **10:25 am** : the master dived several times and succeeded to free the officer from his seat and from the boat. The latter was unconscious. A fishing vessel was on station to give assistance.

At **10:27 am** : one person from the port embarked from the gangway in the fishing vessel with the second engineer; they picked up the cadet, unconscious and weakly breathing.

At **10:30 am** : the cadet had been brought to the accommodation gangway as well as the officer, unconscious, kept afloat by the master swimming. The medical team sent the officer to the pier on a stretcher.

At **10:35 am** : the rescue boat arrived; the cadet had been transferred onto a tug moored alongside *CHRISTOPHE COLOMB* astern.

At **10:37 am** : the fishing vessel with the chief officer and the second engineer on board, joined the capsized lifeboat: they knocked on the hull and heard the AB shouting. The second engineer dived and freed the AB stucked by his inflated life-jacket, the sea level giving him small clearance to breathe. The second engineer pierced the AB's life-jacket with a knife.

At **10:40 am** : the AB, although he was weakly breathing, succeeded to escape the lifeboat by himself. He had been transferred to the tugboat by the rescue boat where he had been taken in charge by the shore medical team, together with the cadet. Both had been transferred to Shenzhen hospital.

At **10:50 am** : the rescue team ceased resuscitation attempt of the officer who had been declared dead by the doctors.

At **11:10 am** : the 150 litres of diesel oil contained in the lifeboat began to spread. The agent and the port authorities had been informed and an oil-skimming boat requested.

At **11:30 am** : Commercial operations had been interrupted. The agent informed the vessel that the cadet had died.

At **3:30 pm** : beginning of Port State Control operations.

At **5:30 pm** : Commercial operations resumed. The destroyed lifeboat had been towed by the terminal operator. She had been thereafter transferred aboard *CMA CGM BUTTERFLY*, bound to Le Havre.

6 ANALYSIS

The method selected for this analysis is the method usually employed by *BEA*mer for all its investigations**,** in compliance with the "Code for the Investigation of Marine Casualties and Accidents" laid out in Resolution MSC 255(84) adopted by the International Maritime Organization (IMO).

The factors involved have been classed in the following categories :

- **natural factors ;**
- **material factors ;**
- **human factor ;**

In each of these categories, BEAmer investigators have listed the possible factors and tried to qualify them relatively to their characters :

- **certain, probable, hypothetical ;**
- **causal or underlying ;**
- **circumstantial, inherent ;**
- **aggravating.**

With the aim to reject, after examination, factors with no influence on the course of events and to retain only those that could, with a good probability, have a real influence on the course of facts. The investigators are aware that maybe they have not given an answer to all the issues raised by this accident. Their aim remains to avoid other accident of the same type; they have privileged with no *a priori* an inductive analysis of the factors which have a significant risk of recurrence due to their inherent character.

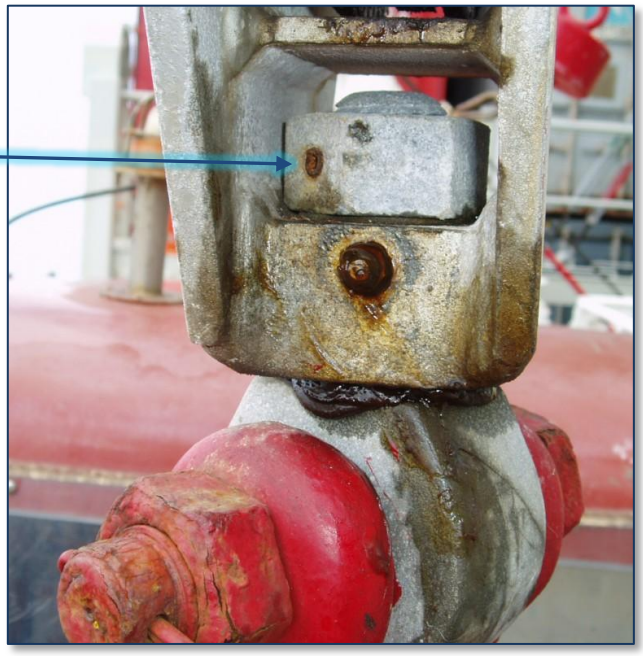
6.1 Natural factors

Weather conditions **did not have any impact** on the accident and its consequences. Note that Yantian is the only Asian port of call where the mooring basin is sheltered enough to allow lifeboat launching drills.

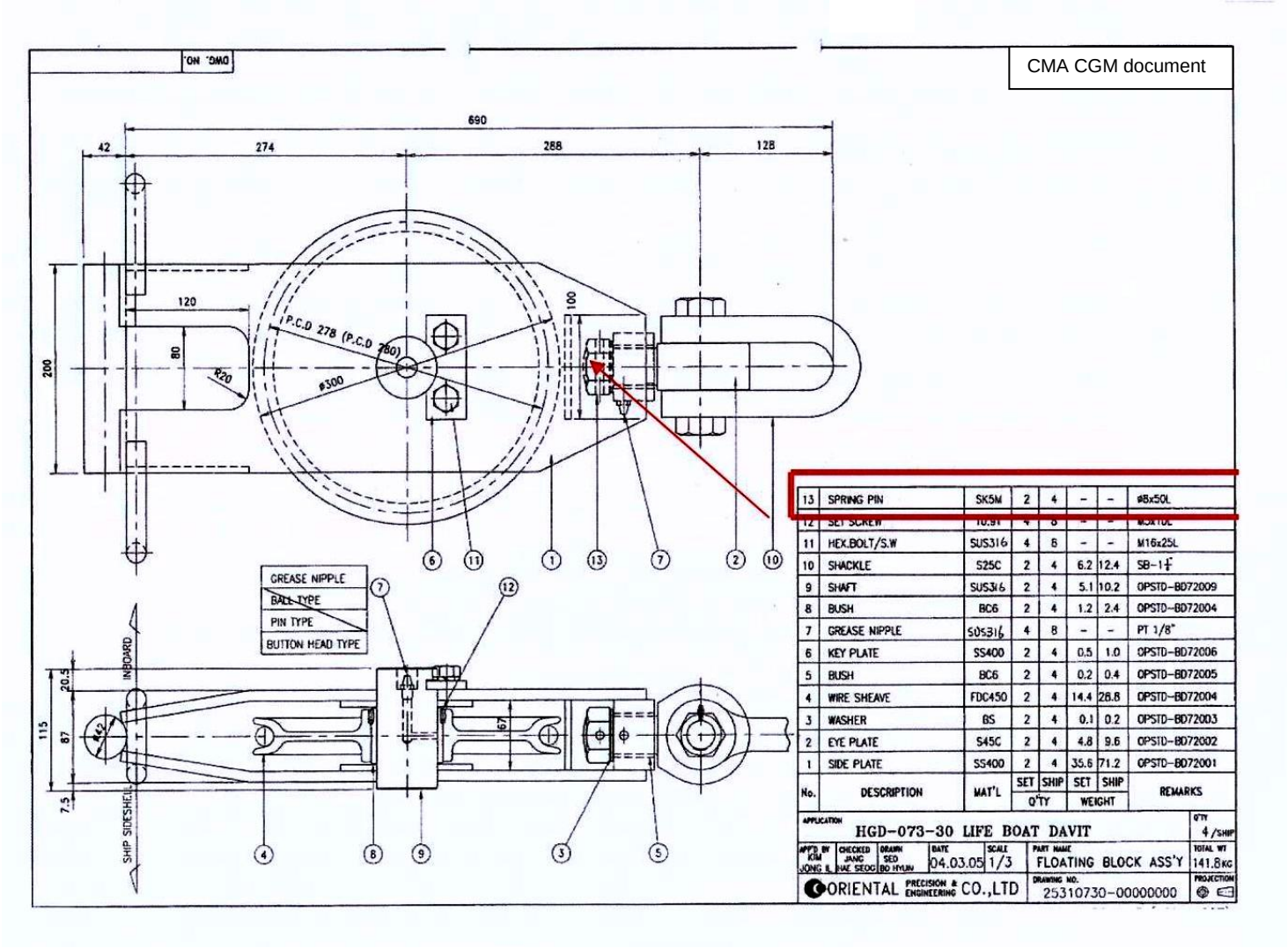
6.2 Material factors

Missing pin

The lack of a spring pin on the swivel screw nut had allowed it to unscrew then to disconnect from the release hook connecting parts.



CMA CGM document



No.	DESCRIPTION	MAT'L	SET Q'TY	SHIP Q'TY	SET WEIGHT	SHIP WEIGHT	REMARKS
13	SPRING PIN	SK5M	2	4	–	–	ø8x50L
12	SET SCREW	10.9T	4	8	–	–	M8x10L
11	HEX.BOLT/S.W	SUS316	4	8	–	–	M16x25L
10	SHACKLE	S25C	2	4	6.2	12.4	SB-1¼
9	SHAFT	SUS316	2	4	5.1	10.2	OPSTD-BD72009
8	BUSH	BC6	2	4	1.2	2.4	OPSTD-BD72004
7	GREASE NIPPLE	SUS316	4	8	–	–	PT 1/8"
6	KEY PLATE	SS400	2	4	0.5	1.0	OPSTD-BD72006
5	BUSH	BC6	2	4	0.2	0.4	OPSTD-BD72005
4	WIRE SHEAVE	FDC450	2	4	14.4	28.8	OPSTD-BD72004
3	WASHER	BS	2	4	0.1	0.2	OPSTD-BD72003
2	EYE PLATE	S45C	2	4	4.8	9.6	OPSTD-BD72002
1	SIDE PLATE	SS400	2	4	35.6	71.2	OPSTD-BD72001

APPLICATION: HGD-073-30 LIFE BOAT DAVIT — Q'TY: 4/SHIP
APP'D BY: KIM JONG S. — CHECKED: JANG HAE SEOG — DRAWN: SEO BO HYUN — DATE: 04.03.05 — SCALE: 1/3 — PART NAME: FLOATING BLOCK ASS'Y — TOTAL WT: 141.8KG
ORIENTAL PRECISION & ENGINEERING CO.,LTD — DRAWING NO. 25310730-00000000 — PROJECTION

The survey done after the accident, on board other vessels of the company, shows that even if in some cases the nut safety pin is blocked by a mixture of grease and rust, it is never missing. This pin, tapped in its drilling at the time of the pulley block assembly, can only be removed by using a drift punch.

This tends to prove that the pin would not have been put in place during the pulley block assembly operations, at the time of the construction of the vessel, all the more so no maintenance operation, including a swivel dismantling had been recorded in the vessel historical data.

A metallurgical assessment of the pin drilling, in progress in the frame of the judiciary enquiry, should confirm this assumption.

The missing pin, probably since the construction, is the **causal factor** of the accident.

No survey platform on the lifeboat bow

As amazingly, there is no survey platform forward the davit, the access for greasing operation as well as for close visual survey of vital parts (pulley block, swivel, nut, pin, and so on…) is uneasy and dangerous, contrary to the aft equipment that are easy to access and thus easy to survey.

This situation is not in accordance with the IMO recommendation (cf. §4.3.10 MSC 1049) and is an **underlying factor** likely to impair the survey efficiency.

The lifeboat structure

The structure connected to the hull on which the aft release hook is locked (sling plate, deadwood) had been torn when the bow had been disabled. This shows that this situation, admittedly unlikely, but which cannot obviously be ruled out, had not been considered at the time of the design of the boat.

In these conditions, with her structure too weak to hold her own weight and her crew's, even with only few people aboard, on only one hook, the boat (although built according to the current regulation) do not act as a protection cell at all, as long as she is not floating normally.

The weakness of the structure is an **aggravating factor** of the consequences of the accident. The break and the consequent fall have deprived the crew of a chance for survival.

6.3 HUMAN FACTORS

The crew

Greasing operations, including those of the fore pulley block, had been regularly done by the crew (washer and nut non-corroded and greasy).


CMA CGM document

*BEA*mer had noticed no handling fault during this drill; the current procedures had been strictly implemented aboard the lifeboat as well as aboard the vessel.

Immediately after the accident, the emergency procedures had been implemented with efficiency and self-control. Note that merchant vessel crews are not systematically trained to face special situations or actions (struggle against stress, diving without an aqualung under a boat, swimming to move and keep afloat an unconscious person, and so on …) which adds to *CHRISTOPHE COLOMB* crew's credit.

Periodical survey

As it has been noticed above, the access to the fore pulley block of the lifeboat is uneasy and non-secure. Nevertheless, the tick box "good" of item n° 4 "sheave" in the starboard davit check-list had been ticked during the comprehensive survey carried out in September 2010.

It is likely that the fault (missing pin and/or nut partially unscrewed) should have been detected through a close visual survey of the swivel. Lastly, if there was a physical impossibility to achieve this survey, the tick box "good" should not have been ticked.

7 EXECUTIVE SUMMARY

The fall of the *CMA CGM CHRISTOPHE COLOMB* starboard lifeboat is attributable to a mechanical factor, which was very probably originated during the construction of the vessel.

No anomaly had been recorded during the extensive survey carried out in September 2010.

IMO has been warning at several occasions during the last ten years the maritime industry about the intolerable number of severe accidents occurring during abandon ship drills.

Whether progresses have been recorded on lifeboat, particularly in seakeeping qualities and good protection against weather, the crew's safety during abandon ship drills and actual operation is far from being totally guarantied.

ISM aim is to introduce safe operating practices and safe working environment. In this case, a risk factor had been identified for this class of vessels.

Waiting for corrective measures from the builder or from the owner, the precautions taken by the crew should be considered in the frame of an ISM audit.

8 MEASURES TAKEN

CMA CGM shipping company had immediately forbidden lifeboat lowering and heaving operations with crew aboard. These operations will be now done without the crew who will use a harbour craft (lines-man boat) to join and leave the boat for the drill.

CMA CGM has launched a survey campaign to check the incriminated parts on the vessels of its fleet and had warned the other owners, through Armateurs de France (owners association).

9 PLANNED OPERATIONS

It has been planned to add an access platform at the fore part of the davits on board the vessels of this class.

ORIENTAL PRECISION & ENGINEERING has revised the building process of the tackle and the swivel :

- In a first time, the FPD will be directly fastened to the frame of the floating block for this class of ships (scheduled in July 2011 for *CHRISTOPHE COLOMB*)
- In a second time, the tackle will be forged in a part that can't be dismantled.

10 RECOMMENDATIONS

The *BEA*mer recommends :

to the maritime industry,

1/ to adopt a course of action similar to that in effect in the car industry adopting the same quality requirements, a rigorous risk assessment process and making paramount the safety of the passengers of a transportation asset, moreover of a rescue asset. The fault of a lone part of the “system” should not be fatal.

to the IMO,

2/ to ban definitely the presence of crewmembers aboard davit launched lifeboats, during lowering and hoisting operations, as long as the fault risks of the “davit/lifeboat system “ will not be all identified and suppressed.

3/ to specify, via the LSA Code, that the structure of the lifeboat should be strong enough to support its weight and that of its crew with only one hook.

LISTE DES ANNEXES

APPENDIX LIST

A. Décision d'enquête

Enquiry decision

B. Dossier photos

Picture file

C. Carte

Chart

Annexe A

Décision d'enquête

Enquiry decision

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

Bureau d'enquêtes sur
les événements de mer

Paris, le **18 AVR. 2011**

N/réf. : *BEA*mer **006**

Décision

Le Ministre de l'Ecologie, du Développement durable, des Transports et du Logement ;

Vu la loi n° 2002-3 du 3 janvier 2002 relative aux enquêtes techniques après événements de mer ;

Vu le décret n° 2004-85 du 26 janvier 2004 relatif aux enquêtes techniques après événement de mer, accident ou incident de transport terrestre ;

Vu le décret du 09 septembre 2008 portant délégation de signature (Bureau d'enquêtes sur les événements de mer) ;

Vu le décret du 09 juin 2008 portant nomination du Directeur du Bureau d'enquêtes sur les événements de mer ;

DÉCIDE

Article 1 : En application de l'article 14 de la loi sus-visée, une enquête technique est ouverte concernant l'accident de l'embarcation de sauvetage à bord du porte-conteneurs *CMA CGM CHRISTOPHE COLOMB* immatriculé 9453559 et battant pavillon français, survenu le 15 avril 2011 dans le port de Yantian en Chine.

Article 2 : Elle aura pour but de rechercher les causes et de tirer les enseignements que cet événement comporte pour la sécurité maritime, et sera menée dans le respect des textes applicables, notamment le titre III de la loi sus-visée et la résolution MSC.255 (84) de l'Organisation Maritime Internationale.

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du Développement durable,
des Transports et du Logement
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Pour le Ministre et par délégation
Le Directeur-adjoint du *BEA*mer
Philippe LAINE

Annexe B

Dossier navire

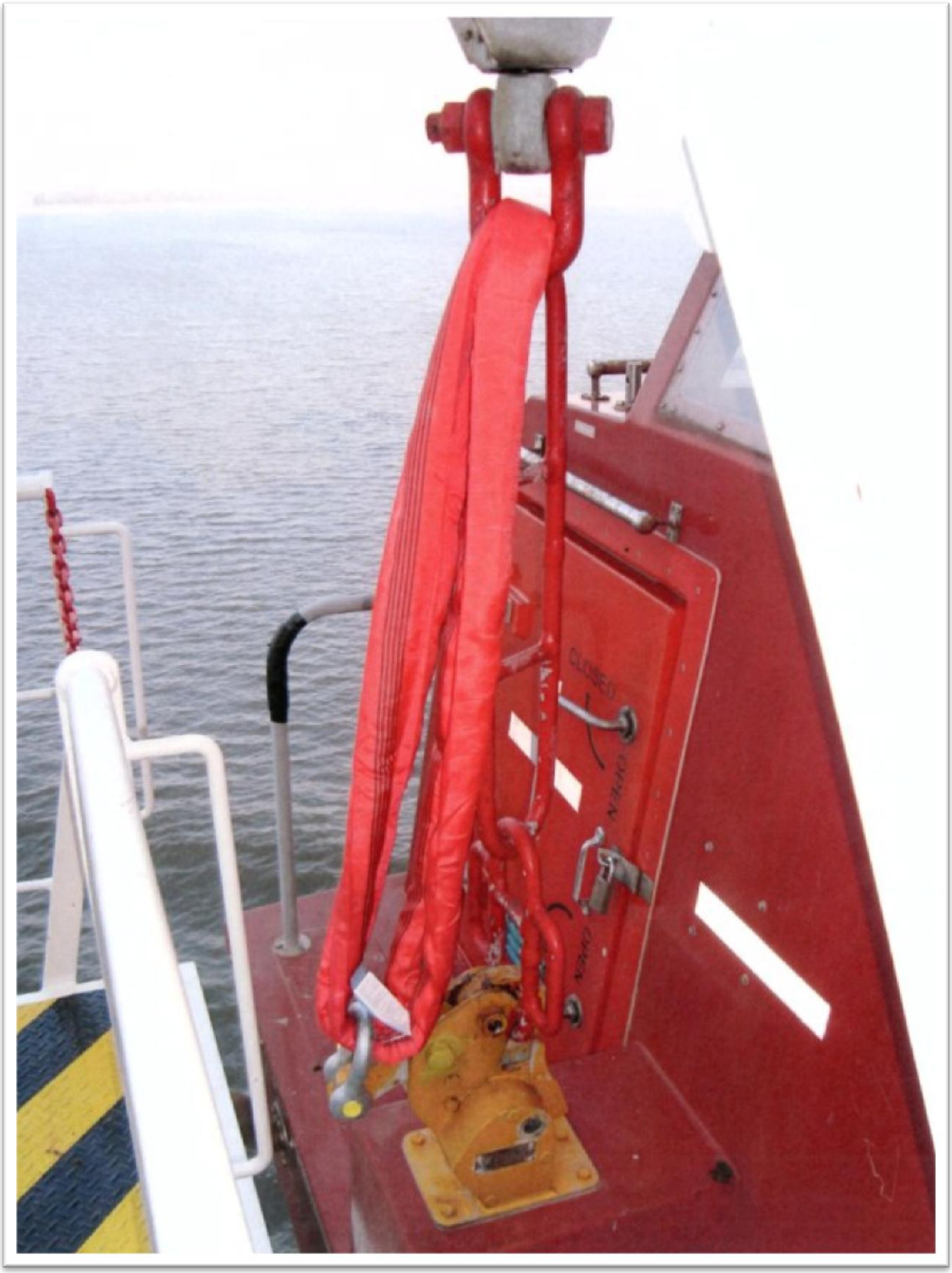
Picture file

Plate-forme bâbord arrière / Aft platform

Hissage de l'embarcation bâbord / Hoisting the lifeboat

Vue du moufle arrière au cours du hissage de l'embarcation bâbord

View of back tackle slacken during lifting of port lifeboat



Ceinture de liaison entre émerillon et croc de largage
(Fall Protection Device)

Vis de l'émerillon tribord après l'accident / Starboard swivel screw after the accident

Perçage pour goupille

drilling for pin

Annexe C

Carte

Chart

Russia
Mongolia
China
Beijing
North Korea
South Korea
Nepal
Bhutan
Bangladesh
India
Myanmar (Burma)
Laos
Vietnam
Thailand
Cambodia
Philippines
Taiwan
Hailar
Qiqihar
Harbin
Changchun
Shenyang
Hohhot
Tianjin
Dalian
Shijiazhuang
Yantai
Taiyuan
Qingdao
Jinan
Lianyungang
Zhengzhou
Xi'an
Lanzhou
Xining
Yinchuan
Yumen
Golmud
Urumqi
Karamay
Yining
Kashi
Shiquanhe
Lhasa
Chengdu
Chongqing
Guiyang
Kunming
Nanning
Changsha
Wuhan
Hefei
Nanjing
Shanghai
Hangzhou
Nanchang
Fuzhou
Xiamen
Guangzhou
Hong Kong
Macau
Zhanjiang
Haikou
Hainan
Kao hsiung
Luzon
Yellow Sea
East China Sea
South China Sea
Bay of Bengal
Gulf of Tonkin
Lake Baikal
Lake Balkhash
Yangtze R.
Huang R.
Brahmaputra R.
Ganges R.
Indus R.
Mekong R.
Irrawaddy R.
Amur R.
Yenisey R.
Angara R.
Ob' R.
Irtysh R.
500 km
500 mi

Yingkou
Dandong
Qinhuangdao
Dalian
Tianjin
Longkou
Inchon
Ulsan
Busan
Yosu
Shidao
Rizhao
Lianyungang
Zhenjiang
Shanghai
Zhapu
Ningbo
China
Tokyo
Yokohama
Kakogawa
Kure
Kikuma
Tokuyama
Shimonoseki
Xiuyu
Quanzhou
Keelung
Taipei
Taichung
Guangzhou
Yantian
Kowloon
Shuidong
Hongkong
Beihai
Fangcheng
Zhanjiang
Yangpu
Haikou
Basuo

Ministère de l'Écologie, du Développement durable, des Transports et du Logement

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