



REPUBLIC OF TURKEY
MINISTRY OF TRANSPORT AND INFRASTRUCTURE
Accident Investigation Board

Accident Investigation Report On
Fire Onboard of M/T HABAŞ

Habaş Platform / İzmit /Turkey
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This report is prepared by the Accident Investigation Board.

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PURPOSE

This marine accident was investigated in accordance with the By-law on the Investigation of Marine Accidents and Incidents which came into force after being published at the Official Gazette No.29056 on 10th July 2014.

Investigation procedures and principles are further applied by considering Resolutions of International Maritime Organization concerning International Standards and Recommended Applications for Safety Investigations Directed to MSC 255(84) (Accident Investigation Code) and Resolution A.1075(28) Sea Accidents or Incidents, and European Union Directive 2009/18/EC.

Marine accident investigation shall be inadmissible in any judicial and administrative proceedings whose purpose or one of whose purposes is to attribute or apportion liability or blame.

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ABBREVIATIONS

<i>ISM Code</i>	<i>:International Safety Management Code</i>
<i>SMC</i>	<i>:Safety Management Certificate</i>
<i>DOC</i>	<i>:Document of Compliance</i>
<i>SMS</i>	<i>:Safety Management System</i>
<i>STCW</i>	<i>:Standards of Training Certification and Watchkeeping</i>
<i>GT</i>	<i>:Gross Tonnage</i>
<i>SOLAS</i>	<i>:Safety of Life At Sea</i>

SECTION 1-SUMMARY



Figure 1: Location of the Accident

Note: All times used in this report are local time (GMT +2)

On the date of 27.04.2017 at 11:30, the vessel HABAŞ approached to Yarımcı, Habaş Tütünçiftlik Platform in order to unload its LPG cargo. On the same day, as of 17:00, it started to unload 2599.59 cubic meters of LPG and the unloading process was completed on the date of 29.04.2017 at 14:30.

It was planned that after unloading its cargo, the vessel HABAŞ would enter the shipyard in Tuzla for repair and maintenance works. The agent boat SERDAR 2 sailed from the Tütünçiftlik Municipality pier around 16:00 with the materials needed for cleaning of the vessel at the shipyard and the temporary workers who would carry these materials to the ship. It approached to Habaş platform around 16:15 and then approached the starboard side of the vessel HABAŞ. Cleaning materials were started to put onboard the vessel with the help of day laborers and seamen.

Around 16:25, a fire broke out with an explosion on the boat and on the sea surface and the fire spread to the platform and the vessel. The agent boat EFE HÜSEYİN, which was very close to the scene of the accident, took some of the accident casualties to the coast for the purpose of delivering them to the ambulance. Meanwhile, the service boat SERDAR 2 was taken away from the vessel by a maritime police boat.

The vessel's crew extinguished the fire with the vessel's own means and partially with the help of the tugboats, which came for help, around 17:30. 9 people were injured and one person died in the accident. While the service boat SERDAR 2 completely burned, partial paint damage occurred on the paint surface of the cargo tank No. 4 and the starboard side of the HABAS tanker.

SECTION 2-FACTUAL INFORMATION

2.1 Information on LPG Carrier HABAS

Name of Vessel : M/T HABAS

Flag : Turkish

Place of Build : Japan / 28 February 1984
/Year

Port of Registry : Istanbul

Type of Ship : LPG Tanker

Shipowner : Habaş Petroleum Products Ind. and Trade Inc.

Gross Ton : 6529

Net Ton : 1958

DWT : 5999

IMO No : 8208426

Call Sign : TCJL

Length Overall : 112,16 m.

Breadth : 19,4 m.

Depth : 8,3 m.

Main Engine : MITSUBISHI 6UEC/ 4476 Kw

Number of Crew : 24

Previous Port of Call : Temryuk/Russia

Next Port of Call : Habaş Platform-İzmit/Turkey



Figure 2: HABAS Vessel

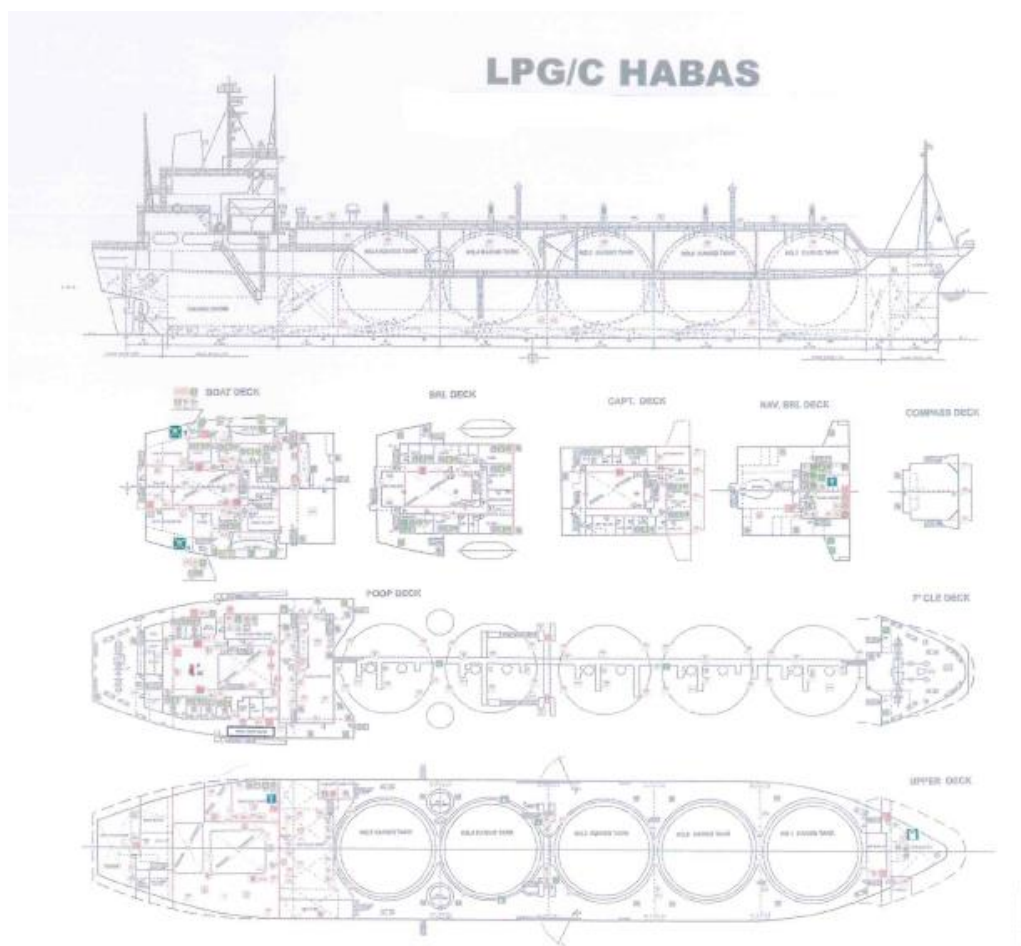


Figure 1: General Arrangement Plan of HABAS

2.2 Information on Agent Boat SERDAR 2

Name of Boat : SERDAR 2
Flag : Turkish
Place of Build / Year : Marmara Island / 01 September 1989
Port of Registry : Kocaeli
Type of Ship : Agent Boat
Shipowner : Suat İspirli
Gross Ton : 10,96
Net Ton : 7,45
Call Sign : YMA5321
Length Overall : 9,5 m.
Breadth : 3,4 m.
Depth : 1,2 m.



Figure 3: SERDAR 2 Agent Boat

2.3 Information on the Accident

Date and Time	: 29 April 2017 / 16:30
Place of the Accident	: Habaş Tütünçiftlik Platform / Yarımca
Location of the Accident	: 40° 44' 23" K - 029°47' 04" D
Death / Injured	: 1 / 9
Pollution	: None

2.4 Weather and Sea State

Around the time of the accident, the wind was blowing at 10-20 km/h (beaufort: 2-4) from east and southeast and wave height was 0,5-1 meter. The vision was clear.

SECTION 3- SEQUENCE OF EVENTS IN THE ACCIDENT

3.1 Cargo Operation Carried Onboard

The tanker HABAŞ loaded its cargo, 2599.591 MT AIR LPG MIX, from the port of Temryuk/Russia to be transported to the port of İzmit/Turkey (Habaş Tütünçiftlik Platform) and sailed at 11:00 on the date of 24.04.2017. The vessel HABAŞ approached to Habaş Tütünçiftlik Platform in order to unload its cargo at 11:30 on the date of 27.04.2017.

The cargo hose was connected between the vessel and the platform at 14:00 to unload the cargo on board and unloading the liquid LPG was started as of 18:00. The unloading of the liquid phase of the cargo was completed at 10:10 on the date of 28.04.2017 and the unloading of the gas phase of the cargo was started at 10:15. The unloading of the gas phase of the cargo was completed at 14:30 on the date of 28.04.2017.

After the unloading was completed, the manifold valve was closed and the drain valve in the platform was opened for draining the remaining gas in the cargo hose. Releasing the gas into sea via the drain circuit took approximately 10 minutes. After the drain procedure, the end of the cargo hose connected to the vessel was removed from the vessel's manifold at 15:30 and was given to the platform. The calculations related to the cargo were completed at 16:30 and the documents were delivered to the vessel at 17:00.

However, according to the statements of some casualties involved in the unloading operation of the cargo; unloading the gas phase of the cargo was completed on the date of 29.04.2017 at 02:30. Afterwards, the vessel manifold connection of the cargo hose between the platform and the vessel was removed and put to the platform. Then, the spiral flexible hose of gray color on the platform was lowered to approximately 1 meter below the sea surface by connecting one end of the hose to the vessel's manifold and attaching a valve / weight to the other end. The remaining gas in the cargo tanks was released to the sea by opening the valve of the vessel's manifold. When the pressure indicated on the vessel manifold gauge was reduced to 1.3 bars, the releasing procedure of the gas remaining in the next tank was started. While the boat carrying temporary workers approached to the platform and the materials brought was being put onboard, releasing gas to the sea continued.

3.2 Carrying Materials to the Vessel

It was planned that after unloading its cargo, the vessel HABAŞ would enter the shipyard in Tuzla for repair and maintenance works on the date of 05.05.2017. In order to carry the cleaning materials to be used in the cleaning of the vessel at the shipyard (1000-liter tanks, sawdust in sacks, piece of cloth/rag, fan for use in tank ventilation, spiral pipes, etc.) to the vessel, HABAŞ A.Ş. (HABAŞ Inc.) reached an agreement with Akın Denizcilik (Akın Shipping). Akın Denizcilik assigned 9 people, 2 of whom are their own personnel, to carry out the work. The people whom Akın Denizcilik agreed with to carry out the work, except for its own personnel, are the people working freelance for daily wage at daily works.

The team created by Akın Denizcilik came to Kocaeli Tütünciftlik municipality pier, which the agent boat SERDAR 2 is under its' authority, with the materials loaded to the truck beforehand from Tuzla / İstanbul. The workers, who loaded the equipment in the truck into the boat SERDAR 2, got onboard the boat with Akın Denizcilik representatives. The boat SERDAR 2 with 11 people in total, including the boat master and crew, sailed around 16:00 towards Habaş Platform, where the vessel HABAŞ was moored.

3.2 The Moment of the Accident

The agent boat SERDAR 2 approached at 16:15 in a way that its stern is close to starboard of the vessel HABAŞ and its bow is close to Habaş platform's stairs. 4 persons in total, two of whom were temporary workers and two of them were boat crew, stayed on the agent boat while the other 7 persons went aboard the vessel. Two temporary workers and boat crew on the boat tied the materials brought to heaving line while the workers on the vessel and the seaman who were helping the workers started to take these materials aboard. A while after starting to take the materials aboard, an explosion occurred around 16:25 at the place where the agent boat SERDAR 2 is located. Immediately after the explosion, a fireball arose from the sea surface towards the vessel's deck. The flames first spread all over the agent boat SERDAR 2 and then grew spreading to the vessel and the platform. Some of the seamen and temporary workers, who were trying to take the materials aboard on the vessel's starboard deck during the explosion, were injured by the explosion. Some of

the temporary workers and the seamen on board gathered at the stern of the vessel after getting out of the first shock.

At the time of the explosion, 2nd Officer and 3rd Officer were accompanying 1st Officer, while he was in between sphere tanks No. 4-5 measuring the pressure and temperature of the tanks. The officers, who saw the flames and smoke arising following the explosion, returned to the accommodation space of the vessel. Afterwards, 2nd officer asked the engine crew to operate the fire pumps. Immediately after that, 2nd Officer at 16:25 and 1st Officer at 16:29 called the master, who was not onboard at the time of the explosion, and reported the accident. The master instructed the officers to close the open valves on the sphere tanks and the group valves on the hose circuit reaching from the manifold to the tanks. In the meantime, 1st Officer called İzmit pilotage services station and requested powerful tugboats with firefighting features.

In the moments when the accident occurred, the Chief Engineer was in the officers' cabin and the 3rd Engineer was in the engine control room. Chief Engineer heard the sound of the explosion, and then learned about the fire after a seaman shouted at the stem saying there is a fire at the bow. Chief Engineer shouted saying there is a fire onboard the vessel and on the other hand, he went down to the engine room to inform the engine crew in the engine control room about the fire.

On the other hand, the aforementioned accident was detected by İzmit Vessel Traffic Services (VTS) at 16:30 and all authorities were informed immediately. With the instructions of Harbour Master of Kocaeli, Söndüren 7, which is under the ownership of Coastal Safety General Directorate, TÜPRAŞ's T.DAMLA1, T.DAMLA 2, T.DAMLA 7 and HASAN TURAL tugboats and Coastal Safety General Directorate's KIYEM 2 high speed evacuation boat, , were sent to the scene of the accident by VTS for the evacuation of possible injured personnel. Moreover, the boats which belong to the Coast Guard Command and the Maritime Police took action to arrive at the scene.

The two temporary workers and two boat personnel on the agent boat SERDAR 2 were seriously affected by the fire. One of the temporary workers on the boat fell first from the

plastic tank, on which he was, on the boat and then fell into the sea and got on board the boat with his own efforts and on the other hand, the other temporary worker went missing. After the explosion, the boat master jumped into the sea after the fire spread all over the boat and got on the platform. The last remaining boat personnel on the boat, by the boat master's instruction, entered into the accommodation space of the boat, where the flames did not reach yet, and he was caught among flames with the second explosion occurred as he set the throttle control lever of the boat engine at dead slow ahead to astern. The boat personnel waited to be saved by holding on the empty tanks he threw from the boat into the sea.

3.3 Firefighting Operation

After the shock following the incident, the deck officers carried out the shipmaster's instructions. Within this scope, they controlled the valves on the sphere tanks and closed the valves No. 2 and 5 on the sphere tanks and the group valves on the hose circuits reaching from the manifold to the tanks. Afterwards, they started to respond to the fire with fire extinguisher equipment from the starboard bow side to extinguish the fire on the deck.

The seaman in the staff room, who learned about the fire in the vessel after the chief engineer shouted saying there was a fire, went on the boat deck, saw that the fire was on the starboard side, and passed to the bow and got to the starboard bow side of the vessel after taking fire hose and nozzle from the fire cabinet in the deck head. He connected the fire hose to the hydrant between tanks No. 2 and 3. In the meantime, another injured seaman during the fire, 1st Officer, 2nd Officer and 3rd Officer started to respond to the fire at the deck from the starboard bow side.

When the personnel in the engine room went upstairs, they saw that the fire was close to accommodation space of the vessel and in response put into use the fire pump and the Sprinkler System. The Electrical Officer cut off the electricity in the power line of the vessel's deck. 3rd Engineer stopped the fans of accommodation space and engine room working as aspirator, took fire hose and nozzle from the engine room and connected it to the hydrant at the starboard stern side. Afterwards, he started to respond to the fire together with the oiler.

The oiler and 3rd Engineer, who were responding to the fire by spraying sea water from the starboard stern side of the vessel, could spray water interally since thick smoke was coming towards them because they were under wind. 1st Officer, 3rd Officer and a seaman were trying to extinguish the fire by spraying sea water while 2nd Officer also participated in the firefighting efforts with four portable carbon dioxide cylinders and a foam cylinder which he took from different points of the vessel. However, the fire extinguisher cylinders, whose replacement and maintenance were carried out a week before, performed poorly than expected by running out in a very short period of time.

3.3.1 Platform Officer's Response to the Fire

The platform officer, who heard the explosion inside the cabin of the platform, came out of the cabin and realized that there was a fire and started to spraying water in the direction where the smoke was coming by operating the fire pump on the platform. Afterwards, he saw the agent boat on fire and started to spray water towards it. When the platform officer saw that the agent boat on fire separated from the vessel, he tried to extinguish the fire on the platform fenders and the cargo discharge hose.

3.3.2 Extinguishing the Fire

The respond to the fire by the vessel crew from starboard bow and stern side of the vessel got a result; the fire was first taken under control and then was extinguished. Afterwards, responding to the fire continued on the flexible hose of gray color, one end of which was connected to the vessel's manifold and on the fire cargo unloading hose located between the vessel and the platform and on the fenders. On the other hand, the agent boat SERDAR 2, which was on fire a bit far away from the vessel, was tugged by the Maritime Police's boat to the coast of Tütünciftlik at 16:55 and was made clear from HABAŞ.

The fire on the vessel and the platform was under control at 17:05 and flames and smoke coming from the vessel and platform ceased. After the fire was taken under control, cooling works for the vessel and the platform was started. In this context, TÜPRAŞ's tugboat DAMLA-1, which was previously sent for firefighting, participated in the cooling

works for approximately 5-6 minutes. Then, the crew and the platform officer continued to carry out the cooling works for about an hour.

3.4 Evacuation of Injured People

The agent boat EFE HÜSEYİN, which was close to the accident area, approached the tanker HABAŞ immediately after the explosion in order to take the casualties who jumped into the sea. The agent boat EFE HÜSEYİN took 7 (temporary workers and seamen who came to work onboard the vessel) slightly and seriously injured people in total from the vessel,, and 1 injured person from the sea, and sailed to transfer them to the ambulances waiting for on the Tütünciftlik municipality pier.

The agent boat EFE HÜSEYİN, which gave the injured people to the ambulances waiting on the coast, then came to take the casualties on the platform and saved one more person who jumped into the sea after the accident. The boat EFE HÜSEYİN, which took two more injured people on the platform around 16:50, set sail towards the Tütünciftlik Municipal Pier. The high speed evacuation boat KIYEM 2 which came alongside the vessel HABAŞ at 16:57 confirmed that all injured people were transferred to the coast and that there were no more injured personnel on board.

On the other hand, it was revealed with the missing person report filed to the police by the relatives of the worker on the date of 29 April 2017 (the day after the accident) that a worker was missing, who was on the agent boat and whose absence were not recognized after the accident. The aforementioned casualty's dead body was found by the Maritime Police on the date of 01 May 2017 at 20-meter depth near the Habaş Platform.

3.5 Damage Caused to the Tanker HABAŞ and the Platform

Fire on the vessel was a paint fire in general. As a result of the fire, a paint damage occurred on the vessel's starboard freeboard deck, handrails and the starboard side of the tank No. 4 (Figure 4, 5).



Figure 4: Fire Damage Caused to the vessel HABAŞ

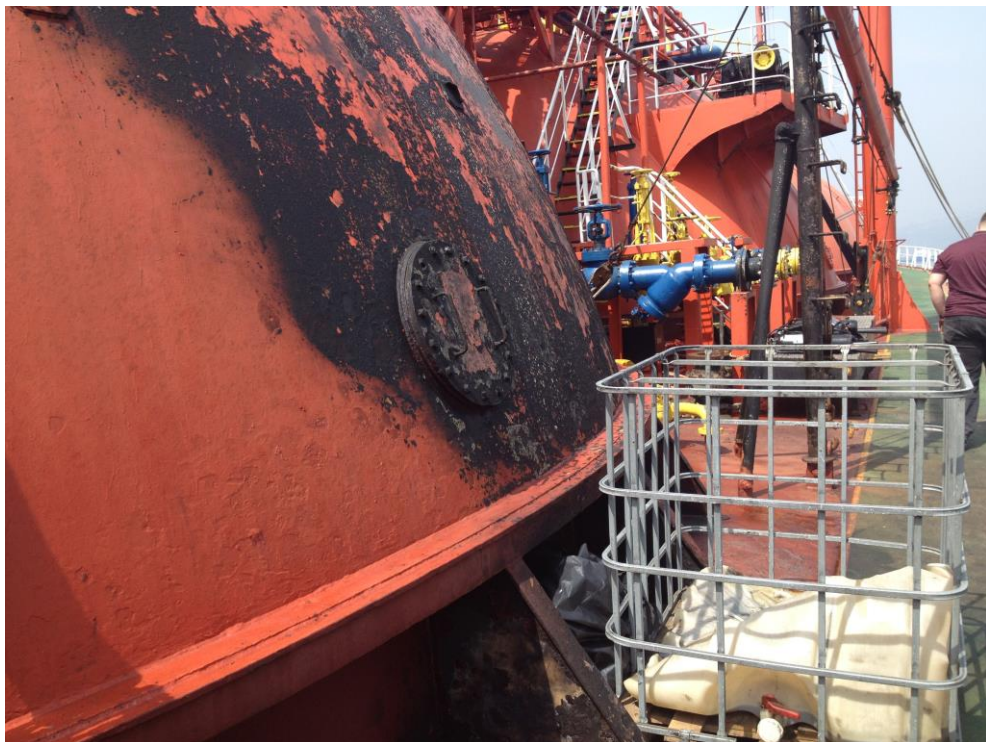


Figure 5: Fire Damage Caused to the vessel HABAŞ

The gray hose, which is used to especially releasing the remaining gas in the vessel's tanks into the sea and which was attached to the vessel's manifold at the time of the fire, was completely burned (Figure 6). The black rubber hose used in unloading the vessel's cargo and the platform fenders was partially burnt (Figure 7).

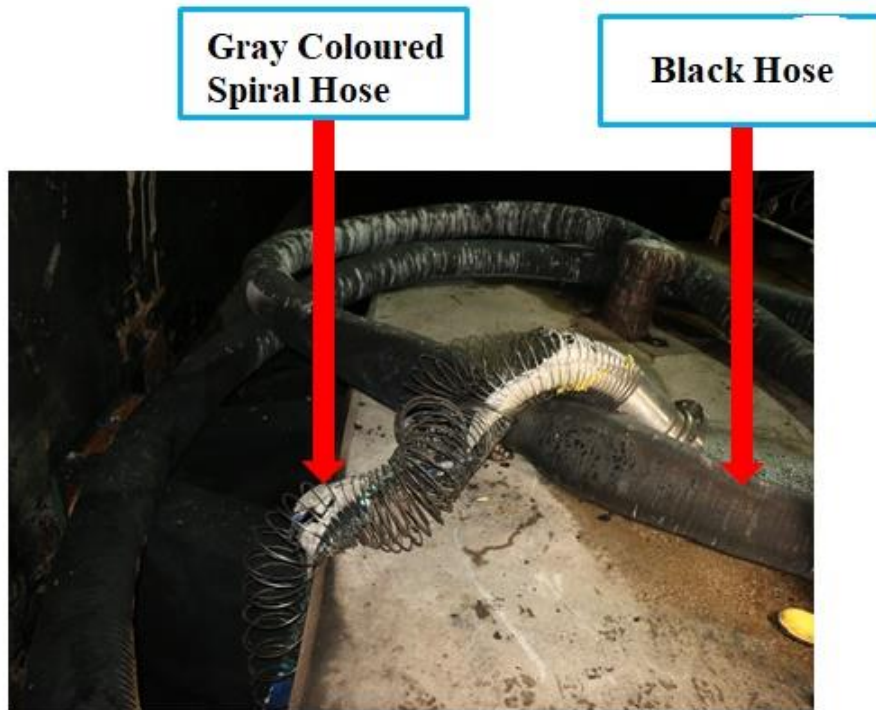


Figure 6: Hoses used in the Vessel in Cargo Unloading Operation



Figure 7: Black Hose Damaged by the Fire

The rubber and plastic fenders of the Habaş Platform were also damaged by the fire (*Figure 8,9*).



Figure 8: Platform Fender Damaged by the Fire



Figure 9: Platform Fender Damaged by the Fire

3.6 Damage Caused to the Agent Boat SERDAR 2

While the boat superstructure of the agent boat SERDAR 2 was completely burned, port and starboard of the shell were partially burned, the fuel tank were broken to pieces after the explosion and the boat became unusable (Figure 10, 11).



Figure 10: Damage caused to the Agent Boat SERDAR 2 after the Fire



Figure 11: Damage caused to the Agent Boat SERDAR 2 after the Fire

3.7 Safety Management Certificate (SMC) and Document of Compliance (DOC) of the Vessel HABAS

The Safety Management System (SMS) was established by Habaş Petrol Ürünleri Sanayi ve Ticaret A.Ş (Habaş Petroleum Products Industry and Trade Inc.) in accordance with the International Safety Management Code (ISM Code) and the Regulation on Implementation of the Code to Turkish Flagged Vessels and Their Managers.

The vessel's Safety Management Certificate was issued on the date of 4 June 2017 by the classification society Bureau Veritas (BV) at İstanbul/Turkey. It was required that an intermediate survey would be carried out between 10 June 2017 and 10 July 2017 for the SMC certificate.

Document of Compliance for HABAS Petrol Ürünleri Sanayi ve Tic. A.Ş (HABAS Petroleum Products Industry and Trade Inc.) was issued by Harbour Master of Istanbul on the date of 18 August 2016 as a result of the survey carried out and its annual survey was not carried out yet at that time.

In the reports issued as a result of the audit carried out on 08.10.2016 by the Designated Person Ashore (DPA) of the vessel HABAS within the scope of the Safety Management System, no non-compliance was reported in the report.

3.7.1 Cargo Unloading Procedure in SMS Manual

According to "Emergency Preparedness" Article 8 of ISM Code and "Emergency Preparedness" Article 13 of the Regulation on Implementation of the International Safety Management Code to Turkish Flagged Vessels and Their Managers, the company managing the ship must identify possible emergency situations that may occur on board and establish procedures to respond them.

According to the ISM Code, an SMS manual was prepared by the vessel's company to explain and implement its SMS. "Cargo Handling" operations were described in the Article 10 of the Cargo Handling Procedure in the SMS manual, and the work and procedures to be carried out regarding the unloading of the cargo were described in the "Unloading"

subheading numbered as 10.2. In the paragraph 10 of "Unloading" subheading numbered as 10.2, the procedures to be carried out after unloading cargo is specified stating that *“After the cargo hose or loading arm is disconnected from the vessel, it is closed with blind flange and the grounding cable is removed and the unloading is completed.”*

Pressure supply of the liquid remaining in the Hose circuit and pumping cargo vapor were specified in the subheading 10.2.2, and in its subparagraph 2, the procedures to be followed for pumping the high pressure cargo vapor remaining in the final part of the unloading of the cargo were specified as; *“When high pressure cargo vapor remains in the tank after unloading, this vapor is pumped into coast tanks with steam pipe after being sucked by gas compressors with No. 1 and No. 2 or pumped into bypass circuit on the tank using liquid line.”*. The matters to be considered during removing the cargo hose are listed, as below, in the subparagraph 2 under the heading "matters to be considered with regard to toxic or dangerous cargoes" of paragraph 5 on dangerous and toxic cargo of the subheading 11.2.1 "Sub-services and Fireman's Outfit" of the section 11 of SMS manual on Safety and Emergency Measures.

“The matters listed below shall be given special attention while disconnecting cargo hose connections of toxic/dangerous cargoes.

- a) *The orders of the officer in charge are followed*
- b) *Personal protective clothing, equipment and respiratory equipment should be worn*
- c) *Before the hose is removed, drain should be carried out and the pressure in the pipeline should be reduced by turning on the test valve.”*

3.7.2 Getting on board the Ship and Vehicles Alongside

The procedures regarding Getting on board the Ship are determined in the subheading 9.2.2 of Cargo Handling Procedure (HB 5052) titled section 9.2 on General Warnings of SMS manual as *“An easily observed place, which is sufficiently illuminated at nights, should be determined for getting on board the ship during the ship's port procedures.”* and the procedures regarding Observing of Getting on board the Ship are determined in the subheading 9.2.3 as *“People except for the ones with the shipmaster's permission and the people in charge, and drunk people, except for the ones who is with special permission and will be taken to a separated section in the ship, should be prevented from getting on board the ship.”*

The procedures to be followed regarding the vehicles alongside are determined in the subheading 9.2.11 as *“Unauthorized boats should be forbidden to come alongside or to approach the ship. The operations including cargo vapor ventilation to tugboats or other self-propelled vessels should not be allowed.”*

3.7.3 Cargo Vapor

The characteristic of cargo vapor is described under Cargo Vapor heading in the Article 1 of the subheading 11.1.2 on Liquefied gas tankers' safety guide of section 11 of SMS manual on the Safety and Emergency Measures of the Cargo Handling Procedure as *“Although the measures taken for cargo vapors in normal tankers are basically same, more care is required than regular tankers. This is because the cargo vapor is lighter or heavier than its specific gravity and has a little toxicity that is permissible...”* and spreading of cargo vapor is described in item1 of paragraph 2 of Firefighting subheading 11.2 as *“There are a lot of cargo vapors that are heavier than air. The cargo vapors tend to go out through openings in the tank and ventilation during loading and unloading and remain on the upper deck. The cargo vapor may enter the engine room through the ventilation air intake opening. When the wind speed is lower than 5 miles/hr (2.2 m/sec), this wind is not enough to distribute the cargo vapor. The air cannot take away the flammable/toxic gases when there is not enough movement in the air and this situation is very dangerous. In this case, attention should be paid to keep the cargo vapor in a place where it can be distributed. However, if the density of the cargo vapor is high, a stronger wind may be required to distribute the cargo vapor.”*

3.8 The vessel HABAŞ's personnel/crew

The tanker HABAŞ should be manned with 15 personnel according to the Minimum Safe Manning Certificate. According to the Ship's Crew List, there is 24 personnel working on board, and the qualifications of the ship's crew are in compliance with the said navigation zone and the tonnage class of the ship.

3.8.1 The Master

The master is 40 years old and has the Oceangoing Master certificate of competency. In 2001, he started to work onboard tankers as a deck officer. Onboard the LPG tanker HABAŞ, he has experience of 12 years and 6 months in total, respectively 6 months as Unlimited Watchkeeping Officer, 7 years as Unlimited 1st Officer and 5 years as a Master.

3.8.2 Key Personnel (1st Officer)

1st Officer is 37 years old and has Oceangoing 1st Officer certificate of competency. He has worked as deck officer in dry cargo ships between the years 2006-2010. He started to work as 2nd Officer onboard HABAŞ after 2010, and he started to work as 1st Officer onboard the same tanker after 2013.

3.8.3 2nd Officer

2nd Officer is 52 years old and has a certificate of competency to work as 1st Officer onboard the ships up to 3000 GT (Section A-II/1 of Standards of Training, Certification and Watchkeeping for Seafarers). He started his career on sea as a Radio Officer in 1986 and developed his certificate of competency with the trainings he received and his orientation examination.

He worked as Radio Officer and 3rd Officer onboard the LPG tanker HABAŞ between the years 2003-2012 and he continued to work as 2nd Officer after 2012.

3.8.4 3rd Officer

3rd Officer is 26 years old and has Oceangoing Watchkeeping Officer certificate of competency. He has been working as 3rd Officer onboard the LPG tanker HABAŞ since 2013.

3.9 The Crew of the Agent Boat SERDAR 2

The boat master is 52 years old and has Able Seamen competency. The person, except temporary workers and onboard the boat and stated that he helped the boat master, is 62 years old and has no certificate of competency as a seafarer.

3.10 Port Shift

After the vessel approached to Habaş Platform on the date of 27 April 2017 at 11:20, following the completion of customs, health and other port controls, the Master informed the company's DPA and left the vessel. The master left the vessel and deputized 1st Officer. On the date of 29.04.2017 at 16:25, he learned about the accident and returned to the vessel around 17:30 on the same day. 2nd Officer left the vessel getting a day off at the day when the vessel approached the platform and returned the vessel around 13:00 on the

day of the accident. 3rd Officer got a day off on the date of 28.04.2017 and returned to the vessel on the day of the accident. On the day of the accident, 8 personnel, especially the Master and 2nd Engineer, were not on board.

During the unloading of the cargo, 1st Officer stayed on board, and coordinated the work to be carried out on board and the unloading operation of the cargo. In the last 24 hours before the end of the unloading, he was able to sleep 6 hours in the last 24 hours between 19:00 - 22:00 and 05:00 - 08:00.

3.11 The Characteristics of LPG Cargo

LPG (Liquefied Petroleum Gas) is the hydrocarbons, such as propane, butane and their isomers or mixtures of these gases, which is obtained during distillation and fractionation of petroleum and are liquefied under pressure afterwards. LPG is an odorless, colorless, non-corrosive, highly flammable gas, and has a risk of fire and explosion. In the analytical report on the cargo of the vessel HABAŞ, it is seen that the cargo has a mixture ratio as 2.13% of Ethane, 7.84% of Isobutane, 28.72% of Propane and 60.18% of Butane when the substances below 1% are ignored.

LPG's characteristic to be liquefiable easily under pressure provides great convenience in the storage and transport of it. LPG is in gaseous state under normal conditions. In pressurized containers, it can be liquefied at relatively low pressures. In order to keep the LPG in a liquid state in a closed container, a pressure of about five times the atmospheric pressure is required. When the pressure applied on the LPG is removed, it transforms from LIQUID state to the GASEOUS state. The volume of LPG is increased by 250 times as it transforms from liquid state to the gaseous state. LPG is twice as light as water in the liquid state and twice as heavy as air in the gaseous state. It accumulates to the bottom when there is a gas leak. When one liter LPG is transformed into gas, it occupies about 300 liters of space. Under 1 atmospheric pressure, the propane starts to liquefy/condense at -25°C , butane at 20°C , and mixture LPG at 10°C .

There will be a rapid combustion or explosion if there is an ignition source in the environment when the vapors of flammable or inflammable liquids are accumulated with air in an appropriate ratio. This appropriate ratio is called the flammable range or explosive range.

Lower Explosive Limit (LEL): It is the lowest level of vapor percentage in air required to create a fire or explosion. LEL for LPG is 2.1%. In the concentrations below this, there will be no fire since the fuel (substance) is not enough and the mixture is considered to be a lean mixture in this context.

Upper Explosive Limit (UEL): It is the highest level of vapor percentage in air required to create a fire or explosion. UEL for LPG is 9.6%. In the concentrations above this, there will be no fire since the air (oxygen) is not enough and the mixture is considered to be a rich mixture in this context.

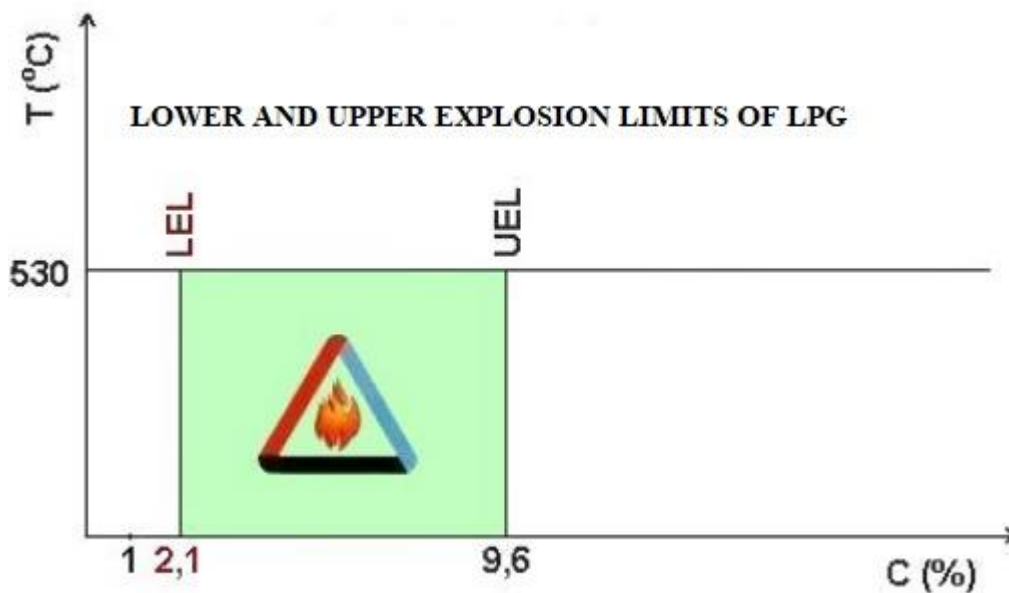


Figure 2: Combustion (Explosion) Rates of Natural Gas and LPG

3.12 Gas Measurement

In the Regulation 4.5.7.1 Portable instrument of Section II-2 of SOLAS, it is stated that onboard tankers, there should be at least one portable measuring device together with sufficient spare kits for the purpose of measuring flammable vapor concentrations and the appropriate measures for the calibration of the aforementioned devices should be taken.

1st Officer stated that there was a fixed gasometer on the platform and a portable gasometer which belongs to the vessel on the vessel, measurements were carried out continuously with the portable gasometer during the unloading and no alarm heard during the unloading on the day of the incident. As a matter of fact, the portable gas detector used by the ship personnel during the unloading of the cargo was severely damaged by the fire (Figure 12).



Figure 12: Gas Detector Damaged by the Fire

SECTION 4- ANALYSIS

4.1 Unloading the Cargo

2599.591 MT AIR LPG MIX cargo on board was unloaded in two phases, which consists of liquid and gas. Black rubber cargo hose was connected between the vessel and platform on the date of 27.04.2017 at 14:00 and liquid LPG unloading operation started as of 18:00. The unloading of liquid phase of the cargo was completed on the date of 28 April 2017 at 10:10 and at 10:15, the unloading of gas phase of the cargo started. The unloading operation carried out so far match up with both the casualties' statements and the records of the vessel. However, there are differences between the official records of the vessel and the casualties' statements regarding the unloading operation being carried out after 02:30 on the date of 29.04.2017.

4.1.1 Official Records and the Statement of a Group of Casualties

After the accident, there is information about the time, at which the unloading procedure took place, in the Time Sheet (Annex-1) which includes Master's Report, Incident Scene Report and the procedures carried out throughout the unloading operation. According to the aforementioned reports and time sheet;

- 1. The unloading of the cargo in the gas phase was started on the date of 28.04.2017 at 10:15 and ended on the date of 29.04.2017 at 14:30.*
- 2. After completion of the unloading, the manifold valve was closed and the drain valve at the platform was opened for draining of the remaining gas in the cargo hose (Figure 13).*



Figure 13: Gas Draining Line at the Platform

- 3. Pumping gas into the sea with draining circuit took about 10 minutes. After the draining process, the end of the cargo hose attached to the vessel was removed from the vessel's manifold at 15:30 and put to the platform.*
- 4. The calculations regarding the cargo were completed at 16:30 and the documents were delivered to the vessel at 17:00.*

4.1.2 Statements of the Other Group of Casualties

However, according to the statements of some of the ship's crew;

- 1. Following the completion of the unloading of the gas phase of the cargo on the date of 29.04.2017 at 02:30, the unloading operation was terminated.*
- 2. The vessel's manifold connection of the black rubber cargo hose between the platform and the vessel was removed and put to the platform.*
- 3. One end of the spiral flexible hose of gray color on the platform is attached to the vessel's manifold and its other end was put into the sea through between the fenders*

at the platform by attaching a valve/weight. The end of the hose put into the sea stayed approximately 1 meter below the surface of the sea.

- 4. The valve of the vessel's manifold was opened by turning 1-2 rounds and the remaining gas in the cargo tanks of the vessel was started to be released into the sea. After releasing the gas into the sea, bubbles were observed occasionally on the sea surface.*
- 5. The seamen carried out shift change between themselves at 08:00 as the releasing the gas into the sea was going on. At the shift change, the seaman who gave the shift told the seaman who took the shift that he must notify the 1st Officer in the event that the pressure indicated in the manifold gauge falls below 1.3 bars.*
- 6. At one stage, the vessel's manifold valve was turned down and the pressure was reduced since the end of the flexible hose in the sea was moving right and left due to gas pressure. Moreover, some of the casualties observed that bubbles on the sea surface went on at the point where it was released into the sea.*
- 7. When the pressure value indicated in the manifold gauge was reduced to 1.3 bars, the tanks were exchanged to release the gas remaining in the next tank.*
- 8. Releasing the gas into the sea continued as the materials were being carried to the vessel after the boat carrying temporary workers approached to the platform.*

4.1.3 Comparison of Official Records and Statements

As stated above, there are important differences between the official records of the vessel and the casualty's statements regarding the unloading operation. These differences are important in terms of determining the factors and the main reasons that caused the accident. Therefore, when the information/documents and official records and statements obtained from the investigations carried out after the accident were compared, the results are as follows.

1. In the official records of the vessel, a single hose used in the unloading was mentioned, while some casualties stated in their statements that another hose was also used after the unloading.

After the accident, when the pictures taken at the scene of the accident are examined, the cargo hose, which was used in the unloading of the vessel's cargo and taken to the platform after the unloading of the cargo was completed, was partially burned (Figure 14, 15, 16).



Figure 14: Hose used in the Cargo Operation



Figure 15: Hose used in the Cargo Operation



Figure 16: Hose used in the Cargo Operation

The gray colored spiral hose, which was stated by the casualty personnel and used for releasing the cargo/gas remaining in the tanks into the sea, was completely burned (Figure 17, 18).

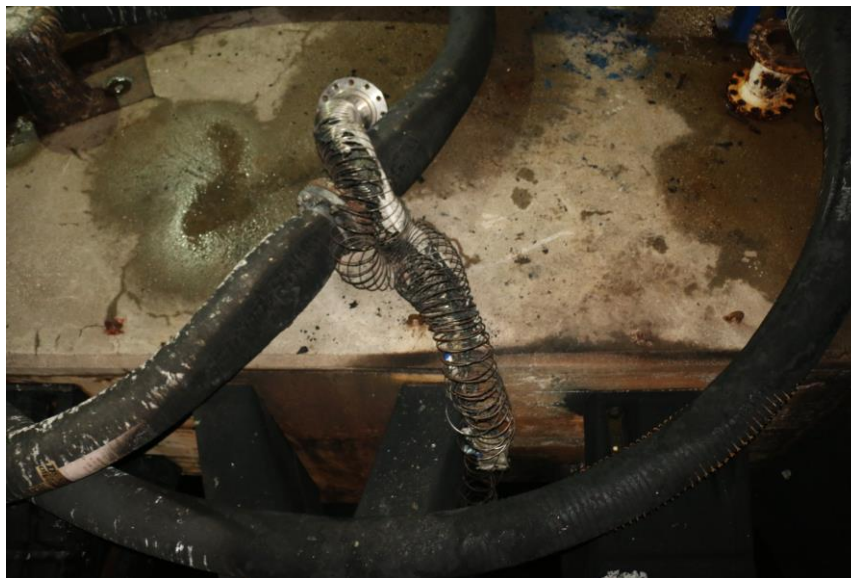


Figure 17: Hose used in Releasing Gas Vapor Remaining in the Tanks into the Sea.



Figure 18: Hose used in Releasing Gas Vapor Remaining in the Tanks into the Sea.

As it can be understood from the pictures taken after the accident, the black cargo hose was partially affected by the fire, while the other spiral hose of gray color was completely burned.

2. The burn marks was observed on the vessel's manifold on the starboard side of the vessel where the fire took place, while there were no signs found regarding the fire on the blind flange of the manifold (Figure 19). This supports the statements of the casualties about that the gray flexible hose, which was connected to the vessel's manifold at the time of fire and that the manifold was not closed with a blind flange, contrary to the submitted documents and some of casualty's statements.



Figure 19: The Vessel's Manifold

On the other hand, following the meeting between 1st Officer and 2nd Officer and the master after the accident, the fact that the valves, which were open on the tanks, were closed indicates that the cargo operation was not completely finished.

In the light of the pictures taken at the scene of the accident, the investigation at the scene of the accident and the statements made by some of the casualties, it was concluded that after the cargo operation was completed, LPG vapor was accumulated on the sea surface as a result of that gas vapor, which was remaining in the tanks, was released to the sea with gray flexible hose.

4.2 Cargo Unloading Procedures in SMS Manual

When the procedures regarding the unloading of the cargo described in Section 2.3.1 of SMS Manual are examined, it is observed that the matters are generally described regarding how to release the high pressure cargo vapor remaining in the tank after unloading, and the procedures to be carried out after unloading and the removal of the cargo hose connections of the poisonous / dangerous cargoes. In the official records received after the accident, it is also observed that the procedures related to the unloading

were pretty much followed. However, it is clear that if the unloading operation had been carried out as stated in the official records and some casualty's statements, the gas accumulation on the sea surface, which is one of the environmental conditions that caused the accident to happen, would not occur. This shows that the unloading operation carried out on the vessel was not carried out in accordance with the section of SMS manual.

On the other hand, it attracts the attention that it is an important deficiency that there is no information about what pressure value, to which the cargo / gas vapor remaining in cargo tanks should be pumped, in the section of SMS Manual on Cargo Handling Procedure (HB 5052).

4.3 Cargo Vapor

The LPG, which is released from any leakage source to open air, absorbs enough heat from the air and ground to circulate and evaporate. The cold gas cools the surrounding air and causes the moisture in the air to condense, thus causing the water vapor to form a mist cloud. An invisible LPG vapor is formed around this mist cloud. In addition to the invisible LPG vapor, there is also LPG vapor mixed with air with at the rate of 2 - 9%. The mist cloud with this mixture is called "Combustion and Fire Area".

Following the termination of the unloading operation of the cargo in the gas phase on the vessel HABAŞ, the gas vapor remaining in the cargo hose was released into the sea with the draining circuit on the platform. The gas, which could not be pumped to the platform and left in the tanks, started to be released into the sea with the gray flexible hose attached to the starboard manifold of the vessel using the pressure difference between the tank and the sea. When the pressure value indicated in the manifold gauge was reduced to 1.3 bars, the tanks were exchanged to release the gas remaining in the next tank. This process continued as the materials were being carried to the vessel after the boat carrying temporary workers approached to the platform.

Since LPG vapor is two times heavier than air, it is clear that LPG can remain on the sea surface at the point where it is released to the sea. As explained earlier, the lower flammability limit for LPG are composed of 2.4% LPG and 97.6% air mixture, while the

upper limit consists of 9.5% LPG and 90.3% air mixture. It is considered that this invisible LPG vapor caused the formation of an invisible gas cloud called "Combustion and Fire Area" as a result of mixing with 2-9% air. The movement of this LPG cloud in the open air is directly related to the wind and ground structure. A strong wind can spread the LPG cloud in a short time, while the light wind can drag it to the ground level.

In the section of SMS manual on the Safety and Emergency Measures of the Cargo Handling Procedure; it is stated that when the wind speed is lower than 5 miles/hr, this wind is not enough to distribute the cargo vapor, and the cargo vapors tend to go out through openings in the tank and ventilation during loading and unloading and remain on the upper deck. It has also been pointed out that if there is not enough movement in the air, the air will not be able to take away flammable/toxic gases and this situation is very dangerous and attention should be paid that the cargo vapor should be kept in a place where it can spread.

According to the information received from the official authorities on the weather and sea condition in the region, it is stated that there was a wind with 06-20 km/h speed in the east-southeast direction on the day of the accident. Information on the weather at the accident time and afterwards is not available in the log book recorded by the ship crew. It is determined that the information on the weather before the accident was recorded at 00:00, 08:00 and 12:00. According to the aforementioned records, the wind and sea were calm between 00:00 and 08:00, while the wind was blowing with 2 (6-11 km/h) (force) in the western direction at 12:00 according to the beaufort scale, and the sea state was recorded as 1.

It is considered that when the wind speed is lower than 9 km/h (5 miles/hr), and when it is considered that the wind is not able to take away the flammable/toxic gases, the present meteorological conditions allowed the LPG cloud to stay above the water and close to the vessel (*Figure 3*).

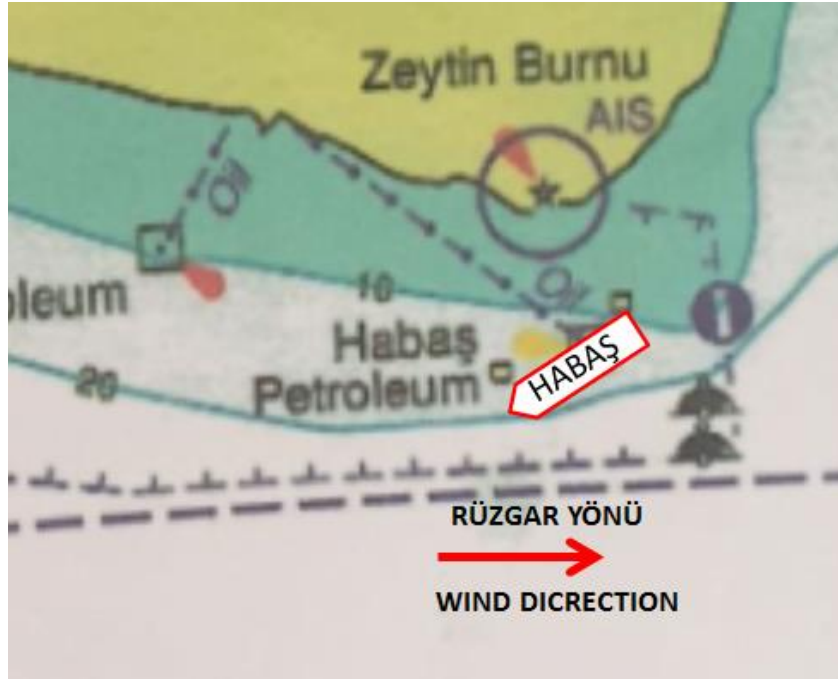


Figure 3: Wind Direction on the Day of the Accident

On the other hand, in the section (3.2.1) of SMS manual in which the cargo vapor is explained, the characteristics of the cargo vapor are stated and it is stated that it would be dangerous if the cargo vapor is not distributed on the deck. However, the accumulation of cargo vapor on the sea surface in the areas where the loading / unloading is carried out and the measures to be taken for distributing the cargo vapor from the deck or the sea surface were not mentioned. Moreover, LPG's characteristics were not mentioned for the vessel HABAŞ, which transports especially LPG.

4.4 Possible Reason for the Explosion

In addition to SOLAS and other safety regulations on shipping/maritime, standards regarding firefighting and fire measures are based on a basis.

The purpose of Regulation 4 under the Probability of ignition heading of Section II-2 of SOLAS, is explained as the prevention of explosion of flammable and combustible liquids. For this purpose, it should be ensured that vessels meet the functional requirements described below.

- .1 means shall be provided to control leaks of flammable liquids;*
- .2 means shall be provided to limit the accumulation of flammable vapours;*

.3 the ignitability of combustible materials shall be restricted;

.4 ignition sources shall be restricted;

.5 ignition sources shall be separated from combustible materials and flammable liquids; and

.6 the atmosphere in cargo tanks shall be maintained out of the explosive range.

Immediately after the explosion, a fireball arose from the sea surface towards the vessel's deck (*Figure 20, 21*).



Figure 20: The Moment of the Explosion



Figure 21: The Moment of the Explosion

As the gas in the environment run out, flames which could be seen from far away reduced after seconds. The fire that started on the vessel's side caused the vessel's paint, the gray-colored spiral hose attached to the vessel and the rubber platform fenders to catch fire. After a short time, the fire grew and the bare flames began to be accompanied by a dark black smoke (*Figure 22, 23*).



Figure 22: Explosion and the Fire which Started After the Explosion



Figure 23: Explosion and the Fire which Started After the Explosion

Combustion/explosion occurs by the combination of three elements. The first one is the presence of a flammable substance such as solid, liquid and gas in the environment; the second one is the presence of a source of heat or sparks that may cause fire, and finally the presence of sufficient oxygen/air in the environment.

The flammable material necessary for the fire/explosion to occur was accumulated on the sea surface by pumping the LPG vapor remaining in the vessel's tanks. LPG vapor mixed with air on the sea surface reached to a mixture of 97.6% air with 2.4% LPG, which is the lower flammability limit for LPG. After the last factor necessary for an explosion or fire to occur was added into the environment, an explosion occurred first and a fire broke out.

There is no sufficient evidence of how the heat or spark source was added to the environment. However, the explosion/fire occurred in the area where the agent boat SERDAR 2 was approached to the vessel. This situation strengthens the possibility that the spark or heat source is related to the agent boat SERDAR 2 or the activities of employees on the agent boat. This is because the engine of the agent boat was working while the material was being carried to the vessel, and there is the possibility that a spark might occur due to a short circuit or from the engine exhaust. On the other hand, it may be caused because of the spark occurred due to use of a flammable material such as cigarettes and lighters by the employees on the agent boat or the spark resulting from the electrostatic discharge or heating energy caused by hitting or friction of the carried material to the vessel.

4.5 Supply to and Getting On-Off the Vessel Procedures

There is a legal regulation concerning the supply to and getting on-off the vessel procedures. In addition to this legal regulation, regulations under ISPS regarding all kinds of supply, safety measures for getting on-off the vessel for visiting or business purpose must be taken by the ship and Port facility. On the other hand, in order to safely carry out the work and procedures to be carried out onboard the vessel, it is necessary to determine the procedures in SMS manual regarding getting on-off the vessel or receiving material on board.

4.5.1 Procedures Regarding Getting onboard the Ship and Vehicles Alongside in the SMS Manual

One day before the accident, the vessel's DPA went to the vessel with the agent boat SERDAR 2. When the DPA returned to the coast with the service boat SERDAR 2, he came across with one of the survivor casualty seaman and told him that workers would come for cleaning a day later from outside¹.

On the day of the accident, the agent boat SERDAR 2, which made two trips until the time of the accident, took 3rd Officer and the cooling team to the vessel in these trips. In the meantime, the master of the agent boat SERDAR 2 was informed by the DPA during a talk with him towards noon about that the daily workers who would bring the materials to the vessel were on their way. 1st Officer was informed by the DPA again on the telephone that the materials would be brought to the vessel by the service boat². The agent boat SERDAR 2, which took the daily workers and the materials to be taken to the vessel, sailed from the Tütünçiftlik Municipal Pier around 16:00. The seamen, who were informed by 1st Officer that the service boat would bring material to the vessel, met the service boat when the service boat approached the vessel. After the service boat approached to the Habaş platform from the bow around 16:15, 7 of the daily workers came down to the platform. While the daily workers were crossing the platform to the vessel, the service boat approached to the vessel. Daily workers who changed their clothes on the vessel were

¹ The Casualty Statements

² 1st Officer stated in his written statement that no information was provided regarding that the service boat would come to the vessel.

warned by 1st Officer that they should not smoke cigarettes and use similar flammable materials. Afterwards, the workers and the seamen started to take the material brought by the service boat to the vessel.

In the meantime, although the cargo was unloaded, the releasing operation of the cargo/vapor in the cargo tanks into the sea with gray spiral hose attached to the vessel's manifold had been continuing for about 16 hours³. The casualties stated that bubbles were observed occasionally on the sea surface at the point where the gas was released into the sea and that there was a smell of gas in the environment. While this was the case, the service boat was approached to the vessel in an uncontrolled manner. Moreover, the daily workers who have almost no knowledge about LPG were taken on board the vessel and these workers started to take these materials to the vessel.

LPG transported on board as the cargo is obtained by mixing the propane and butane, which are liquefied petroleum gases, in a certain ratio. This mixture generally consists of a mixture of 30% propane and 70% butane. Since butane has a boiling point of 0 degree and propane has a boiling point of - 42 degrees at atmospheric pressure, LPG transforms from liquid state to the gaseous state even at very low temperatures and the volume increases by 250 times in this transformation. LPG, which can explode by igniting with a spark or heat source, is highly flammable and can be toxic.

The risk of fire in LPG tankers, which has a risk of dangerous fire and explosion, is not the same with the risk of fire and the possible results of fire in a dry cargo vessel. It is very dangerous onboard LPG tankers to smoke cigarettes and to use tools and materials spreading sparks, open flames and heat. Therefore, appropriate measures should be taken to prevent unauthorized and untrained persons in LPG tankers, especially during unloading and loading operations. A certain procedure should be determined for the sea vehicles to come alongside these ships.

There is no sign that procedures in Safety Management System manual regarding Getting onboard the Vessel, Monitoring of Getting onboard the Ship, regarding the Vehicles Alongside are applied in any phase of the practices carried out onboard the vessel including the boat's coming alongside, the daily workers' getting on board and the brought materials' being taken on the vessel. In addition, it is considered that the present procedures

³ Casualty statements

specified in the Safety Management System manual do not adequately cover the practices carried out by ship's crew before the accident.

On the other hand, in order to prevent the formation of an explosive atmosphere onboard the vessel, as well as the distribution of cargo vapor, it is very important to put the necessary measures for the prevention of unauthorized/uncontrolled getting on - off the vessel, which may be the source of explosion, in SMS manual.

The master also stated that he did not know that the service boat would come alongside the vessel. The fact that the master, responsible for all operations of the vessel did not know about this situation, and the fact that notification that the materials would be delivered to the vessel was made on the day of accident shows that there is a significant lack of coordination between the company and the vessel.

4.5.2 Legal Procedures for Supply to and Getting On-Off the Vessel Procedures

In the second paragraph of Article 28 of the By-law on Ports, it is stipulated that "The vessels and sea vehicles to provide service between the ships and sea vehicles subject to customs control and places provided with customs services sail from the places determined by harbor master and the customs administration and approach to the same place. Approaching, mooring and other similar matters shall be specified in their permission certificates."'. A meeting on the Sea Service Vehicles was held on the date of 25.10.2016 by the harbor master. In this meeting, the relevant article of the By-law on Ports was referred and the decision of the agent boat owners "Criminal procedure will be taken if service is provided at places except for the places under customs control and supervision or without authorization by Custom Administrations and Harbor Masters." was notified verbally and in written form to the meeting participants.

The owner of the boat SERDAR 2, which provided service to the vessel HABAS on the day of the accident, also participated to the meeting. The owner of the boat is also one of the casualties on the day of the event. The owner of the boat did not get permission from the Harbor Master regarding the supply made on the day of the accident.

4.6 Firefighting

4.6.1 Firefighting on the vessel HABAS

In accordance with Regulation 7 of Section II-2 of SOLAS; in case a fire is determined onboard vessels, a general alarm must be given in order to detect the fire at the origin, to start a safe escape and firefighting activities. General alarm is given and the ship's crew is informed of the fire. After the general alarm, the ship's crew gets together at the emergency muster stations indicated on the muster cards.

The fire is responded within the framework of procedures specified under firefighting in SMS manual and under the control of the master or the person acting for the master. The person who will coordinate the firefighting will plan how to fight the fire and how to communicate depending on the circumstances. More than one team is organized, including firefighting, support and technical team. Leaders of these teams are appointed by the master. The collaboration and communication between these teams is ensured via the bridge. All other teams are responsible for carrying out the tasks assigned to them and for reporting all developments to the bridge. Teams that move with this principle get their equipment and go to the fire area where they will go in accordance with the order they receive.

After the fire detected onboard the vessel HABAS, the general alarm was not given and the ship's crew were not informed about the fire and the ship's crew did not get together at the emergency muster point mentioned in the muster cards. As the master was outside the ship, there was no one taking the responsibility for planning, organizing the crew and controlling within the scope of firefighting. The firefighting was completely spontaneous, and 1st Officer, 3rd Officer and 2 seamen carried out the first respond to fire with sea water on the starboard bow side of the vessel. 2nd Officer supported the firefighting operations by responding to fire with portable fire extinguishers (foam and CO₂).

Electrical Officer, who was in the technical team in firefighting, turned off the fans of engine room ventilation pumping the air outside into inside and deactivated the deck power line. Right in front of the ship's starboard accommodation space, 4th engineer and an oiler

organized a firefighting team and participated in firefighting operations by using sea water. However, since they did not use clothing and equipment suitable for firefighting, they were affected by smoke. Immediately after that, they started to fight the fire again using the firefighting equipment (boots and respiratory equipment).

During the fire, 8 of the ship's crews consisting of 24 people are off duty/outside the vessel. 2 of the ship's crew among 16 people were injured during the accident, and the majority of the ship's crew participated in the firefighting activities. There was no communication coordination between the teams involved in the firefighting process and there was no one to manage these teams. As a result of well-intentioned firefighting efforts of the ship's crew, the fire was under control in 20 minutes.

In the meantime, communication, one of the most important elements of the firefighting, remained incomplete. The VTS Center, which wanted to contact the vessel via the VHF channel since the firefighting was not managed from a center like the bridge, could not reach the vessel for a long time. This led to delays in the coordination of external support to extinguish the fire. The communication on board was carried out with the vessel phone, which 1st Officer had, in the beginning. Then 1st Officer assigned 2nd Officer for communication. During the accident, while the 2nd Officer was providing communication between the vessel and the coast, he asked for help by calling 112 Emergency Call Center on the other hand. In the meantime, he went to the platform, took the portable VHF from the platform official and used it to call TÜPRAŞ's (refinery facility located near the scene of the accident) tugboats and asked for help. VTS, who heard the call for help of 2nd Officer from VHF also established communication with the vessel. Immediately after that, the coordination lacked between the vessel and VTS was established in the scope of the firefighting. In this scope, one of the tugboats from TÜPRAŞ participated in the fire cooling operation.

The fire on board was fought with carbon dioxide cylinders, foam cylinders and sea water. However, the vessel's firefighting equipment was not limited to them. The firefighting equipment onboard generally consists of the following; main fire line, fixed dry chemical powder fire extinguisher which can be controlled from the deck and the bridge, nitrogen

fire extinguishing system, emergency fire line and portable fire extinguishers. All systems are shown in the Fire Control Plan (Annex-2). With the fixed dry chemical powder fire extinguishing system on the deck (Figure 24, 25), it is possible to carry out an effective firefighting. However, since fire extinguishing operations lacked a good planning, this system was not used in fire extinguishing operations and some of the ship's crew could not participate in fire extinguishing operations.



Figure 24,25: Fixed Dry Chemical Powder Firefighting System

In the subheading 12.1 *Firefighting organization and points to take into consideration* of section 11 on Cargo Handling Procedure, Safety and Emergency Measures of SMS manual, Operation Management and Task List are specified in the subparagraph 1, General Firefighting Procedure are specified in the subparagraph 2, and Points to Take into Consideration Generally in Fire are specified in the subparagraph 3. When the Operation Management and Task List were examined, it was observed that the 1st Officer was not assigned a task in this list. According to the aforementioned list, the master has the general control and no planning was made considering that the master was absent. According to the general firefighting procedure, required fire alarm was not given. Coordination, planning and communication were insufficient in the firefighting. The ship's crew who participated in the firefighting operations fought the fire without personal protective clothing and did not use some of the equipment that could be used to extinguish the fire. While it was tried to extinguish the fire on the vessel with personal efforts, external support

could not be provided to extinguish the fire since the communication between vessel-coast could not be established.

In accordance with Regulation 15 of Section II-2 of SOLAS, the ship's crew should have the necessary training and education in terms of ensuring the procedures are implemented. For this purpose, the crew should have the necessary knowledge and skills in order to fulfill their duties in emergency situations due to a fire. In accordance with Regulation 19.3.2 of Section III of SOLAS, each person from the crew shall participate in at least one abandon ship drill and one fire drill every month.

When the vessel's SMS records are examined, it is observed that fire drills are planned and carried out on board every month. As stated under the subheading *Firefighting organization and points to take into consideration*, the failure in firefighting shows that drills were only on paper or poorly understood by the ship's crew.

4.6.2 Firefighting Facilities Present on the Platform

The platform attendant, who got out from the cabin in the platform with the sound of the explosion, operated the fire pump on the platform. The platform officer first tried to support the firefighting operations by spraying water with the help of the water cannon (Figure 26) first towards the place which the smoke was coming from and then to the burning agent boat. Upon seeing that the burning agent boat moving away from the vessel, he tried to extinguish the ongoing fire on the platform fenders and the cargo unloading hose.



Figure 26 : Water Cannon Used in Firefighting Operations

Within the scope of the examinations at the scene of the accident after the accident, the platform was also examined. In these examinations, the fire pump was operated to see the range of spraying water of the water cannon on the platform (Figure 27, 28, 29). The water coming out of the fire extinguishing cannon can reach from its place to the edge of the platform where the vessels approach. It is designed not only to respond to the fires on platform, but also to fires that break out onboard vessels. It is considered that the water cannon was insufficient in firefighting operations with both its range and its low pressure.



Figure 27: The Range of the Water Cannon Used in Firefighting Operations



Figure 28: The Range of the Water Cannon Used in Firefighting Operations



Figure 29: The Range of the Water Cannon Used in Firefighting Operations

SECTION 5 – CONCLUSIONS

Safety issues related to the occurrence of the accident are listed below:

1. Following the completion of the unloading of the gas phase of the cargo, the gas vapor remaining in the tanks is released into the sea by the method not defined in the SMS manual.
2. The gas vapor released into the sea caused the formation of an invisible gas cloud on the sea surface, at a place near the vessel's side due to suitable meteorological conditions.
3. The owner of the agent boat SERDAR 2 did not get permission from the Harbor Master regarding making supply to the vessel.
4. There is no indication that the procedure under SMS was carried out by the ship's crew regarding the getting onboard the vessel by the daily workers on the agent boat SERDAR 2 and taking the cleaning material on the boat to the vessel.
5. It is considered that the procedures for the getting on-off the vessel specified in SMS manual do not sufficiently cover the practices carried out by the ship's crew before the accident.
6. The SMS manual related to cargo unloading operation carried out onboard the vessel is not clear enough about the cargo operation and does not cover the whole cargo operation.
7. There are no regulations on the tasks that require a proxy for the master in emergencies that may occur on board.
8. The crew was not informed of the fire by giving a general alarm on board.
9. Within the scope of firefighting, the ship's facilities were not fully utilized.
10. Planning, coordination and communication in firefighting operation and in extinguishing the fire were not carried out as required.
11. The part of the SMS manual related to firefighting organization is not clear enough and does not cover the whole firefighting operation.
12. The equipment used for firefighting on the platform was insufficient.

SECTION 6 – RECOMMENDATIONS

6.1 Habaş Petrol Ürünleri Sanayi ve Ticaret A.Ş. (Habaş Petroleum Products Industry and Trade Inc.) is recommended to;

- 22/04-18** Review the SMS and eliminate the deficiencies detected in SMS manual as soon as possible, particularly the cargo operation part,
- 23/04-18** Provide refresher training related to loading-unloading operations for deck officers working in loading-unloading operations on board,
- 24/04-18** Ensure that all procedures applied onboard the vessel related to the SMS are applicable and make the internal audits more strict and check that the system is carried out properly,
- 25/04-18** Ensure that the drills to be carried out in accordance with the SOLAS regulations are effectively carried out onboard the vessels in its fleet,

6.2 HABAŞ LPG Terminal is recommended to;

- 26/04-18** Review the compliance of firefighting equipment on the platform, to which the LPG vessels approach, in accordance with the international standards,

The context of this Report shall not be used to in order to attribute blame or apportion responsibility among parties.

Annex-1: Time Sheet

HABAS PETROLEUM PRODUCTS INDUSTRIES & TRAINING PVT. HABAS PETROL, DEBHELUR, KARNATAKA STATE, INDIA					
QUALITY AND SAFETY DEPARTMENT					Form No: DMR 123
TIME SHEET					
Issued by:	Approved by:	Publication Date:	Issue Date:	Issue Status:	Page:
MURUGA	MURUGA	20/01/2017	20/01/2017	0	1 of 1

VESSEL	LPG/C HABAS	VOYAGE NO	0917	DATE	29.04.2017
PORT	Habas platform / yamata			OPERATION	Discharging

Incident taking place	Date	Time
Arrived On Board	27.04.2017	09:00
Pilot on board	27.04.2017	09:00
Notice of Readiness Tendered	27.04.2017	09:05
Notice of Readiness Accepted	27.04.2017	As per op
Pilot Left	27.04.2017	10:30
All Fast	27.04.2017	11:15
Pilot left the vessel	27.04.2017	11:20
First Frigate	27.04.2017	12:00
Hoist connected	27.04.2017	14:00
Calculations completed	27.04.2017	14:50
Discharging liquid commenced habag	27.04.2017	18:30
Discharging liquid completed habag	27.04.2017	22:30
Discharging liquid commenced ppg	28.04.2017	00:30
Discharging liquid completed ppg	28.04.2017	10:30
Discharging vapour commenced habag	28.04.2017	10:15
Discharging vapour completed habag	28.04.2017	14:30
Ballasting started	-----	-----
Ballasting finished	-----	-----
Hoist disconnected	29.04.2017	15:30
Calculations completed	29.04.2017	16:30
Papers delivered to the vessel	29.04.2017	17:00
Ready to departure	29.04.2017	
Vessel departed	29.04.2017	
Blowing commenced	-----	-
Blowing completed	-----	-

RECEIVED BY:

MASTER OF LPG/C HABAS
 MURAT PULAT
 LPG/C HABAS
 CHIEF OFFICER



Annex-2: Fire Control Plan

