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Specification of the Emergency Repair Scenario

1.1 Introduction

The main purpose of the specification of the scenario is to provide a framework for the identification of the user requirements of the integration tool, based on the analysis of processes which take place in the business case "Emergency Repair".

The processes concerning the emergency response and repair after accident are very complex and may strongly vary depending on many influencing factors. Due to this circumstances it was necessary to specify the scenario processes and events at high level of abstraction, in order to simplify the analysis and modelling of the processes and their corresponding data. Furthermore, the definition of some limiting conditions makes it easier to develop a first prototype of the MARVIN integration tool for the Emergency Repair business case.

The simplification of the basic scenario was achieved considering several aspects including the selection of an easy and realistic emergency case, making restrictions to the development of the incident and to the actors being involved in the corresponding processes.

Another important aspect, which was also taken into consideration, was to allow for extensibility of the basic scenario. This comprises the possibility of adding further processes and actors during the analysis phase and the development of the prototype. A revision of the scenario specification may be necessary when other important aspects and constraints between the individual processes and their interfaces to each other become more visible.

1.2 Type of Casualty

The most common ship casualties, which may result in a repair of the ship in a shipyard, are collision, grounding and fire/explosion. The collision case was rejected as candidate for the basic scenario, due to the need of involving the same actors for each vessel respectively (crew, owner, response company, classification society etc.). Considering a fire/explosion case would involve additional parties such as fire-fighting companies, rescue organizations etc., which would make the basic scenario too complex. Considering these aspects, the grounding case appeared to be the most suitable casualty type to be used as basic emergency scenario. Since it is possible to restrict the consequences of the casualty in such a manner that only some of the usually involved parties are considered as actors.

Grounding casualties are usually categorized in two major types [1]:

- Grounding on soft sea beds (e.g. sand, mud), the so-called *Soft Grounding events.*
- Grounding on hard bottoms (e.g. rock pinnacle, coral reef), the so-called *Hard Grounding events.*

Hard grounding events result in most cases in "major" damages of the ship bottom (e.g. rupture of shell plates and severe deformations of the adjacent structures) due to the penetration of the rock into the hull. This leads automatically to the consideration of oil spill from fuel tanks or in the worst cases (VLCC, chemical tankers) from cargo compartments. This would unavoidably involve many other parties in the scenario, such as environmental and coastal authorities, clean up companies, etc. Therefore, it is obvious to select a soft grounding casualty or alternatively make some restrictions to the type of damage, cargo condition (e.g. ballast) type of vessel, in order to keep the scenario as simple as possible.

1.3 Emergency Scenario

The emergency case is based on a grounding casualty that may for instance occur as consequence of one of the following reasons:

- Over-reliance by watch keeping officers on the automated features of the integrated bridge system
- Failure in the functionality of modern navigation aids.
- Human factor (e.g. watch keeper falls asleep due to lack of adequate rest).
- Damage in the steering system of the vessel.
- Underestimation of extremely bad weather conditions (Storm, Hurricane, etc.)
- Serious machinery breakdown.

It is assumed that no oil spill nor other kind of pollution occurs, and that nobody is injured as result of the casualty. Serious damages of the ship bottom or the propulsion and steering systems as consequence of the grounding lead to the necessity of towing the ship to a shipyard for repair.

Further simplification of the scenario shall be achieved by excluding the cases of cargo damage or loss, the transportation or evacuation of passengers and the transfer of bunker or cargo to other ship(s). This leads to a restriction of the vessel type and cargo condition.

Some examples of grounding casualties occurred in the past years, which illustrate the basic emergency scenario, are shortly described in annex A.

1.4 Actors

The following parties are considered as main actors of the basic emergency scenario. The processes involving these actors will be analyzed and modelled and should be considered to form part of the prototype of the integration tool.

- Ship Crew: Represents the person or persons taking decisions and actions onboard of the Ship (e.g. Shipmaster, Pilot, On-Scene Commander).
- Ship Owner: Offshore site in charge of the administration and management of the vessel (e.g. Owner, Managing or Shipping Company).
- ER Company: Emergency Response Company contracted by the owner to technically assist the vessel in case of accidents.
- Ship Yard: Company, which provides the infrastructure and facilities to repair the vessel after the accident. This includes suppliers and subcontractors.
- Tug Company: Company, which is contracted by either the Owner or the Yard to provide the necessary tugs for re-floating the vessel and towing it to the shipyard.

- Class Society: Classification Society from which the vessel obtained the class certificates and which is responsible for the necessary surveys and inspections of the vessel after the accident.
- Insurance Company: Organization with which the Owner of the vessel has arranged an Insurance Contract (Policy) to cover costs of damage, loss or liability caused by any perils[1] of the sea.

The following parties are currently not included in the scenario neither for analysis nor for modelling of processes.

- MRCC: Maritime Rescue Co-ordination Centre
- Port Authority:
- Coastal Authority:
- Flag State:
- P&I Club:

Though, processes which concern the notification of the accident (e.g. reporting the casualty according to mandatory regulations) may be included in the process modelling, but shall not be part of the functionality of the integration tool.

1.5 Repair of the vessel

In the general case, after the damage the owner of the vessel contacts the shipyard for the arrangement of the repair. This “Invitation To Tender”, initiates the Tendering processes. Then the shipyard creates an estimation for the material and work requirements of the repair. Following the appropriate external suppliers and subcontractors are communicated so that a quotation for the required materials or services to be bought can be produced. Next the Tender is prepared and submitted to the ship owner. The vessel arrives at the shipyard and it is placed on the dry dock if docking is required.
The shipyard’s and the ship owner’s representatives make the “in-place inspection” of the ship so that damages can be specified in detail. Then the repair is initiated and the responsible persons of the shipyard (invoicer) keep record of the repair work that is executed. Finally the cost of the repair items is calculated and the final invoice of the repair is produced.
In order to achieve simplification of the scenario, the processes that will be considered will include the “Request for Tender” and they will cover the workflow until the submission of the Tender from the Shipyard to the Ship owner. The suppliers and sub contractors are considered internal to the shipyard, so in this phase the quotation from the external providers will be produced from within the shipyard and incorporated in the Tender. This will lead to the limitation of the number of involved actors and will help to have a complete process beginning from the Casualty, until the submission of the Tender and the agreement or the rejection of the Tender.

[1] The cause of a possible loss, such as fire, windstorm, theft, explosion, or riot, covered in an insurance policy. *Perils of the sea* are perils which are unique to maritime transportation and which could not be prevented by reasonable efforts, including sinking of the vessel, stranding, heavy weather, lightning, collision with other vessels or submerged objects (e.g. icebergs)

References

[1] Simonsen, B. Cerup (1997a). "Mechanics of Ship Grounding". Ph.D. Thesis. Technical University of Denmark, Dept of Department of Naval Architecture and Offshore Engineering, Lyngby, 260 pp.

[2] Pedersen, T. "Final Report for the STVF Research Programme MARINE STRUCTURAL DESIGN" – http://www.ish.dtu.dk/reports/rpg/97/

[3] Paik, J.K., et al. "Residual Strength Assessment of Ships after Collision and Grounding, Marine Technology, Vol 35, No. 1, Jan 1998, pp. 38-54.

Annex A: Examples of casualties

Australian Marine Incident Investigation Unit "MIIU", Report N^o 39–1992

"The Japanese-registered wood-chip carrier Daishowa Maru arrived off Twofold Bay, New South Wales at 1818 local time on 10 February 1992. As the ship was not to berth until 0700, 11 February, the Master proceeded to the Quarantine Anchorage, where the ship anchored at 1930 on 10 February 1992.

Shortly after midnight, in strong winds, the ship dragged anchor and although attempts were made to weigh anchor and head out to sea, it was driven ashore on Whale Spit, off Tororago Point, at 0040, 11 February.

The ship was eventually re-floated at 1000 on 13 February 1992 and towed to anchorage in the outer bay. An underwater survey showed that the ship had suffered considerable damage to the bottom plating, but the hull had not been breached and no pollution occurred as a result of the grounding.

The propeller, rudder and steering gear had also all been damaged; therefore, the owners decided that the ship should be towed to Japan for repairs. The towage operation commenced on 14 February 1992."

Australian Marine Incident Investigation Unit "MIIU", Report N^o 40–1995

"The 182 m long, Australian flag bulk carrier River Torrens arrived off the Port of Newcastle, New South Wales, at 2100on 31 May 1995, loaded with about 27,000 tonnes of wheat from South Australian ports. At 2107, a licensed pilot for the port boarded the ship to take the vessel to no. 3 berth, the Western Basin Grain Terminal. The night was fine, partly cloudy, with a light north-easterly wind and a swell of about 1.6 m at the harbour entrance.

The vessel’s bridge passed the outer end of the Southern Breakwater at 2123. The vessel was to the south of the transit of the main leading lights and turning to port, although full starboard rudder had been applied. The vessel’s speed at the time was estimated to be 8 to 9 knots. As soon as the vessel was in the lee of the Southern Breakwater, the vessel’s speed was reduced to half ahead and then, after about a minute, to slow ahead.

River Torrens steadied as it approached no. 2 buoy and, as the vessel then began to swing to starboard, full port rudder was applied to counter the swing and avoid no. 2 buoy. However, the propeller and rudder came into contact with the steeply shelving channel bank 80 m east of no. 2 buoy. Although the rudder was kept hard to port and one of the waiting tugs pushed hard on the starboard bow, the vessel continued across the channel.

The Pilot ordered the anchors to be let go, but before they could be released the vessel grounded on the northern side of the channel at 2127, about 10 minutes before high-water.

After initial attempts to re-float the vessel, both tugs were positioned at the ship’s stern to tow the vessel off the bank. Using the ship’s engine and tug power, the ship was re-floated at 2147 and resumed passage for the grain berth.

An inspection of the ship showed all propeller blades were damaged, the lower half of the spade rudder was bent to an angle of about 30 degrees from the vertical and some damage to the main engine crankshaft was evident. Forward, there were some superficial scrape marks to the bottom paint work. On 4 June, River Torrens entered dry dock where further assessment of the damage was made and repairs to the vessel began."

Transportation Safety Board of Canada "TSB" – Report N^o M94L0037

"On 10 December 1994, the "ANAX", loaded with 17,717 metric tonnes of wheat from Duluth, USA, was transiting the St. Lawrence River bound for Baie Comeau, Quebec, with two pilots on board. When the vessel was off Beaumont, a power interruption occurred on the emergency electrical system supplying the navigation instruments and the steering position. A few minutes later, the vessel grounded on a rocky bottom on the south side of the channel. The vessel sustained major damage requiring dry-docking. No one was injured, and no pollution was reported as a result of this occurrence."

Transportation Safety Board of Canada "TSB" – Report N° M93N0002

"The "CSL ATLAS" departed from Lower Cove, Newfoundland, bound for New York, U.S.A. The master did not engage the services of a pilot for the departure. Shortly after, the vessel grounded 1.1 cables west of Pigeon Head. The "CSL ATLAS" jettisoned 5,645 tonnes of cargo and was re-floated later the same day. The vessel sustained extensive damage to the underside portion of the hull; three compartments were holed. There was neither pollution nor injury as a result of this grounding.

The Board determined that the "CSL ATLAS" grounded because the master sailed at night from a port with which he was unfamiliar, did not employ the recognized departure procedure, did not establish either a bridge resource management regime or a voyage plan for leaving the berth, and did not engage either the pilot or tug available."

