Enhancing SAR Communication and Decision Making using Vessel TRIAGE: Concept and Developments

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Aalto University, Marine Technology, Finland
The Finnish Lifeboat Institution, Finland
NAPA Ltd, Finland

6th International Maritime Conference on Design for Safety
Hamburg, Germany, 28-30 November 2016
WIDE COLLABORATION

Vessel TRIAGE Method

GREEN

YELLOW

RED

BLACK
A method for assessing and communicating the safety status of vessels in maritime distress situations
Vessel TRIAGE Concept
Vessel TRIAGE catalyst

COSTA CONCORDIA

13.01.2013

Thyrrenean Sea
Vessel TRIAGE catalyst

LISCO GLOARIA
09.10.2010
Fehmarn Belt
Vessel TRIAGE catalyst

AMORELLA
14.12.2013
Archipelago Sea
Vessel TRIAGE

Cooperation between SAR services and various actors would be significantly more effective

Nationally and internationally
At sea and on land
Medical triage principle…
... Vessel TRIAGE application

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**GENERAL SITUATION**
- The situation aboard is stable. Although the vessel may have been damaged by the accident, the damage does not threaten the safety of the people aboard.
- The damage to the vessel has been assessed. It is highly unlikely that the damage will spread or get worse.
- The vessel still protects the people aboard against the prevailing conditions.

**OPERATIONAL FOCUS**
- Damage control or firefighting operations are not required.
- If there are injured people aboard, the operational focus is on emergency care.
- Only patients in need of urgent care are evacuated from the vessel.
- Active monitoring of the situation aboard is important.

**GREEN**
- The vessel is separated, broken, sunk, burnt or otherwise damaged so badly that it no longer provides protection to the people aboard against the prevailing conditions that is, the vessel has totally lost its seaworthiness.
- Even if the vessel is still completely or partly afloat, it is no longer safe to work aboard, even to save human lives.

**OPERATIONAL FOCUS**
- The operational focus is on evacuating the vessel.
- All non-essential personnel will be evacuated from the vessel.
- Patients classification may not be able to be carried out aboard the vessel.
- Enough resources are available, damage control or firefighting will be carried out to provide extra time for evacuation.
- Using shoveling in shells, it could be an alternative to evacuation, or to provide extra time for evacuation.
- Continuous monitoring of the situation aboard becomes more important.
- Damage slowly spreads progressively - significant risk of the situation turning "black".

**OPERATIONAL FOCUS**
- The operational focus is on rescuing people on the hull as well as searching for and rescuing those in the water.
- Patients classification cannot be carried out aboard the vessel.
- Operations involving diving or rescue by means of full generation are special operations that are planned and decided on separately.
- As a rule, additional personnel are not dispatched from and into the vessel.
Other SAR classification systems

• **According to Emergency Phases**
  
  *International Maritime and Aeronautical*
  
  • Uncertainty Phase
  • Alert Phase
  • Distress Phase

• **According to size of the Accident**
  
  • Daily mission (1-10 persons OR max 2 seriously injured)
  • Multi Patients mission (less than 20 persons OR 3-10 seriously injured)
  • Disaster (over 20 persons OR over 10 seriously injured)
  • Multi Actor case (humans, environmental and property is in danger)
Vessel TRIAGE categories

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![Green Vessel](image1)

![Yellow Vessel](image2)

![Red Vessel](image3)

![Black Vessel](image4)
Vessel TRIAGE categories: examples

GREEN

THE VESSEL IS SAFE AND CAN BE ASSUMED TO REMAIN SO
Vessel TRIAGE categories: examples

**YELLOW**

The vessel is currently safe, but there is a risk that the situation will get worse.
Vessel TRIAGE categories: examples

**RED**

THE LEVEL OF SAFETY HAS SIGNIFICANTLY WORSENED AND EXTERNAL ACTIONS ARE REQUIRED TO ENSURE THE SAFETY OF THE PEOPLE ABOARD
Vessel TRIAGE categories: examples

BLACK

THE VESSEL IS NO LONGER SAFE AND HAS BEEN LOST
Common language

1) Exchange of information

2) Decision on vessel’s Vessel Triage category

GREEN
- The vessel is safe and can be assumed to remain so

YELLOW
- The vessel is currently safe, but there is a risk that the situation will get worse or the vessel status is unclear

RED
- The level of safety aboard has significantly weakened and immediate external action is required to ensure the safety of the people aboard

BLACK
- The vessel is no longer safe and has been lost
# Threat factor matrix

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<td><strong>Flooding</strong></td>
<td>Flooding affects a limited or contained space and has no effect on the vessel’s stability and seaworthiness.</td>
<td>Flooding can be kept under control with pumps and watertight compartments, but the seaworthiness of the vessel is restricted.</td>
<td>Extensive flooding or progressive flooding to undamaged watertight compartments. Flooding cannot be kept under control and poses a direct danger on the entire vessel.</td>
<td>Flooding is so severe that evacuation operations are no longer possible. OR Vessel has capsized or sunk.</td>
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<td><strong>Listing, decrease of stability</strong></td>
<td>Listing or decrease of stability does not affect the seaworthiness of the vessel.</td>
<td>Seaworthiness of the vessel is restricted due to a decrease of stability or a notable list.</td>
<td>Large heel angles. The seaworthiness of the vessel is significantly impaired, its stability is threatened and there is an imminent need to evacuate.</td>
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<td>Vessel has lost its manoeuvrability, but is still capable of emergency anchoring or drifting safely.</td>
<td>Vessel has lost its manoeuvrability and is not capable of emergency anchoring or drifting safely.</td>
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<td>Functions important for ship operations are kept running by backup systems while the fault is repaired.</td>
<td>Operational capability of the vessel is limited: Backup systems do not work as planned OR functions important for ship operations are kept running by backup systems, but the fault cannot be repaired at sea.</td>
<td>A full black-out of long duration that cannot be repaired at sea poses a direct danger on the entire vessel.</td>
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<td><strong>Fire, explosion</strong></td>
<td>Fire has been extinguished and there is no danger of reignition AND/OR the consequences of an explosion do not affect the vessel’s safety.</td>
<td>Fire or explosion affects only a limited area and can be brought under control with the vessel’s own or external damage control/firefighting resources.</td>
<td>Fire cannot be kept under control OR the consequences of an explosion pose a direct danger on the entire vessel.</td>
<td>Conditions on board the vessel are not survivable. The consequences of the fire or explosion pose a direct danger to persons aboard. OR Vessel has been destroyed.</td>
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<td><strong>Danger posed by hazardous substances</strong></td>
<td>Release of hazardous substances on board does not pose any danger on the vessel.</td>
<td>Release of hazardous substances on board poses a danger in certain sections of the vessel, but the release can be contained to these sections.</td>
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Operational focus based on Vessel TRIAGE classification

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**OPERATIONAL FOCUS**

- **GREEN**: Damage control or firefighting operations are not or are no longer required.
- **YELLOW**: Only patients in need of urgent care are evacuated from the vessel.
- **RED**: Active monitoring of the situation aboard is important.
- **BLACK**: The operational focus is on rescuing people on the hull as well as searching for and rescuing those in the water.
- **OPERATIONAL FOCUS**

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**OPERATIONAL FOCUS**

- The operational focus is on limiting damage / damage control and preparations for possible evacuation from the vessel.
- In addition to carrying out damage control measures and rescue operations, it is important to determine the actual condition of the vessel.
- At the discretion of the master of the vessel, non-essential persons can be evacuated from the vessel.
- Active monitoring of the situation aboard is important.

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**OPERATIONAL FOCUS**

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- Continuous monitoring of the situation aboard becomes more important.
- Triage usually moves progressively from yellow to red to black.

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Vessel TRIAGE
Technology development
Threat factor Stability and Flooding

- Based on SOLAS s-factor

\[ s_{\text{final}} = K \cdot \left( \frac{GZ_{\text{max}} \cdot \text{range}}{0.12 \cdot 16} \right)^{\frac{1}{4}} K = \sqrt[4]{\frac{15^\circ - \phi}{15^\circ - 7^\circ}} \]

- Based on comparison of
  - actual measured/predicted flooding extent
  - interpolated maximum floodable length for that location

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<td>GREEN</td>
<td>small heeling and good stability, ( s_{\text{final}} = 1.0 )</td>
<td></td>
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<tr>
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<td>increased risk due to heel and/or decreased stability: ( 0.8 \leq s_{\text{final}} &lt; 1.0 )</td>
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<tr>
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<td>large heeling and/or decreased stability: ( s_{\text{final}} &lt; 0.8 )</td>
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\[ F_{\text{ext}} = \frac{L_{\text{flood}}}{FL(x_{\text{flood}})} \]

- GREEN | flooding is limited to a single WT compartment
- YELLOW | more than one WT compartment is flooded but \( F_{\text{ext}} \leq 1.0 \)
- RED | Flooding extent exceeds floodable length, \( F_{\text{ext}} > 1.0 \)
Example: collision damage

- Large passenger ship
  125000 GT
- Collision damage to 2 WT compartments
- One open WT door that is successfully closed after 10 minutes before flooding progresses
Water detected in one WT compartment
Water predicted to spread because of open WT door
WT door closed, flooding limited to two WT compartments
Fleetrange service
Fleetrange service
Place of refuge - risk assessment tool

A risk assessment tool that feeds the decision making process

An unified and coordinated command and control of the situation

A structure for rapid and effective decision-making.

Risk criteria based ranking of potential places of refuge (Vessel Triage).

Input from all the stakeholders when designing a strategy and a risk assessment procedure.

Establishing technical and objective criteria and procedures for risk assessments pertaining to requests for refuge.
Vessel TRIAGE
Regulatory development
NCSR3 concerns and comments to Vessel TRIAGE

- Valid for all accidental situations
- No additional workload to crew
- Benefit to communication should be confirmed
- SAR response decisions should not become Master responsibility
- No conflict with existing emergency assessment and communication methods

- Application should be consistent between individuals
- Communication procedures should be harmonized across multiple SAR regions
- Regulatory implications should be accounted for
Future international development…

Finnish Transport Safety Agency and Finnish Border Guard will submit the Vessel Triage initiative to ICAO-IMO approval:

2015 Vessel TRIAGE METHOD has been presented to ICAO-IMO Joint Working Group with a proposal for testing and a long term goal to implement it in the IAMSAR Manual

2016 Vessel TRIAGE METHOD was presented to NCSR3. Proposed and agreed to recommend further testing.

2017 Vessel TRIAGE METHOD was presented to NCSR4. NCSR4 did not support the inclusion to the IAMSAR manual at this time and encouraged for further testing.
Shared Situational Awareness

Shore Side Responders  JRCC / MRCC  Distress Vessel  Shipping Company
HIGHLY POSITIVE DEVELOPMENT

EUSBSR FLAGSHIP PROJECT
- EU Strategy for Baltic Sea Region PA Safe supports this initiative and has included it to the new Policy Area on Maritime Safety and Security program
  - To become a leading region in maritime safety and security

NAPA LTD
- Applies Vessel TRIAGE principles and colors in its passenger ship flooding damage stability systems
- Internationally 90 % market share on cruising industry

PLACE OF REFUGE DECISION PROCESS
- Finnish Transport agency will include Vessel TRIAGE method in their place of refuge decision making process

MIRG SOP’S
- Emergency responders will benefit from this method
- Nationally and Internationally

SHIPPING COMPANIES WANT TO IMPLEMENT
- Finnlines, Tallink-Silja, Viking Line, Bore want to implement in their safety management systems in due course.

IMRF SUPPORTS THE INITIATIVE STRONGLY

Aalto University
School of Engineering
"No: Vessel TRIAGE is not the answer to life, the universe and everything. But it will help improve understanding. And that alone makes it worthwhile”

David Jardine-Smith IMRF secretary
Thank you.
Questions?

Jori Nordström
Vessel Triage Project 2014-2015
Project Manager (Captain)

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Facebook (Vessel Triage)
Twitter (@vesseltriage)