



**C.U.G.R.I.**  
Consorzio Inter-Universitario per la Previsione e Prevenzione dei Grandi Rischi  
University Consortium for Research on Great Hazards  
University of Salerno – “Federico II” University of Naples  
[www.cugri.it](http://www.cugri.it)



## **“TEMPESTE ESTREME”**

**Aspetti tecnici, gestionali ed assicurativi**



**Mare agitato: danni e responsabilita' nell'esercizio operativo di unita'  
navali e carico associato**

Giovanni Puppo

( RINA )

Seminario Telematico nel quadro della Genoa Shipping Week  
tenuto Martedì 5 Ottobre 2021 - Ore 15.00  
sulla Piattaforma dell'Ordine degli Ingegneri di Genova



Rough Seas:  
IN THE OPERATION OF NAVAL UNITS AND ASSOCIATED CARGO.



## Introduction

RINA is active in verification, Certification, Marine Classification, Product Testing, Site and Vendor Supervision, Training and Engineering Consultancy across a wide range of Industries and Sectors .

RINA operates through a network of companies covering Marine, Energy, Transport & Infrastructures, Business Assurance and Industrial Innovation.

# Rough Seas:

In the OPERATION OF NAVAL UNITS AND ASSOCIATED CARGOS



5 Ottobre 2021 - 16.00

Genoa Shipping Week



Climate change leads to more extreme weather, but early warnings and warning systems may save lives and properties.

## IMPACT OF UNPREDICTABLE WEATHER BRINGS NEW LOSS SCENARIOS

The shipping industry is no stranger to extreme weather, which remains an important factor in many accidents. Changing weather patterns are resulting in physical damage incidents and supply chain disruption.

## Recalls from relevant rules and guidance

1. SOLAS Ch V Regulation 34 – Safe Navigation and Avoidance of Dangerous Situations
2. SOLAS Ch V Regulation 31, Danger Messages
3. IMO MSC.1/Circ. 1228 (2007): REVISED GUIDANCE TO THE MASTER FOR AVOIDING DANGEROUS SITUATIONS IN ADVERSE WEATHER AND SEA CONDITIONS.
4. IMO MSC/Circ.1063: Weather routing service
5. IMO MSC Circ.1610: Maritime service in the context of E Navigation
6. CSS Code Annex 13 in determining safe stowage and securing of cargoes

# RECALLS FROM RELEVANT RULES AND GUIDANCE



## **REGULATION 34 - Safe navigation and avoidance of dangerous situations**

- 1 Prior to proceeding to sea, the master shall ensure that the intended voyage has been planned using the appropriate nautical charts and nautical publications for the area concerned, taking into account the guidelines and recommendations developed by the Organization.\*
- 2 The voyage plan shall identify a route which:
  - .1 takes into account any relevant ships' routing systems;
  - .2 ensures sufficient sea room for the safe passage of the ship throughout the voyage;
  - .3 anticipates all known navigational hazards and adverse weather conditions; and
  - .4 takes into account the marine environmental protection measures that apply, and avoids as far as possible actions and activities which could cause damage to the environment.
- 3 The owner, the charterer, or the company, as defined in regulation IX/1, operating the ship or any other person, shall not prevent or restrict the master of the ship from taking or executing any decision which, in the master's professional judgement, is necessary for safe navigation and protection of the marine environment.

\* Refer to the Guidelines for Voyage Planning, adopted by the Organization by resolution A.893(21).

# RECALLS FROM RELEVANT RULES AND GUIDANCE



## REGULATION 31 - Danger messages

- 1 The master of every ship which meets with dangerous ice, a dangerous derelict, or any other direct danger to navigation, or a tropical storm, or encounters sub-freezing air temperatures associated with gale force winds causing severe ice accretion on superstructures, or winds of force 10 or above on the Beaufort scale for which no storm warning has been received, is bound to communicate the information by all means at his disposal to ships in the vicinity, and also to the competent authorities. The form in which the information is sent is not obligatory. It may be transmitted either in plain language (preferably English) or by means of the International Code of Signals.
- 2 Each Contracting Government will take all steps necessary to ensure that when intelligence of any of the dangers specified in paragraph 1 is received, it will be promptly brought to the knowledge of those concerned and communicated to other interested Governments.
- 3 The transmission of messages respecting the dangers specified is free of cost to the ships concerned.
- 4 All radio messages issued under paragraph 1 shall be preceded by the safety signal, using the procedure as prescribed by the Radio Regulations as defined in regulation IV/2.



# RECALLS FROM RELEVANT RULES AND GUIDANCE



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IMO

*E*

Ref. T1/2.04

MSC.1/Circ.1228  
11 January 2007

## REVISED GUIDANCE TO THE MASTER FOR AVOIDING DANGEROUS SITUATIONS IN ADVERSE WEATHER AND SEA CONDITIONS

1 The Maritime Safety Committee, at its eighty-second session (29 November to 8 December 2006), approved the Revised Guidance to the master for avoiding dangerous situations in adverse weather and sea conditions, set out in the annex, with a view to providing masters with a basis for decision making on ship handling in adverse weather and sea conditions, thus assisting them to avoid dangerous phenomena that they may encounter in such circumstances.

2 Member Governments are invited to bring the annexed Revised Guidance to the attention of interested parties as they deem appropriate.

3 This Revised Guidance supersedes the Guidance to the master for avoiding dangerous situations in following and quartering seas (MSC/Circ.707).

# RECALLS FROM RELEVANT RULES AND GUIDANCE



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Ref. T2/8.03

MSC/Circ.1063  
19 December 2002

## **PARTICIPATION OF SHIPS IN WEATHER ROUTEING SERVICES**

1 The Maritime Safety Committee, at its seventy-sixth session (2 to 13 December 2002), in response to a proposal from the United Kingdom approved an MSC Circular aimed at establishing minimum standards for weather routeing services that are consistent with voyage planning requirements (SOLAS Chapter V, regulation V/34) and load line zone restrictions.

2 Presently, weather routeing services remain relatively unregulated and are mainly a commercial service. Improvement in weather routeing services and safety can be achieved only by an increased dialogue between ships' masters and their weather routeing service providers and through a continuous review of the information that is provided by them.

3 Member Governments are invited to bring the attached guidance to the attention of shipowners, ship operators, ship managers, ship charterers and masters, and to encourage them to incorporate it into agreements between weather routeing services and their clients.

4 This circular complements MSC/Circ.1017, which urges masters of ships to participate in the Voluntary Observing Ships' (VOS) Scheme of the World Meteorological Organization (WMO).

# RECALLS FROM RELEVANT RULES AND GUIDANCE



MSC.1/Circ.1610  
14 June 2019

## INITIAL DESCRIPTIONS OF MARITIME SERVICES IN THE CONTEXT OF E-NAVIGATION

1 The Maritime Safety Committee, at its 101st session (5 to 14 June 2019), adopted resolution MSC.467(101) on *Guidance on the definition and harmonization of the format and structure of Maritime Services in the context of e-navigation*, and:

- .1 agreed to consolidate the descriptions of Maritime Services and to consider them together with all involved international organizations and interested Member States in order to harmonize the provision and exchange of maritime information and data; and
- .2 invited Member States and international organizations acting as domain coordinating bodies to submit descriptions of Maritime Services to the Organization, taking into account the guidance provided in the resolution.

# RECALLS FROM RELEVANT RULES AND GUIDANCE



The purpose of the CSS Code (Code of Safe Practice for Cargo Stowage and Securing) is to provide an international standard to promote the safe stowage and securing of cargoes by:

- ✓ drawing the attention of shipowners and ship operators to the need to ensure that the ship is suitable for its intended purpose;
- ✓ providing advice to ensure that the ship is equipped with proper cargo securing means;
- ✓ providing general advice concerning the proper stowage and securing of cargoes to minimize the risks to the ship and personnel;
- ✓ providing specific advice on those cargoes which are known to create difficulties and hazards with regard to their stowage and securing;
- ✓ advising on actions which may be taken in heavy sea conditions; and
- ✓ advising on actions which may be taken to remedy the effects of cargo shifting.

In providing such advice, it should be borne in mind that the Master is responsible for the safe conduct of the voyage and the safety of the ship, its crew and cargo.

# Heavy weather typical damages and Claim types

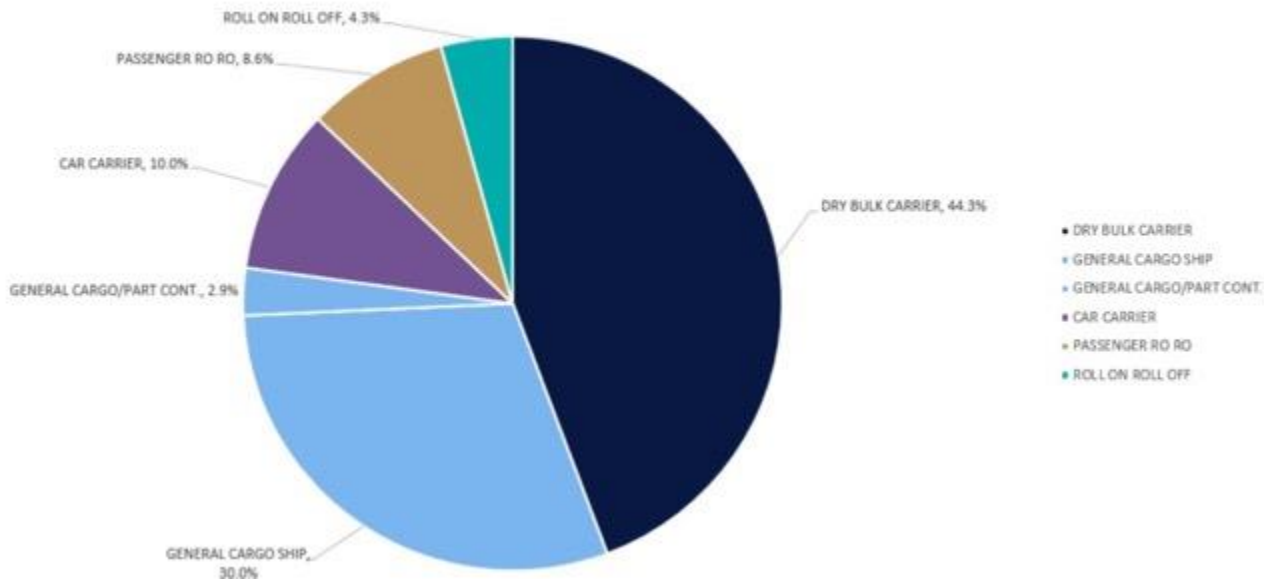


Claim types where heavy weather is a factor:

- **Structural damage:** indents , buckling, cracks , structural failure, collapsing.
- **Machinery damages:** primary and essential equipment , secondary equipment
- **Physical damage:** cargo shifting, breaking, collapsing, falling
- **Wet damage:** cargo affected by water ingress to cargo spaces
- **Cargo lost overboard:** deck cargoes
- **Contamination:** resulting from physical damage of adjacent cargo.

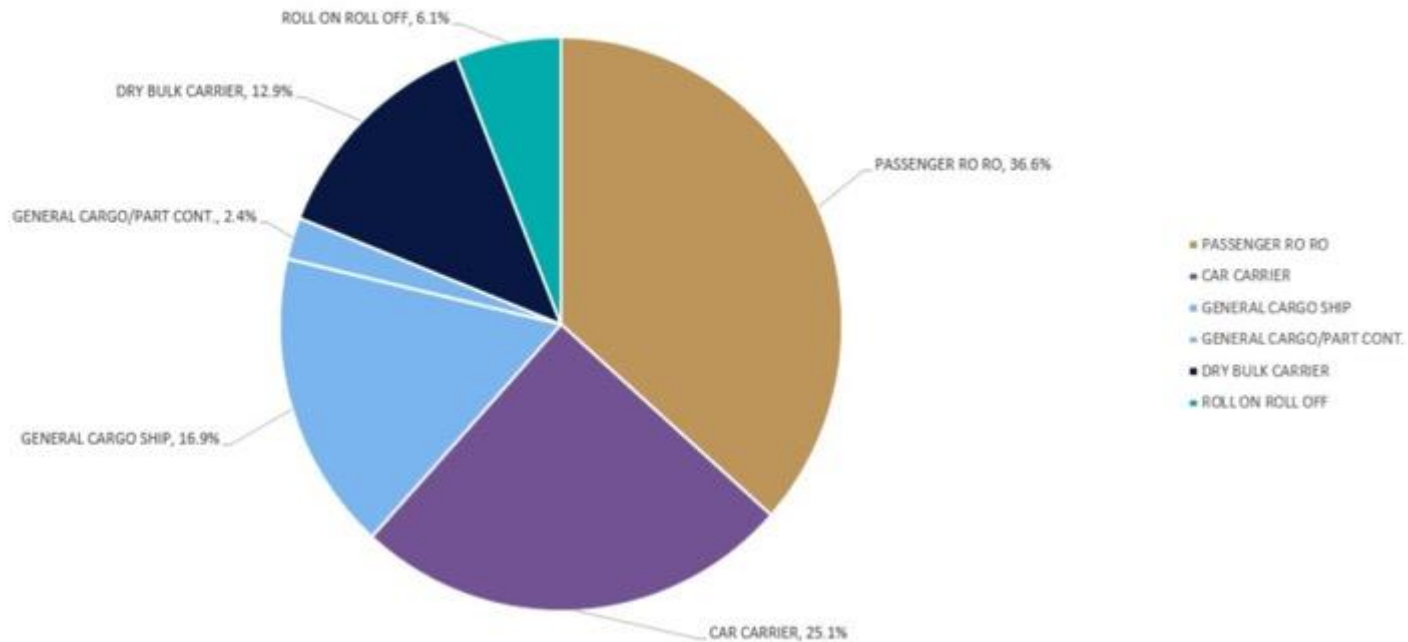
# Claim data - Number of incidents

Number of Incidents in % by Ship Type, 2015-2019  
(excluding container ships and tankers)



# Claim data - Claim value

Claim Value in % by Ship Type, 2015-2019  
*(excluding container ships and tankers)*



## Contributory factors



- Preparation for sea passage and early warning evaluation.
- Ship suitable for intended voyage.
- Condition of hatch covers, access hatches, deck fittings.
- Cargo stowage and securing.
- Stability considerations.
- Avoiding heavy weather.
- Ship handling in heavy weather.



## Preventive action

- ✓ Company procedures and SMS
- ✓ Early meteorological warning evaluation .
- ✓ Cultivating the safety culture and good seamanship
- ✓ Training and experience
- ✓ Maintenance, inspections and tests
- ✓ Sea Passage planning; weather routing
- ✓ Monitoring and avoiding heavy weather
- ✓ Ship handling knowledge

# Factors to Consider



IMO MSC.1/Circ. 1228  
(2007): REVISED  
GUIDANCE TO THE  
MASTER FOR  
AVOIDING  
DANGEROUS  
SITUATIONS IN  
ADVERSE WEATHER  
AND SEA  
CONDITIONS.

MSC.1/Circ.1228  
ANNEX  
Page 2

1.8 The height of significant waves should also be estimated.

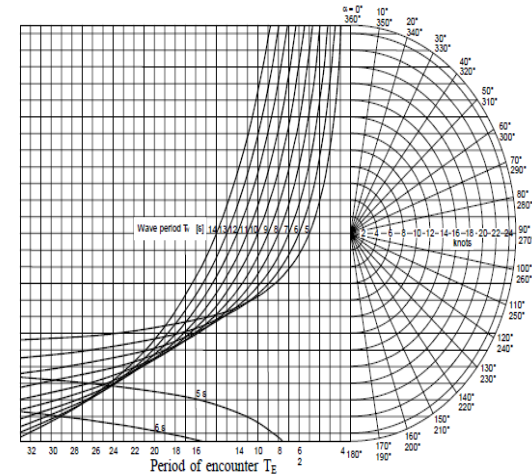


Figure 1: Determination of the period of encounter  $T_E$

## Heavy Weather



SOLAS Regulation 31, Danger Messages, refers to wind strengths of Beaufort scale force 10 and above.

Special areas to be duly considered as example Drake Passage

Guidance on Company SMS may include to avoid areas where the forecast significant wave height is greater than 7.0 metres or the wind strength is greater than Beaufort scale force 9.

# The Beaufort Scale



Wind Force	Description	Wind Speed			Specifications	Probable Wave Height		Sea State
		km/h	mph	knots		meters	Max	
0	<b>Calm</b>	<1	<1	<1	Smoke rises vertically. Sea like a mirror	--	--	0
1	<b>Light Air</b>	1-5	1-3	1-3	Direction shown by smoke drift but not by wind vanes. Sea rippled	0.1	0.1	1
2	<b>Light Breeze</b>	6-11	4-7	4-6	Wind felt on face; leaves rustle; wind vane moved by wind. Small wavelets on sea	0.2	0.3	2
3	<b>Gentle Breeze</b>	12-19	8-12	7-10	Leaves and small twigs in constant motion; light flags extended. Large wavelets on sea	0.6	1.0	3
4	<b>Moderate Breeze</b>	20-28	13-18	11-16	Raises dust and loose paper; small branches moved. Small waves, fairly frequent white horses	1.0	1.5	3-4
5	<b>Fresh Breeze</b>	29-38	19-24	17-21	Small trees in leaf begin to sway; crested wavelets form on inland waters. Moderate waves, many white horses	2.0	2.5	4
6	<b>Strong Breeze</b>	38-49	25-31	22-27	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty. Large waves, extensive foam crests	3.0	4	5
7	<b>Near Gale</b>	50-61	32-38	28-33	Whole trees in motion; inconvenience felt when walking against the wind. Foam blown in streaks across the sea	4.0	5.5	5-6
8	<b>Gale</b>	62-74	39-46	34-40	Twigs break off trees; generally impedes progress. Wave crests begin to break into spindrift	5.5	7.5	6-7
9	<b>Strong Gale</b>	75-88	47-54	41-47	Slight structural damage (chimney pots and slates removed). Wave crests topple over, spray affects visibility	7.0	10.0	7
10	<b>Storm</b>	89-102	55-63	48-55	Seldom experienced inland; trees uprooted; considerable structural damage. Sea surface largely white	9.0	12.5	8
11	<b>Violent Storm</b>	103-117	64-72	56-63	Very rarely experienced; accompanied by widespread damage. Medium-sized ships lost to view behind waves. Sea covered in white foam, visibility seriously affected	11.5	16.0	8
12	<b>Hurricane</b>	118+	73+	64+	Devastation. Air filled with foam and spray, very poor visibility	14+	---	9

## Heavy Weather

SOLAS Regulation 34 – Safe Navigation and Avoidance of Dangerous Situations:

“The voyage plan shall identify a route which:

.3 anticipates all known navigational hazards and adverse weather conditions”

Code of Safe Practice for Cargo Stowage and Securing (CSS Code):

“One way of reducing excessive accelerations is for the master, as far as possible and practicable, to plan the voyage of the ship carefully so as to avoid areas with severe weather and sea conditions. The master should always consult the latest available weather information.”

## Heavy Weather

- Monitor weather forecasts
- Make positive decisions to avoid forecast heavy weather where possible
- Have a sufficient reserve of bunkers and oils to allow routeing around heavy weather



## Heavy Weather



Implement Adverse Weather procedures as set out in the Code of Safe Working Practices, Chapter 11.

Avoid going out on deck.

SMS heavy weather checklist

## Heavy Weather



### Refer to IMO Circ. 1228

Adjust course and speed as appropriate, check lashings and add lashings.

### CSS Code Chapter 7:

The following actions may be considered:

1. alterations of course to reduce accelerations
2. reductions of speed to reduce accelerations and vibration
3. monitoring the integrity of the ship
4. restowing or resecuring the cargo and, where possible, increasing the friction; and
5. diversion of route in order to seek shelter or improved weather and sea conditions.



## Heavy Weather

Viking Sky's loss power and near-grounding in heavy weather off the coast of Norway



# Weather Routing



M/V “EL FARO” - NTSB EXECUTIVE SUMMARY:

CAPTAIN'S FAILURE AND POOR COMPANY SAFETY CULTURE

Captain’s failure to avoid sailing into a hurricane despite numerous opportunities to route a safer course to avoid the system.

# Weather Routing



•NTSB determines the captain’s insufficient action to avoid Hurricane Joaquin, his failure to use the most current weather information, and his late decision to muster the crew, as the main cause of the accident.

Contributing were:

- Ineffective bridge resource management on board El Faro, which included the captain’s failure to adequately consider officers’ suggestions.
- Inadequacy of both TOTE’s oversight and its safety management system.
- Flooding in a cargo hold from an undetected open watertight scuttle and damaged seawater piping;
- Loss of propulsion due to low lube oil pressure to the main engine resulting from a sustained list; and subsequent downflooding through unsecured ventilation closures to the cargo holds.
- Lack of an approved damage control plan that would have assisted the crew in recognizing the severity of the vessel’s condition and in responding to the emergency.
- Lack of appropriate survival craft for the conditions.



Make it sure, make it simple.