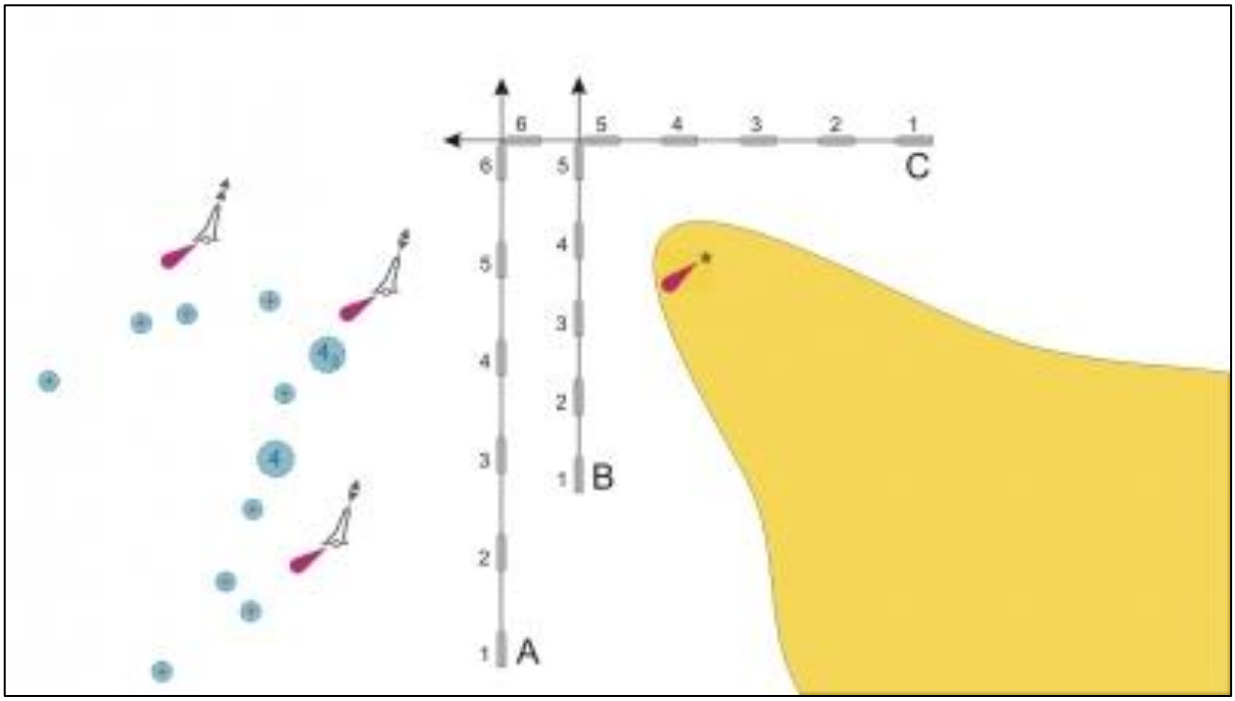
Training the Trainees and Trainers in COLREGs



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Foreword

The term **"navigation"** refers to the actions undertaken to ensure that a vessel sails safely from its port of departure to its port of arrival within a defined period of time. The navigation of a vessel is exposed to numerous hazards and accidents, which may have far-reaching consequences for people, society, property, and the marine environment.

Analyses of past maritime accidents (Ziarati, et al, 2014)[1] have shown that **human error** and **misinterpretation of the Rules** are the most frequent causes of vessel collisions. Recognising this issue, the **Centre for Factories of the Future (C4FF)** initiated a programme aimed at reducing accidents at sea. C4FF and its partners submitted a proposal to the **European Union**, which was subsequently approved. The resulting project, titled **"Avoiding Collisions at Sea" (ACTs)[2]**, was funded through the EU's **Leonardo da Vinci** programme.

Maritime educators have reported that both **cadets** and, in some cases, **experienced officers** continue to experience significant difficulty in applying the COLREGs effectively during multi-ship encounters. This highlights a critical pedagogical gap that the ACTs Plus project sought to address.

The main objective of the ACTs project was to identify **skill gaps** in the knowledge and teaching of the **International Regulations for Preventing Collisions at Sea, 1972 (COLREGs)** among maritime professionals. The research clearly revealed deficiencies in understanding and applying certain parts of the COLREGs, primarily due to incorrect interpretation of the Rules. The findings indicated that improving **learning methods**, **comprehension**, and the **correct application** of the COLREGs—using insights from this research—was essential to reduce future incidents.

During the project, it was also observed that applying the Rules in **multi-ship collision situations**, where more than one Rule may simultaneously apply, posed a new challenge. In response, C4FF and its partners developed a second proposal, **"Avoiding Collisions at Sea Plus" (ACTs Plus)[3]**, which was submitted to the **European Commission** under the **Erasmus+** programme. The proposal was approved, leading to new findings that are presented in this publication.

The **ACTs Plus** project developed a systematic approach to enhance the understanding and teaching of the COLREGs in multi-ship collision scenarios. The methodology involves **decomposing complex multi-ship encounters** into a series of **individual ship-to-ship interactions**. By analysing each bilateral interaction, researchers identify the potentially **conflicting obligations** imposed on a single vessel under different Rules. These obligations are then synthesised to determine the **give-way vessel(s)** and to propose the most appropriate **collision-avoidance manoeuvres**.

The outcomes of the ACTs Plus project contribute to both maritime education and navigational safety by providing a structured framework for understanding and applying the

[1] https://marifuture.org/Publications/Papers/maider_maritime_aids_development_for_emergency_responses.pdf
[2] https://marifuture.org/Publications/Papers/April2019Paper.pdf
[3] https://marifuture.org/Publications/Papers/Avoiding_Collisions_At_Sea.pdf

COLREGs in complex operational contexts. The research findings have been integrated into interactive teaching resources, including **illustrated scenarios, videos, and quizzes**, which are accessible through the **ACTs Plus online platform**: https://advanced.ecolregs.com.

The combined results of the **ACTs** and **ACTs Plus** projects confirm that improving navigational safety depends fundamentally on enhancing human understanding and interpretation of the COLREGs. As maritime operations grow increasingly complex, particularly in congested waters, the adoption of refined teaching methodologies and analytical approaches such as those developed under ACTs Plus represents a vital step towards reducing human error and preventing collisions at sea.

Despite this, the Rules remain valid for multi-ship encounters. However, maritime instructors report that many **cadets**—and even some **senior officers**—experience significant difficulty in applying the COLREGs correctly in such complex situations.

This book presents the approach and outcomes of the **ACTs Plus Erasmus+ project**, which focuses on improving the understanding and application of the COLREGs in multi-ship encounters. The project's methodology involves **deconstructing multi-ship encounters** into several **individual ship-to-ship interactions**. The often-contradictory **obligations** identified in these interactions are then analysed to determine the **give-way vessel(s)** and to recommend the most appropriate **collision avoidance actions**.

Several example scenarios of multi-ship encounters—supported by **graphics, videos, and interactive quizzes**—are available on the **ACTs Plus online platform.**

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Chair - Centre for Factories of the Future

Rules

Part A - General

Rule 1 (Application)

(a) These Rules shall apply to all vessels upon the high seas and in all waters connected therewith navigable by seagoing vessels.

(b) Nothing in these Rules shall interfere with the operation of special rules made by an appropriate authority for roadsteads, harbours, rivers, lakes or inland waterways connected with the high seas and navigable by seagoing vessels. Such special rules shall conform as closely as possible to these Rules.

(c) Nothing in these Rules shall interfere with the operation of any special rules made by the Government of any State with respect to additional station or signal lights, shapes or whistle signals for ships of war and vessels proceeding under convoy, or with respect to additional station or signal lights or shapes for fishing vessels engaged in fishing as a fleet. These additional station or signal lights, shapes or whistles shall, so far as possible, be such that they cannot be mistaken for any light, shape or signal authorised elsewhere under these Rules.

(d) Traffic separation schemes may be adopted by the Organisation for the purpose of these Rules.

(e) Whenever the Government concerned shall have determined that a vessel of special construction or purpose cannot comply fully with the provision of any of these Rules with respect to the number, position, range or arc of visibility of lights or shapes, as well as to the disposition and characteristics of sound-signalling appliances, such vessel shall comply with such other provisions in regard to the number, position, range or arc of visibility of lights or shapes, as well as to the disposition and characteristics of sound-signalling appliances, as her Government shall have determined to be the closest possible compliance with these Rules in respect of that vessel.

Rule 2 (Responsibility)

(a) Nothing in these Rules shall exonerate any vessel, or the owner, master or crew thereof, from the consequences of any neglect to comply with these Rules or of the neglect of any precautions which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

(b) In construing and complying with these Rules due regard shall be had to all dangers of navigation and collision and to any special circumstances, including the limitations of the vessels involved, which may make a departure from these Rules necessary to avoid immediate danger.

Rule 3 (General definitions)

For the purpose of these Rules, except where the context otherwise requires:

(a) The word "vessel" includes every description of water craft, including non-displacement craft, WIG craft and seaplanes, used or capable of being used as a means of transportation on water.

(b) The term "power-driven vessel" means any vessel propelled by machinery.

(c) The term "sailing vessel" means any vessel under sail provided that propelling machinery, if fitted, is not being used.

(d) The term "vessel engaged in fishing" means any vessel fishing with nets, lines, trawls or other fishing apparatus which restricts manoeuvrability, but does not include a vessel fishing with trolling lines or other fishing apparatus which do not restrict manoeuvrability.

(e) The term "seaplane" includes any aircraft designed to manoeuvre on the water.

(f) The term "vessel not under command" means a vessel which through some exceptional circumstance is unable to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel.

(g) The term "vessel restricted in her ability to manoeuvre" means a vessel which from the nature of her work is restricted in her ability to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel. The term "vessels restricted in their ability to manoeuvre" shall include but not be limited to:

(i) a vessel engaged in laying, servicing or picking up a navigation mark, submarine cable or pipeline;

(ii) a vessel engaged in dredging, surveying or underwater operations;

(iii) a vessel engaged in replenishment or transferring persons, provisions or cargo while underway;

(iv) a vessel engaged in launching or recovery of aircraft;

(v) a vessel engaged in mine clearance operations;

(vi) a vessel engaged in a towing operation such as severely restricts the towing vessel and her tow in their ability to deviate from their course.

(h) The term "vessel constrained by her draught" means a power-driven vessel which, because of her draught in relation to available depth and width of navigable water, is severely restricted in her ability to deviate from the course she is following.

(i) The word "underway" means that a vessel is not at anchor, or made fast to the shore, or aground.

(j) The words "length" and "breadth" of a vessel mean her length overall and greatest breadth.

(k) Vessel shall be deemed to be in sight of one another only when one can be observed visually from the other.

(l) The term "restricted visibility" means any condition in which visibility is restricted by fog, mist, falling snow, heavy rainstorms, sandstorms or any other similar causes.

(m) The term "Wing-In-Ground (WIG) craft" means a multimodal craft which, in its main operational mode, flies in close proximity to the surface by utilizing surface-effect action.

Part B - Steering and sailing rules

Section I - Conduct of vessels in any condition of visibility

Rule 4 (Application)

Rules in this section apply in any conditions of visibility.

Rule 5 (Look-out)

Every vessel shall at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and or the risk of collision.

Rule 6 (Safe speed)

Every vessel shall at all times proceed at a safe speed so that she can take proper and effective action to avoid a collision and be stopped within a distance appropriate to the prevailing circumstances and conditions.

In determining a safe speed the following factors shall be among those taken into account:

(a) By all vessels:

(i) the state of visibility;

(ii) the traffic density including concentrations of fishing vessels or any other vessels;

(iii) the manoeuvrability of the vessel with special reference to stopping distance and turning ability in the prevailing conditions;

(iv) at night the presence of background light such as from shore lights or from backscatter of her own lights;

(v) the state of wind, sea and current, and the proximity of navigational hazards;

(vi) the draught in relation to the available depth of water.

(b) Additionally, by vessels with operational radar:

(i) the characteristics, efficiency and limitations of the radar equipment;

(ii) any constraints imposed by the radar range scale in use;

(iii) the effect on radar detection of the sea state, weather and other sources of interference;

(iv) the possibility that small vessels, ice and other floating objects may not be detected by radar at an adequate range;

(v) the number, location and movements of vessels detected by radar;

(vi) the more exact assessment of the visibility that may be possible when radar is used to determine the range of vessels or other objects in the vicinity.

Rule 7 (Risk of collision)

(a) Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. If there is any doubt such risk shall be deemed to exist.

(b) Proper use shall be made of radar equipment if fitted and operational, including long-range scanning to obtain early warning of risk of collision and radar plotting or equivalent systematic observations of detected objects.

(c) Assumptions shall not be made on the basis of scanty information, especially scanty radar information.

(d) In determining if risk of collision exists the following considerations shall be among those taken into account:

(i) such risk shall be deemed to exist it the compass bearing of an approaching vessel does not appreciably change;

(ii) such risk may sometimes exist even when an appreciable bearing change is evident, particularly when approaching a very large vessel or a tow or when approaching a vessel at close range.

Rule 8 (Action to avoid a collision)

(a) Any action taken to avoid collision shall be taken in accordance with the Rules of this Part and shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship.

(b) Any alteration of course and/or speed to avoid collision shall, if the circumstances of the case admit, be large enough to be readily apparent to another vessel observing visually or by radar; a succession of small alterations of course and/or speed should be avoided.

(c) If there is sufficient sea-room, alteration of course alone may be the most effective action to avoid a close-quarters situation provided that it is made in good time, is substantial and does not result in another close-quarters situation.

(d) Action taken to avoid a collision with another vessel shall be such as to result in passing at a safe distance. The effectiveness of the action shall be carefully checked until the other vessel is finally past and clear.

(e) If necessary to avoid collision or allow more time to assess the situation, a vessel shall slacken her speed or take all way off by stopping or reversing her means of propulsion.

(f)

(i) A vessel which, by any of these Rules, is required not to impede the passage or safe passage of another vessel shall, when required by the circumstances of the case, take early action to allow sufficient sea-room for the safe passage of the other vessel.

(ii) A vessel required not to impede the passage or safe passage of another vessel is not relieved of this obligation if approaching the other vessel so as to involve risk of collision and shall, when taking action, have full regard to the action which may be required by the Rules of this Part.

(iii) A vessel, the passage of which is not to be impeded remains fully obliged to comply with the Rules of this part when the two vessels are approaching one another so as to involve risk of collision.

Rule 9 (Narrow channels)

(a) A vessel proceeding along the course of a narrow channel or fairway shall keep as near to the outer limit or the channel or fairway which lies on her starboard side as is safe and practicable.

(b) A vessel of less than 20 m in length or a sailing vessel shall not impede the passage of a vessel which can safely navigate only within a narrow channel or fairway.

(c) A vessel engaged in fishing shall not impede the passage of any other vessel navigating within a narrow channel or fairway.

(d) A vessel shall not cross a narrow channel of fairway if such crossing impedes the passage of a vessel which can safely navigate only within such channel or fairway. The latter vessel may use the sound signal prescribed in Rule 34 (d) if in doubt as to the intention of the crossing vessel.

(e)

(i) In a narrow channel or fairway when overtaking can only take place if the vessel to be overtaken has to take action to permit safe passing, the vessel intending to overtake shall indicate her intention by sounding the appropriate signal prescribed in Rule 34 (c)(i). The vessel to be overtaken shall, if in agreement, sound the appropriate signal prescribed in Rule 34 (c)(ii) and take steps to permit safe passing. If in doubt she may sound the signals prescribed in Rule 34 (d).

(ii) This rule does not relieve the overtaking vessel of her obligation under Rule 13.

(f) A vessel nearing a bend or an area of narrow channel or fairway where other vessels may be obscured by an intervening obstruction shall navigate with particular alertness and caution and shall sound the appropriate signal prescribed in Rule 34 (e).

(g) Any vessel shall, if the circumstances of the case admit, avoid anchoring in a narrow channel.

Rule 10 (Traffic separation schemes)

(a) This Rule applies to traffic separation schemes adopted by the Organisation and does not relieve any vessel of her obligation under any other Rule.

(b) A vessel using a traffic separation scheme shall:

(i) proceed in the appropriate traffic lane in the general direction of traffic flow for that lane;

(ii) so far as practicable keep clear of a traffic separation line or separation zone;

(iii) normally join or leave a traffic lane at the termination of the lane, but when joining or leaving from either side shall do so at as small an angle to the general direction of traffic flow as practicable.

(c) A vessel shall, so far as practicable, avoid crossing traffic lanes but if obliged to do so shall cross on a heading as nearly as practicable at right angles to the general direction of traffic flow.

(d)

(i) A vessel shall not use an inshore traffic zones when she can safely use the appropriate traffic lane within the adjacent traffic separation scheme. However, vessels of less than 20 m in length, sailing vessels and vessels engaged in fishing may use the inshore traffic zones.

(ii) Notwithstanding subparagraph (d)(i), a vessel may use an inshore traffic zone when *en route* to or from a port, offshore installation or structure, pilot station or any other place situated within the inshore traffic zone, or to avoid immediate danger.

(e) A vessel other than a crossing vessel or a vessel joining or leaving a lane shall not normally enter a separation zone or cross a separation line except:

(i) in cases of emergency to avoid immediate danger;

(ii) to engage in fishing within a separation zone.

(f) A vessel navigating in areas near the terminations of traffic separation schemes shall do so with particular caution.

(g) A vessel shall so far as practicable avoid anchoring in a traffic separation scheme or in areas near its terminations.

(h) A vessel not using a traffic separation scheme shall avoid it by as wide a margin as is practicable.

(i) A vessel engaged in fishing shall not impede the passage of any vessel following a traffic lane.

(j) A vessel of less than 20 m in length or a sailing vessel shall not impede the safe passage of a power-driven vessel following a traffic lane.

(k) A vessel restricted in her ability to manoeuvre when engaged in an operation for the maintenance of safety of navigation in a traffic separation scheme is exempted from complying with this Rule to the extent necessary to carry out the operation.

(l) A vessel restricted in her ability to manoeuvre when engaged in an operation for the laying, servicing or picking up of a submarine cable, within a traffic separation scheme, is exempted from complying with this Rule to the extent necessary to carry out the operation.

Section II - Conduct of vessels in sight of one another

Rule 11 (Application)

Rules in this Section shall apply to vessels in sight of one another.

Rule 12 (Sailing vessels)

(a) When two sailing vessels are approaching one another, so as to involve risk of collision, one of them shall keep out of the way of the other as follows:

(i) when each has the wind on a different side, the vessel which has the wind on the port side shall keep out of the way of the other;

(ii) when both have the wind on the same side, the vessel which is to windward shall keep out of the way of the vessel which is to leeward;

(iii) if a vessel with the wind on the port side sees a vessel to windward and cannot determine with certainty whether the other vessel has the wind on her port or starboard side, she shall keep out of the way of the other.

(b) For the purposes of this Rule the windward side shall be deemed to be the side opposite to that on which the mainsail is carried or, in the case of a square-rigged vessel, the side opposite to that on which the largest fore-and-aft sail is carried.

Rule 13 (Overtaking)

(a) Notwithstanding anything contained in the Rules of Part B, Sections I and II, any vessel overtaking any other shall keep out of the way of the vessel being overtaken.

(b) A vessel shall be deemed to be overtaking when coming up with another vessel from a direction more than 22.5° abaft her beam, that is, in such a position with reference to the vessel she is overtaking, that at night she would be able to see only the sternlight of that vessel but neither of her sidelights.

(c) When a vessel is in any doubt as to whether she is overtaking another, she shall assume that this is the case and act accordingly.

(d) Any subsequent alteration of the bearing between the two vessels shall not make the overtaking vessel a crossing vessel within the meaning of these Rules or relieve her of the duty of keeping clear of the overtaken vessel until she is finally past and clear.

Rule 14 (Head-on situation)

(a) When two power-driven vessels are meeting on reciprocal or nearly reciprocal courses so as to involve risk of collision each shall alter her course to starboard so that each shall pass on the port side of the other.

(b) Such a situation shall be deemed to exist when a vessel sees the other ahead or nearly ahead and by night she could see the masthead lights of the other in line or nearly in a line and/or both sidelights and by day she observes the corresponding aspect of the other vessel.

(c) When a vessel is in any doubt as to whether such a situation exists she shall assume that it does exist and act accordingly.

Rule 15 (Crossing situation)

When two power-driven vessels are crossing so as to involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way and shall, if the circumstances of the case admit, avoid crossing ahead of the other vessel.

Rule 16 (Action by give-way vessel)

Every vessel which is directed to keep out of the way of another vessel shall, as far as possible, take early and substantial action to keep well clear.

Rule 17 (Action by stand-on vessel)

(a)

(i) Where one of two vessels is to keep out of the way the other shall keep her course and speed.

(ii) The latter vessel may, however, take action to avoid collision by her manoeuvre alone, as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action in compliance with these Rules.

(b) When, from any cause, the vessel required to keep her course and speed finds herself so close that collision cannot be avoided by the action of the give-way vessel alone, she shall take such action as will best aid to avoid collision.

(c) A power-driven vessel which takes action in a crossing situation in accordance with subparagraph (a)(ii) of this Rule to avoid collision with another power-driven vessel shall, if the circumstances at the case admit, not alter course to port for a vessel on her own port side.

(d) This Rule does not relieve the give-way vessel of her obligation to keep out of the way.

Rule 18 (Responsibilities between vessels)

Except where Rule 9, Rule 10, and Rule 13 otherwise require:

(a) A power-driven vessel underway shall keep out of the way of:

(i) a vessel not under command;

(ii) a vessel restricted in her ability to manoeuvre;

(iii) a vessel engaged in fishing;

(iv) a sailing vessel.

(b) A sailing vessel underway shall keep out of the way of:

(i) a vessel not under command;

(ii) a vessel restricted in her ability to manoeuvre;

(iii) a vessel engaged in fishing.

(c) A vessel engaged in fishing when underway shall, so far as possible, keep out of the way of:

(i) a vessel not under command;

(ii) a vessel restricted in her ability to manoeuvre.

(d)

(i) Any vessel other than a vessel not under command or a vessel restricted in her ability to manoeuvre shall, if the circumstances of the case admit, avoid impeding the safe passage of a vessel constrained by her draught, exhibiting the signals in Rule 28.

(ii) A vessel constrained by her draught shall navigate with particular caution having full regard to her special condition.

(e) A seaplane on the water shall, in general, keep well clear of all vessels and avoid impeding their navigation. In circumstances, however, where risk of collision exists, she shall comply with the Rules of this part.

(f)

(i) A WIG craft, when taking off, landing and in flight near the surface, shall keep well clear of all other vessels and avoid impeding their navigation;

(ii) A WIG craft operating on the water surface shall comply with the Rules of this Part as a power-driven vessel.

Section III - Conduct of vessels in restricted visibility

Rule 19 (Conduct of vessels in restricted visibility)

(a) This Rule applies to vessels not in sight of one another when navigating in or near an area of restricted visibility.

(b) Every vessel shall proceed at a safe speed adapted to the prevailing circumstances and conditions of restricted visibility. A power-driven vessel shall have her engines ready for immediate manoeuvre.

(c) Every vessel shall have due regard to the prevailing circumstances and conditions of restricted visibility when complying with the Rules of Section I of this Part.

(d) A vessel which detects by radar alone the presence of another vessel shall determine if a close-quarters situation is developing and/or risk of collision exists. If so, she shall take avoiding action in ample time, provided that when such action consists of an alteration of course, so far as possible the following shall be avoided:

(i) an alteration of course to port for a vessel forwards of the beam, other than for a vessel being overtaken;

(ii) an alteration of course towards a vessel abeam or abaft the beam.

(e) Except where it has been determined that a risk of collision does not exist, every vessel which hears apparently forwards of her beam the fog signal of another vessel, or which cannot avoid a close-quarters situation with another vessel forwards of her beam, shall reduce her speed to the minimum at which she can be kept on her course. She shall if necessary take all her way off and in any event navigate with extreme caution until danger of collision is over.

Part C - Lights and shapes

Rule 20 (Application)

(a) Rules in this part shall be complied with in all weathers.

(b) The Rules concerning lights shall be complied with from sunset to sunrise, and during such times no other lights shall be exhibited, except such lights as cannot be mistaken for the lights specified in these Rules or do not impair their visibility or distinctive character, or interfere with the keeping of a proper look-out.

(c) The lights prescribed by these Rules shall, if carried, also be exhibited from sunrise to sunset in restricted visibility and may be exhibited in all other circumstances when it is deemed necessary.

(d) The Rules concerning shapes shall be complied with by day.

(e) The lights and shapes specified in these Rules shall comply with the provisions of Annex I to these Regulations.

Rule 21 (Definitions)

(a) "Masthead light" means a white light placed over the fore-and-aft centreline of the vessel showing an unbroken light over an arc of the horizon of 225° and so fixed as to show the light from right ahead to 22.5° abaft the beam on either side of the vessel.

(b) "Sidelights" means a green light on the starboard side and a red light on the port side each showing an unbroken light over an arc of the horizon of 112.5° and so fixed as to show the light from right ahead to 22.5° abaft the beam on its respective side. In a vessel of less than

20 m in length the sidelights may be combined in one lantern carried on the fore-and-aft centreline of the vessel.

(c) "Sternlight" means a white light placed as nearly as practicable at the stern showing an unbroken light over an arc of the horizon of 135° and so fixed as to show the light 67.5° from right aft on each side of the vessel.

(d) "Towing light" means a yellow light having the same characteristics as the "sternlight" defined in paragraph (c) of this Rule.

(e) "All-round light" means a light showing an unbroken light over an arc of the horizon of 360°.

(f) "Flashing light" means a light flashing at regular intervals at a frequency of 120 flashes or more per minute.

Rule 22 (Visibility of lights)

The lights prescribed in these Rules shall have an intensity as specified in section 8 of Annex I to these Regulations so as to be visible at the following minimum ranges:

(a) In vessels of 50 m or more in length:

- a masthead light, 6 miles;

- a sidelight, 3 miles;

- a sternlight, 3 miles;

- a towing light, 3 miles;

- a white, red, green or yellow all-round light, 3 miles.

(b) In vessels of 12 m or more in length but less than than 50 m in length:

- a masthead light, 5 miles; except that where the length of the vessel is less than 20 m, 3 miles;

- a sidelight, 2 miles;

- a sternlight, 2 miles;

- a towing light, 2 miles;

- a white, red, green or yellow all-round light, 2 miles.

(c) In vessels of less than 12 m in length:

- a masthead light, 2 miles;

- a sidelight, 1 miles;

- a sternlight, 2 miles;

- a towing light, 2 miles;

- a white, red, green or yellow all-round light, 2 miles.

(d) In inconspicuous, partly submerged vessels or objects being towed:

- a white all-round light, 3 miles.

Rule 23 (Power-driven vessels underway)

(a) A power-driven vessel underway shall exhibit:

(i) a masthead light forward;
(ii) a second masthead light abaft of and higher than the forward one; except that a vessel of less than 50 m in length shall not be obliged to exhibit such light but may do so;
(iii) sidelights;
(iv) a sternlight.

(b) An air-cushion vessel when operating in the non-displacement mode shall, in addition to the lights prescribed in paragraph (a) of this Rule, exhibit an all-round flashing yellow light.
(c) A WIG craft only when taking off, landing and in flight near the surface shall, in addition to the lights prescribed in paragraph (a) of this Rule, exhibit a high intensity all-round flashing red light.
(d)

(i) A power-driven vessel of less than 12 m in length may in lieu of the lights prescribed in paragraph (a) of this Rule exhibit an all-round white light and sidelights;
(ii) a power-driven vessel of less than 7 m in length whose maximum speed does not exceed 7 knots may in lieu of the lights prescribed in paragraph (a) of this Rule exhibit an all-round white light and shall, if practicable, also exhibit sidelights;
(iii) the masthead light or all-round white light on a power-driven vessel of less than 12 m in length may be displaced from the fore-and-aft centreline of the vessel if centreline fitting is not practicable, provided that the sidelights are combined in one lantern which shall be carried on the fore-and-aft centreline of the vessel or located as nearly as practicable in the same fore-and-aft line as the masthead light or the all-round white light.

Rule 24 (Towing and pushing)

(a) A power-driven vessel when towing shall exhibit:

(i) instead of the light prescribed in Rule 23 (a)(i) or (a)(ii), two masthead lights in a vertical line. When the length of the tow, measured from the stern of the towing vessel to the after end of the tow exceeds 200 m, three such lights in a vertical line;

(ii) sidelights;

(iii) a sternlight;

(iv) a towing light in a vertical line above the sternlight;

(v) when the length of the tow exceeds 200 m, a diamond shape where it can best be seen.

(b) When a pushing vessel and a vessel being pushed ahead are rigidly connected in a composite unit they shall be regarded as a power-driven vessel and exhibit the lights prescribed in Rule 23.

(c) A power-driven vessel when pushing ahead or towing alongside, except in the case of a composite unit, shall exhibit:

(i) instead of the light prescribed in Rule 23 (a)(i) or (a)(ii), two masthead lights in a vertical line;

(ii) sidelights;

(iii) a sternlight.

(d) A power-driven vessel to which paragraph (a) or (c) of this Rule applies shall also comply with Rule 23 (a)(ii).

(e) A vessel or object being towed, other that those mentioned in paragraph (g) of this Rule, shall exhibit:

(i) sidelights;

(ii) a sternlight;

(iii) when the length of the tow exceeds 200 m, a diamond shape where it can best be seen.

(f) Provided that any number of vessels being towed alongside or pushed in a group shall be lighted as one vessel,

(i) a vessel being pushed ahead, not being part of a composite unit, shall exhibit at the forward end, sidelights.

(ii) a vessel being towed alongside shall exhibit a sternlight and at the forward end, sidelights.

(g) An inconspicuous, partly submerged vessel or object, or combination of such vessel or objects being towed, shall exhibit:

(i) if it is less than 25 m in breadth, one all-round white light at or near the forward end and one at or near the after end except that dracones need not exhibit a light at or near the forward end;

(ii) if it is 25 m or more in breadth, two additional all-round white lights at or near the extremities of its breadth;

(iii) if it exceeds 100 m in length, additional all-round white lights between the lights prescribed in sub-paragraphs (i) and (ii) so that the distance between the lights shall not exceed 100 m.

(iv) a diamond shape at or near the aftermost extremity of the last vessel or object being towed and if the length of the tow exceeds 200 m an additional diamond shape where it can best be seen and located as far forward as is practicable.

(h) Where from any sufficient cause it is impracticable for a vessel or object being towed to exhibit the lights or shapes prescribed in paragraph (e) or (g) of this Rule, all possible measures shall be taken to light the vessel or object towed or at least to indicate the presence of such vessel or object.

(i) Where from any sufficient cause it is impracticable for a vessel not normally engaged in towing operations to display the lights prescribed in paragraph (a) or (c) of this Rule, such vessel shall not be required to exhibit those lights when engaged in towing another vessel in distress or otherwise in need of assistance. All possible measures shall be taken to indicate the nature of the relationship between the towing vessel and the vessel being towed as authorised by Rule 36, in particular by illuminating the towline.

Rule 25 (Sailing vessels underway and vessels under oars)

(a) A sailing vessel underway shall exhibit:

(i) sidelights;

(i) a sternlight.

(b) In a sailing vessel of less than 20 m in length the lights prescribed in paragraph (a) of this Rule may be combined in one lantern at or near the top of the mast where it can best be seen.

(c) A sailing vessel underway may, in addition to the lights prescribed in paragraph (a) of this Rule, exhibit at or near the top of the mast, where they can best be seen, two all-round lights in a vertical line, the upper being red and the lower green, but these lights shall not be exhibited in conjunction with the combined lantern permitted by paragraph (b) of this Rule.

(d)

(i) A sailing vessel of less than 7 m in length shall, if practicable, exhibit the lights prescribed in paragraph (a) or (b) of this Rule, but if she does not, she shall have ready at hand an electric torch or lighted lantern showing a white light which shall be exhibited in sufficient time to prevent collision.

(ii) A vessel under oars may exhibit the lights prescribed in this Rule for sailing vessels, but if she does not, she shall have ready at hand an electric torch or lighted lantern showing a white light which shall be exhibited in sufficient time to prevent a collision.

(e) A vessel proceeding under sail when also being propelled by machinery shall exhibit forward where it can best be seen a conical shape, apex downwards.

Rule 26 (Fishing vessels)

(a) A vessel engaged in fishing, whether underway or at anchor, shall exhibit only the lights and shapes prescribed in this Rule.

(b) A vessel when engaged in trawling, by which is meant the dragging through the water of a dredge net or other apparatus used as a fishing appliance, shall exhibit:

(i) two all-round lights in a vertical line, the upper being green and the lower white, or a shape consisting of two cones with their apexes together in a vertical line one above the other;

(ii) a masthead light abaft of and higher that the all-round green light; a vessel of less than 50 metres in length shall not be obliged to exhibit such a light but may do so;

(iii) when making way through the water, in addition to the lights prescribed in this paragraph, sidelights and a sternlight.

(c) A vessel engaged in fishing, other than trawling shall exhibit:

(i) two all-round lights in a vertical line, the upper being red and the lower white, or a shape consisting of two cones with their apexes together in a vertical line one above the other;

(ii) when there is outlying gear extending more than 150 m horizontally from the vessel, an all-round white light or a cone apex upwards in the direction of the gear;

(iii) when making way through the water, in addition to the lights prescribed in this paragraph, sidelights and a sternlight.

(d) The additional signals described in Annex II to these Regulations apply to a vessel engaged in fishing in close proximity to other vessels engaged in fishing.

(e) A vessel when not engaged in fishing shall not exhibit the lights or shapes prescribed in this Rule, but only those prescribed for a vessel of her length.

Rule 27 (Vessels not under command or restricted in their ability to manoeuvre)

(a) A vessel not under command shall exhibit:

(i) two all-round red lights in a vertical line where they can best be seen;

(ii) two balls or similar shapes in a vertical line where they can best be seen;

(iii) when making way through the water, in addition to the lights prescribed in this paragraph, sidelights and a sternlight.

(b) A vessel restricted in her ability to manoeuvre, except a vessel engaged in mine clearance operations, shall exhibit:

(i) three all-round lights in a vertical line where they can best be seen. The highest and lowest of these lights shall be red and the middle light shall be white;

(ii) three shapes in a vertical line where they can best be seen. The highest and lowest of these shapes shall be balls and the middle one a diamond;

(iii) when making way through the water, a masthead light or lights, sidelights and a sternlight, in addition to the lights prescribed in subparagraph (i);

(iv) when at anchor, in addition to the lights or shapes prescribed in subparagraphs (i) and (ii), the light, lights or shape prescribed in Rule 30.

(c) A power-driven vessel engaged in a towing operation such as severely restricts the towing vessel and her tow in their ability to deviate from their course shall, in addition to the lights and shapes prescribed in Rule 24 (a), exhibit the lights or shapes prescribed in subparagraphs (b)(i) and (ii) of this Rule.

(d) A vessel engaged in dredging or underwater operations, when restricted in her ability to manoeuvre, shall exhibit the lights and shapes prescribed in subparagraph(b)(i), (ii) and (iii) of this Rule and shall in addition, when an obstruction exists, exhibit:

(i) two all-round red lights or two balls in a vertical line to indicate the side on which the obstruction exists;

(ii) two all-round green lights or two diamonds in a vertical line to indicate the side on which another vessel may pass;

(iii) when at anchor, the lights or shapes prescribed in this paragraph instead of the lights or shape prescribed in Rule 30.

(e) Whenever the size of a vessel engaged in diving operations makes it impracticable to exhibit all the lights and shapes prescribed in the paragraph (d) of this Rule, the following shall be exhibited:

(i) three all-round lights in a vertical line where they can best be seen. The highest and lowest of these lights shall be red and the middle light shall be white;

(ii) a rigid replica of the International Code flag "A" not less than 1 metre in height. Measures shall be taken to ensure its all-round visibility.

(f) A vessel engaged in mine clearance operations shall in addition to the lights prescribed for a power-driven vessel in Rule 23 or to the lights or shape prescribed for a vessel at anchor in Rule 30 as appropriate, exhibit three all-round green lights or three balls. One of these lights or shapes shall be exhibited near the foremast head and one at each end of the fore yard. These lights or shapes indicate that it is dangerous for another vessel to approach within 1000 m of the mine clearance vessel.

(g) Vessels of less than 12 m in length, except those engaged in diving operations, shall not be required to exhibit the lights and shapes prescribed in this Rule.

(h) The signals prescribed in this Rule are not signals of vessels in distress and requiring assistance. Such signals are contained in Annex IV to these Regulations.

Rule 28 (Vessels constrained by their draught)

A vessel constrained by her draught may, in addition to the lights prescribed for power-driven vessels in Rule 23, exhibit where they can best be seen three all-round red lights in a vertical line, or a cylinder.

Rule 29 (Pilot vessels)

(a) A vessel engaged on pilotage duty shall exhibit:

(i) at or near the masthead, two all-round lights in a vertical line, the upper being white and the lower red;

(ii) when underway, in addition, sidelights and a sternlight;

(iii) when at anchor, in addition to the lights prescribed in sub-paragraph (i), the light, lights or shape prescribed in Rule 30 for vessels at anchor.

(b) A pilot vessel when not engaged on pilotage duty shall exhibit the lights or shapes prescribed for a similar vessel of her length.

Rule 30 (Anchored vessels and vessels aground)

(a) A vessel at anchor shall exhibit where it can best be seen:

(i) in the fore part, an all-round white light or one ball;

(ii) at or near the stern and at a lower level that the light prescribed in subparagraph (i), an all-round white light.

(b) A vessel of less than 50 m in length may exhibit an all-round white light where it can best be seen instead of the lights prescribed in paragraph (a) of this Rule.

(c) A vessel at anchor may, and a vessel of 100 m and more in length shall, also use the available working or equivalent lights to illuminate her decks.

(d) A vessel aground shall exhibit the lights prescribed in paragraph (a) or (b) of this Rule and in addition, where they can best be seen:

(i) two all-round red lights in a vertical line;

(ii) three balls in a vertical line.

(e) A vessel of less than 7 m in length, when at anchor, not in or near a narrow channel, fairway or anchorage, or where other vessels normally navigate, shall not be required to exhibit the lights or shape prescribed in paragraphs (a) and (b) of this Rule.

(f) A vessel of less than 12 m in length, when aground, shall not be required to exhibit the lights or shapes prescribed in subparagraphs (d)(i) and (ii) of this Rule.

Rule 31 (Seaplanes)

Where it is impractical for a seaplane or a WIG craft to exhibit lights and shapes of the characteristics or in the positions prescribed in the Rules of this part she shall exhibit lights and shapes as closely similar in characteristics and position as is possible.

Part D - Sound and light signals

Rule 32 (Definitions)

(a) The word "whistle" means any sound signalling appliance capable of producing the prescribed blasts and which complies with the specifications in Annex III to these Regulations.

(b) The term "short blast" means a blast of about one second duration.

(c) The term "prolonged blast" means a blast of from four to six seconds duration.

Rule 33 (Equipment for sound signals)

(a) A vessel of 12 m or more in length shall be provided with a whistle, a vessel of 20 m or more in length shall be provided with a bell in addition to a whistle, and a vessel of 100 m or more in length shall, in addition, be provided with a gong, the tone and sound of which cannot be confused with that of the bell. The whistle, bell and gong shall comply with the specifications in Annex III to these Regulations. The bell or gong or both may be replaced by other equipment having the same respective sound characteristics, provided that manual sounding of the prescribed signals shall always be possible.

(b) A vessel of less than 12 m in length shall not be obliged to carry the sound signalling appliances prescribed in paragraph (a) of this Rule but if she does not, she shall be provided with some other means of making an efficient sound signal.

Rule 34 (Manoeuvring and warning signals)

(a) When vessel are in sight of one another, a power-driven vessel underway, when manoeuvring as authorised or required by these Rules, shall indicate that manoeuvre by the following signals on her whistle:

- one short blast to mean "I am altering my course to starboard";

- two short blasts to mean "I am altering my course to port";

- three short blasts to mean "I am operating astern propulsion".

(b) Any vessel may supplement the whistle signals prescribed in paragraph (a) of this Rule by light signals, repeated as appropriate, whilst the manoeuvre is being carried out:

(i) these signals shall have the following significance:

- one flash to mean "I am altering my course to starboard";

- two flashes to mean "I am altering my course to port";

- three flashes to mean "I am operating astern propulsion";

(ii) the duration of each flash shall be about one second, the interval between flashes shall be about one second, and the interval between successive signals shall be not less than ten seconds;

(iii) the light used for this signal shall, if fitted, be an all-round white light, visible at a minimum range of 5 miles, and shall comply with the provisions of Annex I to these Regulations.

(c) When in sight of one another in a narrow channel or fairway:

(i) a vessel intending to overtake another shall in compliance with Rule 9 (e)(i) indicate her intention by the following signals on her whistle:

- two prolonged blasts followed by one short blast to mean "I intend to overtake you on your starboard side";

- two prolonged blasts followed by two short blasts to mean "I intend to overtake you on your port side".

(ii) the vessel about to be overtaken when acting in accordance with Rule 9 (e)(i) shall indicate her agreement by the following signal on her whistle:

- one prolonged, one short, one prolonged and one short blast, in that order.

(d) When vessels in sight of one another are approaching each other and from any cause either vessel fails to understand the intentions or actions of the other, or is in doubt whether sufficient action is being taken by the other to avoid collision, the vessel in doubt shall immediately indicate such doubt by giving at least five short and rapid blasts on the whistle. Such signal may be supplemented by a light signal of at least five short and rapid flashes.

(e) A vessel nearing a bend or an area of the channel of fairway where other vessels may be obscured by an intervening obstruction shall sound one prolonged blast. Such signal shall be answered with a prolonged blast by any approaching vessel that may be within hearing around the bend or behind the intervening obstruction.

(f) If whistles are fitted on a vessel at a distance apart of more that 100 m, one whistle only shall be used for giving manoeuvring and warning signals.

Rule 35 (Sound signals in restricted visibility)

In or near an area of restricted visibility, whether by day or night, the signals prescribed in this Rule shall be used as follows:

(a) A power-driven vessel making way through the water shall sound at intervals of not more than 2 minutes one prolonged blast.

(b) A power-driven vessel underway but stopped and making no way through the water shall sound at intervals of not more than 2 minutes two prolonged blasts in succession with an interval of about 2 seconds between them.

(c) A vessel not under command, a vessel restricted in her ability to manoeuvre, a vessel constrained by her draught, a sailing vessel, a vessel engaged in fishing and a vessel engaged in towing or pushing another vessel shall, instead of the signals prescribed in paragraphs (a)

or (b) of this Rule, sound at intervals of not more than 2 minutes three blasts in succession, namely one prolonged followed by two short blasts.

(d) A vessel engaged in fishing, when at anchor, and a vessel restricted in her ability to manoeuvre when carrying out her work at anchor, shall instead of the signals prescribed in paragraph (g) of this Rule sound the signal prescribed in paragraph (c) of this Rule.

(e) A vessel towed or if more than one vessel is towed the last vessel of the tow, if manned, shall at intervals of not more than 2 minutes sound four blasts in succession, namely one prolonged followed by three short blasts. When practicable, this signal shall be made immediately after the signal made by the towing vessel.

(f) When a pushing vessel and a vessel being pushed ahead are rigidly connected in a composite unit they shall be regarded as a power-driven vessel and shall give the signals prescribed in paragraphs (a) or (b) or this Rule.

(g) A vessel at anchor shall at intervals of not more than one minute ring the bell rapidly for about 5 seconds. In a vessel of 100 m of more in length the bell shall be sounded in the forepart of the vessel and immediately after the ringing of the bell the gong shall be sounded rapidly for about 5 seconds in the after part of the vessel. A vessel at anchor may in addition sound three short blasts in succession, namely one short, one prolonged and one short blast, to give warning of her position and of the possibility of collision to an approaching vessel.

(h) A vessel aground shall give the bell signal and if required the gong signal prescribed in paragraph (g) of this Rule and shall, in addition, give three separate and distinct strokes on the bell immediately before and after the rapid ringing of the bell. A vessel aground may in addition sound an appropriate whistle signal.

(i) A vessel of 12 m or more but less than 20 m in length shall not be obliged to give the bell signals prescribed in paragraphs (g) and (h) of this Rule. However, if she does not, she shall make some other efficient sound signal at intervals of not more than 2 minutes.

(j) A vessel of less than 12 m in length shall not be obliged to give the above-mentioned signals but, if she does not, shall make some other efficient sound signal at intervals of not more than 2 minutes.

(k) A pilot vessel when engaged on pilotage duty may in addition to the signals prescribed in paragraphs (a), (b) or (g) of this Rule sound an identity signal consisting of four short blasts.

Rule 36 (Signals to attract attention)

If necessary to attract the attention of another vessel any vessel may make light or sound signals that cannot be mistaken for any signal authorised elsewhere in these Rules, or may direct the beam of her searchlight in the direction of the danger, in such a way as not to embarrass any vessel. Any light to attract the attention of another vessel shall be such that it cannot be mistaken for any aid to navigation. For the purpose of this Rule the use of high-intensity intermittent or revolving lights, such as strobe lights, shall be avoided.

Rule 37 (Distress signals)

When a vessel is in distress and requires assistance she shall use or exhibit the signals described in Annex IV to these Regulations.

Part E - Exemptions

Rule 38 (Exemptions)

Any vessel (or class of vessels) provided that she complies with the requirements of the International Regulation for Preventing Collisions and Sea, 1960, the keel of which is laid or which is at a corresponding stage of construction before the entry into force of these Regulations may be exempted from compliance therewith as follows:

(a) The installation of lights with ranges prescribed in Rule 22, until four years after the date of entry into force of these Regulations.

(b) The installation of lights with colour specifications as prescribed in Section 7 of Annex I to these Regulations, until four years after the date of entry into force of these Regulations.

(c) The repositioning of lights as a result of conversion from Imperial to metric units and rounding off measurement figures, permanent exemption.

(d)

(i) The repositioning of masthead lights on vessels of less than 150 m in length, resulting from the prescriptions of section 3 (a) of Annex I to these Regulations, permanent exemption.

(ii) The repositioning of masthead lights on vessels of 150 m or more in length, resulting from the prescriptions of section 3 (a) of Annex I to these Regulations, until nine years after the date of entry into force of these Regulations.

(e) The repositioning of masthead lights resulting from the prescriptions of section 2 (b) of Annex I to these Regulations, until nine years after the date of entry into force of these Regulations.

(f) The repositioning of sidelights resulting from the prescriptions of section 2 (g) and 3 (b) of Annex I to these Regulations, unti ninel years after the date of entry into force of these Regulations.

(g) The requirements for sound signal appliances prescribed in Annex III to these Regulations, until nine years after the date of entry into force of these Regulations.

(h) The repositioning of all-round lights resulting from the prescription of section 9 (b) of Annex I to these Regulations, permanent exemption.

Annex I - Positioning and technical details of lights and shapes

1. Definition

The term "height above the hull" means height above the uppermost continuous deck. This height shall be measured from the position vertically beneath the location of the light.

2. Vertical positioning and spacing of lights

(a) On a power-driven vessel of 20 m of more in length the masthead lights shall be placed as follows:

(i) the forwards masthead light, or if only one masthead light is carried, then that light, at a height above the hull of not less than 6 metres, and, if the breadth of the vessel exceeds 6 m, then at a height above the hull not less than such breadth, so however that the light need not be placed at a greater height above the hull than 12 m;

(ii) when two masthead lights are carried the after one shall be at least 4.5 m vertically higher than the forward one.

(b) The vertical separation of masthead lights of power-driven vessels shall be such that in all normal conditions of trim the after light will be seen over and separate from the forward light at a distance of 1000 m from the stem when viewed from sea-level.

(c) The masthead light of a power-driven vessel of 12 m but less than 20 m in length shall be placed at a height above the gunwale of not less than 2.5 m.

(d) A power-driven vessel of less than 12 m in length may carry the uppermost light at a height of less than 2.5 m above the gunwale. When, however, a masthead light is carried in addition to sidelights and a sternlight or the all-round light prescribed in Rule 23 (d)(i) is carried in addition to sidelights, then such masthead light or all-round light shall be carried at least 1 m higher than the sidelights.

(e) One of the two or three masthead lights prescribed for a power-driven vessel when engaged in towing or pushing another vessel shall be placed in the same position as either the forward masthead light or the after masthead light; provided that, if carried on the aftermast, the lowest after masthead lights shall be at least 4.5 m vertically higher than the forward masthead light.

(f)

(i) The masthead light or lights prescribed in Rule 23 (a) shall be so placed as to be above and clear of all other lights and obstructions except as described in subparagraph (ii).

(ii) When it is impracticable to carry the all-round lights prescribed by Rule 27 (b)(i) or Rule 28 below the masthead lights, they may be carried above the after masthead light(s) or vertically in between the forwards masthead light(s) and after masthead light(s), provided that in the latter case the requirement of section 3 (c) of this annex shall be complied with.

(g) The sidelights of a power-driven vessel shall be placed at a height above the hull not greater than three quarters of that of the forward masthead light. They shall not be so low as to be interfered with by deck lights.

(h) The sidelights, if in a combined lantern and carried on a power-driven vessel of less than 20 m in length, shall be placed not less than 1 m below the masthead light.

(i) When the Rules prescribe two or three lights to be carried in a vertical line, they shall be spaced as follows:

(i) on a vessel of 20 m in length or more such lights shall be spaced not less than 2 m apart, and the lowest of these lights shall, except where a towing light is required, be placed at a height of not less than 4 m above the hull;

(ii) on a vessel of less than 20 m in length such lights shall be spaced not less than 1 m apart and the lowest of these lights shall, except where a towing light is required, be placed at a height of not less than 2 m above the gunwalel;

(iii) when three lights are carried they shall be equally spaced.

(j) The lower of the two all-round lights prescribed for a vessel when engaged in fishing shall be at a height above the sidelights not less than twice the distance between the two vertical lights.

(k) The forward anchor light prescribed in Rule 30 (a)(i), when two are carried, shall not be less than 4.5 m above the after one. On a vessel of 50 m or more in length this forward anchor light shall be placed at a height of not less than 6 m above the hull.

3. Horizontal positioning and spacing of lights

(a) When two masthead lights are prescribed for a power-driven vessel, the horizontal distance between them shall not be less than one half of the length of the vessel but need not be more than 100 m. The forward light shall be placed not more than one quarter on the length of the vessel from the stem.

(b) On a power-driven vessel on 20 m or more in length the sidelights shall not be placed in front of the forward masthead lights. They shall be placed at or near the side of the vessel.

(c) When the lights prescribed in Rule 27 (b)(i) or Rule 28 are placed vertically between the forward masthead light(s) and the after masthead light(s) these all-round lights shall be placed at a horizontal distance of not less than 2 m from the fore-and-aft centreline of the vessel in the athwartship direction.

(d) When only one masthead light is prescribed for power-driven vessel, this light shall be exhibeted forward of amidship; except that a vessel of less than 20 m in lenght need not exhibit this light forward of amidship but shall exhibit it as far forward as is practicable.

4. Details of location of direction-indicating lights for fishing vessels, dredgers and vessels engaged in underwater operations

(a) The light indicating the direction of the outlying gear from a vessel engaged in fishing as prescribed in Rule 26 (c)(ii) shall be placed at a horizontal distance of not less than 2 m and not more than 6 m away from the two all-round red and white lights. This light shall be placed not higher than the all-round white light prescribed in Rule 26 (c)(i) and not lower than the sidelights.

(b) The lights and shapes on a vessel engaged in dredging or underwater operations to indicate the obstructed side and/or the side on which it is safe to pass, as prescribed in Rule 27 (d)(i) and (ii), shall be placed at the maximum practical horizontal distance, but in no case less than 2 m, from the lights or shapes prescribed in Rule 27 (b)(i) and (ii). In no case shall the upper of these lights or shapes be at a greater height than the lower of the three lights or shapes prescribed in Rule 27 (b)(i) and (ii).

5. Screens for sidelights

The sidelights of vessels of 20 m or more in length shall be fitted with inboard screens painted matt black, and meeting the requirements of section 9 of this annex. On vessels of less than 20 m in length the sidelights, if necessary to meet the requirements of section 9 of this annex, shall be fitted with inboard matt black screens. With a combined lantern, using a single vertical filament and a very narrow division between the green and red sections, external screens need not be fitted.

6. Shapes

(a) Shapes shall be black and of the following sizes:

(i) a ball shall have a diameter of not less than 0.6 m:

(ii) a cone shall have a base diameter of not less than 0.6 m and a height equal to its diameter:

(iii) a cylinder shall have a diameter of at least 0.6 m and a height of twice its diameter:

(iv) a diamond shape shall consist of two cones as defined in (ii) above having a common base.

(b) The vertical distance between shapes shall be at least 1.5 m.

(c) In a vessels of less than 20 m in length shapes of lesser dimensions but commensurate with the size of the vessel may be used and the distance apart may be correspondingly reduced.

7. Colour specification of lights

The chromaticity of all navigation lights shall conform to the following standards, which lie within the boundaries of the area of the diagram specified for each colour by the International Commission on Illumination (CIE).

The boundaries of the area for each colour are given by indicating the corner co-ordinates, which are as follows:

(i)	White						
x		0.525	0.525	0.452	0.310	0.310	0.443
y		0.382	0.440	0.440	0.348	0.283	0.382
(ii)	Green						
x		0.028	0.009	0.300	0.203		
y		0.385	0.723	0.511	0.356		
(iii)	Red						
x		0.680	0.660	0.735	0.721		
y		0320	0.320	0.265	0.259		
(iv)	Yellow						
x		0.612	0.618	0.575	0.575		
y		0.382	0.382	0.425	0.406		

8. Intensity of lights

(a) The minimum luminous intensity of lights shall be calculated by using the formula:

$I = 3.43 \times 10^6 \times T \times D^2 \times K^{-D}$

Where

I is luminous intensity in candelas under service conditions,

T is threshold factor 2×10^{-7} lux,

D is range of visibility (luminous range) of the light in nautical miles,

K is atmospheric transmissivity.

For prescribed lights the value of K shall be 0.8, corresponding to a meteorological visibility of approximately 13 nautical miles.

(b) A selection of figures derived from the formula is given in the following table:

Range of visibility (luminous range) of light in nautical miles D	Luminous intensity of light in candelas for K = 0.8 I
1	0.9
2	4.3
3	12
4	27
5	52
6	94

NOTE: The maximum luminous intensity of navigation lights should be limited to avoid undue glare. This shall not be achieved by a variable control of the luminous intensity.

9. Horizontal sectors

(a)

(i) In the forward direction, sidelights as fitted on the vessel shall show the minimum required intensities. The intensities shall decrease to reach practical cut-off between 1° and 3° outside the prescribed sectors.

(ii) For sternlights and masthead lights and at 22.5° abaft the beam for sidelights, the minimum required intensities shall be maintained over the arc of the horizon up to 5° within the limits of the sectors prescribed in Rule 21. From 5° within the prescribed sectors the intensity may decrease by 50% up to the prescribed limits; it shall decrease steadily to reach practical cut-off at not more than 5° outside the prescribed sectors.

(b)

(i) All-round lights shall be so located as not to be obscured by masts, topmasts or structures within angular sectors of more than 6°, except anchor lights prescribed in Rule 30, which need not be placed at an impractical height above the hull.

(ii) If it is impracticable to comply with paragraph (b)(i) of this section by exhibiting only one all-round light, two all-round lights shall be used suitably positioned or screened so that they appear, as far as practicable, as one light at a distance of one mile.

10. Vertical sectors

(a) The vertical sectors of electric lights as fitted, with the exception of lights on sailing vessels underway, shall ensure that:

(i) at least the required minimum intensity is maintained at all angles from 5° above to 5° below the horizontal;

(ii) at least 60% of the required intensity is maintained from 7.5° above to 7.5° below the horizontal.

(b) In the case of sailing vessels underway the vertical sectors of electric lights as fitted shall ensure that:

(i) at least the required minimum intensity is maintained at all angles from 5° above to 5° below the horizontal;

(ii) at least 50% of the required minimum intensity is maintained from 25° above to 25° below the horizontal.

(c) In the case of lights other than electric these specifications shall be met as closely as possible.

11. Intensity of non-electric lights

Non-electric lights shall so far as practicable comply with the minimum intensities, as specified in the table given in section 8 of this annex.

12. Manoeuvring light

Notwithstanding the provisions of paragraph 2 (f) of this annex the manoeuvring light described in Rule 34 (b) shall be placed in the same fore-and-aft vertical plane as the masthead light or lights and, where practicable, at a minimum height of 2 m vertically above the forward masthead light, provided that it shall be carried not less than 2 m vertically above or below the after masthead light. On a vessel where only one masthead light is carried the manoeuvring light is carried, the manoeuvring light, if fitted, shall be carried where it can best be seen, not less than 2 m vertically apart from the masthead light.

13. High-speed craft*

(a) The masthead light of high-speed craft may be placed at a height related to the breadth of the craft lower than prescribed in paragraph 2 (a)(i) of this annex, provided that the base

angle of the isosceles triangles formed by the sidelights and masthead light, when seen in end elevation, is not less than 27°.

(b) On high sped-craft of 50 m or more in length, the vertical separation between foremast and mainmast of 4.5 m required by paragraph 2 (a)(ii) of this annex may be modified provided that such distance shall not be less than the value determined by the following formula:

$$y = \frac{(a + 17\Psi)C}{1000} + 2$$

where:

y is the height of the mainmast light above the foremast light in metres;

a is the height of the foremast light above the water surface in service condition in metres;

Ψ is the trim in service condition in degrees.

C is the horizontal separation of the masthead lights in metres.

* Refer to the International Code of Safety for High-Speed Craft, 1994 and the International Code of Safety for High-Speed Craft, 2000.

14. Approval

The construction of light and shapes and the installation of lights on board the vessel shall be to the satisfaction of the appropriate authority of the State whose flag the vessel in entitled to fly.

Annex II - Additional signals for fishing vessel fishing in close proximity

1. General

The lights mentioned herein shall, is exhibited in pursuance of Rule 26 (d), be places where they can best be seen. They shall be at least 0.9 m apart but at a lower level than lights prescribed in Rule 26 (b)(i) and (c)(i). The lights shall be visible all round the horizon at a distance of at least 1 mile but at a lesser distance then the lights prescribed by these Rules for fishing vessels.

2. Signals for trawlers

(a) Vessels of 20 m or more in length when engaged in trawling, whether using demersal or pelagic gear, shall exhibit:

(i) when shooting their nets:

two white lights in a vertical line;

(ii) when hauling their nets:

one white light over one red light in a vertical line;

(iii) when the net has come fast upon an obstruction:

two red lights in a vertical line.

(b) Each vessel of 20 m or more in length engaged in pair trawling shall exhibit:

(i) by night, a searchlight directed forwards and in the direction of the other vessel of the pair;

(ii) when shooting or hauling their nets or when nets have come fast upon an obstruction, the lights prescribed in 2 (a) above.

(c) A vessel of less than 20 m in length engaged in trawling, whether using demersal or pelagic gear or engaged in pair trawling, may exhibit the lights prescribed in paragraphs (a) or (b) of this section, as appropriate.

3. Signals for purse seiners

Vessels engaged in fishing with purse seine gear may exhibit two yellow lights in a vertical line. These lights shall flash alternately every second and with equal lights and occultation duration. These lights may be exhibited only when the vessel is hampered by its fishing gear.

Annex III - Technical details of sound signal appliances

1. Whistles

(a) Frequencies and range of audibility

The fundamental frequency of the signal shall lie within the range 70-700 Hz. The range of audibility of the signal from a whistle shall be determined by those frequencies, which may include the fundamental and/or one or more higher frequencies, which lie within the range 180-700Hz (± 1%) for a vessel of 20 m or more in length, or 180-2100 Hz(±1%) for a vessel of less than 20 m in length and which provide the sound pressure levels specified in paragraph 1 (c) below.

(b) Limits of fundamental frequencies

To ensure a wide variety of whistle characteristics, the fundamental frequency of a whistle shall be between the following limits:

(i) 70-200 Hz, for a vessel 200 m or more in length;

(ii) 130-350 Hz, for a vessel 75 m but less than 200 m in length;

(iii) 250-700 Hz, for a vessel less than 75 m in length.

(c) Sound signal intensity and range of audibility

A whistle fitted in a vessel shall provide, in the direction of maximum intensity of the whistle and at a distance of 1 m from it, a sound pressure level in at least one 1/3-octave band within the range of frequencies 180-700 Hz (± 1%) for a vessel of 20 m or more in length, or 180-2100 Hz (±1%) for a vessel of less than 20 m in length, of not less than the appropriate figure given in the table below.

Length of vessel in metres	1/3-octave band level at 1 m in dB referred to $2x10^{-5}$ N/m^2	Audibility range in nautical miles
200 or more	143	2
75 but less than 200	138	1.5
20 but less than 75	130	1
Less than 20	120* 115** 111***	0.5

* When the measured frequencies lie within the range 180-450 Hz
** When the measured frequencies lie within the range 450-800 Hz
*** When the measured frequencies lie within the range 800-2100 Hz

The range of audibility in the table above is for information and is approximately the range at which a whistle may be heard on its forward axis with 90% probability in conditions of still air on board a vessel having average background noise level at the listening posts (taken to be 68 dB in the octave band centred on 250 Hz and 63 dB in the octave band centred on 500 Hz).

In practice the range at which a whistle may be heard is extremely variable and depends critically on weather conditions; the values given can be regarded as typical but under conditions of strong wind or high ambient noise level at the listening post the range may be much reduced.

(d) Directional properties

The sound pressure level of a directional whistle shall be not more than 4 dB below the prescribed sound pressure level on the axis at any direction in the horizontal plane within ± 45° on the axis. The sound pressure level at any other direction in the horizontal plane shall be not more than 10 dB below the prescribed sound pressure level on the axis, so that the range in any direction will be at least half the range on the forward axis. The sound pressure level shall be measured in that 1/3-octave band which determines the audibility range.

(e) Positioning of whistles

When a directional whistle is to be used as the only whistle on a vessel, it shall be installed with its maximum intensity directed straight ahead.

A whistle shall be placed as high as practicable on a vessel, in order to reduce interception of the emitted sound by obstructions and also to minimize hearing damage risk to personnel. The sound pressure level of the vessel's own signal at listening posts shall not exceed 110 dB (A) and so far as practicable should not exceed 100 dB (A).

(f) Fitting of more than one whistle

If whistles are fitted at a distance apart of more than 100 metres, if shall be so arranged that they are not sounded simultaneously.

(g) Combined whistle systems

If due to the presence of obstructions the sound field of a single whistle or of one of the whistles referred to in paragraph 1 (f) above is likely to have a zone of greatly reduced signal level, it is recommend that a combined whistle system be fitted so as to overcome this reduction. For the purposes of the Rules a combined whistle system is to be regarded as a single whistle. The whistles of a combined system shall be located at a distance apart of not more than 100 m and arranges to be sounded simultaneously. The frequency of any one whistle shall differ from those of the others by at least 10 Hz.

2. Bell or gong

(a) Intensity of signal

A bell or gong, or other device having similar sound characteristics shall produce a sound pressure level of not less than 110 dB at a distance of 1 m from it.

(b) Construction

Bells and gongs shall be made of corrosion-resistant material and designed to give a clear tone. The diameter of the mouth of the bell shall be not less than 300 mm, for vessels of 20 m or more in length. Where practicable, a power-driven bell striker is recommended to ensure constant force but manual operation shall be possible. The mass of the striker shall be not less than 3% of the mass of the bell.

3. Approval

The construction of sound signal appliances, their performance and their installation on board the vessel shall be to the satisfaction of the appropriate authority of the State whose flag the vessel is entitled to fly.

Annex IV - Distress signals

1. The following signals, used or exhibited either together or separately, indicate distress and need of assistance:

(a) a gun or other explosive signal fired at intervals of about a minute;
(b) a continuous sounding with any fog signalling apparatus;
(c) rockets or shells, throwing red stars fired one at a time at short intervals;
(d) a signal made by any signalling method consisting of the group . . . - - - . . . (SOS) in the Morse Code;
(e) a signal sent by radiotelephony consisting of the spoken word "MAYDAY";
(f) the International Code Signal of distress indicated by N.C.;
(g) a signal consisting of a square flag having above or below it a ball or anything resembling a ball;
(h) flames on the vessel (as from a burning tar barrel, oil barrel, etc.);
(i) a rocket parachute flare or hand flare showing a red light;
(j) a smoke signal giving off orange-coloured smoke;
(k) slowly and repeatedly raising and lowering arms outstretched to each side;
(l) a distress alert by means of digital selective calling (DSC) transmitted on:

(i) VHF channel 70; or
(ii) MF/HF on the frequencies 2187.5 kHZ, 8414.5 kHZ, 4207.5 kHZ, 6312 kHZ, 12577 kHZ or 16804.5 kHZ;

(m) a ship-to-shore distress alert transmitted by the ship's Inmarsat or other mobile satellite service provider ship earth station;
(n) signals transmitted by emergency position indicating radio beacons;
(o) approved signals transmitted by radiocommunication systems, including survival craft radar transponders.

2. The use or exhibition of any of the foregoing signals except for the purpose of indicating distress and need of assistance and the use of other signals which may be confused with any of the above signals, is prohibited.

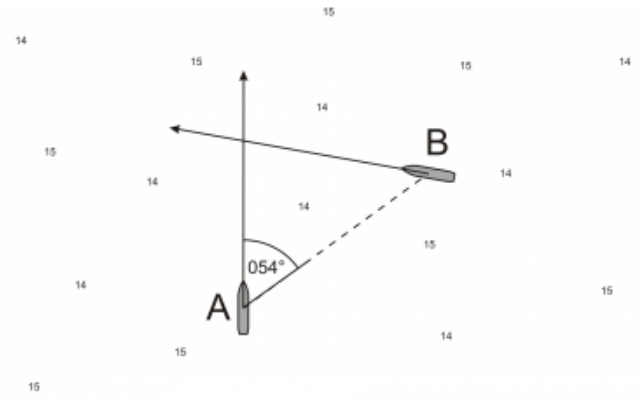
3. Attention is drawn to the relevant sections of the International Code of Signals, the International Aeronautical and Maritime Search and Rescue Manual, Volume III and the following signals:

(a) a piece of orange coloured canvas with either a black square and circle or other appropriate symbol (for identification from the air);
(b) a dye marker.

Scenarios

Scenario 1

Just limited under keel clearance is not enough to consider a vessel as constrained by her draught



- Description of scenario:
  Vessel A: Power-driven vessel underway (Dynamic draft 12 m)
  Vessel B: Power-driven vessel underway (Dynamic draft 5 m)
  Area: Open sea (Depth 14~15 m)
  Visibility: Good (Vessels are in sight of one another)
  Vessel A and vessel B are crossing so as to involve risk of collision
  Vessel A has vessel B on her own starboard side (relative bearing STBD 054°)

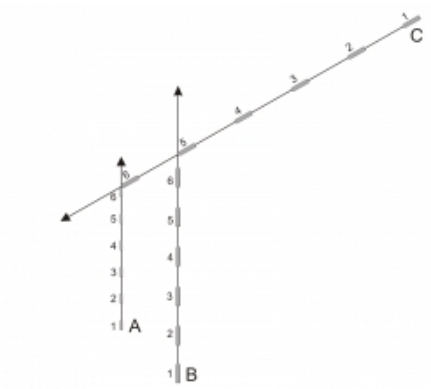
- Rule(s) to be applied:
  Rule 15 Crossing situation
  Rule 16 (Action by give-way vessel)
  Rule 17 (Action by stand-on vessel)

- Applying the Rule(s) and comments:
  Crossing situation (vessel A and vessel B):
  In accordance with Rule 15 (Crossing situation), when two power-driven vessels are crossing so as to involve risk of collision, the vessel (vessel A) which has the other (vessel B) on her own starboard side shall keep out of the way.
  In accordance with Rule 15 (Crossing situation), vessel A shall, if the circumstances of the case admit, avoid crossing ahead of the vessel B.
  In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel A) which is directed to keep out of the way of another vessel (vessel B) shall, so far as possible, take early and substantial action to keep well clear.
  In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way (vessel A) the other (vessel B) shall keep her course and speed.

- Comments: Although vessel A navigates in an area with a small underkeel clearance but with adequate space to take avoiding action she should not be regarded as a vessel constrained by her draught and Rule 18 (Responsibilities between vessels) doesn't apply. Limited under keel clearance in not by itself enough to consider vessel A as constrained by her draught if the waterway provides ample manoeuvring room of the same depth on either side.

Scenario 2

Overtaking and crossing situation on the high seas

- Description of scenario:
  Vessel A: power-driven vessel
  Vessel B: power-driven vessel
  Vessel C: power-driven vessel
  Area: On the high seas
  Visibility: Good (Vessels in sight of one another)
  Vessel A and vessel B are sailing in approximately parallel courses and vessel B is overtaking vessel A on her starboard side
  

  Vessel A has vessel C on her own starboard side (relative bearing STBD 035°)
  Vessel A and vessel C are crossing so as to involve risk of collision
  Vessel B and vessel C are crossing but there is no risk of collision

- Rule(s) to be applied:Rule 13 (Overtaking)
  Rule 15 (Crossing situation)
  Rule 16 (Action by give-way vessel)
  Rule 17 (Action by stand-on vessel)

- Applying the Rule(s) and comments:Overtaking situation (vessel A and vessel B):
  In accordance with Rule 13 (a) (Overtaking situation), notwithstanding anything contained in the Rules of Part B, sections I and II, any vessel overtaking (vessel B) any other vessel (vessel A) shall keep out of the way of the vessel being overtaken (Vessel A).
  In accordance with Rule 13 (d) (Overtaking situation), any subsequent alteration of the bearing between the two vessels shall not make the overtaking vessel (Vessel B) a crossing vessel within the meaning of these Rules or relieve her (Vessel B) of the duty of keeping clear of the overtaken vessel (Vessel A) until she is finally past and clear.
  In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel B) which is directed to keep out of the way of another vessel (vessel A) shall, so far as possible, take early and substantial action to keep well clear.
  In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way the other shall keep her course and speed.

- Crossing situation (vessel A and vessel C):
  In accordance with Rule 15 (Crossing situation), when two power-driven vessels are crossing so as to involve risk of collision, the vessel (vessel A) which has the other (vessel C) on her own starboard side shall keep out of the way.
  In accordance with Rule 15 (Crossing situation), vessel A shall, if the circumstances of the case admit, avoid crossing ahead of vessel C.
  In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel A)

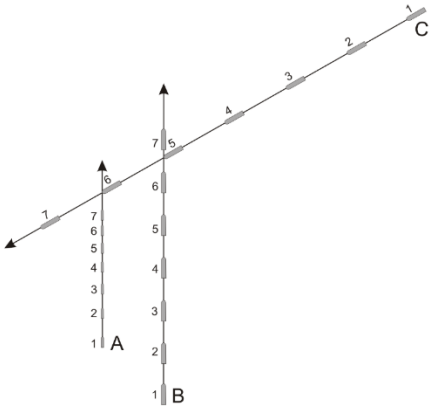
which is directed to keep out of the way of another vessel (vessel C) shall, so far as possible, take early and substantial action to keep well clear.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way the other shall keep her course and speed.
Vessel A, in accordance with Rule 17 (Action by stand-on vessel) shall keep her course and speed for vessel B, but in accordance with Rule 15 (Crossing situation) vessel A shall keep out of the way of vessel C.

- Comments:
  In accordance with Rule 17 (a)(i) (Action by stand-on vessel), vessel C shall keep her course and speed for vessel A and vessel B.
  In accordance with Rule 17 (a)(i) (Action by stand-on vessel), vessel A shall keep her course and speed for vessel B, but in accordance with Rule 15 (Crossing situation), vessel A shall keep out of the way for vessel C

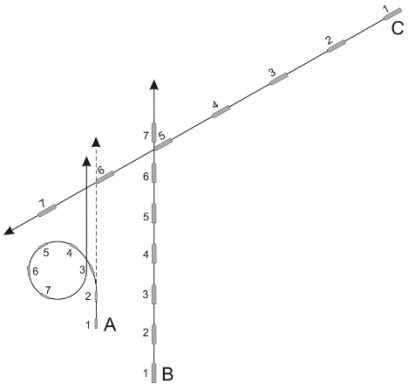
- Actions:

  In accordance with the ordinary practice of seamen, vessels A may take the following actions to avoid collision or close-quarters situation.

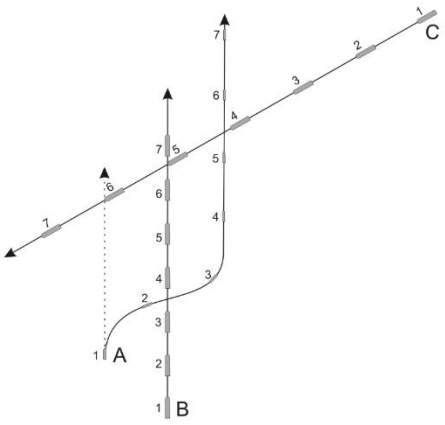
  a) Vessel A may reduce speed to enable safe passing of vessel C



  b) Vessel A may make 360° turn to port to avoid collision with vessel C

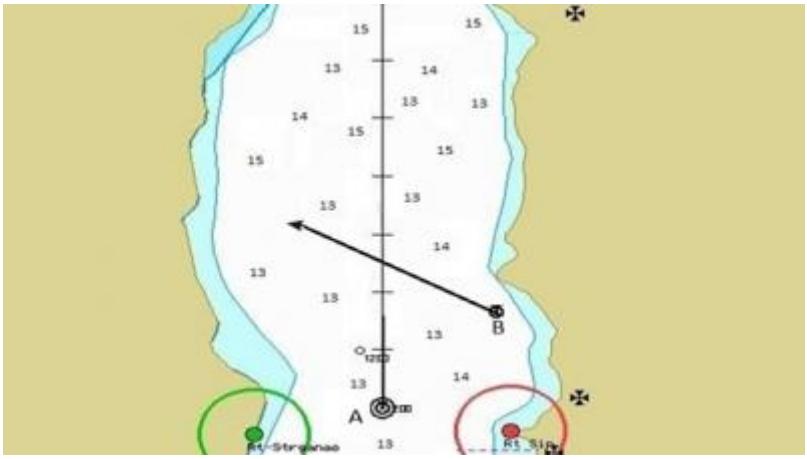


c) Vessel A may take early and substantial action by alteration her course to starboard, if such action does not result in close-quarter situation with vessel B



Scenario 3

Application of Rule 18 in narrow channels or fairways where Rule 9 applies



- Description of scenario:

  Vessel A: Power-driven vessel constrained by her draught underway (Dynamic draught 11 m)
  Vessel B: Power-driven vessel underway more than 20 m in length (Dynamic draught 6 m)
  Area: Narrow channel (Depth 13~15 m)
  Visibility: Good (Vessels are in sight of one another)
  Vessel A and vessel B are crossing so as to involve risk of collision
  Vessel A has vessel B on her own starboard side (relative bearing STBD 054°)

- Rule(s) to be applied:

  Rule 9 (Narrow channel)
  Rule 8 (Action to avoid collision)
  Rule 34 (Manoeuvring and warning signals)

- Applying the Rule(s) and comments:

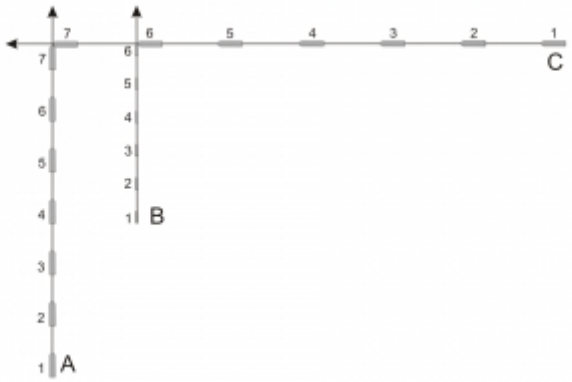
  Crossing situation (vessel A and vessel B):
  In accordance with Rule 9 (d) (Narrow channels), a vessel (vessel B) shall not cross a narrow channel or fairway if such crossing impedes the passage of a vessel which can safely navigate only within such channel or fairway (vessel A).
  In accordance with Rule 9 (d) (Narrow channels), a vessel which can safely navigate only within such channel or fairway (vessel A) may use the sound signal prescribed in Rule 34 (d) (Manoeuvring and warning signals) if in doubt as to the intention of the crossing vessel (vessel B).
  In accordance with Rule 8 (f)(i) (Action to avoid collision), a vessel (vessel B) which is required not to impede the passage or safe passage of another vessel (vessel A) shall, when required by the circumstances of the case, take early action to allow sufficient sea-room for the safe passage of the other vessel (vessel A).

In accordance with Rule 8 (f)(ii) (Action to avoid collision), a vessel (vessel B) required not to impede the passage or safe passage of another vessel (vessel A) is not relieved of this obligation if approaching the other vessel (vessel A) so as to involve risk of collision and shall, when taking action, have full regard to the action which may be required by the Rules of Part B (Steering and Sailing Rules).
In accordance with Rule 8 (f)(iii) (Action to avoid collision), a vessel (vessel A) the passage of which is not to be impeded remains fully obliged to comply with the Rules of part B (Steering and Sailing Rules) when the two vessels are approaching one another so as to involve risk of collision.
In accordance with Rule 34 (d) (Manoeuvring and warning signals), if a vessel (vessel A) fails to understand the intentions or actions of the other vessel (vessel B), or is in doubt whether sufficient action is being taken by the other vessel (vessel B) to avoid collision, the vessel in doubt (vessel A) shall immediately indicate such doubt by giving at least five short and rapid blasts on the whistle.
In accordance with Rule 34 (d) (Manoeuvring and warning signals), sound signal may be supplemented by a light signal of at least five short and rapid flashes.

Comments:
In this scenario it is necessary to determine which Rule to apply, Rule 9 (Narrow channels) or Rule 18 (Responsibilities between vessels)? It is clear that vessel A is vessel constrained by her draught and that vessels are crossing in narrow channel .
In accordance with Rule 18 (d)(i) any vessel (vessel B) other than a vessel not under command or a vessel restricted in her ability to manoeuvre shall, if the circumstances of the case admit, avoid impeding the safe passage of a vessel constrained by her draught (vessel A), but this Rule cannot be applied if Rule 9 (Narrow channels) otherwise require.
Rule 9 (d) (Narrow channels) requires that a vessel (vessel B) shall not cross a narrow channel or fairway if such crossing impedes the passage of a vessel which can safely navigate only within such channel or fairway (vessel A).
Actually both Rules (Rule 9 and Rule 18) require that vessel B shall not cross a narrow channel or fairway if such crossing impedes the passage of a vessel which can safely navigate only within such channel or fairway (vessel A).

Scenario 4

Overtaking and crossing situation on the high seas



- Description of scenario:Vessel A:

  Power-driven vessel underway
  Vessel B: Power-driven vessel underway
  Vessel C: Power-driven vessel underway
  Area: On the high seas
  Visibility: Good (Vessels are in sight of one another)
  Vessel A and vessel B are sailing in approximately parallel courses and vessel A is overtaking vessel B on her port side
  Vessel A has vessel C on her own starboard side (relative bearing STBD 058°)
  Vessel A and vessel C are crossing so as to involve risk of collision
  Vessel B has vessel C on her own starboard side (relative bearing STBD 068°)
  Vessel B and vessel C are crossing so as to involve risk of collision

- Rule(s) to be applied:

  Rule 13 (Overtaking)
  Rule 15 (Crossing situation)
  Rule 16 (Action by give-way vessel)
  Rule 17 (Action by stand-on vessel)

- Applying the Rule(s) and comments:

  Overtaking situation (vessel A and vessel B):
  In accordance with Rule 13 (a) (Overtaking), notwithstanding anything contained in the Rules of Part B, sections I and II, any vessel overtaking (vessel A) any other vessel (vessel B) shall keep out of the way of the vessel being overtaken (vessel B).
  In accordance with Rule 13 (d) (Overtaking situation), any subsequent alteration of the bearing between the two vessels shall not make the overtaking vessel (vessel A) a crossing vessel within the meaning of these Rules or relieve her (vessel A) of the duty of keeping clear of the overtaken vessel (vessel B) until she is finally past and clear.

In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel A) which is directed to keep out of the way of another vessel (vessel B) shall, so far as possible, take early and substantial action to keep well clear.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way (vessel A) the other (vessel B) shall keep her course and speed.

Crossing situation (vessel A and vessel C):
In accordance with Rule 15 (Crossing situation), when two power-driven vessels are crossing so as to involve risk of collision, the vessel (vessel A) which has the other (vessel C) on her own starboard side shall keep out of the way.
In accordance with Rule 15 (Crossing situation), vessel A shall, if the circumstances of the case admit, avoid crossing ahead of vessel C.
In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel A) which is directed to keep out of the way of another vessel (vessel C) shall, so far as possible, take early and substantial action to keep well clear.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way (vessel A) the other (vessel C) shall keep her course and speed.

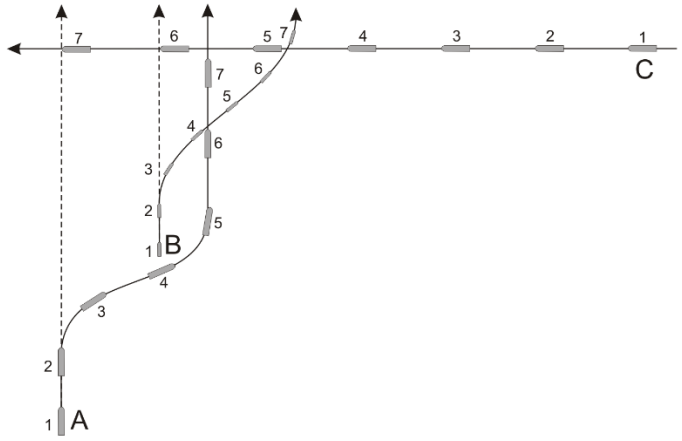
Crossing situation (vessel B and vessel C):
In accordance with Rule 15 (Crossing situation), when two power-driven vessels are crossing so as to involve risk of collision, the vessel (vessel B) which has the other (vessel C) on her own starboard side shall keep out of the way.
In accordance with Rule 15 (Crossing situation), vessel B shall, if the circumstances of the case admit, avoid crossing ahead of vessel C.
In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel B) which is directed to keep out of the way of another vessel (vessel C) shall, so far as possible, take early and substantial action to keep well clear.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way (vessel B) the other (vessel C) shall keep her course and speed.

Comments:
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), vessel C shall keep her course and speed for vessel A and vessel B.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), vessel B shall keep her course and speed for vessel A, but in accordance with Rule 15 (Crossing situation), vessel B shall keep out of the way for vessel C.

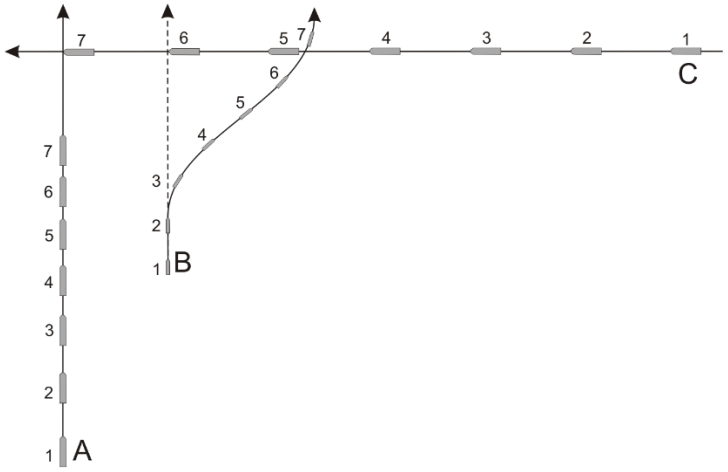
- Actions:

  Vessel A and vessel B can take following actions to avoid collision or close-quarters situation.

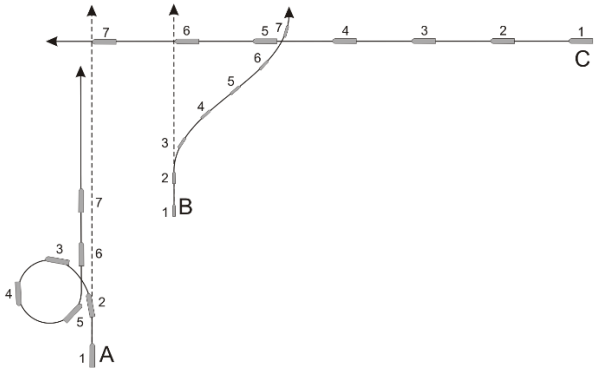
a) Vessel A may take early and substantial action by alteration her course to starboard, and pass astern of vessel C on safe distance immediately after the same action was done by vessel B



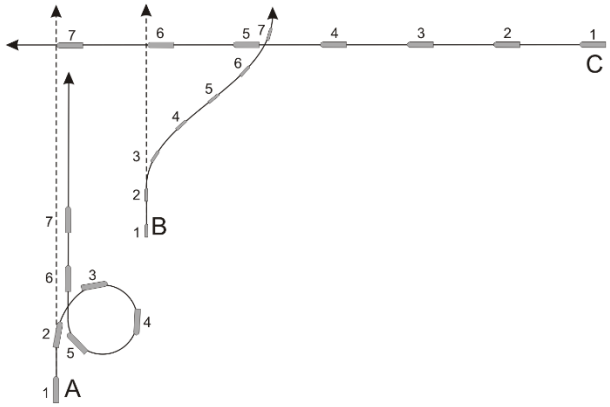
b) Vessel A may reduce speed to enable safe passing of vessel C



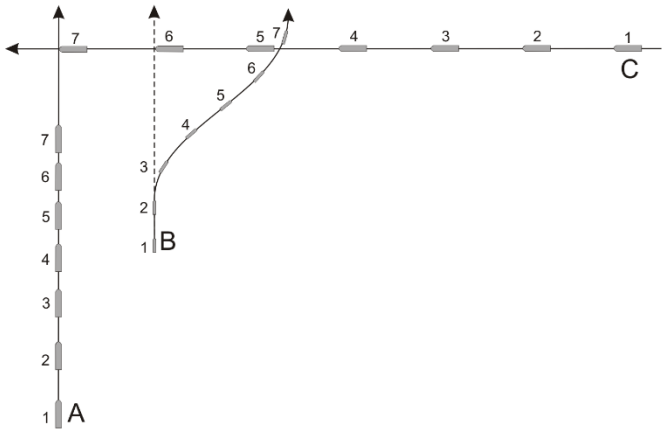
c) Vessel A may make 360° turn to port to avoid collision with vessel C



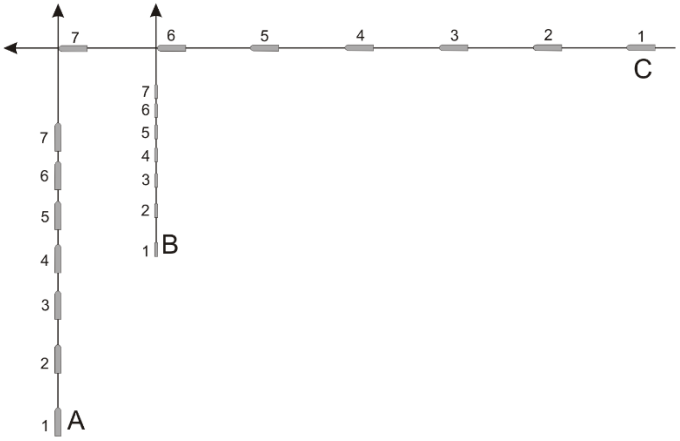
d) Vessel A may take early action by making 360° turn to starboard to avoid collision with vessel C



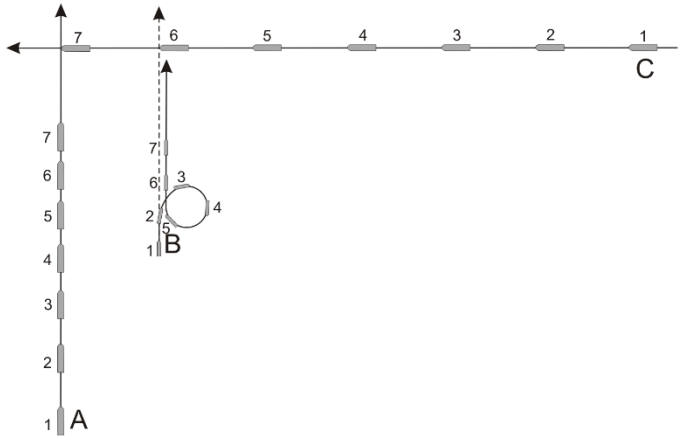
e) Vessel B may alter her course to starboard to avoid collision with vessel C and pass astern on safe distance



f) Vessel B may reduce speed to enable safe passing of vessel C

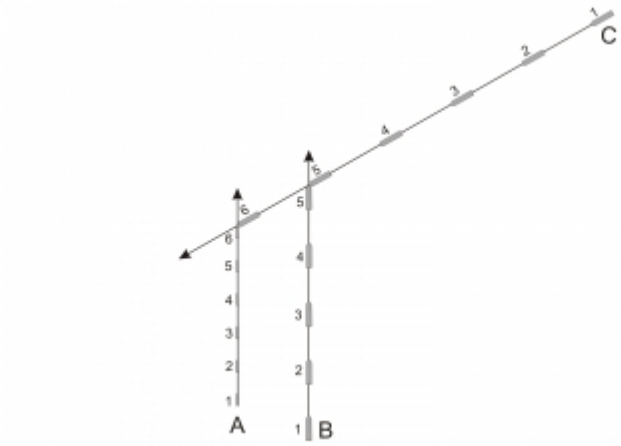


g) Vessel B may make 360° turn to starboard to avoid collision with vessel C



Scenario 5

Overtaking and crossing situation on the high seas



- Description of scenario:

  Vessel A: Power-driven vessel underway
  Vessel B: Power-driven vessel underway
  Vessel C: Power-driven vessel underway
  Area: On the high seas
  Visibility: Good (Vessels are in sight of one another)
  Vessel A and vessel B are sailing in approximately parallel courses and vessel B is overtaking vessel A on her starboard side
  Vessel A has vessel C on her own starboard side (relative bearing STBD 044°)
  Vessel A and vessel C are crossing so as to involve risk of collision
  Vessel B has vessel C on her own starboard side (relative bearing STBD 036°)
  Vessel B and vessel C are crossing so as to involve risk of collision

- Rule(s) to be applied:
  Rule 13 (Overtaking)
  Rule 15 (Crossing situation)
  Rule 16 (Action by give-way vessel)
  Rule 17 (Action by stand-on vessel)
- Applying the Rule(s) and comments:
  Overtaking situation (vessel A and vessel B):
  In accordance with Rule 13 (a) (Overtaking), notwithstanding anything contained in the Rules of Part B, sections I and II, any vessel overtaking (vessel B) any other vessel (vessel A) shall keep out of the way of the vessel being overtaken (vessel A).
  In accordance with Rule 13 (d) (Overtaking situation), any subsequent alteration of the bearing between the two vessels shall not make the overtaking vessel (vessel B) a crossing vessel within the meaning of these Rules or relieve her (vessel B) of the duty of keeping clear of the overtaken vessel (vessel A) until she is finally past and clear.
  In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel B) which is directed to keep out of the way of another vessel (vessel A) shall, so far as

possible, take early and substantial action to keep well clear.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way (vessel B) the other (vessel A) shall keep her course and speed.

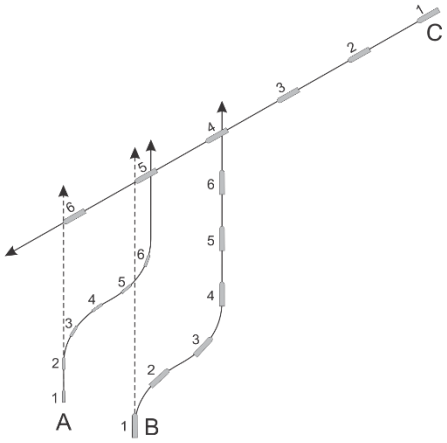
Crossing situation (vessel A and vessel C):
In accordance with Rule 15 (Crossing situation), when two power-driven vessels are crossing so as to involve risk of collision, the vessel (vessel A) which has the other (vessel C) on her own starboard side shall keep out of the way.
In accordance with Rule 15 (Crossing situation), vessel A shall, if the circumstances of the case admit, avoid crossing ahead of vessel C.
In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel A) which is directed to keep out of the way of another vessel (vessel C) shall, so far as possible, take early and substantial action to keep well clear.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way (vessel A) the other (vessel C) shall keep her course and speed.

Crossing situation (vessel B and vessel C):
In accordance with Rule 15 (Crossing situation), when two power-driven vessels are crossing so as to involve risk of collision, the vessel (vessel B) which has the other (vessel C) on her own starboard side shall keep out of the way.
In accordance with Rule 15 (Crossing situation), vessel B shall, if the circumstances of the case admit, avoid crossing ahead of vessel C.
In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel B) which is directed to keep out of the way of another vessel (vessel C) shall, so far as possible, take early and substantial action to keep well clear.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way (vessel B) the other (vessel C) shall keep her course and speed.

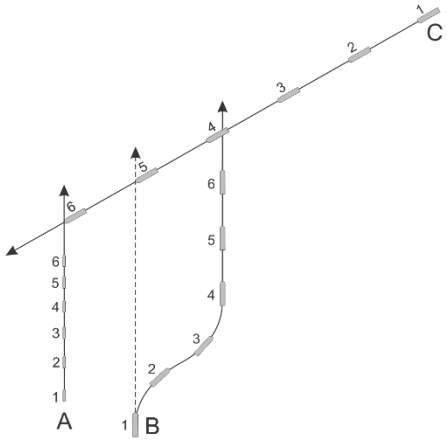
Comments:
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), vessel C shall keep her course and speed for vessel A and vessel B.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), vessel A shall keep her course and speed for vessel B, but in accordance with Rule 15 (Crossing situation), vessel A shall keep out of the way for vessel C.

- Actions:
  In accordance with the ordinary practice of seamen, vessel A and vessel B may take the following actions to avoid collision or close-quarters situation.

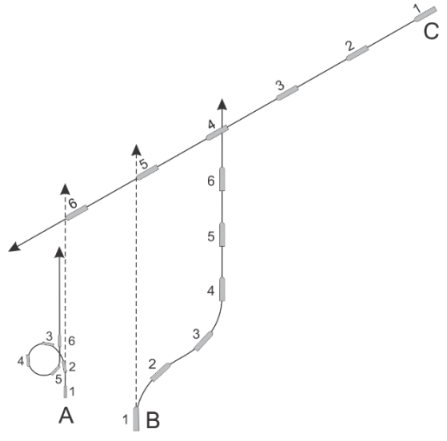
  a) Vessel A may alter course to starboard to avoid collision with vessel C and pass astern on safe distance immediately after the same action was done by vessel B



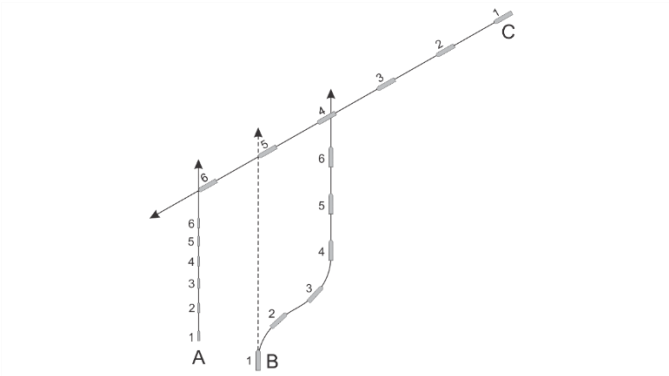
b) Vessel A may reduce speed to enable safe passing of vessel C



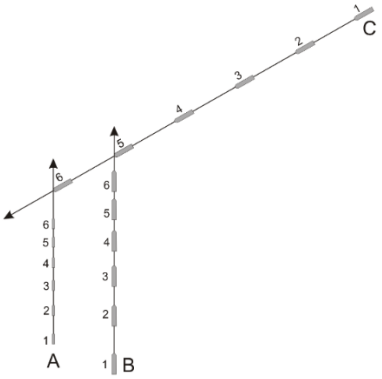
c) Vessel A may make 360° turn to port to avoid collision with vessel C



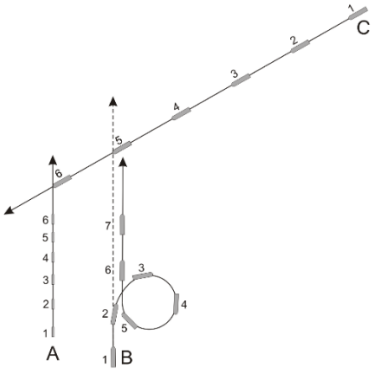
d) Vessel B may alter course to starboard to avoid collision with vessel C and pass astern on safe distance



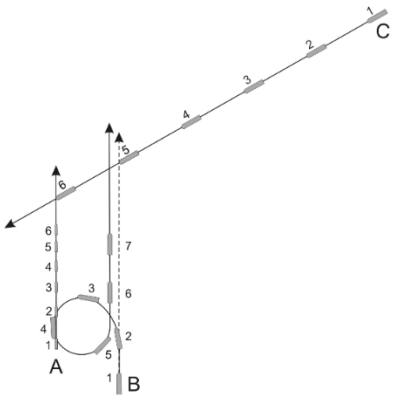
e) Vessel B may reduce speed to enable safe passing of vessel C



f) Vessel B may make 360° turn to starboard to avoid collision with vessel C

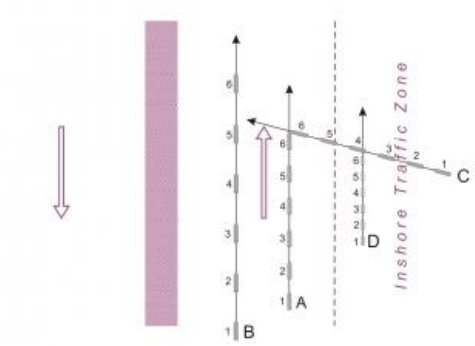


g) Vessel B may take early action by making 360° turn to port to avoid collision with vessel C (when vessel B is not able to alter her course to starboard or changing her speed would not result in passing vessel C at safe distance)



Scenario 6

Multi-ship encounter situation in a traffic separation scheme



- Description of scenario:
  Vessel A: Power-driven vessel , proceeding in appropriate traffic lane
  Vessel B: Power-driven vessel , proceeding in appropriate traffic lane
  Vessel C: Sailing vessel , crossing traffic lanes
  Vessel D: Vessel engaged in fishing in inshore traffic zone
  Area: Traffic separation scheme
  Visibility: Good (Vessels in sight of one another)
  Vessel A and vessel B are sailing in approximately parallel courses and vessel B is overtaking vessel A on her port side
  Vessel A and vessel C are crossing so as to involve risk of collision
  Vessel A has vessel C on her own starboard side (relative bearing STBD 040°)
  Vessel A and vessel D are sailing in approximately parallel courses and Vessel A is overtaking vessel D on her port side

- Rule(s) to be applied:
  Rule 8 (Action to avoid a collision)
  Rule 10 (Traffic separation schemes)
  Rule 13 (Overtaking)
  Rule 18 (Responsibilities between vessels)

- Applying the Rule(s) and comments:
  Crossing situation in a traffic separation scheme (vessel A and vessel C)
  In accordance with Rule 10 (b)(i) (Traffic separation schemes), a vessel using a traffic separation scheme (vessel A) shall proceed in the appropriate traffic lane in the general direction of traffic flow for that lane.
  In accordance with Rule 10 (c) (Traffic separation schemes), a vessel (vessel C) shall so far as practicable avoid crossing traffic lanes, but if obliged to do so shall cross on a heading as nearly as practicable at right angles to the general direction of traffic flow.
  In accordance with Rule 10 (j) (Traffic separation schemes), a vessel of less than 20 meters in length or a sailing vessel (vessel C) shall not impede the safe passage of

a power-driven vessel (vessel A) following a traffic lane.
In accordance with Rule 8 (f)(i) (Action to avoid a collision), a vessel (vessel C) which, by any of these Rules, is required not to impede the passage or safe passage of another vessel shall, when required by the circumstances of the case, take early action to allow sufficient sea room for the safe passage of the other vessel (vessel A).
In accordance with Rule 8 (f)(iii) (Action to avoid a collision), a vessel the passage of which is not to be impeded (vessel A) remains fully obliged to comply with the rules of this part when the two vessels are approaching one another so as to involve risk of collision.

Comments:
In accordance with Rule 8 (f)(iii) (Action to avoid a collision), a vessel the passage of which is not to be impeded (vessel A), will most probably proceed in the appropriate traffic lane in the general direction of traffic flow for that lane in accordance with Rule 10 (b)(i) (Traffic separation schemes), keeping her course and speed.
If the vessel C doesn't take early and substantial action to allow sufficient sea room for the safe passage of the vessel A, vessel A shall take appropriate actions to avoid collision in accordance with Rule 8 (f)(iii) (Action to avoid a collision).
In accordance with Rule 10 (j) (Traffic separation schemes), sailing vessel C shall not impede the safe passage of a power-driven vessel A following a traffic lane.
In accordance with Rule 8 (f)(I) (Action to avoid a collision) vessel C shall take early action to allow sufficient sea room for the safe passage of the vessel A.

- Actions:
  In accordance with Rule 10 (j) (Traffic separation schemes) sailing vessel C may take the following actions to avoid collision or close-quarters situation with vessel A.
  If vessel C doesn't take early and substantial action in accordance with Rule 8 (f)(iii) (Action to avoid a collision), vessel A may also take some actions to avoid collision with vessel C

Scenario 7

Multi-ship encounter situation in a traffic separation scheme

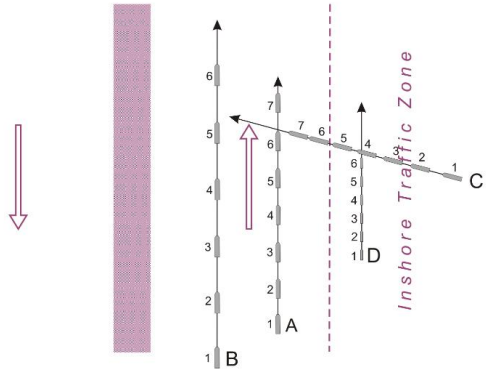
- Description of scenario:
  Vessel A: Power-driven vessel , proceeding in appropriate traffic lane
  Vessel B: Power-driven vessel , proceeding in appropriate traffic lane
  Vessel C: Sailing vessel , crossing traffic lanes
  Vessel D: Vessel engaged in fishing in inshore traffic zone
  Area: Traffic separation scheme
  Visibility: Good (Vessels in sight of one another)
  Vessel A and vessel B are sailing in approximately parallel courses and vessel B is overtaking vessel A on her port side
  Vessel A and vessel C are crossing so as to involve risk of collision
  Vessel A has vessel C on her own starboard side (relative bearing STBD 040°)
  Vessel A and vessel D are sailing in approximately parallel courses and Vessel A is overtaking vessel D on her port side
  Rule(s) to be applied:
  Rule 8 (Action to avoid a collision)
  Rule 10 (Traffic separation schemes)
  Rule 13 (Overtaking)
  Rule 18 (Responsibilities between vessels)

- Applying the Rule(s) and comments:
  Crossing situation in a traffic separation scheme (vessel A and vessel C)
  In accordance with Rule 10 (b)(i) (Traffic separation schemes), a vessel using a traffic separation scheme (vessel A) shall proceed in the appropriate traffic lane in the general direction of traffic flow for that lane.
  In accordance with Rule 10 (c) (Traffic separation schemes), a vessel (vessel C) shall so far as practicable avoid crossing traffic lanes, but if obliged to do so shall cross on a heading as nearly as practicable at right angles to the general direction of traffic flow.
  In accordance with Rule 10 (j) (Traffic separation schemes), a vessel of less than 20 meters in length or a sailing vessel (vessel C) shall not impede the safe passage of a power-driven vessel (vessel A) following a traffic lane.
  In accordance with Rule 8 (f)(i) (Action to avoid a collision), a vessel (vessel C) which, by any of these Rules, is required not to impede the passage or safe passage of another vessel shall, when required by the circumstances of the case, take early action to allow sufficient sea room for the safe passage of the other vessel (vessel A).
  In accordance with Rule 8 (f)(iii) (Action to avoid a collision), a vessel the passage of which is not to be impeded (vessel A) remains fully obliged to comply with the rules of this part when the two vessels are approaching one another so as to involve risk of collision.

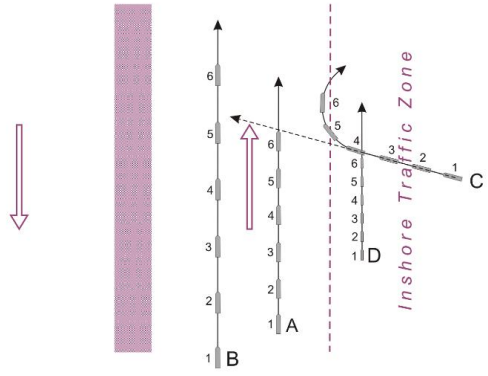
Comments:
In accordance with Rule 8 (f)(iii) (Action to avoid a collision), a vessel the passage of which is not to be impeded (vessel A), will most probably proceed in the appropriate traffic lane in the general direction of traffic flow for that lane in accordance with Rule 10 (b)(i) (Traffic separation schemes), keeping her course and speed.
If the vessel C doesn't take early and substantial action to allow sufficient sea room for the safe passage of the vessel A, vessel A shall take appropriate actions to avoid collision in accordance with Rule 8 (f)(iii) (Action to avoid a collision).
In accordance with Rule 10 (j) (Traffic separation schemes), sailing vessel C shall not impede the safe passage of a power-driven vessel A following a traffic lane.
In accordance with Rule 8 (f)(I) (Action to avoid a collision) vessel C shall take early action to allow sufficient sea room for the safe passage of the vessel A.

- Actions:
In accordance with Rule 10 (j) (Traffic separation schemes) sailing vessel C may take the following actions to avoid collision or close-quarters situation with vessel A.
If vessel C doesn't take early and substantial action in accordance with Rule 8 (f)(iii) (Action to avoid a collision), vessel A may also take some actions to avoid collision with vessel C

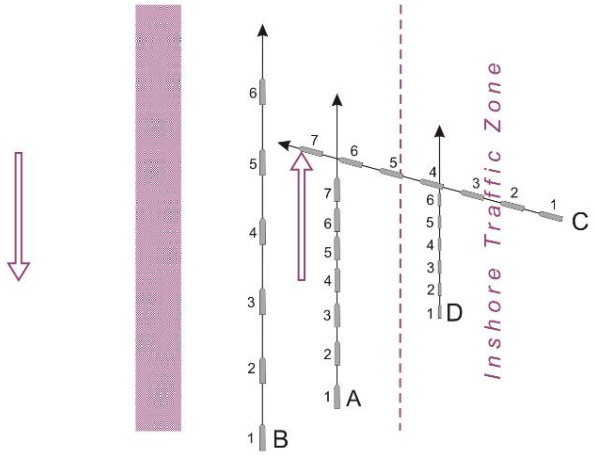
a) Vessel C may reduce her speed to enable safe passing of vessel A



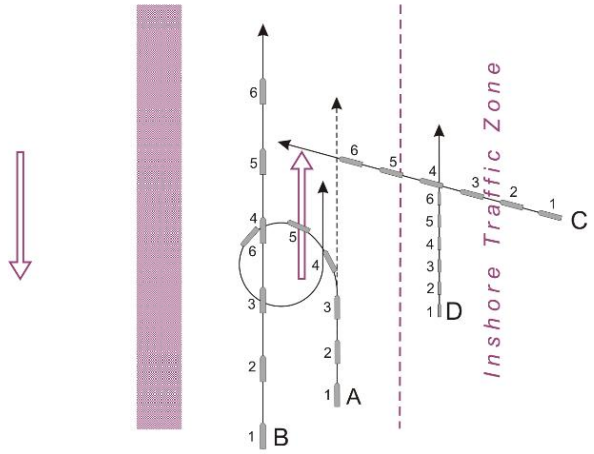
b) Vessel C may alter her course to starboard to enable safe passing of vessel A (altering her course to port is impossible due to vessel D engaged in fishing)



c) If vessel C doesn't take early and substantial action in accordance with Rule 8 (f)(iii) (Action to avoid a collision), vessel A may reduce her speed to avoid collision with vessel C

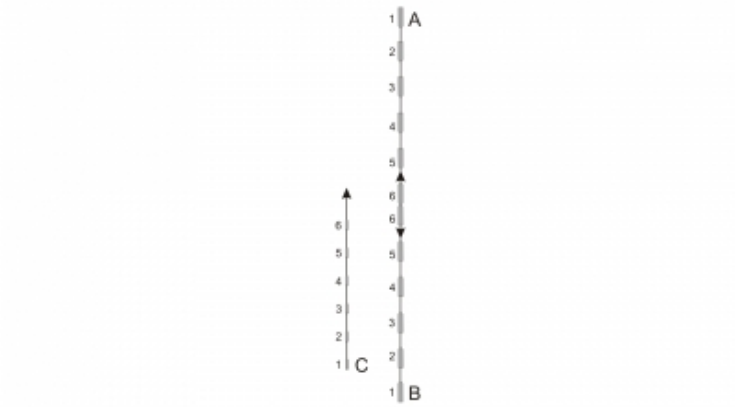


d) If vessel C doesn't take early and substantial action in accordance with Rule 8 (f)(iii) (Action to avoid a collision), vessel A may make 360° turn to port when the vessel B is passed clear ahead to avoid collision with vessel C (altering her course to starboard is impossible due to vessel D engaged in fishing)



Scenario 8

Overtaking and head-on situation on the high seas



- Description of scenario:
  Vessel A: Power-driven vessel
  Vessel B: Power-driven vessel
  Vessel C: Power-driven vessel
  Area: On the high seas
  Visibility: Good (Vessels in sight of one another)
  Vessel A and vessel B are meeting on reciprocal or nearly reciprocal courses so as to involve risk of collision
  Vessel B is overtaking vessel C on her starboard side

- Rule(s) to be applied:
  Rule 8 (Action to avoid collision)
  Rule 13 (Overtaking)
  Rule 14 (Head-on situation)
  Rule 16 (Action by give-way vessel)

- Applying the Rule(s) and comments:
  Head-on situation (vessel A and vessel B):
  In accordance with Rule 14 (b) (Head-on situation), head-on situation shall be deemed to exist when a vessel sees the other ahead or nearly ahead and by night she could see the masthead lights of the other in line or nearly in a line and/or both sidelights and by day she observes the corresponding aspect of the other vessel.
  In accordance with Rule 14 (a) (Head-on situation), when two power-driven vessels are meeting on reciprocal or nearly reciprocal courses so as to involve risk of collision each shall alter her course to starboard so that each shall pass on the port side of the other.
  In accordance with Rule 16 (Action by give-way vessel), vessels A and B which are both directed to keep out of the way of each other shall, so far as possible, take early and substantial action to keep well clear.

Overtaking situation (vessel B and vessel C):
In accordance with Rule 13 (b) (Overtaking situation), a vessel (vessel B) shall be deemed to be overtaking when coming up with another vessel (vessel C) from a direction more than 22.5 degrees abaft her beam.
In accordance with Rule 13 (a) (Overtaking situation), notwithstanding anything contained in the Rules of Part B, sections I and II, any vessel overtaking (vessel B) any other vessel (vessel C) shall keep out of the way of the vessel being overtaken (vessel C).
In accordance with Rule 13 (d) (Overtaking situation), any subsequent alteration of the bearing between the two vessels shall not make the overtaking vessel (vessel B) a crossing vessel within the meaning of these Rules or relieve her (vessel B) of the duty of keeping clear of the overtaken vessel (vessel C) until she is finally past and clear.
In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel B) which is directed to keep out of the way of another vessel (vessel C) shall, so far as possible, take early and substantial action to keep well clear.

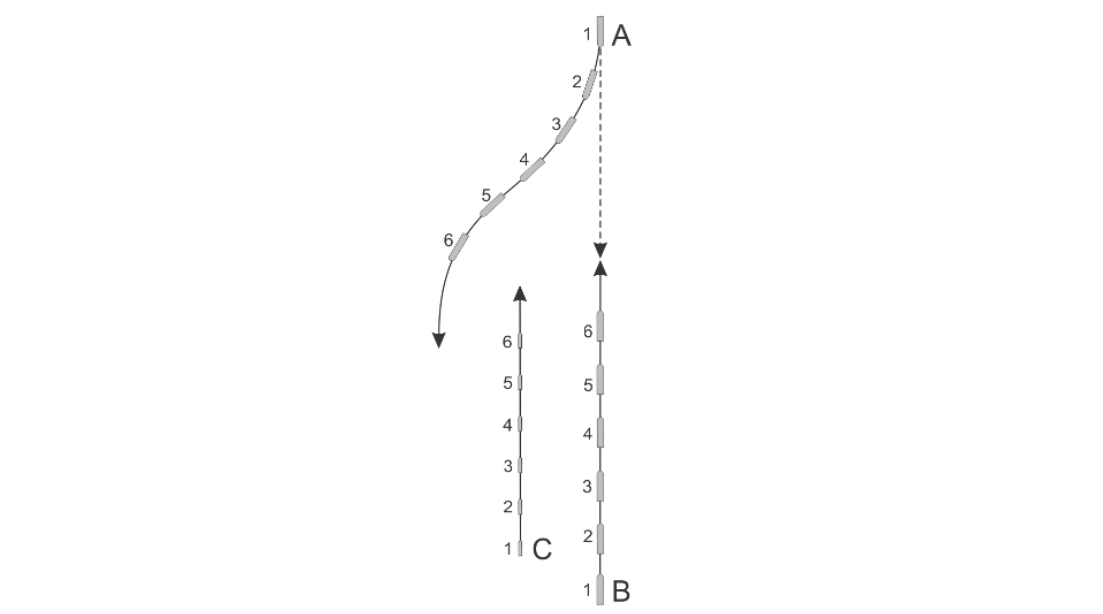
Comments:
Vessel A is directed to keep out of the way of vessel B in head-on situation (vessel A and vessel B) and shall alter her course to starboard. Sufficient alteration of her course (vessel A) to starboard only to keep out of the way of vessel B would cause close-quarters situation with vessel C.

Close-quarters situation (vessels A, B and C):
In accordance with Rule 8 (c) (Action to avoid collision), if there is sufficient sea-room, alteration of course alone (vessel A) may be the most effective action to avoid a close-quarters situation (vessel A and vessel B) provided that it is made in good time, is substantial and does not result in another close-quarters situation (vessel A and vessel C).

Comments:
Vessel A would be able to avoid this situation by assessing it well in advance taking into account vessel B and vessel C.
Vessel B would also be able to avoid this situation by assessing it well in advance taking into account vessel A and vessel C.

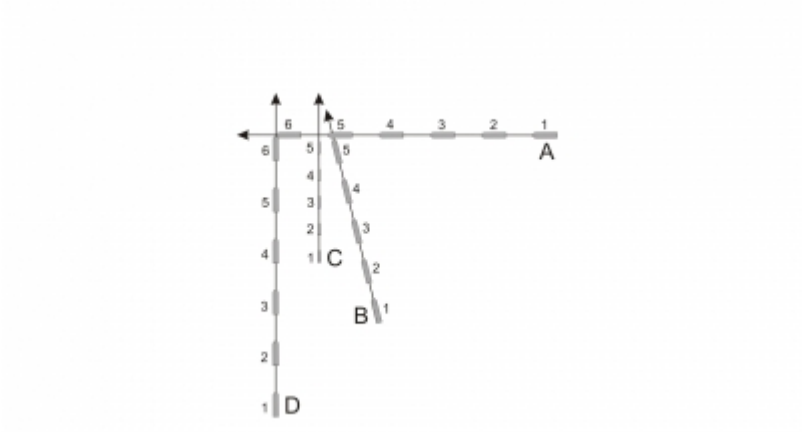
- Actions:
  In accordance with Rule 8 (c) (Action to avoid collision), vessel A may take the following action to avoid collision and close-quarters situation.

  a) Vessel A shall alter her course to starboard substantially to avoid collision with vessel B and shall pass ahead of vessel C to avoid close-quarters situation with her. When vessel A undertakes this action there is no more risk of collision with vessel B, so vessel B shall keep her course and speed.



Scenario 9

Overtaking and crossing situation with vessel restricted in her ability to manoeuvre on the high seas



- Description of scenario:
  Vessel A: Power-driven vessel
  Vessel B: Vessel restricted in her ability to manoeuvre
  Vessel C: Power-driven vessel
  Vessel D: Power-driven vessel
  Area: On the high seas
  Visibility: Good (Vessels are in sight of one another)
  Vessel A and vessel B are crossing so as to involve risk of collision
  Vessel A has vessel B on her own portside (relative bearing PORT 045°)
  Vessel A and vessel C are crossing so as to involve risk of collision
  Vessel A has vessel C on her own portside (relative bearing PORT 025°)
  Vessel A and vessel D are crossing so as to involve risk of collision
  Vessel A has vessel D on her own portside (relative bearing PORT 045°)
  Vessel B is overtaking vessel C on her starboard side so as to involve risk of collision
  Vessel B has vessel C on her own portside (relative bearing PORT 030°)
  Vessel C and vessel D are sailing in approximately parallel courses and vessel D is overtaking vessel C on her port side.

- Rule(s) to be applied:
  Rule 13 (Overtaking)
  Rule 15 (Crossing situation)
  Rule 18 (Responsibilities between vessels)
  Rule 16 (Action by give-way vessel)
  Rule 17 (Action by stand-on vessel)
- Applying the Rule(s) and comments:
  Crossing situation (vessel A and vessel B):
  In accordance with Rule 18 (a)(ii) (Responsibilities between vessels), a power-driven

vessel underway (vessel A) shall keep out of the way of a vessel restricted in her ability to manoeuvre (vessel B).

Crossing situation (vessel A and vessel C):
In accordance with Rule 15 (Crossing situation), when two power-driven vessels are crossing so as to involve risk of collision, the vessel (vessel C) which has the other (vessel A) on her own starboard side shall keep out of the way.
In accordance with Rule 15 (Crossing situation), vessel C shall, if the circumstances of the case admit, avoid crossing ahead of vessel A.
In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel C) which is directed to keep out of the way of another vessel (vessel A) shall, so far as possible, take early and substantial action to keep well clear.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way the other shall keep her course and speed (vessel A).

Crossing situation (vessel A and vessel D):
In accordance with Rule 15 (Crossing situation), when two power-driven vessels are crossing so as to involve risk of collision, the vessel (vessel D) which has the other (vessel A) on her own starboard side shall keep out of the way.
In accordance with Rule 15 (Crossing situation), vessel D shall, if the circumstances of the case admit, avoid crossing ahead of vessel A.
In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel D) which is directed to keep out of the way of another vessel (vessel A) shall, so far as possible, take early and substantial action to keep well clear.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way the other shall keep her course and speed (vessel A).

Overtaking situation (vessel B and vessel C):
In accordance with Rule 18 (a)(i) (Responsibilities between vessels), except where Rule 9 (Narrow channels), Rule 10 (Traffic separation schemes) and Rule 13 (Overtaking) otherwise require, a power-driven vessel underway (vessels C) shall keep out of the way of a vessel restricted in her ability to manoeuver (vessel B).
As in this case, vessel restricted in her ability to manoeuvre (vessel B) overtakes power driven vessel (vessel C), Rule 13 (Overtaking) has to be applied. In accordance with Rule 13 (a) (Overtaking), notwithstanding anything contained in the Rules of Part B, sections I and II, any vessel overtaking (vessel B) any other vessel (vessel C) shall keep out of the way of the vessel being overtaken.
In accordance with Rule 13 (d) (Overtaking situation), any subsequent alteration of the bearing between the two vessels shall not make the overtaking vessel (Vessel B) a crossing vessel within the meaning of these Rules or relieve her (Vessel B) of the duty of keeping clear of the overtaken vessel (Vessel C) until she is finally past and clear.
In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel B) which is directed to keep out of the way of another vessel (vessel C) shall, so far as possible, take early and substantial action to keep well clear.

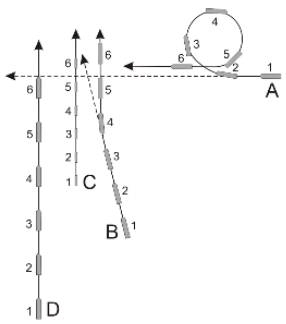
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way the other (vessel C) shall keep her course and speed.

Overtaking situation (vessel D and vessel C):
In accordance with Rule 13 (a) (Overtaking situation), notwithstanding anything contained in the Rules of Part B, sections I and II, any vessel overtaking (vessel D) any other vessel (vessel C) shall keep out of the way of the vessel being overtaken.
In accordance with Rule 13 (d) (Overtaking situation), any subsequent alteration of the bearing between the two vessels shall not make the overtaking vessel (vessel D) a crossing vessel within the meaning of these Rules or relieve her (vessel D) of the duty of keeping clear of the overtaken vessel (vessel C) until she is finally past and clear.
In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel D) which is directed to keep out of the way of another vessel (vessel C) shall, so far as possible, take early and substantial action to keep well clear.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way the other (vessel C) shall keep her course and speed.

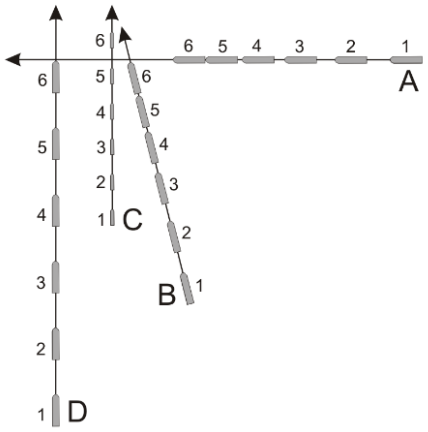
Comments:
In described scenario, there aren't any stand-on vessels which shall keep their course and speed.
Vessel A is a stand–on vessel to vessels C and D (Rule 15) but shall keep out of the way of vessel B (Rule 18 (a)).
Vessel B is a stand–on vessel to vessel A (Rule 18 (a)) but shall keep out of the way of vessel C (Rule 13 (a)).
Vessel C is stand–on vessel for vessels B and D (Rule 17 (a)(i)) but shall keep out of the way of vessel A (Rule 15).
Vessel D is a give-way vessel for vessel A (Rule 15) and also for vessel C (Rule 13).

- Actions:
  In accordance with the ordinary practice of seamen, vessels A and B can take the following actions to avoid collision or close-quarters situation.

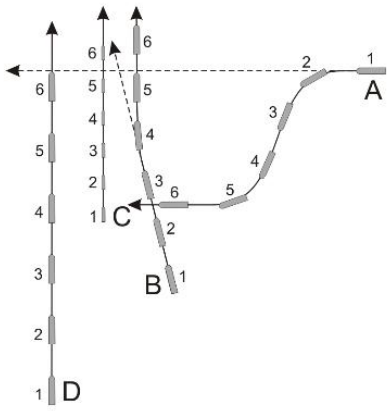
  a) Vessel A may make 360° turn to starboard to avoid collision with vessels B, C and D; vessel B may alter her course to starboard to parallel course with vessel C and D (when vessel A and B undertake these actions there is no more risk of collision with vessels C and D, which means that vessels C and D shall keep their course and speed)



b) Vessel A may reduce her speed and cross astern of vessels B, C and D; vessel B may reduce her speed to cross astern of vessel C but ahead of vessel A (when vessel A and B undertake these actions there is no more risk of collision with vessels C and D, which means that vessels C and D shall keep their course and speed)

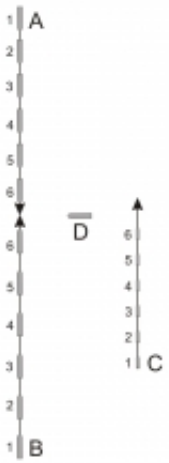


c) Vessel A may take early and substantial action by altering her course to port and cross astern of vessels B, C and D; vessel B may alter her course to starboard to parallel course with vessel C and D (when vessels A and B undertake these actions there is no more risk of collision with vessels C and D, which means that vessels C and D shall keep their course and speed)



Scenario 10

Head-on and overtaking situation with vessel not under command on the high seas



- Description of scenario:
  Vessel A: Power-driven vessel
  Vessel B: Power-driven vessel
  Vessel C: Power-driven vessel
  Vessel D: Vessel not under command
  Area: On the high seas
  Visibility: Good (Vessels in sight of one another)
  Vessel A and vessel B are meeting on reciprocal or nearly reciprocal courses so as to involve risk of collision
  Vessel B is overtaking vessel C on her port side
  Vessel D is underway , but she is not making way through the water

- Rule(s) to be applied:
  Rule 13 (Overtaking)
  Rule 14 (Head-on situation)
  Rule 16 (Action by give-way vessel)
  Rule 18 (Responsibilities between vessels)

- Applying the Rule(s) and comments:
  Head-on situation (vessel A and vessel B):
  In accordance with Rule 14 (b) (Head-on situation), head-on situation shall be deemed to exist when a vessel sees the other ahead or nearly ahead and by night she could see the masthead lights of the other in line or nearly in a line and/or both sidelights and by day she observes the corresponding aspect of the other vessel.
  In accordance with Rule 14 (a) (Head-on situation), when two power-driven vessels are meeting on reciprocal or nearly reciprocal courses so as to involve risk of collision each shall alter her course to starboard so that each shall pass on the port side of the other.

In accordance with Rule 16 (Action by give-way vessel), vessels A and B which are both directed to keep out of the way of each other shall, so far as possible, take early and substantial action to keep well clear.

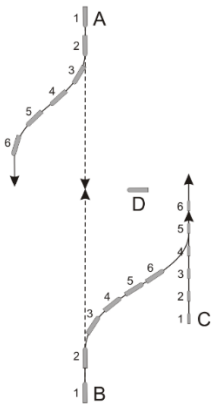
Responsibility between vessels (vessels A,B,C and vessel D):
In accordance with Rule 18 (a)(i) (Responsibilities between vessels), except where Rule 9 (Narrow channels), Rule 10 (Traffic separation schemes) and Rule 13 (Overtaking) otherwise require, a power-driven vessel underway (vessels A, B and C) shall keep out of the way of a vessel not under command (vessel D).

Overtaking situation (vessel B and vessel C):
In accordance with Rule 13 (b) (Overtaking situation), a vessel (vessel B) shall be deemed to be overtaking when coming up with another vessel (vessel C) from a direction more than 22.5 degrees abaft her beam.
In accordance with Rule 13 (a) (Overtaking situation), notwithstanding anything contained in the Rules of Part B, sections I and II, any vessel overtaking (vessel B) any other vessel (vessel C) shall keep out of the way of the vessel being overtaken (vessel C).
In accordance with Rule 13 (d) (Overtaking situation), any subsequent alteration of the bearing between the two vessels shall not make the overtaking vessel (vessel B) a crossing vessel within the meaning of these Rules or relieve her (vessel B) of the duty of keeping clear of the overtaken vessel (vessel C) until she is finally past and clear.
In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel B) which is directed to keep out of the way of another vessel (vessel C) shall, so far as possible, take early and substantial action to keep well clear.

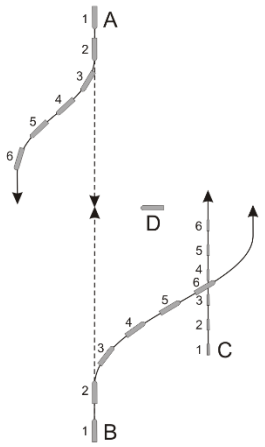
Comments:
Vessel B is directed to keep out of the way of vessel A in head-on situation (vessel A and vessel B) and shall alter her course to starboard. Vessel B is also directed to keep out of the way of vessel D considering responsibility between vessels (vessel B and vessel D). Vessel B is also directed to keep out of the way of vessel C in overtaking situation (vessel B and vessel C).
Vessel B is directed to keep out of the way of all other vessels (vessel A, D and C) and she shall alter her course to starboard considering head-on situation with vessel A.

- Actions:
  Vessels A and B can take the following actions to avoid collision or close-quarters situation.

  a) Vessel A may alter her course to starboard to avoid collision with vessel B and pass on the port side of vessel B; vessel B may alter her course to starboard and reduce her speed to sail astern of vessel C and pass astern of vessel D

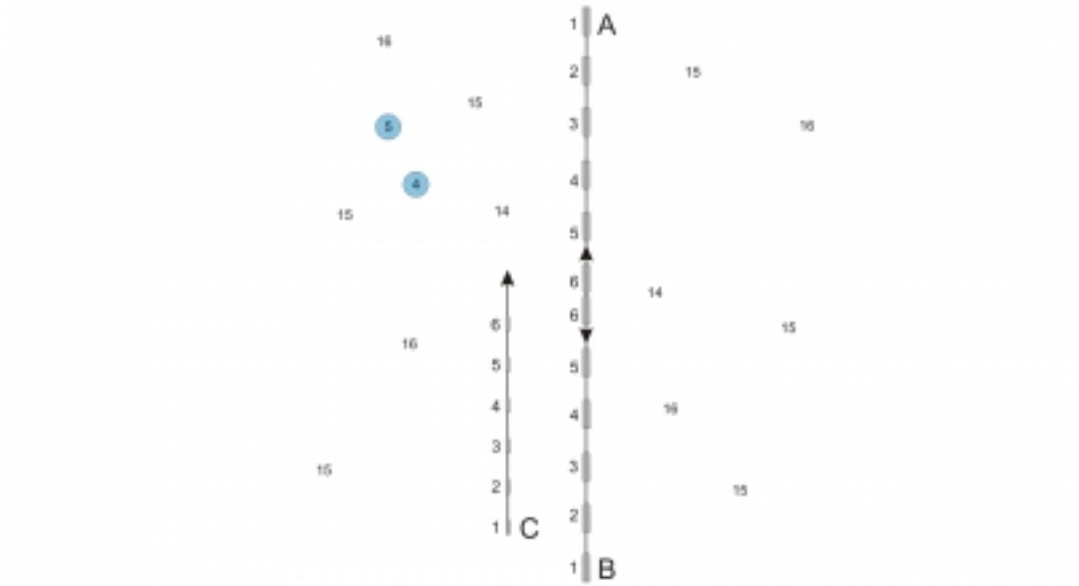


b) Vessel A may alter her course to starboard to avoid collision with vessel B and pass on the port side of vessel B; vessel B may alter her course to starboard to pass astern of vessel C and then overtake vessel C on her starboard side



Scenario 11

Head-on and overtaking situation on the high seas close to shallow water areas



- Description of scenario:
  Vessel A: Power-driven vessel
  Vessel B: Power-driven vessel
  Vessel C: Power-driven vessel
  Area: High seas (Depth ~ 15 m close to shallow water areas)
  Visibility: Good (Vessels in sight of one another)
  Vessel A and vessel B are meeting on reciprocal or nearly reciprocal courses so as to involve risk of collision
  Vessel B is overtaking vessel C on her starboard side

- Rule(s) to be applied:
  Rule 8 (Action to avoid collision)
  Rule 13 (Overtaking)
  Rule 14 (Head-on situation)
  Rule 16 (Action by give-way vessel)

- Applying the Rule(s) and comments:
  Head-on situation (vessel A and vessel B):
  In accordance with Rule 14 (b) (Head-on situation), head-on situation shall be deemed to exist when a vessel sees the other ahead or nearly ahead and by night she could see the masthead lights of the other in line or nearly in a line and/or both sidelights and by day she observes the corresponding aspect of the other vessel.
  In accordance with Rule 14 (a) (Head-on situation), when two power-driven vessels

are meeting on reciprocal or nearly reciprocal courses so as to involve risk of collision each shall alter her course to starboard so that each shall pass on the port side of the other.
In accordance with Rule 16 (Action by give-way vessel), vessels A and B which are both directed to keep out of the way of each other shall, so far as possible, take early and substantial action to keep well clear.

Overtaking situation (vessel B and vessel C):
In accordance with Rule 13 (b) (Overtaking situation), a vessel (vessel B) shall be deemed to be overtaking when coming up with another vessel (vessel C) from a direction more than 22.5 degrees abaft her beam.
In accordance with Rule 13 (a) (Overtaking situation), notwithstanding anything contained in the Rules of Part B, sections I and II, any vessel overtaking (vessel B) any other vessel (vessel C) shall keep out of the way of the vessel being overtaken (vessel C).
In accordance with Rule 13 (d) (Overtaking situation), any subsequent alteration of the bearing between the two vessels shall not make the overtaking vessel (vessel B) a crossing vessel within the meaning of these Rules or relieve her (vessel B) of the duty of keeping clear of the overtaken vessel (vessel C) until she is finally past and clear.
In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel B) which is directed to keep out of the way of another vessel (vessel C) shall, so far as possible, take early and substantial action to keep well clear.

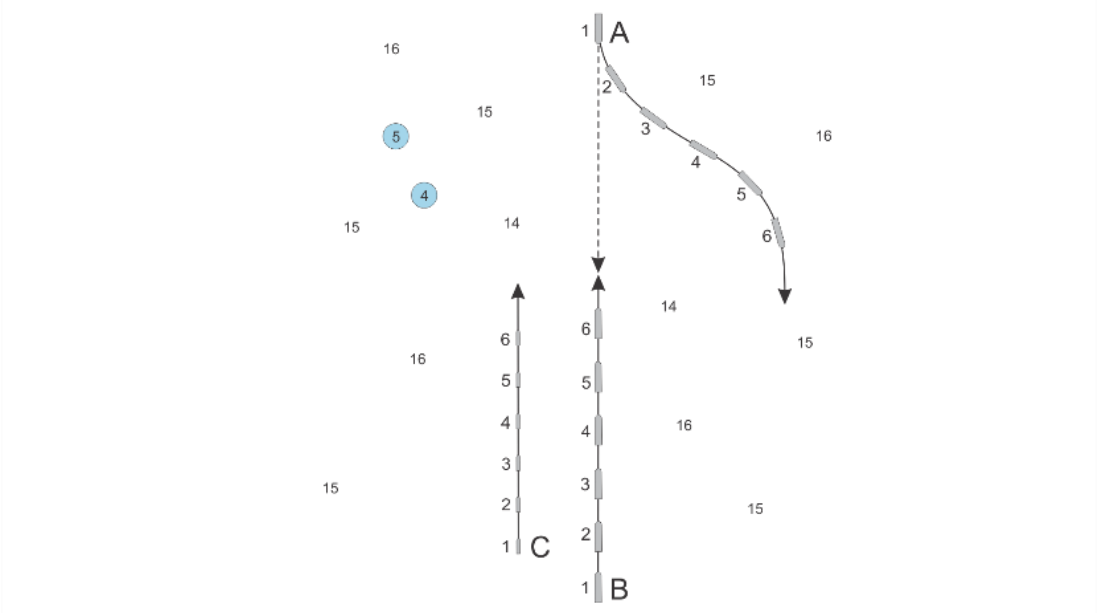
Comments:
Vessel A is directed to keep out of the way of vessel B in head-on situation (vessel A and vessel B) and shall alter her course to starboard. Sufficient alteration of her course (vessel A) to starboard only to keep out of the way of vessel B would cause close-quarters situation with vessel C.

Close-quarters situation (vessels A, B and C):
In accordance with Rule 8 (c) (Action to avoid collision), if there is sufficient sea-room, alteration of course alone (vessel A) may be the most effective action to avoid a close-quarters situation (vessel A and vessel B) provided that it is made in good time, is substantial and does not result in another close-quarters situation (vessel A and vessel C).

Comments:
Vessel A may not alter her course to starboard to avoid collision with vessel B, because this brings she (vessel A) in close-quarters situation with vessel C. Further alteration of her (vessel A) course to starboard to avoid close-quarter situation with vessel C brings her (vessel A) in danger of grounding due to two shallow water locations on her starboard side.

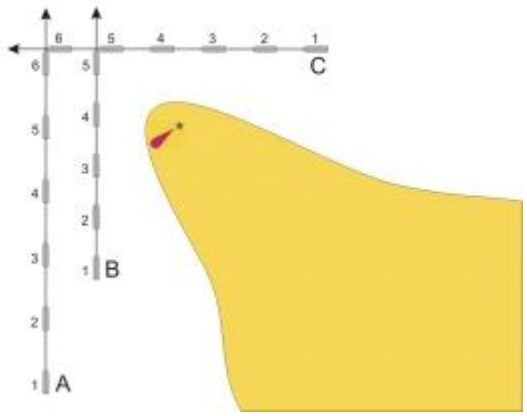
- Actions:
In accordance with Rule 8 (c) (Action to avoid collision), vessels A may take the following actions to avoid collision and close-quarters situation.

a) Vessel A shall alter her course to port substantially well in advance (when vessel A undertakes this action there is no more risk of collision with vessel B which means vessel B shall keep her course and speed)



Scenario 12

Multi-ship encounter situation in coastal waters close to headland



- Description of scenario:
  Vessel A: Power-driven vessel
  Vessel B: Power-driven vessel
  Vessel C: Power-driven vessel
  Area: Coastal waters
  Visibility: Good (vessels are partly obscured in early stage of the scenario by headland, but when coming closer all vessels are in sight of one another)
  Vessel A and vessel B are sailing in approximately parallel courses and vessel A is overtaking vessel B on her port side
  Vessel A has vessel C on her own starboard side (relative bearing STBD 035°)
  Vessel B has vessel C on her own starboard side (relative bearing STBD 045°)
  Vessel A and vessel B are both in a crossing situation with vessel C so as to involve a risk of collision.

- Rule(s) to be applied:
  Rule 7 (Risk of collision)
  Rule 13 (Overtaking)
  Rule 15 (Crossing situation)
  Rule 16 (Action by give-way vessel)
  Rule 17 (Action by stand-on vessel)

- Applying the Rule(s) and comments: Overtaking situation (vessel A and B):
  In accordance with Rule 13 (a) (Overtaking situation), notwithstanding anything contained in the Rules of Part B, sections I and II, any vessel overtaking (vessel A) any other vessel (vessel B) shall keep out of the way of the vessel being overtaken (Vessel B).
  In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel A) which is directed to keep out of the way of another vessel (vessel B) shall, so far as

possible, take early and substantial action to keep well clear.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way (vessel A) the other (vessel B) shall keep her course and speed.

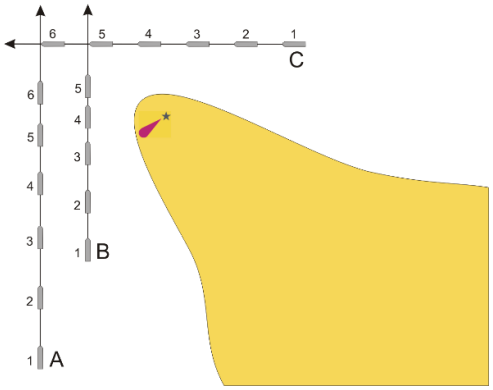
Crossing situation (vessel A and vessel C):
In accordance with Rule 7 (d)(i) (Risk of collision), a risk of collision shall be deemed to exist if the compass bearing of an approaching vessel does not appreciably change.
In accordance with Rule 15 (Crossing situation), when two power-driven vessels are crossing so as to involve risk of collision, the vessel (vessel A) which has the other (vessel C) on her own starboard side shall keep out of the way.
In accordance with Rule 15 (Crossing situation), vessel A shall, if the circumstances of the case admit, avoid crossing ahead of vessel C.
In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel A) which is directed to keep out of the way of another vessel (vessel C) shall, so far as possible, take early and substantial action to keep well clear.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way (vessel A) the other (vessel C) shall keep her course and speed.
In accordance with Rule 17 (a)(ii) (Action by stand-on vessel) the latter vessel (vessel C) may, however, take action to avoid collision by her manoeuvre alone, as soon as it becomes apparent to her that the vessel required to keep out of the way (vessel A) is not taking appropriate action in compliance with these Rules.

Crossing situation (vessel B and vessel C):
In accordance with Rule 15 (Crossing situation), when two power-driven vessels are crossing so as to involve risk of collision, the vessel (vessel B) which has the other (vessel C) on her own starboard side shall keep out of the way.
In accordance with Rule 15 (Crossing situation), vessel B shall, if the circumstances of the case admit, avoid crossing ahead of vessel C.
In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel B) which is directed to keep out of the way of another vessel (vessel C) shall, so far as possible, take early and substantial action to keep well clear.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way (vessel B) the other (vessel C) shall keep her course and speed.
In accordance with Rule 17 (a)(ii) (Action by stand-on vessel) the latter vessel (vessel C) may, however, take action to avoid collision by her manoeuvre alone, as soon as it becomes apparent to her that the vessel required to keep out of the way (vessel B) is not taking appropriate action in compliance with these Rules.

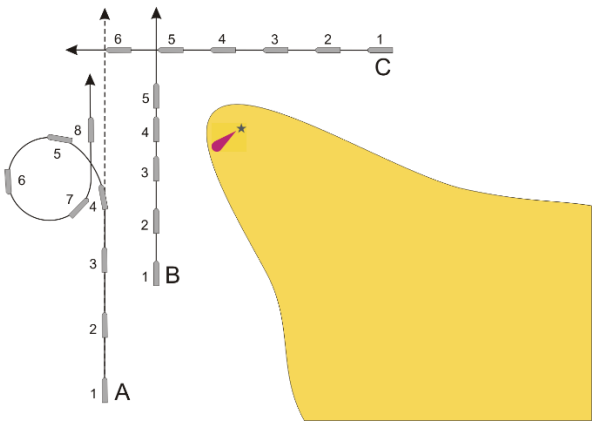
Comments:
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), vessel C shall keep her course and speed for vessel A and vessel B.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), vessel B shall keep her

course and speed for vessel A, but in accordance with Rule 15 (Crossing situation), vessel B shall keep out of the way for vessel C.
In accordance with Rule 13 (a) (Overtaking situation), vessel A shall keep out of the way of vessel B, but in accordance with Rule 15 (Crossing situation), vessel A shall keep out of the way for vessel C.
Vessels A, B and C shall sound warning signals in accordance with Rule 34 (e) (Manoeuvring and warning signals) when nearing cape of the headland if other vessels may be obscured. In accordance with Rule 34 (e) (Manoeuvring and warning signals), a vessel nearing a bend where other vessels may be obscured by an intervening obstruction shall sound one prolonged blast. Such signal shall be answered with a prolonged blast by any approaching vessel that may be within hearing around the bend or behind the intervening obstruction.

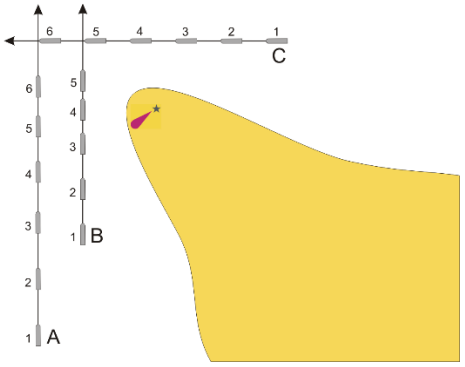
- Actions:
  Vessel A and vessel B can take following actions to avoid collision or close-quarters situation.
  If vessels A and B are not taking appropriate action, vessel C may also take some actions in accordance with Rule 17 (a)(ii) (Action by stand-on vessel).



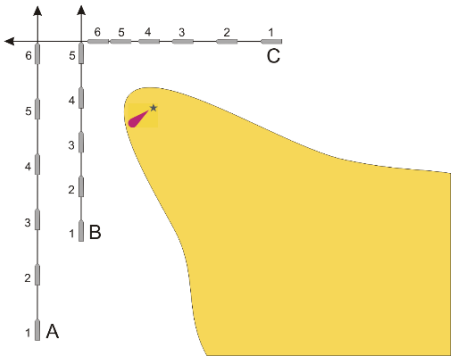
b) Vessel A may make 360° turn to port to avoid collision with vessel C (when she gains sight of vessel C and determines that the risk of collision exists)



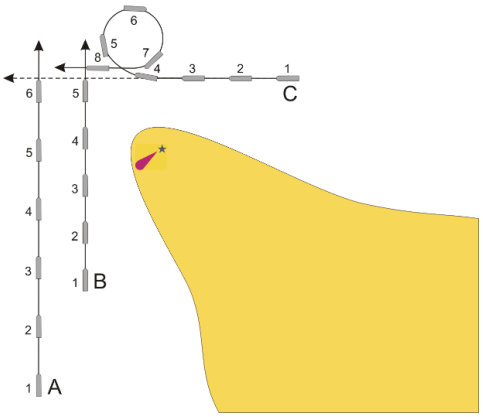
c) Vessel B may reduce speed at her earliest opportunity to avoid collision with vessel C (when she gains sight of vessel C and determines that the risk of collision exists)



d) Vessel C may reduce speed (when she gains sight of vessel A and B and determines that the risk of collision exists), as soon as it becomes apparent to her (vessel C) that the vessels required to keep out of the way (vessels A and B) are not taking appropriate action in compliance with these Rules

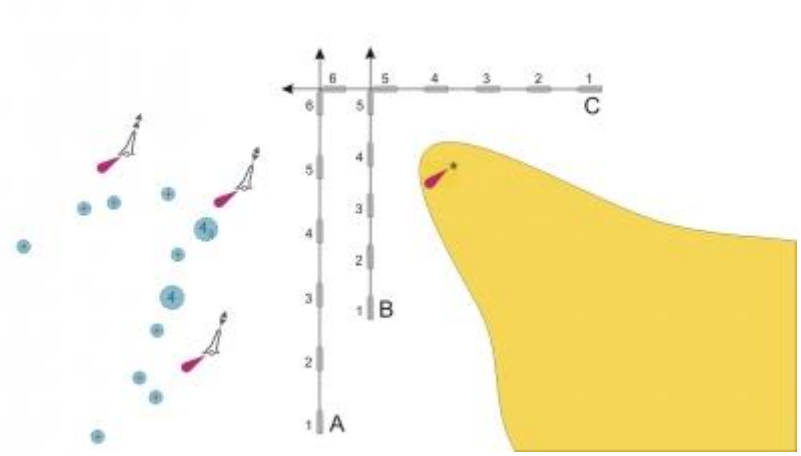


e) Vessel C may make 360° turn to starboard (when she gains sight of vessel A and B and determines that the risk of collision exists), as soon as it becomes apparent to her (vessel C) that the vessels required to keep out of the way (vessels A and B) are not taking appropriate action in compliance with these Rules



Scenario 13

Multi-ship encounter situation in coastal waters close to headland and a shallow water area



- Description of scenario:
  Vessel A: Power-driven vessel
  Vessel B: Power-driven vessel
  Vessel C: Power-driven vessel
  Area: Coastal waters
  Visibility: Good (vessels are partly obscured in early stage of the scenario by headland, but when coming closer all vessels are in sight of one another)
  Vessel A and vessel B are sailing in approximately parallel courses and vessel A is overtaking vessel B on her port side
  Vessel A has vessel C on her own starboard side (relative bearing STBD 035°)
  Vessel B has vessel C on her own starboard side (relative bearing STBD 045°)
  Vessel A and vessel B are both in a crossing situation with vessel C so as to involve a risk of collision.

- Rule(s) to be applied:
  Rule 7 (Risk of collision)
  Rule 13 (Overtaking)
  Rule 15 (Crossing situation)
  Rule 16 (Action by give-way vessel)
  Rule 17 (Action by stand-on vessel)

- Applying the Rule(s) and comments:
  Overtaking situation (vessel A and B):
  In accordance with Rule 13 (a) (Overtaking situation), notwithstanding anything contained in the Rules of Part B, sections I and II, any vessel overtaking (vessel A) any other vessel (vessel B) shall keep out of the way of the vessel being overtaken

(Vessel B).
In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel A) which is directed to keep out of the way of another vessel (vessel B) shall, so far as possible, take early and substantial action to keep well clear.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way (vessel A) the other (vessel B) shall keep her course and speed.

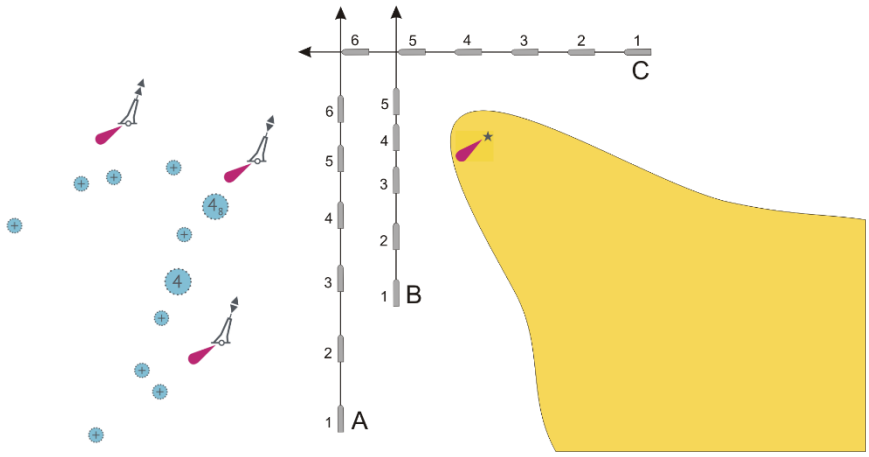
Crossing situation (vessel A and vessel C):
In accordance with Rule 7 (d)(i) (Risk of collision), a risk of collision shall be deemed to exist if the compass bearing of an approaching vessel does not appreciably change.
In accordance with Rule 15 (Crossing situation), when two power-driven vessels are crossing so as to involve risk of collision, the vessel (vessel A) which has the other (vessel C) on her own starboard side shall keep out of the way.
In accordance with Rule 15 (Crossing situation), vessel A shall, if the circumstances of the case admit, avoid crossing ahead of vessel C.
In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel A) which is directed to keep out of the way of another vessel (vessel C) shall, so far as possible, take early and substantial action to keep well clear.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way (vessel A) the other (vessel C) shall keep her course and speed.
In accordance with Rule 17 (a)(ii) (Action by stand-on vessel) the latter vessel (vessel C) may, however, take action to avoid collision by her manoeuvre alone, as soon as it becomes apparent to her that the vessel required to keep out of the way (vessel A) is not taking appropriate action in compliance with these Rules.

Crossing situation (vessel B and vessel C):
In accordance with Rule 15 (Crossing situation), when two power-driven vessels are crossing so as to involve risk of collision, the vessel (vessel B) which has the other (vessel C) on her own starboard side shall keep out of the way.
In accordance with Rule 15 (Crossing situation), vessel B shall, if the circumstances of the case admit, avoid crossing ahead of vessel C.
In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel B) which is directed to keep out of the way of another vessel (vessel C) shall, so far as possible, take early and substantial action to keep well clear.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way (vessel B) the other (vessel C) shall keep her course and speed.
In accordance with Rule 17 (a)(ii) (Action by stand-on vessel) the latter vessel (vessel C) may, however, take action to avoid collision by her manoeuvre alone, as soon as it becomes apparent to her that the vessel required to keep out of the way (vessel B) is not taking appropriate action in compliance with these Rules.

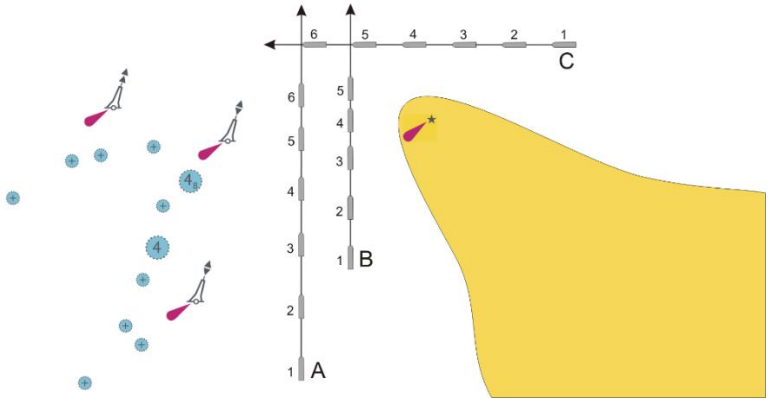
Comments:
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), vessel C shall keep her course and speed for vessel A and vessel B.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), vessel B shall keep her course and speed for vessel A, but in accordance with Rule 15 (Crossing situation), vessel B shall keep out of the way for vessel C.
In accordance with Rule 13 (a) (Overtaking situation), vessel A shall keep out of the way of vessel B, but in accordance with Rule 15 (Crossing situation), vessel A shall keep out of the way for vessel C.
Vessels A, B and C shall sound warning signals in accordance with Rule 34 (e) (Manoeuvring and warning signals) when nearing cape of the headland if other vessels may be obscured. In accordance with Rule 34 (e) (Manoeuvring and warning signals), a vessel nearing a bend where other vessels may be obscured by an intervening obstruction shall sound one prolonged blast. Such signal shall be answered with a prolonged blast by any approaching vessel that may be within hearing around the bend or behind the intervening obstruction.

- Actions:
Vessel A and vessel B can take following actions to avoid collision or close-quarters situation.
If vessels A and B are not taking appropriate action, vessel C may also take some actions in accordance with Rule 17 (a)(ii) (Action by stand-on vessel).

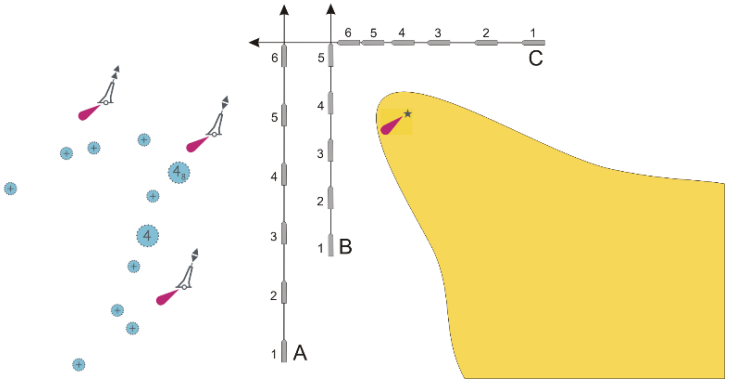
a) Vessel A may reduce speed at her earliest opportunity to avoid collision with vessel C (when she gains sight of vessel C and determines that the risk of collision exists)



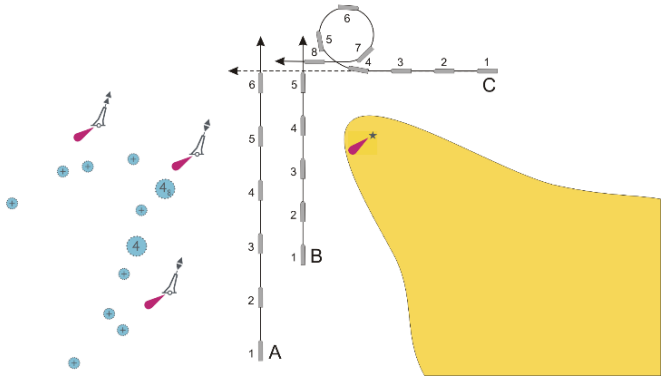
b) Vessel B may reduce speed at her earliest opportunity to avoid collision with vessel C (when she gains sight of vessel C and determines that the risk of collision exists)



c) Vessel C may reduce speed (when she gains sight of vessel A and B and determines that the risk of collision exists), as soon as it becomes apparent to her (vessel C) that the vessels required to keep out of the way (vessels A and B) are not taking appropriate action in compliance with these Rules

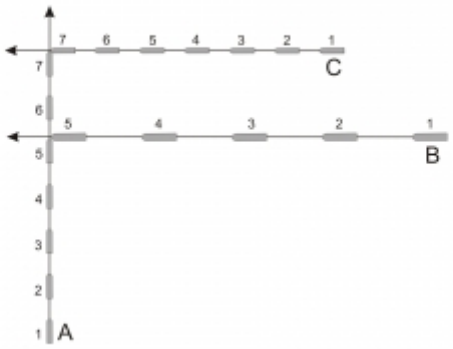


d) Vessel C may make 360° turn to starboard (when she gains sight of vessel A and B and determines that the risk of collision exists), as soon as it becomes apparent to her (vessel C) that the vessels required to keep out of the way (vessels A and B) are not taking appropriate action in compliance with these Rules



Scenario 14

Multi-ship encounter situation with vessel engaged in fishing, power-driven vessel and sailing vessel



- Description of scenario:
  Vessel A: Vessel engaged in fishing
  Vessel B: Power-driven vessel
  Vessel C: Sailing vessel
  Area: On the high seas
  Visibility: Good (Vessels are in sight of one another)
  Vessel A has vessels B and vessel C on her own starboard side
  Vessel A is in a crossing situation with vessel B and vessel C so as to involve a risk of collision
  Vessel B and vessel C are sailing in approximately parallel courses and vessel B is overtaking vessel C on her port side

- Rule(s) to be applied:
  Rule 7 (Risk of collision)
  Rule 13 (Overtaking)
  Rule 16 (Action by give-way vessel)
  Rule 17 (Action by stand-on vessel)
  Rule 18 (Responsibilities between vessels)

- Applying the Rule(s) and comments:
  Crossing situation (vessel A and vessel B):
  In accordance with Rule 7 (d)(i) (Risk of collision), a risk of collision shall be deemed to exist if the compass bearing of an approaching vessel does not appreciably change.
  In accordance with Rule 18 (a)(iii) (Responsibilities between vessels) a power-driven vessel underway (vessel B) shall keep out of the way of a vessel engaged in fishing (vessel A).
  In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel B)

which is directed to keep out of the way of another vessel (vessel A) shall, so far as possible, take early and substantial action to keep well clear.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way (vessel B) the other (vessel A) shall keep her course and speed.

Crossing situation (vessel A and vessel C):
In accordance with Rule 7 (d) (i) (Risk of collision), a risk of collision shall be deemed to exist if the compass bearing of an approaching vessel does not appreciably change.
In accordance with Rule 18 (b)(iii) (Responsibilities between vessels) a sailing vessel underway (vessel C) shall keep out of the way of a vessel engaged in fishing (vessel A).
In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel C) which is directed to keep out of the way of another vessel (vessel A) shall, so far as possible, take early and substantial action to keep well clear.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way (vessel C) the other (vessel A) shall keep her course and speed.

Overtaking situation (vessel B and C):
In accordance with Rule 13 (a) (Overtaking situation), notwithstanding anything contained in the Rules of Part B, sections I and II, any vessel overtaking (vessel B) any other vessel (vessel C) shall keep out of the way of the vessel being overtaken (vessel C).
In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel B) which is directed to keep out of the way of another vessel (vessel C) shall, so far as possible, take early and substantial action to keep well clear.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way (vessel B) the other (vessel C) shall keep her course and speed.

Comments:
Vessel engaged in fishing (vessel A) is obliged to keep her course and speed for crossing vessel B in accordance with the Rule 18 (a)(iii) where a power-driven vessel underway (vessel B) shall keep out of the way of a vessel engaged in fishing (vessel A).
Vessel A is also obliged to keep her course and speed for crossing vessel C in accordance with the Rule 18 (b)(iii) where a sailing vessel underway (vessel C) shall keep out of the way of a vessel engaged in fishing (vessel A).

Power-driven vessel (vessel B) is obliged to keep out of the way for crossing vessel engaged in fishing (vessel A) in accordance with the Rule 18 (a)(iii) where a power-

driven vessel underway (vessel B) shall keep out of the way of a vessel engaged in fishing (vessel A).

When Rule 18 (Responsibilities between vessels) apply, Rule 18 obligation displace Rule 15 (Crossing situation). Nothing in Rule 18 directs the give-way vessel (vessel B) to take, or not take, any particular avoiding action. Thus, in contrast to Rule 15 for crossing situation, Rule 18 does not preclude the vessel directed to keep out of the way from crossing ahead of the other.

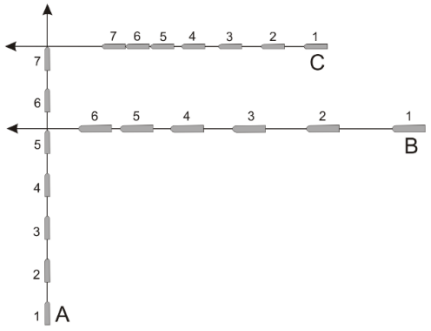
Power-driven vessel (vessel B) is obliged to keep out of the way of the overtaken vessel (vessel C) in accordance with Rule 13 (a) (Overtaking situation), notwithstanding anything contained in the Rules of Part B, sections I and II, any vessel overtaking (vessel B) any other vessel (vessel C) shall keep out of the way of the vessel being overtaken (vessel C).

Power-driven vessel (vessel B) is a vessel with different responsibilities than sailing vessel (vessel C) in accordance with Rule 18 (Responsibilities between vessels), but Rule 18 (Responsibilities between vessels) does not apply because Rule 13 (Overtaking situation) overrides Rule 18 (Responsibilities between vessels). For vessel B it is the most important to determine if the risk of collision with vessels A and C exist well in advance in order to avoid a position where a collision cannot be avoided by the action of the give-way vessel alone.

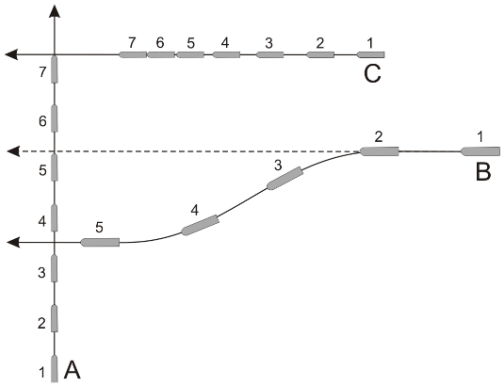
Sailing vessel (vessel C) is obliged to keep out of the way for vessel engaged in fishing (vessel A) in accordance with Rule 18 (b)(iii) but is also obliged to keep her course and speed for overtaking power-driven vessel (vessel B) in accordance with Rule 13 .

In accordance with Rule 8 (Action to avoid collision) any action to avoid collision or close-quarters situation with one vessel shell not result in another close-quarters situation.

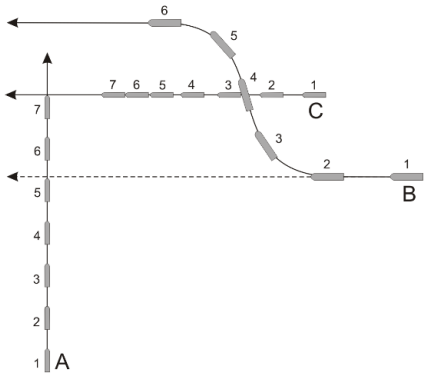
- Actions:
  Vessel B and vessel C can take following actions to avoid collision or close-quarters situation.
  a) Vessel B may reduce her speed and allow vessel A to cross ahead.



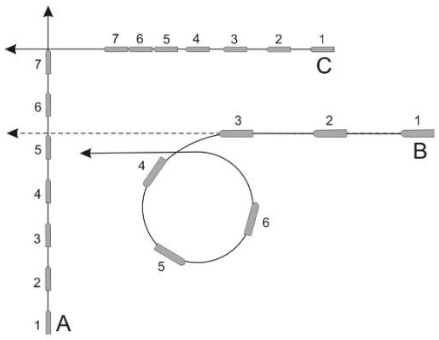
b) Vessel B may turn to port and cross astern of vessel A.



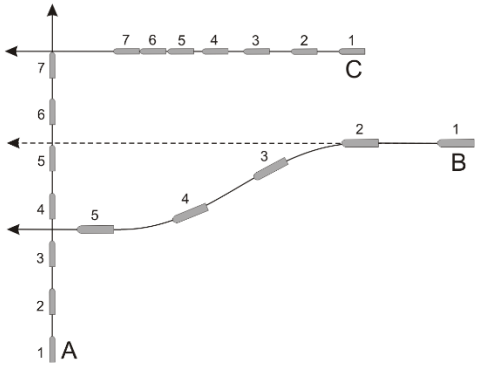
c) Vessel B may reduce speed early and turn to starboard to avoid a close quarter situation with vessel A and cross astern of vessel C so as to overtake her on her starboard side.



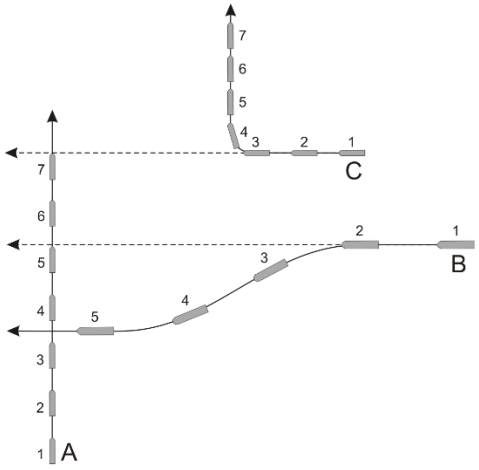
d) Vessel B may make a 360° turn to port to avoid collision with vessel A.



e) Vessel C may reduce her speed and allow vessel A to cross ahead.

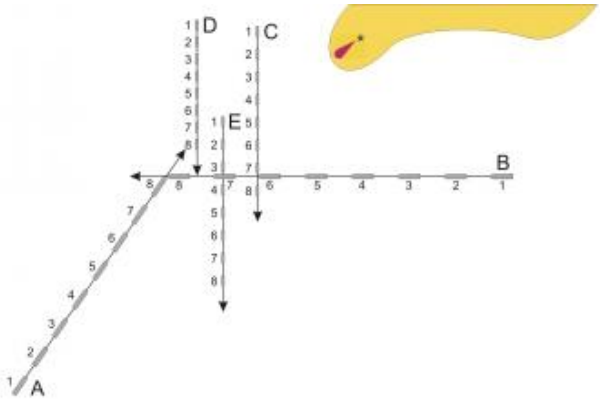


f) Vessel C may turn to starboard to avoid collision with vessel A.



Scenario 15

Multi-ship crossing situations with different responsibilities between vessels



- Description of scenario:
  Vessel A: Vessel restricted in her ability to manoeuvre
  Vessel B: Power-driven vessel
  Vessel C, D and E: Sailing vessels - a fleet of racing sail yachts
  Area: Coastal waters
  Visibility: Good (Vessels in sight of one another)
  Vessel A and Vessel B are crossing so as to involve risk of collision
  Sailing vessels C, D and E are sailing in race and there is no risk of collision with vessels A and B

- Rule(s) to be applied:
  Rule 8 (Action to avoid a collision)
  Rule 16 (Action by give-way vessel)
  Rule 18 (Responsibilities between vessels)

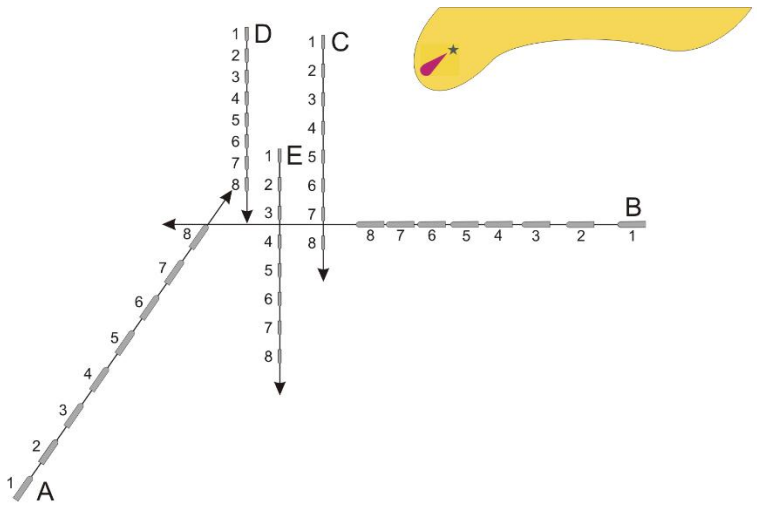
- Applying the Rule(s) and comments:
  Crossing situation between vessel A and vessel B:
  In accordance with Rule 18 (a)(ii) & (iv) (Responsibilities between vessels), a power-driven vessel underway (vessel B) shall keep out of the way of:
  ii) a vessel restricted in her ability to manoeuvre (vessel A);
  iv) a sailing vessel (vessels C, D and E).
  In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel B) which is directed to keep out of the way of another vessel shall, so far as possible, take early and substantial action to keep well clear.
  In accordance with Rule 8 (a) (Action to avoid a collision) any action taken to avoid collision shall be taken in accordance with the Rules of this Part and shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship.
  In accordance with Rule 8 (c) (Action to avoid a collision) if there is sufficient sea-

room, alteration of course alone may be the most effective action to avoid a close-quarters situation provided that it is made in good time, is substantial and does not result in another close-quarters situation.
In accordance with Rule 8 (e) (Action to avoid a collision) if necessary to avoid collision or allow more time to assess the situation, a vessel shall slacken her speed or take all way off by stopping or reversing her means of propulsion.

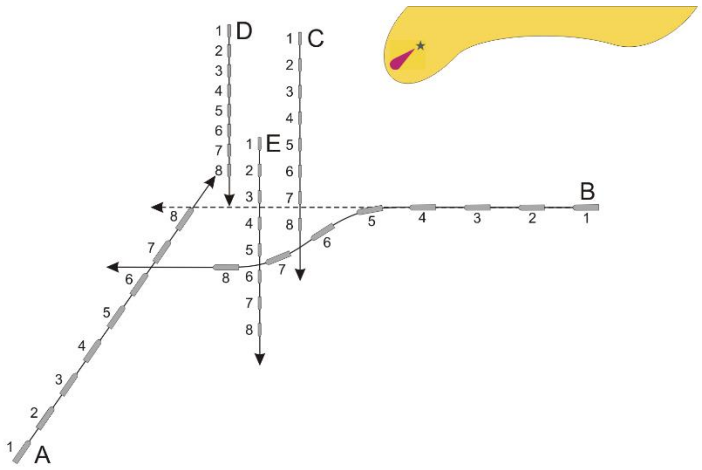
Comments:
Vessel A and vessel B are crossing so as to involve risk of collision.
In accordance with Rule 18 (a)(ii), vessel B as a power-driven vessel shall keep out of the way of a vessel restricted in her ability to manoeuvre (vessel A).
Sailing vessels C, D and E are sailing in a race and there is no risk of collision with vessels A and B but they greatly restrict the possible actions of vessel B to avoid collision with vessel A.
If vessel B takes any action to avoid collision with vessel A and this action results in risk of collision with any sailing vessel , than again in accordance with Rule 18 (a)(iv), vessel B as a power-driven vessel shall keep out of the way of a sailing vessel (vessels C, D and E).
In accordance with Rule 16 , vessel B as a give-way vessel shall take early and substantial action to keep well clear of vessels A, C, D and E.

- Actions:
In accordance with the ordinary practice of seamen, vessel B may take the following actions to avoid collision or close-quarters situation.

a) In accordance with Rule 8 (e), vessel B may slacken her speed or stop because of her limited ability to alter her course in order to avoid the collision with vessel restricted in her ability to manoeuvre (vessel A) and sailing vessels (vessels C, D and E).

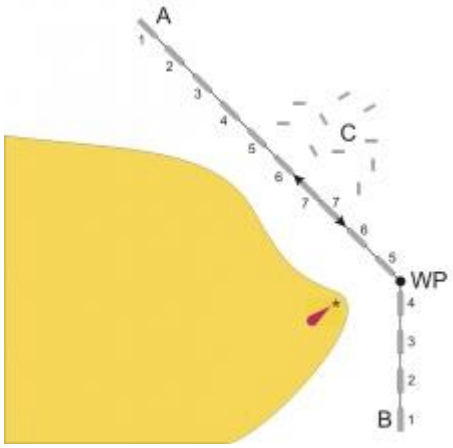


b) Vessel B may alter her course to port and cross ahead of vessel C, astern of vessel E, ahead of vessel D and finally also astern of vessel A. It should be emphasized that in accordance with Rule 18 , the vessel (vessel B) which shall keep out of the way of another is not forbidden to change her course either to port or to starboard to avoid collision, but her action to avoid collision shall not result in another close-quarters situation.



Scenario 16

Risk of collision by strictly following the initial voyage plan



- Description of scenario:
  Vessel A: Power-driven vessel
  Vessel B: Power-driven vessel
  Vessels C: Vessels engaged in fishing sailing almost with zero speed
  Area: Coastal waters
  Visibility: Good (Vessels in sight of one another)
  Vessel A and vessel B are approaching the bend from different directions
  There is no risk of collision between vessels A and B when they sail between their positions 1 and 4
  When vessel B follows her voyage plan and alters her course at WP, vessel A and vessel B are meeting on nearly reciprocal courses so as to involve risk of collision.

- Rule(s) to be applied:
  Rule 8 (Action to avoid a collision)
  Rule 14 (Head-On Situation)

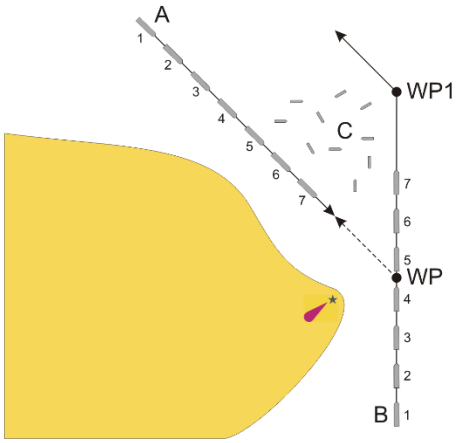
- Applying the Rule(s) and comments:
  Head–on situation (Vessel A and vessel B):
  In accordance with Rule 8 (a) (Action to avoid a collision) any action taken to avoid collision shall be taken in accordance with the Rules of this Part and shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship.
  In accordance with Rule 8 (c) (Action to avoid a collision), if there is sufficient sea-room, alteration of course alone may be the most effective action to avoid a close-quarters situation provided that it is made in good time, is substantial and does not result in another close-quarters situation.
  In accordance with Rule 14 (a) (Head-on situation) when two power-driven vessels

are meeting on nearly reciprocal courses so as to involve risk of collision each shall alter her course to starboard so that each shall pass on the port side of the other.

Comments:
Vessel A first identifies vessels C engaged in fishing and later she also identifies vessel B visually and by radar while approaching the bend. There is no risk of collision between vessel A and vessel B when they sail between positions 1 and 4. Following the course alteration of vessel B at WP in accordance with her voyage plan, both vessels would meet on reciprocal or nearly reciprocal courses as to involve risk of collision. In accordance with Rule 14 (Head-on situation) each vessel (vessels A and B) shall alter her course to starboard but there is no sufficient sea room for vessel A in order to alter its course to starboard due to the coastal line and shallow water neither sufficient sea room for vessel B due to the area occupied by vessels engaged in fishing (vessels C).
In accordance with Rule 8 (Action to avoid a collision), one of the most effective actions to avoid head-on situation (vessels A and B) and avoiding risk of collision or close-quarters situation with any other vessel in the vicinity, vessel B may shift her WP which is stated in her voyage plan to WP1 (a new WP further on her initial course to leave vessels C engaged in fishing on her port side). Shifting of WP is an example of good seamanship.
Complying with COLREG rules is more important than strictly following the voyage plan.

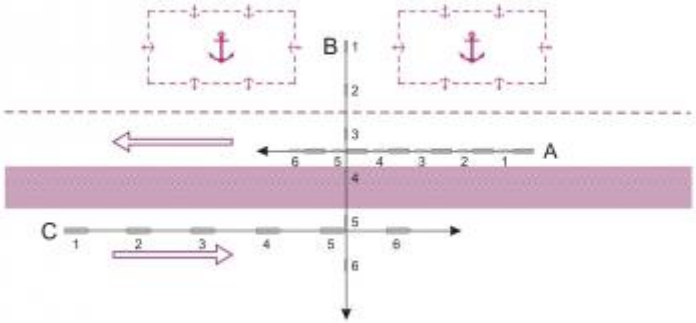
- Actions:
  In accordance with the ordinary practice of seamen, vessel B may take the following actions to avoid collision or close-quarters situation.

  a) Vessel B may shift her WP to WP1 and proceed in her initial course until WP1 to avoid head-on situation with vessel A and leave area occupied by vessels C engaged in fishing on her port side.



Scenario 17

Crossing situation in a traffic separation scheme



- Description of scenario:
  Vessel A: Power-driven vessel engaged in towing operations, proceeding in appropriate traffic lane
  Vessel B: Power-driven vessel of more than 20 m in length, crossing traffic lanes
  Vessel C: Power-driven vessel , proceeding in appropriate traffic lane
  Area: Traffic separation scheme
  Visibility: Good (Vessels in sight of one another)
  Vessel B and vessel C are crossing so as to involve risk of collision
  Vessel B has vessel A on her own port side and there is no risk of collision

- Rule(s) to be applied:
  Rule 8 (Action to avoid a collision)
  Rule 10 (Traffic separation schemes)
  Rule 15 (Crossing situation)
  Rule 16 (Action by giving-way vessel)
  Rule 17 (Action by stand-on vessel)

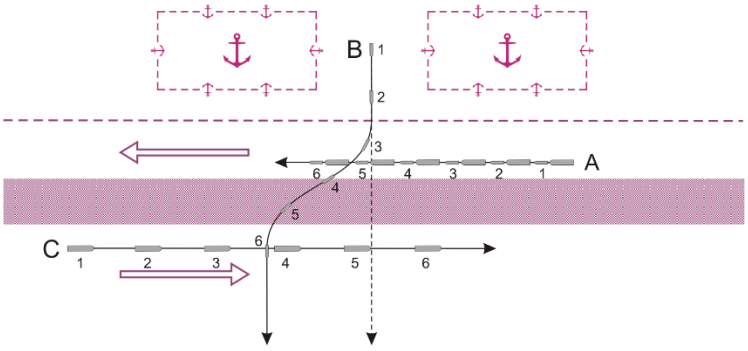
- Applying the Rule(s) and comments:
  Crossing situation in a traffic separation scheme (vessel B and vessel C):
  In accordance with Rule 10 (a) (Traffic separation schemes), Rule 10 applies to traffic separation schemes adopted by the Organization and does not relieve any vessel of her obligation under any other rule.
  In accordance with Rule 10 (b)(i) (Traffic separation schemes), a vessel using a traffic separation scheme (vessel A and vessel C) shall proceed in the appropriate traffic lane in the general direction of traffic flow for that lane.
  In accordance with Rule 10 (c) (Traffic separation schemes), a vessel (Vessel B) shall so far as practicable avoid crossing traffic lanes, but if obliged to do so shall cross on a heading as nearly as practicable at right angles to the general direction of traffic flow.

In accordance with Rule 15 (Crossing situation), when two power-driven vessels are crossing so as to involve risk of collision, the vessel (vessel B) which has the other (vessel C) on her own starboard side shall keep out of the way.
In accordance with Rule 15 (Crossing situation), vessel B shall, if the circumstances of the case admit, avoid crossing ahead of vessel C.
In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel B) which is directed to keep out of the way of another vessel (vessel C) shall, so far as possible, take early and substantial action to keep well clear.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way (vessel B) the other (vessel C) shall keep her course and speed.

Comments:
In accordance with Rule 10 (a), Rule 10 applies to traffic separation schemes adopted by the Organisation and does not relieve any vessel (using a traffic separation scheme) of her obligation under any other Rule. So, in all situations in traffic separation schemes consider that if there is a risk of collision, the rules applicable for such situation would apply. In the case of crossing situation in a traffic separation scheme, Rule 15 (Crossing situation) would apply.
In accordance with Rule 15 (Crossing situation), when two power-driven vessels are crossing so as to involve risk of collision, the vessel (vessel B) which has the other (vessel C) on her own starboard side shall keep out of the way.
In accordance with Rule 10 (c) (Traffic separation schemes), vessel shall so far as practicable avoid crossing traffic lanes, but if obliged to do so shall cross on a heading as nearly as practicable at right angles to the general direction of traffic flow. Crossing traffic lane on a heading not near to right angle due to collision avoiding action doesn't mean contravening the Rule's.
In accordance with Rule 8 (a) (Action to avoid collision) any action taken to avoid collision shall be taken in accordance with the Rules of this Part and shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship. Vessel B may slow down and leave vessel C to pass ahead or alter her course to starboard and pass astern of vessel C, but slow down action could bring vessel B in a crossing situation with vessel A so as to involve risk of collision. In accordance with good seamanship, vessel B shall decide to alter her course to starboard and pass astern of vessel C.

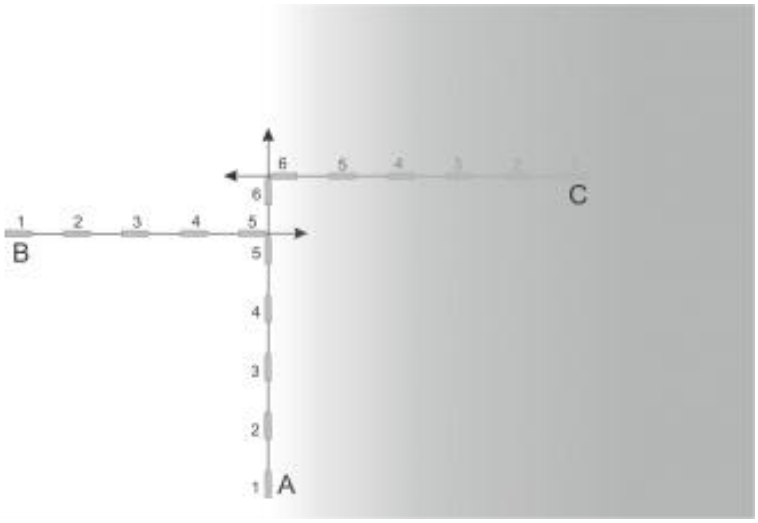
- Actions:
  In accordance with the ordinary practice of seamen, vessel B may take the following action to avoid collision or close-quarters situation.

  a) Vessel B may alter her course to starboard to avoid collision with vessel C and pass astern of vessel C on safe distance.



Scenario 18

Multi-ship encounter situation on the high seas close to the area of restricted visibility



- Description of scenario:
  Vessel A: Power-driven vessel
  Vessel B: Power-driven vessel
  Vessel C: Power-driven vessel
  Area: On the high seas
  Visibility: Restricted (Vessel C could not be observed from vessels A and B)
  Vessel A is navigating near an area of restricted visibility its starboard side
  Vessel A is sounding one prolonged blast at intervals not exceeding two minutes
  Vessel A and vessel B are crossing so as to involve risk of collision and are in sight of one another
  Vessel A has vessel B on her own port side (relative bearing PORT 060°)
  Vessel C is not in sight of vessels A or B and is in the area of restricted visibility
  Vessel C is sounding one prolonged blast at intervals not exceeding two minutes
  Vessel A and C are crossing so as to involve risk of collision
  Vessel A has vessel C on her own starboard side (relative bearing STBD 040°)
  There is no risk of collision between vessels B and C

- Rule(s) to be applied:
  Rule 15 (Crossing situation)
  Rule 16 (Action by give-way vessel)
  Rule 17 (Action by stand-on vessel)
  Rule 19 (Conduct of vessels in restricted visibility)

- Applying the Rule(s) and comments:
  Crossing situation (vessel A and vessel B):
  In accordance with Rule 15 (Crossing situation), when two power-driven vessels are crossing so as to involve risk of collision, the vessel (vessel B) which has the other

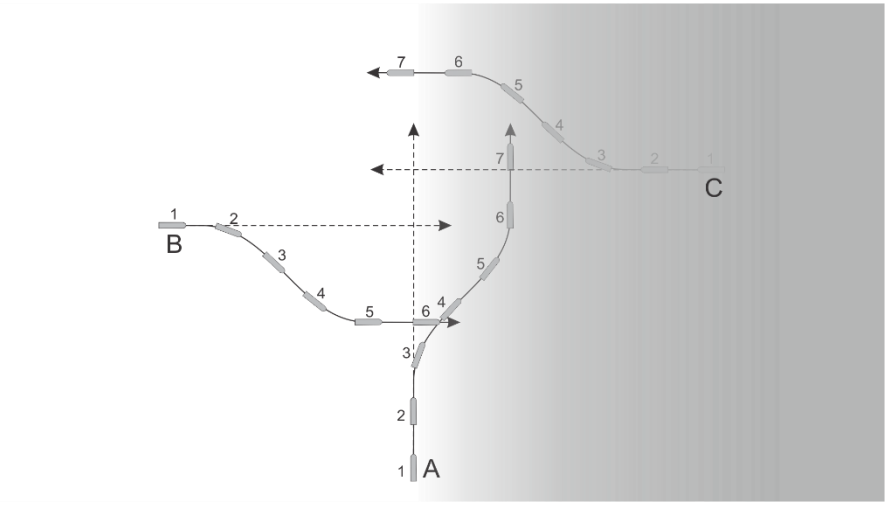
(vessel A) on her own starboard side shall keep out of the way.
In accordance with Rule 15 (Crossing situation), vessel B shall, if the circumstances of the case admit, avoid crossing ahead of vessel A.
In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel B) which is directed to keep out of the way of another vessel (vessel A) shall, so far as possible, take early and substantial action to keep well clear.
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way (vessel B) the other (vessel A) shall keep her course and speed.

Crossing situation (vessel A and vessel C):
Vessel A and vessel C are not in sight of one another, therefore as a risk of collision and/or close quarter situation is developing, Rule 19 (Conduct of vessels in restricted visibility) apply.
In accordance with Rule 19 (d)(i) (Conduct of vessels in restricted visibility), vessel A should avoid an alteration of course to port for a vessel forward of her beam. Vessel A should therefore alter course to starboard (or slow down in accordance with Rule 19 (c) and Rule 8).
In accordance with Rule 19 (d)(i) (Conduct of vessels in restricted visibility), vessel C should avoid an alteration of course to port for a vessel forward of her beam. Vessel C should therefore alter course to starboard (or slow down in accordance with Rule 19 (c) and Rule 8).

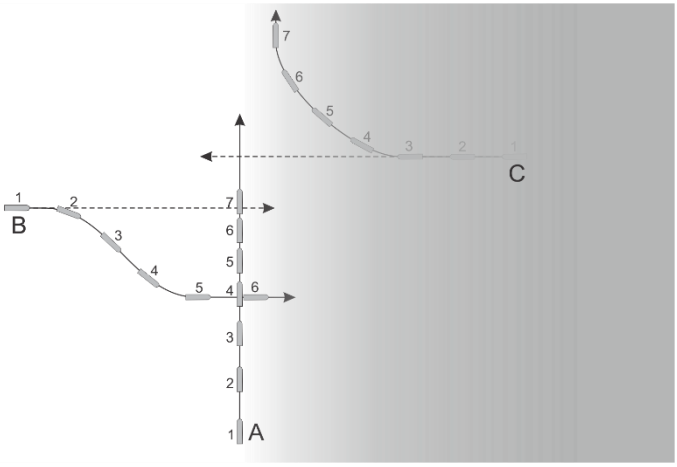
Comments:
Vessel A is navigating near an area of restricted visibility and sounding her prescribed sound signal of one prolonged blast at intervals not exceeding two minutes.
Vessel C is in the area of restricted visibility and she also sound one prolonged blast at intervals not exceeding two minutes.
Vessel B is navigating in clear visibility and is in sight of vessel A. She has detected by radar vessel C and determined in accordance with Rule 7 (Risk of collision) that there is no risk of collision or close quarter situation developing with vessel C.
As there is a risk of collision between vessel A and vessel B and both vessels are in sight of one another, vessel A should maintain her course and speed in accordance with Rule 17 (a)(i) (Action by stand-on vessel), and vessel B is directed to keep out of the way of vessel A in accordance with Rule 16 (Action by give-way vessel).
Vessel A should maintain her course and speed for vessel B but vessel A is in the same time obliged to avoid collision with vessel C. In accordance with Rule 19 (Conduct of vessel in restricted visibility), vessel A and vessel C must give way to each other and should not alter course to port for a vessel forward of the beam (unless they are overtaking it). Therefore vessel A should alter her course to starboard or slow down for vessel C.

- Actions:
  Vessels A, B and C can take following actions to avoid collision or close-quarters situation.

  a) All vessels should alter their course to starboard in accordance with Rule 15 and Rule 19 even such action takes vessel A into the fog bank.

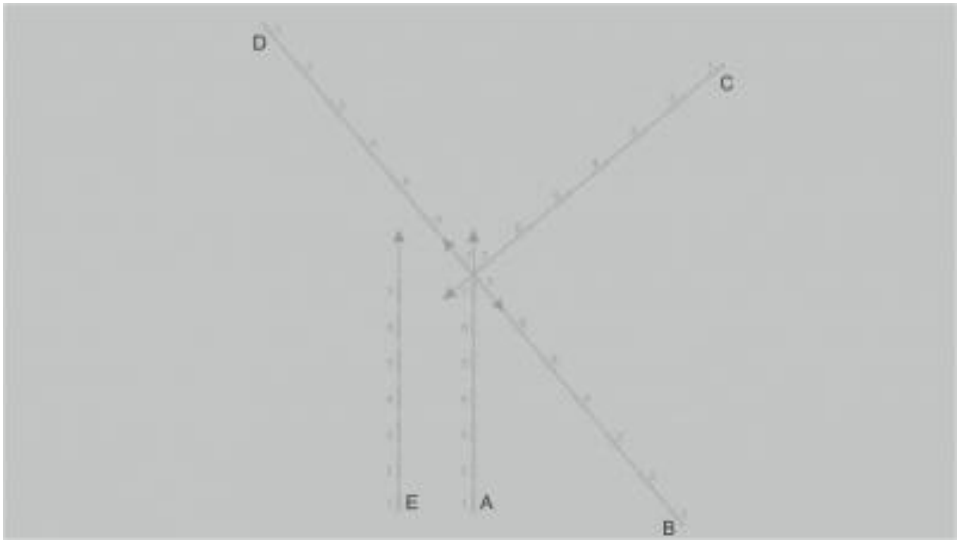


  b) Vessels B and C should alter their course to starboard in accordance with Rule 15 and Rule 19 . Vessel A could slow down to allow vessel C to pass, but this might embarrass vessel B who has to give way to vessel A in accordance with Rule 15. If vessel A for some special circumstances could not alter her course to starboard but slow down to avoid collision with vessel C she could give manoeuvring and warning signals to vessel B because vessels A and B are in sight of one another.



Scenario 19

Multi-ship encounter situation on the high seas in restricted visibility



- Description of scenario:
  Vessel A: Power-driven vessel
  Vessel B: Power-driven vessel
  Vessel C: Power-driven vessel
  Vessel D: Power-driven vessel
  Vessel E: Power-driven vessel
  Area: On the high seas
  Visibility: Restricted (All vessels not in sight of one another)
  Vessel E is doing same course and speed as vessel A
  Vessels A, B, C and D are sailing so to involve risk of collision between each of them
  Vessel A has vessel B on her own starboard side (relative bearing STBD 100°)

- Rule(s) to be applied:
  Rule 2 (Responsibility)
  Rule 19 (Conduct of vessels in restricted visibility)

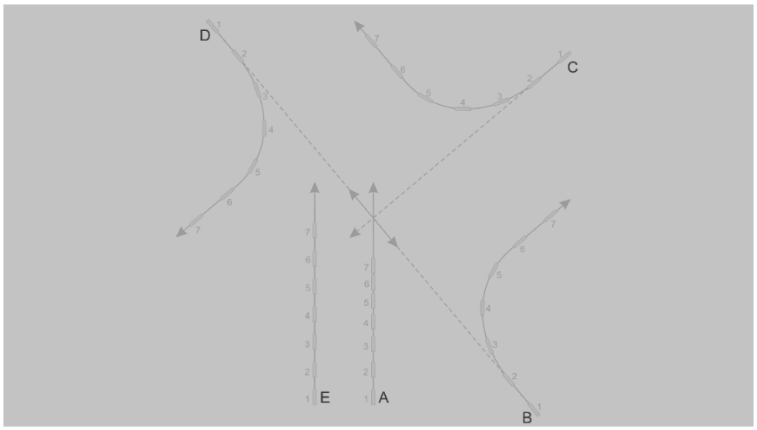
- Applying the Rule(s) and comments:
  Crossing situation (vessels A, B, C and D):
  In accordance with Rule 19 (d)(ii) (Conduct of vessels in restricted visibility), vessel A shall so far as possible avoid an alteration of course towards a vessel abeam or abaft the beam, so she should alter her course to port for vessel B.
  In accordance with Rule 8 (e) (Action to avoid collision) if necessary to avoid collision vessel A shall slacken her speed.
  In accordance with Rule 19 (d)(i) (Conduct of vessels in restricted visibility), vessel A shall so far as possible, avoid an alteration of course to port for vessels C and D

because they are forward of her beam. Therefore vessel A should alter her course to starboard for Vessel C and D.
In accordance with Rule 19 (d)(i) (Conduct of vessels in restricted visibility), vessel B shall so far as possible, avoid an alteration of course to port for vessels A, C and D because they are forward of her beam. Therefore vessel B should alter her course to starboard for vessel A, C and D.
In accordance with Rule 19 (d)(i) (Conduct of vessels in restricted visibility), vessel C shall so far as possible, avoid an alteration of course to port for vessels A, B and D because they are forward of her beam. Therefore vessel C should alter her course to starboard for vessel A, B and D.
In accordance with Rule 19 (d)(i) (Conduct of vessels in restricted visibility), vessel D shall so far as possible, avoid an alteration of course to port for vessels A, B and C because they are forward of her beam. Therefore vessel D should alter her course to starboard for vessel A, B and C.

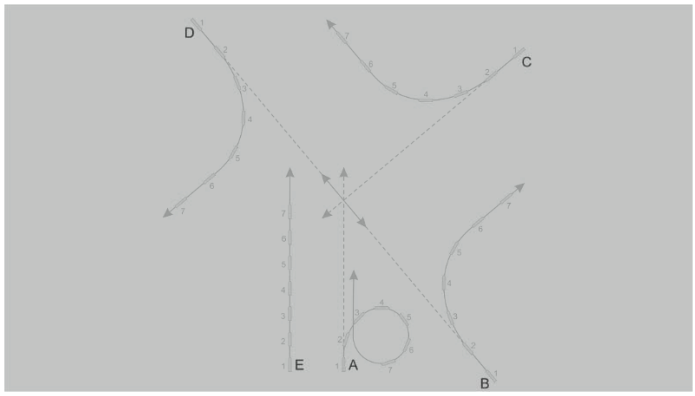
Comments:
Vessel E is doing same course and speed as vessel A. Vessel E is also in crossing situation with vessels B, C and D but between vessel E and all other vessels (A, B, C, D) there is no risk of collision.
All vessels are navigating in restricted visibility and sounding their prescribed sound signals of one prolonged blast at intervals not exceeding two minutes.
All vessels cannot sound manoeuvring and warning signals as laid down in Rule 34 as they are not in sight of one another.
As all vessels are navigating in restricted visibility , there is no stand-on vessel. All vessels are obliged to give way to each other.
Vessel A has obligation to alter her course to starboard to avoid collision with vessel C and D but this is not allowed to avoid collision with vessel B. Vessel A cannot even alter her course to port as vessel E is doing the same course and speed and there is not sufficient sea room for vessel A to come to port and pass astern of vessel E.
Vessels B, C and D have in accordance with the Rules obligation to alter their course to starboard to avoid collision.

- Actions:
  Vessels A, B, C and D can take following actions to avoid collision or close-quarters situation.

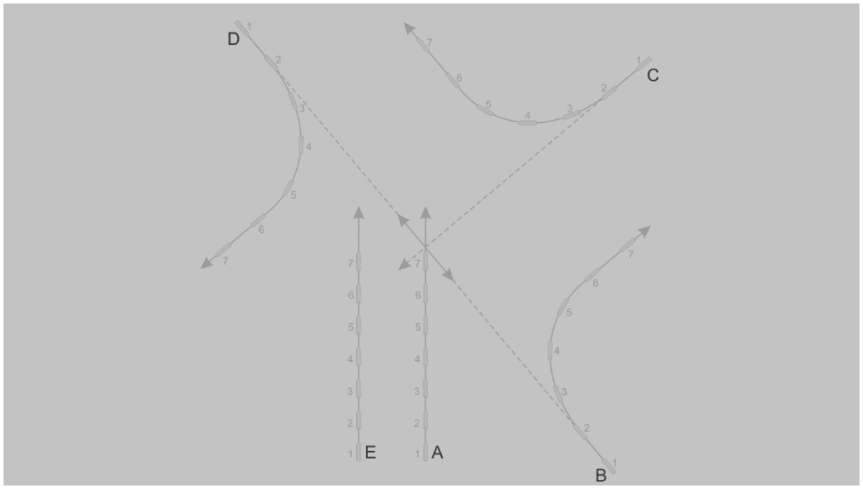
  a) Vessel A can slacken her speed and vessels B, C and D can alter their courses to starboard.



b) Vessel A could make early 360° turn to starboard, even though Rule 19 says she should so far as possible avoid altering towards a vessel abeam or abaft her beam. This is a case where Rule 2 (make a departure from these Rules to avoid immediate danger) and Rule 8 (made in ample time with due regard to the observance of good seamanship) can be seen.



c) Vessel A can keep her course and speed because she observes that vessels B, C and D took early action and altered their course to starboard before vessel A starts any avoiding action. In that case vessel A determines that there is no more risk of collision or close quarters situation developing. Keeping course and speed for vessel A in this case is probably the least dangerous option as it does not require her to alter her course towards another vessel or slow down.



Further Readings

Paper 1 – Published at IAMU18 Proceedings[4]

Avoiding Collisions At Sea – Pareto Analysis

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[4] http://archive.iamu-edu.org/wp-content/uploads/2023/11/AGA18_Proceedings-volume2_2017.pdf.pdf (Page19-28)

ABSTRACT: It has been almost 40 years since the 1972 International Regulations for Preventing Collisions at Sea known as COLREGs were introduced, and regular amendments have been taking place accordingly ever since. Over the last half-century despite improvements in navigational aids such as ARPA and attempts to raise the standards of training through the various STCW conventions, collisions still occur. Many studies and accident reports indicate that the accidents were caused by either human error or are associated with human error as a result of inappropriate human responses. Collisions commonly represent many of these accidents. This paper discusses key issues regarding the application of Collisions Regulations (COLREGs) at sea, reports on the outcome of a recent EU funded eCOLREGs project known as ACTs and a report on a Pareto Analysis supporting the work being carried out in a new project called ACTS Plus which considers more complex cases where there are several rules applied or where there are more than two ships involved in a collision. This paper does not attempt to examine each and every rule included in regulations but the EU Project ACTs and ACTS Plus online platform include some 300 scenarios, many developed and videoed in ship simulators, for those interested to review and explore more. This paper discusses the importance of studying cases where the applications of certain rules or where more than one rule applies are open to misinterpretation.

KEYWORDS: COLREGs, maritime education and training, collision avoidance, Pareto Analysis

1. INTRODUCTION

The International Maritime Organisation (IMO) developed the first standard for Vocational Education and Training (VET) programmes for merchant navy officers (STCW) in 1978, and it has been amended in 1991, 1995, 2003 and 2010 respectively. However, there are currently no mechanisms to monitor how their standards are being applied as many VET providers have been found not to follow many requirements. Therefore, there has always been substantial diversity on the knowledge of seafarers affecting the safety of life at sea. The COLREGs provide various rules as to passing, crossing, overtaking manoeuvres to be made; detailing which ships have the right of the way depending on the circumstances and the types of ships involved, and what actions these ships should take. It also describes the rules on the signals (lights, shapes and sound signals). The recent IMO bulletin “maritime knowledge centre” reports that more than 90% of the collisions are attributed to the human factor (IMO, 2010), and this had earlier been reported by Parker (2010). Ziarati (2017) reports that majority of accidents and incidents are related to collisions. There is a clear indication that Collision regulations are either not understood or ignored although it is a primary set of rules for taking actions to avoid collisions.

It is interesting to note that the earlier studies had been showing that 85% percent of all accidents are either directly initiated by human error or are associated with human error as a result of inappropriate human response (Ziarati, 2006). The human error reported to causing the accidents is now to have apparently increased by 5 percent in recent years. This may be linked to the revolution in automated equipment/systems on board the ships causing the

number of accidents to decrease while increasing human element attributed to accidents. The Pareto Analysis methodology of Ziarati (2006) has been applied to identify where maximum benefits could be felt and which Rule if applied correctly could reduce the number of collisions most.

2. COLREGs IN MET

The purpose of Collision Regulations and resources needed have already been discussed (Stitt, 2002: IMO, 1999). However, across the world, countries have diverse methods of teaching the COLREGs as well as having diverse methods to identify the knowledge of their deck cadet/navigational officer's competency in COLREGs. Some by multiple choice questions, some with on-to-one exams to make sure that those deck cadets/navigational officers know/ understand the COLREGs. Research conducted by the Nautical Institute (Syms, 2002) highlights the suggestions of seafarers, that the improvement of maritime training and education (MET) systems is necessary which will help then to improve the application of COLREGs at sea. The same research (Syms, 2002) also reports that in northern European countries such as United Kingdom, Germany and France, the application and understanding of COLREGs is of a higher standard than when compared to other countries. Ziarati (2006) emphasises that mistakes are usually made not because of deficient or inadequate regulations, but because the regulations and standards, that do exist, are often ignored.

3. RESEARCH INTO TO COLREGS RULES

COLREGs currently have thirty-eight rules and four annexes. It applies to all vessels upon the high seas and in all waters navigable by seagoing vessels. From the point of Belcher (2002), COLREGs are intended to operate in an environment where the Navigational Officer on each vessel has a complete understanding of the situation, knowing which rules are in effect, how those rules are interpreted and what needs to be done in case the action does not occur. Thus, (Belcher, 2002), perceives that the COLREGs operate in an environment of mutual comprehension, understanding and coordination, with clear logical steps ensuring clarity and predictability. MAIB (2004) has conducted a safety study that reviewed 66 collisions and near collisions in their accident database. As a result of the study, the most common contributory factors in all these collisions were poor lookouts (Rule 5) and poor use of radar (rule 7(b), (c)). That means that the standards of lookouts are poor and ineffective and that the radar is not used properly to identify the risk of collision. In fact, COLREGs clearly state the necessity of maintaining a lookout in rule 5 and the use of radar in Rule 7(b), (c):

"Rule 5 - Every vessel shall all the times maintain a proper lookout by sight and by hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make full appraisal of the situation and the risk of collision"

"Rule 7(b) – Proper use shall be made on radar equipment if fitted and operational, including long-range scanning to obtain early warning of risk of collision and radar plotting or equivalent systematic observations of detected objects.

Rule 7(c) – Assumptions shall not be made on the basis of scanty information, especially scanty radar information.

The examples of rule 5 and Rule 7(b), (c) are basic and easy to understand, interpret and comply with compared to other rules of COLREGs. However, it is interesting to see those are the first concerns in the full study report (MAIB, 2004). The same reports also point out that substantial numbers of accidents took place at night and in restricted visibility. The example below shows the collision attributed by poor lookout.

Case 1: Poor lookout - A dredger collided with a fishing vessel in the Dover Traffic Separation Scheme, in daylight, calm conditions and clear visibility. The dredger had been on passage and following the flow of traffic, and the fishing vessel not engaged in fishing, had been crossing the scheme. The vessels approached each other on a collision course for 10 to 12 minutes with the fishing vessel on the dredger's port bow. The watch keeper on the dredger had seen the other vessel and, having identified it as a fishing vessel not engaged in fishing, was expecting her to alter course at the last minute.

With regard to the provision of a lookout, STCW 95 states that the officer in charge of the navigational watch may be the sole lookout "in daylight" provided it can satisfy the provisions in STCW for lookout requirements (STCW, 95). Despite this international requirement to maintain lookout at night, the MAIB (2004) research shows that at least three of fourteen vessels had failed to keep a proper lookout at night. That same research also showed that only a bit over 25% used the radar properly along with the officer on the watch with regard to collisions.

In the same report, the reason for not maintaining lookout was attributed as "lack of competency". However, MAIB believes that poor visual lookout is linked to poor employment of ratings on the bridge (MAIB, 2004). MAIB reports that 20% of collisions are due to fatigue and some 80% due to competency factor. Bridge watch keeping practices have inevitably changed in recent years under the influence of automated systems which are being implemented in order to enhance efficiency and safety as well as to overcome the shortage of seafarers. As the advanced automation systems are developed and deployed on board, it influences the international rules and regulations which are under consideration for being updated in parallel to evolved systems on board the vessels. An earlier survey highlighted the concerns regarding the application of COLREGs rules at sea. The questions were directed to seafarers and in the results, it was noted that close to 50% of the responses showed that seafarers either ignored or disregarded the COLREGs rules (Syms, 2002). In the same survey 90% of the responders identified the reason as "ignorance", "Poor knowledge of COLREGs" and "lack of training". Another finding of that survey was that the most common reason for making manoeuvres contrary to the COLREGs was reluctance to deviate/slow down.

4. SOME RESULTS FROM PROJECT ACTs

The Fig. 1 shows that there are serious concerns about the fact that the percentage of correct answers to a survey carried out by partners of the EU funded project ACTs (Ziarati et al,

2017) was around 70 but more alarming was that those with no experience of COLREGs did better than expected, in some cases almost performed as well as (in 2 cases better than) the more experienced seafarers and/or MET lecturers! This clearly should be a case for concern.

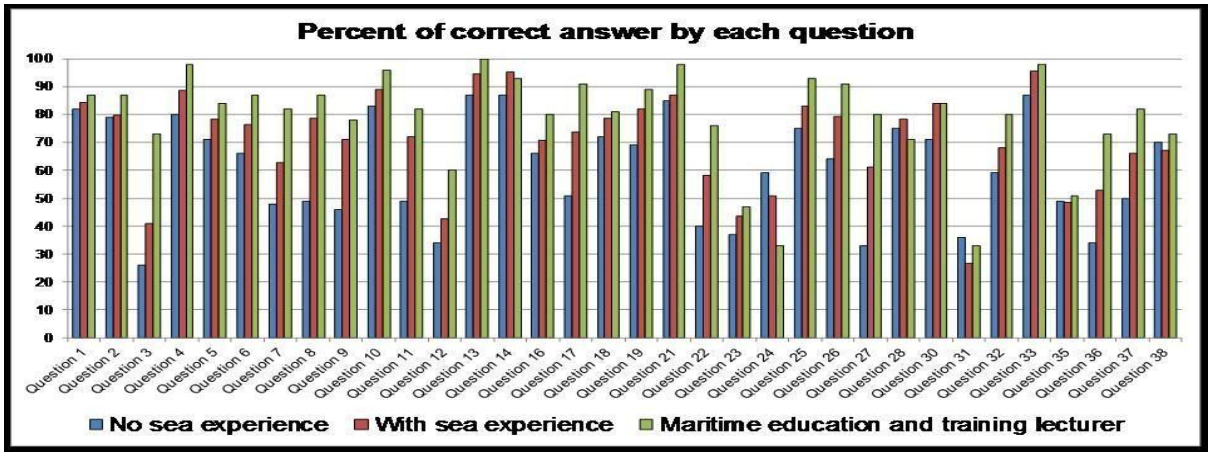

Fig. 1. % of Correct Answers by Respondents – All existing COLREG rules (Ziarati et al, 2017)

The hardest rules to understand in the survey concluded by Ziarati et al (2011, 2017) was found be rule numbers 19, 18 and 10 and to a lesser extent 8 and 9. Fig 2 shows the Pareto analysis for rules difficult to understand by students according to the lecturers.

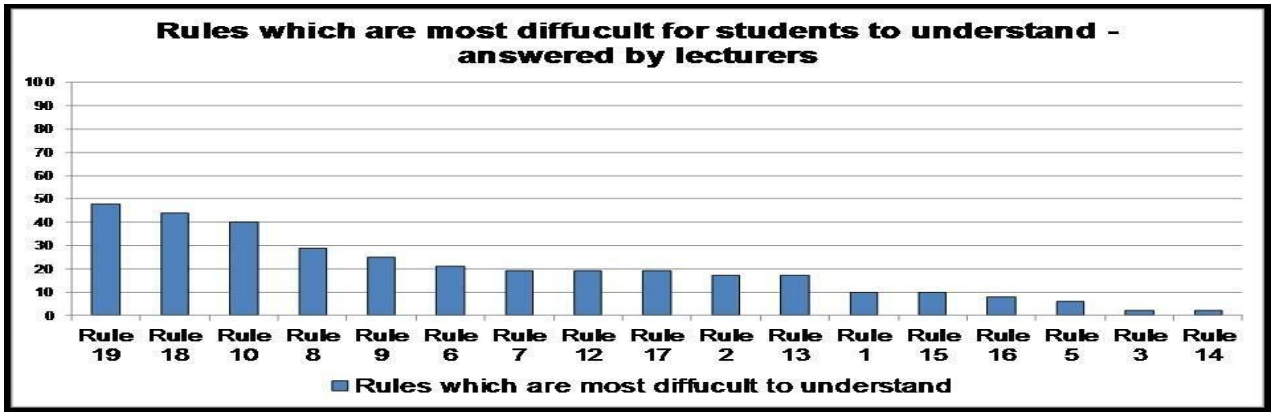

Fig. 2 Pareto Analysis – Identifying the most difficult rules to understand in ranking order

5. THE USE OF VHF AT SEA

Collisions should theoretically be avoided if all navigational officers comply with the International Rules for the prevention of collisions at Sea 1972. It is, however, shocking that these regulations were contravened to varying degrees in different locations across the world, which resulted in many accidents investigated and reported (MAIB, 2004; MARS, 2005). It is reported that the use of VHF is becoming a common practice in collision avoidance although it is not part of the COLREGs (MCA, 2002). The MCA (Maritime and Coastguard Agency)

in the UK took this issue seriously and provided guidance for their seafarer network to highlight the

dangers associated with the use of VHF. According to MARS (2005) “The use of VHF should be kept to minimum and only be used, for instance, an obstruction exists on starboard side for stand on vessel, and however, reduction of speed should be preferred on communicating the intention on VHF”. It should not normally be the case for navigational officer to use VHF to take action to avoid collisions; however, it does usually happen. The MAIB study (2004) shows that after examination of the use of VHF in the collisions and near misses that it was only used in 14 of the 47 collisions, and was only effective in 3 of those.

Case 2 - VHF assisted collision - A cargo vessel was outbound from River Humber in poor visibility. The master of the cargo vessel had the con, a helmsman was steering and the bosun was stationed on the forecastle as a lookout. The master saw the target of an inbound vessel on his radar, and he called the unknown fishing vessel using VHF with the intention of requesting to pass “green-to-green” in the channel. He received an instant response but, by then, it was too late. His ship was committed to the manoeuvre, and the fishing vessel was trying to pass red-to- red. They collided, causing extensive damage to the fishing vessel.

Case 3 – VHF assisted collision - Two container ships were navigating in China Sea. Risk of collision appeared however both did not realise it until 3 minutes before the accident. The stand on vessel tried to contact via VHF on three minutes prior to collision and got a response after several calls, a disagreement took place and the ships collided.

Case 4 - Rule 19: This case study is devoted to an article in Seaways (September 2008) which studied in some depth the problems of interpreting Collision Regulations (COLREGs) Rule 19. The article identifies the Rule 19 to be a continuing problem. The article is by Captain Roger Syms FNI, a Research Associate from the Australian Maritime College. He recollected a discussion with a seagoing officer concerning a discussion he had had with his colleagues, the subject of which was a collision problem in poor visibility. The scenario, somewhat similar to the Scenario 3 presented in the COLREGs survey a few years ago, is: Own ship and the other two vessels involved, one head on and the other to starboard steaming parallel at a range of 0.7 miles, are all proceeding at much the same speed, approximately 17kts. All were container vessels which suggest that all have better than average manoeuvring capabilities. Apparently, the discussion as to the correct manoeuvre within the Rules came up with four possible responses: 1. Turn hard to port (according to rule 2b). 2. Reduce speed and turn hard to starboard. 3. Turn hard to starboard without reducing speed and 4. Do nothing. Let us now examine each of these proposed responses, in reverse order.

Option 4: Do nothing - This is simply not an option. A collision situation is developing with the vessel dead ahead; in such circumstances the own vessel has to take action. Once our vessel has determined that a “risk of collision exists” as per Rule 19(d), “she shall take avoiding action in ample time”. Furthermore, Rule 19 (d) (i) states that we should ‘avoid altering to port’, which leaves us with only one remaining option, to alter to starboard.

Option 3: Turn hard to starboard without reducing speed - This is a correct response within the Rules 19 (d) and avoiding altering to port as per 19 (d) (i). It is clear that a drastic hard-over action is probably not necessary. Any reasonably apparent movement to starboard, anything say, beyond 50˚ will be sufficient to indicate to the vessel ahead that we are following the Rules and will result in allowing the vessel to starboard to draw ahead.

Option 2: Reduce speed and turn to starboard - In taking such action own ship is again clearly indicating that she is complying with the relevant sections of Rule 19.

Option 1: Turn hard to port (according to Rule 2b) - That this can be considered an option is cause for concern! Rule 2(b) suggests that actions beyond and contrary to the Rules may be necessary in order to 'avoid immediate danger'. At this point in time the vessel ahead is six miles and a little over 10 minutes away. This can hardly be construed as immediate danger. Second, even in the unlikely event that it could be construed as immediate, this situation cannot be viewed as in extremis, where no other options for safe compliant manoeuvres are available. In this case, as we can see, there are two perfectly good ones, both of which comply perfectly with the requirements of Rule 19.

Why not starboard? - So the question has to be asked, why would presumably competent seafarers contemplate such a dangerous manoeuvre to port? Or, put more correctly, why are they so reluctant to move to starboard? No apology should be made for moving into conjecture here and opt for Rule 19 (d) (ii), which states that what also should be avoided, when vessels are not in sight, is 'an alteration towards a vessel abeam or abaft the beam'. This may be convincing because a good 80% of the seafarers invariably get this wrong. It is one of the most commonly misconstrued rules in the book. The plain fact is that, in this case, Rule 19 (d) (ii) does not apply.

Why? Because the vessel to starboard does not comply with Rule 19 (d): 'A vessel (our own ship) ... shall determine if a close quarters situation is developing and/or risk of collision exists.' This vessel is proceeding parallel with us at 0.7 miles, and will remain so into infinity. She will remain at the same distance; therefore the risk of close quarters and/or collision does not even begin to exist. If this is yet another potentially fatal misconstruction of 19 (d) (ii), what can be done in mitigation? Other than chucking out the whole sorry 1972 COLREGs mess and starting again, hence the argument that at least the current wording of 19 (d) should be reconstructed to remove this all-too-common confusion? What is needed is a set of words which make it absolutely clear that 'avoiding an alteration towards' refers to a vessel abeam or abaft beam, only when it is perceived as a close quarters or collision risk, and not, as seems to so many at sea, to apply to any vessel abeam or abaft the abeam in any circumstance. Yet again there is a Rule governing conduct in the most difficult circumstances a vessel can find herself in, zero visibility, still misunderstood by the majority of those at sea. It's high time something is done about it. Furthermore, with the advent of big data and artificial intelligent (AI) tools (Akdemir et al, 2014) it seems logical to use these tools and data to develop a decision-making system for deciding which collision rule applies in certain circumstances and also involve other personnel in a ship operating company in the decision-

making process. In more complicated cases such as rule 19 and so forth or when several rules have to be considered an AI tool becomes more than just a feasible option.

6. CONCLUSIONS

It is clear that there are real concerns as respondents with no seafaring experience did better than expected. It is pertinent to note that results of survey were based on a sample of some 1500 people but even so the outcome is not encouraging. A new survey may have to be initiated to verify the outcome of the ACTs survey which could shed more light on the level of understanding and application of COLREGs. The introductory part of the paper has identified serious issues with COLREGs. Use of VHF has also been a case for concern. If COLREGs are understood better and interpreted correctly the probable effect will be the more confident navigational duties that officers can perform. It reduces the use and dependency on VHF.

The MET programmes are the parts of the broken segment if the COLREGs today are not as effective as it should be. There is no room for seafarers in charge of vessel to be 80% correct, what should be required are 100% confidence and no less. A set of standards for officers and

higher ranks across Europe may be helpful to justify the understanding of seafarers so that COLREGs can operate in an environment of mutual comprehension, understanding and coordination. The Project ACTs Plus online course with over 300 scenarios many of which were developed in ship simulators and videoed would help all seafarers to interpret COLREGs and apply them correctly when there is possibility of a collision. The COLREGs need to be updated to meet the improved technology demands. The more automated systems may well be included where needed. The national authorities may take the COLREGs more seriously and issue similar guidance (MCA, 2002) to their seafarer network to spread the word of COLREGs and discourage the use of VHF at sea. This paper was primarily written to warn against treating all rules equally. This is because as shown by the Pareto Analysis some of the Rules, particularly for instance Rule 19, are more challenging and hence further work as demonstrated by Case 4 above is recommended. Also it is of paramount importance to consider scenarios where more than one rule applies.

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Paper 2 – Published at IMLA20 Proceedings[5]

AVOIDING COLLISIONS AT SEA – FROM MULTI-SHIP TO SHIP-TO-SHIP ENCOUNTER

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Abstract

It has been almost 50 years since the 1972 International Regulations for Preventing Collisions at Sea (known as the COLREGs) were introduced with only some minor amendments added since their introduction. Many studies and accident reports indicate that these incidents were primarily caused by either human error or, are associated with human error as a result of inappropriate human responses. Collisions commonly represent many of these incidents and they often happen in multi-ship encounters. The COLREGs were primarily written for ship-on-ship encounters yet they remain valid in their application in multi-ship encounters. However, teachers report that many students (and also senior officers) appear to have serious problems in applying the COLREGs in multi-ship encounters. This paper discusses the "Divida et Impera" approach of "ACTs plus" Erasmus+ project team to facilitate the application of COLREGs in multi-ship encounters. The "Divida et Impera" approach is based on splitting the multi-ship encounters into several ship-on-ship encounters. Then, usually contrary obligations of a single ship identified in several ship-on-ship encounters are interpreted to finally find the give-way vessel(s) and the most appropriate collision avoiding actions. This paper discusses the "Divida et Impera" approach in one example multi-ship encounter scenario. Many other multi-ship encounter scenarios, enriched with graphics, videos and quiz may be found at ACTs Plus online platform (advanced.ecolregs.com).

Keywords: COLREGs, collision avoidance, multi-ship encounters

1. Introduction

It may be argued that the 1972 COLREGs are one of the most long-standing of the rules that still be applied at sea. They have only suffered minor amendments since their initial adoption. On the other hand, seafaring has considerably changed over the last 50 years and these changes have all occurred since the Rules were first adopted. Very large vessels with unusual manoeuvring characteristics were built (first was the boom of super tanker vessels in the 1970's, followed by the construction of very large bulk carriers and in the last 10 years very large and ultra large container and passenger vessels have appeared). The number of vessels

at sea has also increased, and it is suggested that with an increase in traffic density, there is a corresponding increase in the possibility of a collision occurring.

What has greatly increased though, is the general speed of vessels. The High Speed Craft (HSC) with sailing speeds of between 30 and 60 knots are now much in evidence around the world. Additionally, High Speed Ships (HSS) have been built, where ships with a length of over 200m sail with speeds of 32-33 knots. When the fuel prices in the World are lower, even large container ships can sail at speeds of over 30 knots. Further, every new passenger ship can reach the same sorts of speed, regardless of their length. Greater speed leaves the navigator on the bridge with less time to assimilate what is happening and for the overall collision avoidance process to be considered.

However, to assist the Navigator, it is suggested that ARPA Radar is the one device which has greatly facilitated collision avoidance. ARPA however, was not fully developed until the 1980's and 1990's – sometime after the Rules were first adopted. Unfortunately, the limitations of the radar in general and ARPA in particular remain. These limitations revolve around: dense rain; waves; low reflection of smaller objects and other similar limitations which still exist today, despite the associated increase in technology. As a result, it can be suggested that the accuracy of collision avoidance data provided by the ARPA radar remains as satisfactory for ocean passages and possibly coastal navigation where there is not much dense traffic. However, for dense traffic areas and approachable fairways and harbours, the overall accuracy of ARPA can no longer be considered to be as satisfactory.

Other important bridge devices that can have a direct or indirect impact on collision avoidance should be mentioned, such as the development of satellite position systems and ECDIS. The ability to display a very accurate ships position on the electronic chart has greatly reduced the workload of bridge officers. On the other hand, the possibility of almost "perfect" steering and tracking of the ship's movement on the planned voyage have had the effect of creating more congestion, in turn causing more frequent requirement for collision avoidance as vessels converge of the "perfect" track. This also occurs in ocean navigation as the vessels that used to be "off track" due to the limited ability to determine the ship's position and drift caused by external forces acting on the ship, now almost do not exist due to the technology being used. Again, vessels are converging on the "perfect" track.

One of the greatest problems in collision avoidance is that one vessel does not know what the intentions of the other ship are. On the road, using the direction indicator on the car has partially solved this problem. Likewise, in the last 10 years the introduction of AIS has gone some way to enabling Navigating Officers to get some partial data that gives them additional information about another ship such as: status; course; speed; destination and other relevant data about ship and its voyage.

However, AIS does not tell the other vessel what the Watchkeeping officer on one ship is about to do with regard to any collision avoidance manoeuvre they may make.

In many areas of the World, a VTS service has been introduced. As a result many collision hazards have been elegantly resolved by VTS in the same way that air traffic services keep

aircraft apart. However, the main role of the VTS, is at the information service level and not to interfere in the decision-making process required to avoid a collision between two or more ships.

After a short chronological review of the development and changes that have occurred since the current Rules were adopted, a legitimate question would be whether the Rule's are out of date and whether it is necessary to consider completely amending the Rule's in order to meet today's challenges and the needs of the seafarers?

It is suggested that the authors of this paper answered these questions when they conducted workshops whilst undertaking a previous project - Avoiding Collision at Sea (2013-2015). The organized workshops were where Masters, Deck officers, VTS operators, employees of port authorities, pilots and lecturers all participated in looking at and discussing the Rules and their interpretation. The common conclusion from the workshops was that: The Rules could do with some minor changes or updates to reflect new technology, but drastic changes are unlikely to be required. More importantly was the conclusion that there was a requirement that the current Rules need very careful explanation so that they are fully understood, in the same way, in every language. The authors of this article fully agree with the above-mentioned conclusion and as their contribution to better understanding of the Rules, the e- COLREGs Learning Platform (available at www.ecolregs.com) was developed by them.

In order to gain a better understanding of the Rule's, a Rule Learning Platform was developed by the authors, where each Rule was divided into its most simple parts and the corresponding theoretical meaning then explained. The practical scenarios were then further explained in their application together with possible collision avoidance actions.

Active seafarers and students tested the developed Rule Learning Platform and it has been confirmed that it has been very successful in developing and teaching a greater understanding of the Rules. This was exampled by the platform being used for teaching students in the project partners own academic institutions for the last three years and the exam results have shown great improvements in the student's knowledge of the Rules. That the platform has not only been used by Partners on the project shows the data that more than 147.000 users from all countries all over the world used the platform since May 2015.

The ACTs Project Partners have been very proud of the project results but it was clear to everyone that explaining the application of collision avoidance rules between two ships is not enough. This is because in practice, more than two ships are often encountered in the same area. In this case, collision avoidance becomes much more complex and for this reason, the project has been continued through to the current ACTs Plus (ACTs+) project.

As a result, ACTS+ focuses on where more than two ships are encountered in the same area, or when obligations between encountered ships require the determination of the hierarchy among the applicable Rules.

2. Multi-ship and complex multi-rule encounters

The need to continue further work and develop the ACTS+ project had already come from workshops organized within the original ACTs project where active seafarers, teachers and others involved in seafaring had pointed out that it was necessary in cases where more than one rule is involved. It was found that there was consequently a need to explain the relationships and hierarchy of the rules in order to determine suitable courses of action to avoid the collision. Furthermore, it was emphasized that in explaining the application of the Rules, it would be very useful to use scenarios that occur (or may occur) in practice when more than two ships are encountered or, when multi-ships are encountered that have different constraints or, when ships are encountered in specific areas such as Narrow channels or Traffic Separation Schemes.

The authors proposed the project and made an application for funding of this research. It successfully passed the evaluation requirements and the project "Avoiding Collision at Sea Plus" (2016-2019) which was funded under the Erasmus + program by the European Union, was commenced in October 2016.

Through organized workshops, guidelines were provided to show Complex Multi-rule and Multi-ship Scenarios in an easy and user-friendly manner with a clear interpretation to promote better understanding of the rules. The ACTS+ Project demonstrates various situations involving more than two vessels and clearly explains which rules the mariners should apply. A number of multi-ship and multi-rule scenarios were produced to show training in the three main types of situations: crossing situation, overtaking situation and head-on which can take place on the high seas, in narrow channels, in Traffic Separation Schemes and in coastal waters. A total of 18 scenarios were thus developed.

The greatest challenge was not to determine the scenarios, but the way in which the Rules should be applied and which collision avoidance actions can be taken so that the actions that were taken fully complied with the COLREGs. Normally the number of scenarios in practice can far exceed the 18 that the Project developed on the platform, but using the principle of solving complex collision avoidance situation as shown in the 18 developed scenarios, any other complex situation of encountered ships can also be solved.

As the best way to facilitate the application of COLREGs in multi-ship encounters the ACTs+ team utilized the “Divida et Impera” approach. The “Divida et Impera” approach is based on splitting the multi-ship encounters into several ship-on-ship encounters taking into consideration if the situation is occurring on high seas, in narrow channels, in Traffic Separation Schemes, or in coastal waters. It also takes

into account encounters between ships with different responsibilities, or when ships are navigating in or near areas of restricted visibility.

It was not unusual to discover several contrary obligations of a single ship identified in the ship-on-ship encounters. These needed interpreting to finally find the Give Way vessel(s) most appropriate collision avoiding actions. In this paper the “Divida et Impera” approach is discussed on one multi-ship encounter scenario as an example. Many other multi-ship

encounter scenarios, enriched with graphics, videos and a quiz can be found at the ACTs Plus online platform (advanced.ecolregs.com).

3. Case study: Overtaking and crossing situation on the high seas

Every scenario has been developed into five sections:

- Graphics,
- Description of scenario,
- Rule(s) to be applied,
- Applying the Rule(s) and comments,
- Actions.

The first two sections are used to give as short and clear a description of the scenario as is possible. When a graphical scenario view and textual description of the scenario were created, particular care was taken that the amount of data was the minimum required to describe the scenario. However, care was taken that the description does not allow that the reader to make an incorrect or wrong interpretation of the scenario and the subsequent application of the relevant Rules.

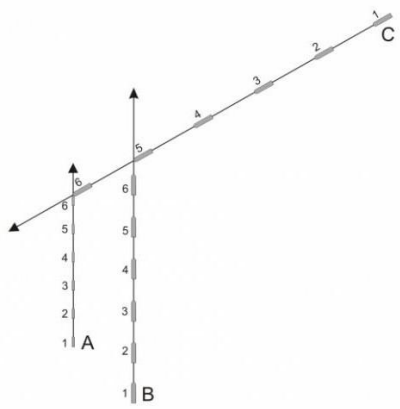
Graphics:	Description of scenario:
	Vessel A: power-driven vessel Vessel B: power-driven vessel Vessel C: power-driven vessel Area: On the high seas Visibility: Good (Vessels in sight of one another) Vessel A and vessel B are sailing in approximately parallel courses and vessel B is overtaking vessel A on her starboard side. Vessel A has vessel C on her own starboard side (relative bearing STBD 035°). Vessel A and vessel C are crossing so as to involve risk of collision. Vessel B and vessel C are crossing but there is no risk of collision.

Figure 1: Example of graphical scenario and its textual description

In the third section (Rule(s) to be applied) only the "main" rules applicable in the present scenario are listed. It is understood that many "general" rules would remain applicable in all the scenarios (such as Rule 1 etc.), but as this platform primarily serves users that are supposed to know the Rules, to avoid too much "unnecessary data" the more "general" rules were intentionally omitted.

Therefore, in the above scenario, the "main" applicable Rules that would need to be considered are: Rule 13 (Overtaking), Rule 15 (Crossing situation), Rule 16 (Action by give-way vessel) and Rule 17 (Action by stand-on vessel).

In the fourth section, the relationship between the ships is shown according to the principle of "Divida et Impera". As the Rules have been written for only the relationship between two ships, the scenario is divided in a way to explain the obligation of avoiding a collision between two ships individually.

The above scenario shows the application of the rules for the Overtaking situation between vessels A and vessel B and the Crossing situation between vessels A and vessel C. In this scenario, there is no risk of collision between vessels B and vessel C and there is therefore no need to demonstrate the application of rules for them. The example of Applying the Rule (s) and comments are detailed below:

Applying the Rule(s) and comments:

Overtaking situation (vessel A and vessel B):

In accordance with Rule 13 (a) (Overtaking situation), notwithstanding anything contained in the Rules of Part B, sections I and II, any vessel overtaking (vessel B) any other vessel (vessel A) shall keep out of the way of the vessel being overtaken (Vessel A).

In accordance with Rule 13 (d) (Overtaking situation), any subsequent alteration of the bearing between the two vessels shall not make the overtaking vessel (Vessel B) a crossing vessel within the meaning of these Rules or relieve her (Vessel B) of the duty of keeping clear of the overtaken vessel (Vessel A) until she is finally past and clear.

In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel B) which is directed to keep out of the way of another vessel (vessel A) shall, so far as possible, take early and substantial action to keep well clear.

In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way the other shall keep her course and speed.

Crossing situation (vessel A and vessel C):

In accordance with Rule 15 (Crossing situation), when two power-driven vessels are crossing so as to involve risk of collision, the vessel (vessel A) which has the other (vessel C) on her own starboard side shall keep out of the way.

In accordance with Rule 15 (Crossing situation), vessel A shall, if the circumstances of the case admit, avoid crossing ahead of vessel C.

In accordance with Rule 16 (Action by give-way vessel), every vessel (vessel A) which is directed to keep out of the way of another vessel (vessel C) shall, so far as possible, take early and substantial action to keep well clear.

In accordance with Rule 17 (a)(i) (Action by stand-on vessel), where one of two vessels is to keep out of the way the other (Vessel C) shall keep her course and speed.

Vessel A, in accordance with Rule 17 (Action by stand-on vessel) shall keep her course and speed for vessel B, but in accordance with Rule 15 (Crossing situation) vessel A shall keep out of the way of vessel C.

The section titled “Comments“ is the practical conclusion (or solution) to avoid a collision between the ships for the given scenario. This section discusses the individual obligations of all ships and on the principle of "elimination" it gives the explanation of which Rule(s) should be applied to each ship. The principle of "elimination" is practically the only correct way of applying the Rules when we have complex multi-ship encounters. For example, a ship which has multiple obligations under various Rules normally cannot take two actions at once. The above scenario is a classic example of this dichotomy when Vessel A should keep their course speed for Vessel B, but at the same time, is obliged to avoid Vessel C by altering course and/or speed.

The principle of "elimination" therefore discards the Rule(s) and all actions in accordance with those Rule(s) that the vessel(s) should not take, and keep the Rule(s) and all actions in accordance with Rule(s) that can or should be taken by the vessel(s). In the mentioned "elimination" principle, the provisions of Rule 8 (Action to avoid collision) must constantly be followed so that any action to avoid collision does not result in another close-quarters situation. Example of Comments is listed below:

Comments:

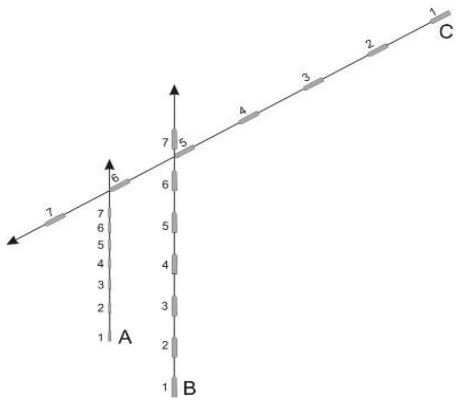
In accordance with Rule 17 (a)(i) (Action by stand-on vessel), vessel C shall keep her course and speed for vessel A and vessel B.

In accordance with Rule 17 (a)(i) (Action by stand-on vessel), vessel A shall keep her course and speed for vessel B, but in accordance with Rule 15 (Crossing situation), vessel A shall keep out of the way for vessel C.

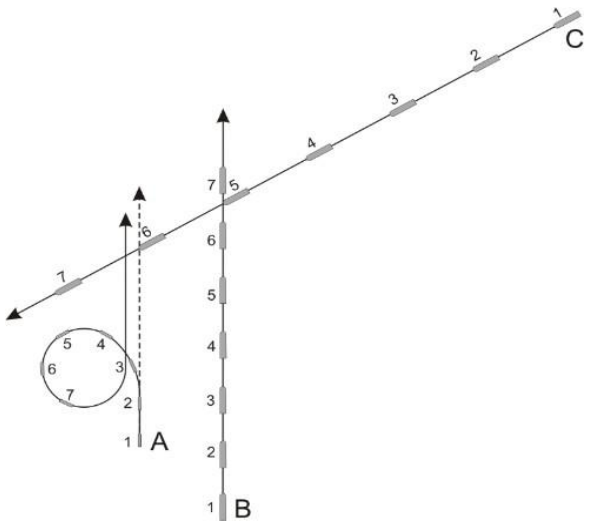
In last part actions to avoid collision or close-quarters situation are shown for all vessels which have an obligation to avoid collision with other vessels. All actions are also taken in accordance with the ordinary practice of seamen. Graphically and Bird's-eye view video has been presented of any possible collision avoidance action, including an ECDIS video where this was applicable. In the scenario presented in this paper, the following actions to avoid collision are possible.

Actions:

a) Vessel A may reduce speed to enable safe passing of vessel C Graphics:



b) Vessel A may make 360° turn to port to avoid collision with vessel C Graphics:



4. Conclusion

Many technical innovations have greatly helped in the conduct of navigation and consequently helped reduced the Watchkeeping Officers' workload. However, the Watchkeeping officer still has to rely on their understanding of the Rules to avoid a collision and they must therefore be capable of applying the correct Rule(s) in whatever situation they may find themselves. Collisions that have occurred in the recent past would tend to prove that the understanding of the Rules and their correct application is unsatisfactory. Therefore any research in this field can be fully justified if it increases knowledge and understanding.

The scenarios which have been developed in the ACTS+ project present even more complex cases of encountering ships when the correct application of the Rules is even more demanding. One of the very good principles for solving such complex cases is presented in this paper and it is based on the principle of "Divida et Impera". It is important to emphasize that this principle can be applied to any complex case of encountering ships, and the result (possible collision avoidance actions) obtained in this way is in compliance with the Rules. Complex cases, which cannot be solved in this way, belong to the category of "special cases" and will require further research in this field.

Acknowledgment

The authors are particularly grateful to their colleagues, active Masters and Mates who through their suggestions and remarks have contributed to the quality of the entire ACTS+ project. We also thank to Transas Marine International for permission to use graphical information and excerpts from TRANSAS Bridge Simulator.

Concluding Remarks

More than **five decades** have passed since the adoption of the **1972 International Regulations for Preventing Collisions at Sea**, which have undergone only minor amendments since their inception. Numerous studies and accident investigations demonstrate that maritime collisions remain primarily attributed to **human error**, often manifested through inappropriate human responses. Although the COLREGs were originally formulated for **bilateral ship-to-ship encounters**, collisions frequently occur in **multi-ship scenarios**, where their practical application becomes more complex.

It is hoped that this book and the papers referred to in it would help ship navigation officers including deck cadets would learn from the scenarios presented and help to navigate safety at sea and ports.