Chapter 7: Voyage Planning for Master

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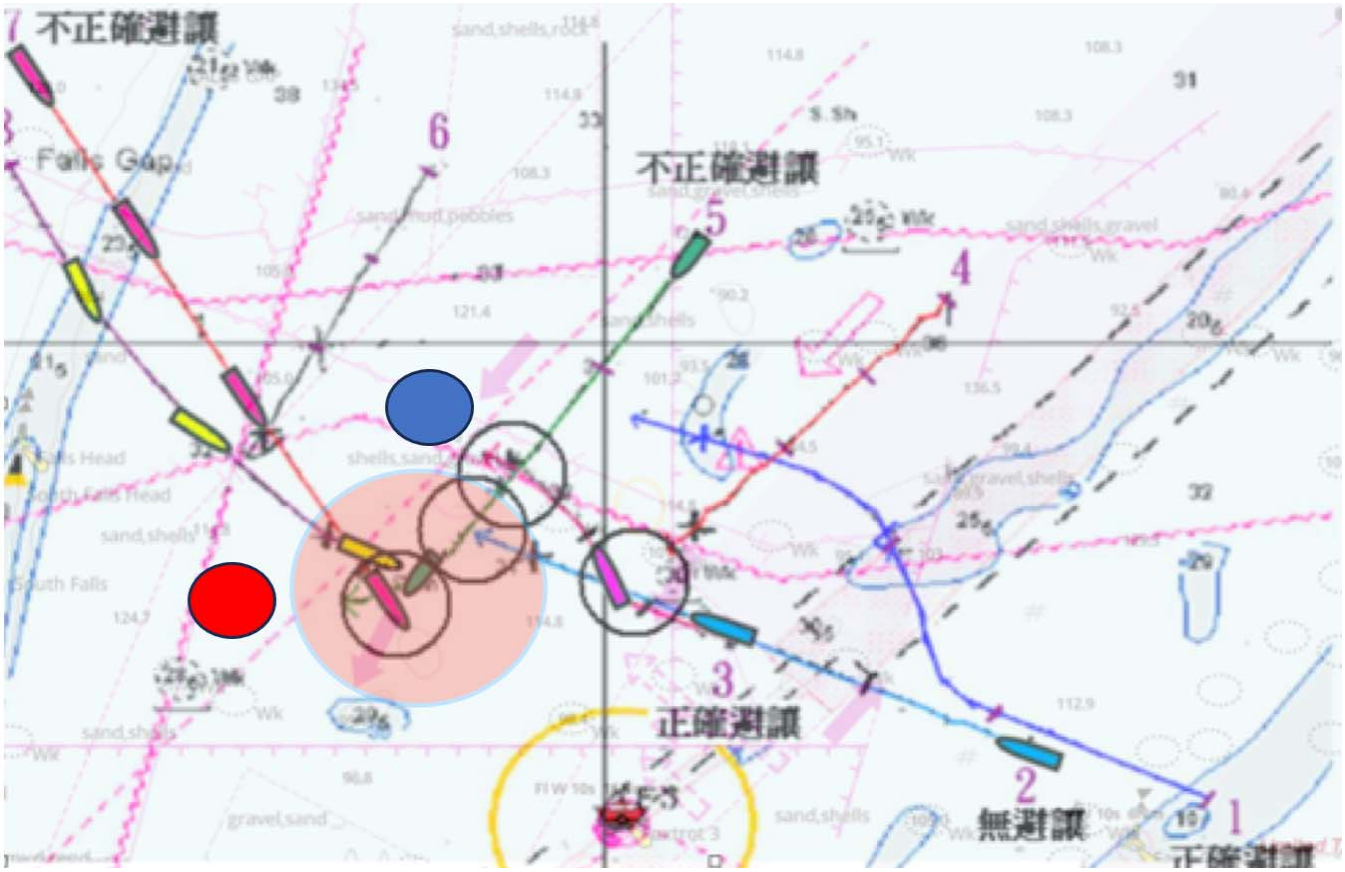


圖形 7-0 1 多船相遇的避碰圓環

地點 地點 地點，

這是房地產的黃金定律，海員也許不瞭解，這個也是海圖規劃的黃金定律，在電子海圖系統裡，我們知道禁航區域，跟安全範圍的設定，以避免靜態的危險，像是暗礁，淺灘，沉船等等。對於動態的危險區域，像是船隻交會區，港區出入口，狹窄水道等地點，當我們在穿越的時候，只有試試看自己運氣如何？這並不是一件正確的事情。熟練的航海家會非常小心，在接近這些熱點區域之前，在當值命令，或是夜令簿上規定，或直接標在紙海圖上，做出呼叫船長的標記。

7-01 避碰的圓環

在圖形 7-01 我們可以看到些熱點，就是兩條船航線相交的地方，在雷達瞭望，我們會說兩條船速度向量線的交叉點（黑色圓圈）。簡單的航行安全守則是避免所有這些熱點區域，像是一號目標，直接開到北邊，這並不是他的原始航線，但是他遠離了這些熱點。五號的目標沒有繞過這些熱點，他試了試他的運氣，一次穿過 3 個，然後在第 3 個跟七號目標發生了碰撞。轉向讓路，不單是改變了本船的船首向，同樣的，也改變了本船的碰撞位置，將本船移到比較有利的位置，像是目標船的船尾，當本船到達時，目標船已經通過了。

在開闊水域，我們可以轉移碰撞的位置，到目標船船尾之後的任何位置。在限制水域，船長必須能夠知道，在讓路之後，本船是往目標船尾之後的哪一個位置前進，來避免擱淺。
5 號的目標是一個慢速船，相較于其他的左舷與右舷的橫越船，儘管如此，如果 5 號目標他的警覺心夠，知道與 7 號目標與 8 號目標會發生碰撞，就在 6 分鐘之後，他就會更小心的應對。
如果 5 號目標要向右舷轉向，讓路給右舷 7 號跟 8 號船隻，這兩條船幾乎是在她的原來航線，右舷正橫的位置。那些在五號目標船左舷的船隻，會發現他們讓路給五號目標的行動，當 5 號船隻也在採取行動去讓路，並沒有立即的效用。碰撞危機仍然可以處理，但是如何處理呢？三個方向的船隻，都向這個粉紅色的區域靠近集中。
如果這個粉紅色的圓圈是一個禁止進入的圓環，而且所有船隻必須反時鐘方向，向右轉再向左轉繞過，此時所有船隻只有一個選擇，向右舷轉向來繞過它，不管他們是否具有碰撞危機？
如果設了這個避碰圓環，也就是禁止進入區域，每條船在航行的時候，向右舷轉向一點來繞過它，這個結果就是所有的船隻，在接近這個避碰圓環的時候，如果有碰撞危機，都最少要向右轉 10 度，然後由讓路船負責讓路，直到安全通過後，再回到原航線。

Location, location, location

This is golden rule for real estate. Seamen may not understand this is also golden rule for voyage planning. In EDCIS training we use ” no go area“ and safety contour to avoid static danger like reef, shallow waters, ship’s wreck etc. In ARPA trainng we did not have the concept of dynamic danger area with something movable like coastal vessel or fishing boats. We just try our luck when we transit in narrow channel like there are nothing else we can do to help the situation. A prudent navigator will use extremely caution in collision position as in figure 7-01 with the help of “Call Captain here” remarks in standing / night order book or on paper chart. Let’s look into these cases and see what we can do to improve it.

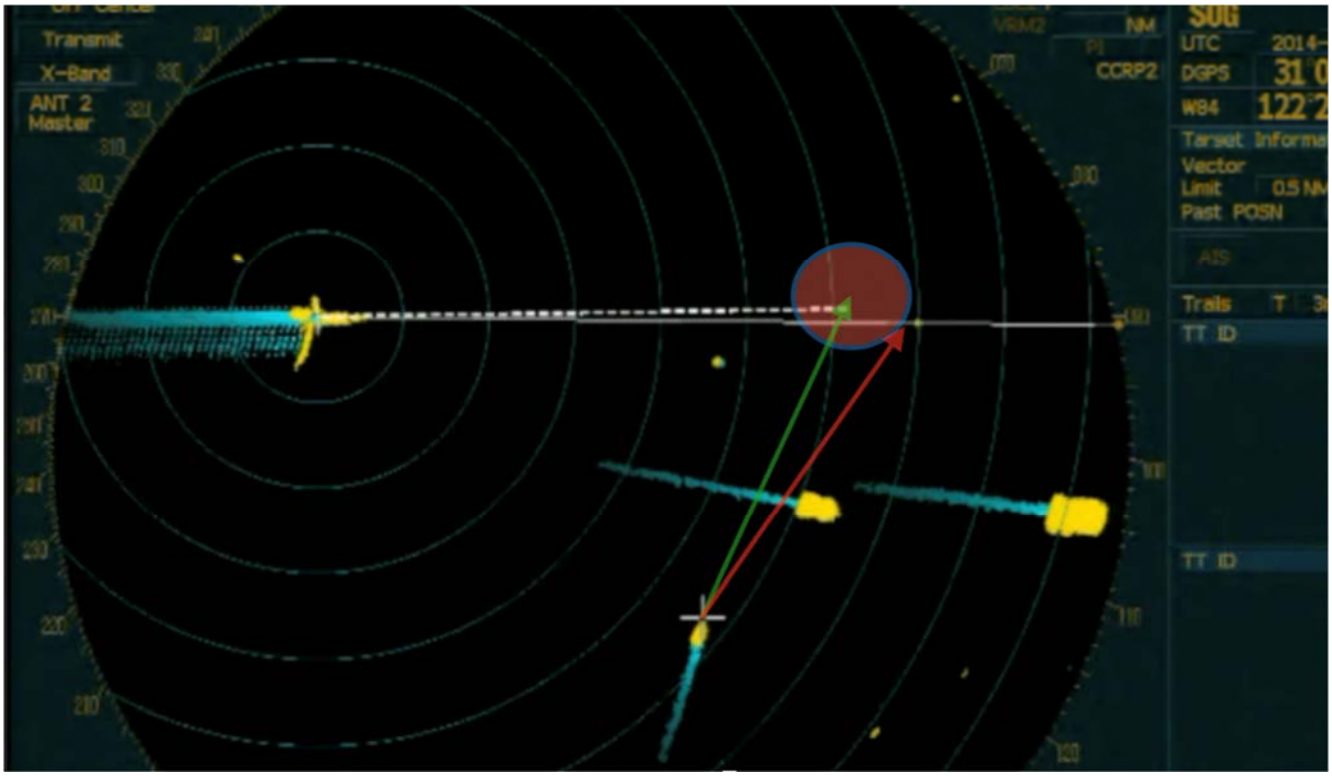
Figure 7- 01: Roundabout for collision avoidance in multiple targets

7-01 Roundabout for collision avoidance

In figure 7-01, we can see hot spots are those crossing point of two vessel’s course line. In radar lookout, it is the crossing point of two vessel’s speed vectors. One simple rule of safety is to avoid all these hot spots like No.1 target go around to north which is not her original course line but far away from these hot spots. No.5 target did not go around hot spot. She had tried and wasted her luck and collided with No.7 target. Give-way is not only change ownship heading to steer, it should change ownship collision position with target vessel to a more favorable position like target’s stern where target vessel had passed already and ownship will arrive later (later is better). In open sea the collision position can be anywhere behind target vessel’s stern. In confined waters Master should be able to know where ownship will be after give -way (to avoid grounding). No.5 target is a slow vessel compare to those vessels crossing from port side and starboard side. Nevertheless, if No.5 target had the vision of her collision risk with No. 7 and No.8 target dead ahead 6 minutes before she will more alert to it. If No. 5 target alter course to starboard side to give way to No. 7 and 8 target vessels which are almost abeam of her original course. Those vessels in No.5 target’s port side may find their action to give way to No. 5 target did not have effect when No. 5 vessel also take actions to give-way. But collision risk is still dissolved. Why?
In figure 7-01, three directions’ vessels converged here in this pink circle which is a concentrated area. If this is a no entry area and all vessels must follow anti-clockwise direction in navigation then all vessels will have only a choice to alter course to starboard side and go around it whether there is a collision risk or not.

With this enlarged collision area (no go area) every vessel approaching should alter course to starboard side to go around.

The result is all vessels passing this collision area will move their collision position to the starboard side of this pink no go area. Then No. 5 south west bound vessels’ collision position with portside vessel (no.1 and 3 in blue circle) will not be same as starboard side vessel (No.7 and 8 in orange circle). These two circle divided by no go area’s diameter. No. 5 target don’t need to do anything to give way while she is stand on vessel by COLREG in blue circle. After portside vessels had all cleared. No.5 vessel arrived Orange circle he may have to give way to No.7 or 8 vessel coming from starboard side.



圖形 7-02 直航船向右轉示範

7-02 如果直航船有義務向右舷轉向，

在避碰規則中，多船隻相遇的情況，並沒有規定，但是多船隻相遇，在世界各地每天都在發生。要解決這個情況，如果超過兩條船在碰撞現場，就是利用圓環的概念，就像岸上一條，創造避碰的圓環。

在圖形 7-01，一通 VHF 的呼叫，從 7 號船隻呼叫 5 號船隻，要求他對 5 分鐘後，會發生的碰撞危機要注意。在這個 VHF 的對話之後，7 號目標船隻有保持他的航向航速，直到碰撞發生。

- ⇒ 碰撞規則要求直航的 7 號目標可以去採取最佳的避碰行動，來避免碰撞，只要讓路的 5 號的目標船還沒有採取行動，如果雙方的距離還遠。
- ⇒ 7 號目標必須採取最佳的避碰行動，來避免碰撞，如果雙方的距離太近，雖然 5 號船必須採取行動，可能會來不及避碰。
- ⇒ 雙方都有某種程度的過錯，5 號的目標船必須讓路，但是沒有採取及早的行動。等到 5 號的目標船要讓路的時候，雙方的距離已經太近。
- ⇒ 5 號的目標船也沒有閑著，在六分鐘內他有 4 個碰撞危機，處理不當，對一個三副也是情有可原，規則不當才是主因吧。
- ⇒ 事實是多佛海峽的北海領港，在經過了這麼多年的航行，在使用這樣的實務，就是把讓路的義務，完全讓給左舷的船隻，要讓左舷船隻來達成避碰的目的。
- ⇒ 換句話說他們並不擔心，左舷的船隻會做什麼？所以並不注意左舷船隻的動態，因為規則規定。

錯誤的心態，造成碰撞的不可避免，當左舷的船隻應該讓路，不論是任何理由，卻沒有執行。不管現在規則是怎樣，如果直航船向右舷轉向，在碰撞前 5 分鐘，這個碰撞位置將會移到他的右邊，這樣可以給讓路船更多的時間，去避免碰撞，就像圖形 7-02。

在直航船向右轉之後，直航船可以評估讓路船動態，如果讓路船並沒有改變航向到右邊去，讓路船可以繼續向右轉，如果讓路船仍然沒有動作，最糟的情形會使得直航船變成被追越船隻。

如果直航船有義務向右舷轉向，這樣兩條船都會更多的時間去避免碰撞。

Figure 7- 02: illustration: Stand on vessel A/C to Starboard

7-02 If Stand on vessel had the obligation to alter course to starboard side

In COLREG, there are no rule for multiple vessels encounter situation. But, it happened everyday around the world. The solution is roundabout concept of the road, every vessel alter course to starboard side to avoid the

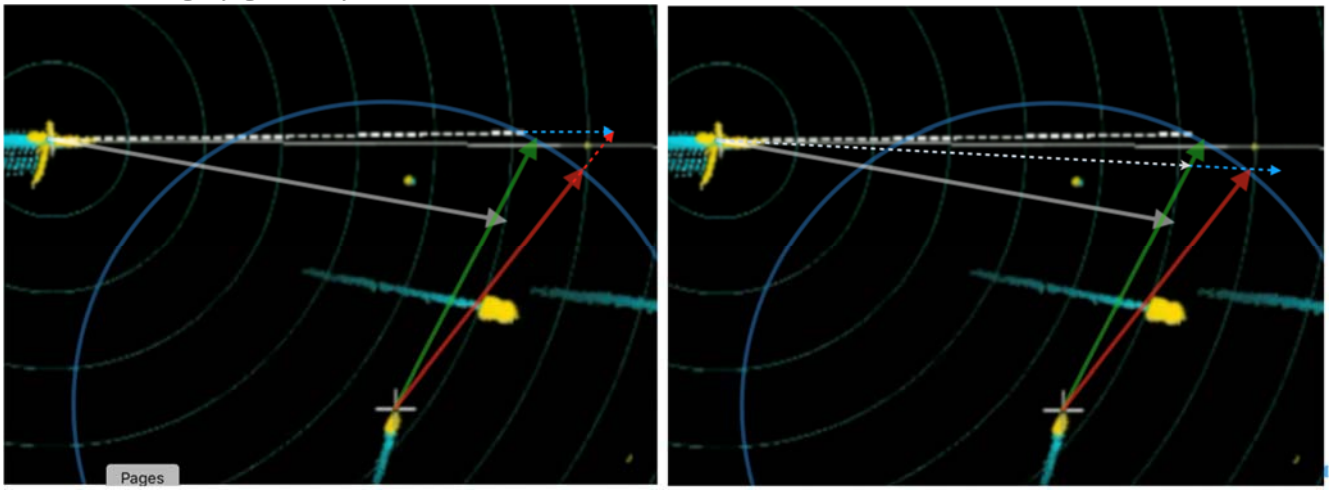
collision if more than two vessels at scene. At that time, a VHF call from no. 7 vessel to No.5 vessel ask for his attention of collision risk 5 minutes before collision. After that VHF conversation, No. 7 target vessel just maintain her course and speed until the collision happened. This is a sign No.7 target vessel had no idea of the collision and her own maneuvering time in this situation. The COLREG had asked No.7 target to take best aide action to avoid the collision as long as No. 5 target had not taken action. When collision happened, both vessels are in fault somehow. One vessel has to give way in earlier stage (second stage). The other vessel is to give way in later stage (third stage) but forget or ignore it in his waiting. At Dover Strait, after so many years, North Sea pilot adopt to this practice ++++++++/-*"leave the obligation to give way vessel (to port side vessel) to fulfil totally". In another words, they don't worry what port side vessel will do and pay no attention to port side vessel's movement. This is a wrong mind-set which make collision awareness lost when the vessel on port side had not acted accordingly out of any cause.

If we leave the COLREG now and think about the possibility of another scenario. In figure 7-02, the stand on vessel had altered course 10 degrees to starboard side while give-way vessel had not. Collision will happen only two vessels arrive same place at same time. If stand on vessel had altered course 10 degrees to starboard side, after 6 minutes, they will not arrive at same place by the end point of their TM speed vectors as figure 7-02. New collision position is moving along their speed vector. Any vessel takes action in a collision situation, the collision position will change immediately. No matter what avoidance action these two vessels had taken, they will arrive new collision position at different time. Thus, difference in arriving time or their position after 6 minutes will help solving collision risk.

Another example: as figure 7-03

If stand on north bound vessel alter course 10 degrees to starboard side 6 minutes before collision (green line to red line direction) and

- **east bound stand-on vessel had not change course and speed,** the collision position will move to give-way starboard side. New collision position is the intersection position of two extended dotted line as left drawing. This **new collision position will give east bound give-way vessel more time TTC** (maybe half minutes) to arrive new collision position. Stand on vessel can evaluate the movement of give-way vessel after course change to starboard side. If give-way vessel had not change course to starboard side to give way, stand on vessel can alter course more to starboard side. By the maneuverability of small vessel and her speed difference with fast give-way TTC will increase very quickly for slow stand on vessel. The worst scenario will make Stand on vessel become overtaken vessel overtaking by give-way vessel.



圖形 7-03 碰撞位置轉移，直航船向右轉 10 度

7-03 如果直航船右轉 10 度，買保險

如果直航船右轉 10 度，讓路船沒有讓路（在圖形 7-03 左圖），效果如下:

⇒ 直航船右轉 10 度，碰撞位置移動到右邊，讓路船必須增加速度，才能到達新的碰撞位置。加快速度在大海上，並不簡單，甚至於並不可能，如果讓路船已經是在海上的全速

前進。原來的碰撞位置，也從一個點脫離，造成適當的海域，直航船有機會可以脫離，讓路船用更多的選項繞過直航船船尾。

⇒ 如果讓路船沒有讓路，保持他原來的航向 270 度，通過碰撞位置的時間增加，兩條船到達碰撞點（紅色與綠色虛線的交點），碰撞時間 TTC 都增加了，速度向量線設定是 3 分鐘。

⇒ 如果這個時間的增加，是因為直航船向右轉 10 度，並不足夠避碰，直航船的避碰選擇，是繼續他向右舷的回轉，最後平行讓路船的航向。

⇒ 建立與讓路船的聯絡，在 VHF 或是霧號，如果可能。

如果讓路船同樣也是向右轉向，那碰撞危機就解決了。在圖形 7-03 的右圖，新的碰撞位置是在讓路船的白色速度向量線的尾端，直航船會先通過這個點，在兩分鐘之後。比原來的碰撞時間少 1 分鐘，讓路船會到達這個新的位置，在 3 分多鐘，1 分多鐘的碰撞時間差異，已經增加了避碰的空間。有安全相對方位概念的讀者，應該會有一點可行的感覺，雖然讓路船船速比本船為快。

如果直航船是 18 節的船速，向右舷轉向 10 度，在碰撞 5 分鐘之前，那這個碰撞位置大約將移動到 482 米的右邊（1852 x 18 / 12 sin100 = 482 meters= 0.26 cables），482 米是 0.26 CABLE，請參考圖形 4-11，轉向後的正橫距離。

在圖形 7-03 左圖，即使讓路船的航向 270 度，沒有改變，船隻的碰撞位置會移動到右邊 482 米，0.26 個 CABLE 距離，大約對 20 節的船是 0.78 分鐘的行駛時間，碰撞時間的增加 0.78 分鐘的差距。0.78 分鐘的行駛時間，對右轉 10 度 18 節的直航船，前進的距離是 433 公尺。

在圖形 7-03 的右圖，讓路船右轉了 3 度，直航船右轉 10 度，在碰撞時間是增加 0.78 分鐘的差距。如果我們還記得圖形 6-09 讓 3 度在 6 分鐘之前，會發生什麼事？這個結果就是，當讓路船到達碰撞位置，讓路船會看到直航船的船尾。

如果兩條船都必須轉向，兩條船都同時轉向 10 度，會製造 0.78 分鐘的碰撞時間差距。這 0.78 分鐘的碰撞時間增加，可能是讓路船在碰撞 3 分鐘之前轉向 10 度，或可能是讓陸船在碰撞 6 分鐘之前轉向 3 度。這兩個情況在圖形 7-03，直航船向右轉向 10 度，結果都是對直航船比較有利。

7-03 If both vessels had altered course to starboard side

For example: In figure 7-03 left drawing, blue dotted line is extended from original course line 090^0 (T). Stand-on vessel original speed vector course 025^0 (T) is green one. She had changed course 10 degrees to starboard side 035^0 (T) as red speed vector. If give-way vessel had not altered course, new collision position will shift along give-way vessel's extended speed vector (blue dotted line) to east.

If stand on north bound vessel alter course 10 degrees to starboard side 6 minutes before collision (green line to red line direction) and

east bound stand-on vessel also altered course 10 degrees to starboard side (dotted line to solid white line), the collision position will move close to give-way small vessel. New collision position is the intersection position of white solid line and red line.

⇒ There is no intersection of while line (speed vector) and red line (speed vector). By radar lookout principle, we know **No intersection point on TM speed vector means No collision risk.**

⇒ Stand on north bound vessel alter course 10 degrees to starboard side moving collision position away from give-way vessel. Although north bound vessel arrive new collision position time had not so much change, give-way east bound vessel arrive new collision position distance is increased which will increase small stand-on vessel's safety margin.

⇒ Give-way east bound vessel have to increase speed to reach new collision position (intersection position of white solid line and red line). Increase speed is not possible in open sea and not easy if give-way vessel already in high speed.

⇒ Collision position will change if any ship takes avoidance action to alter course to starboardside.

⇒ **Collision position can only deteriorate if small stand-on vessel takes avoidance action to alter course to portside** which will surely shorten the time give-way vessel arrive new collision position.

⇒ If the speed vectors in figure 7-03 is 6 minutes, left picture collision time is increased in both vessels if give-way vessel keeps her original course 090^0 (T). If collision time increased because of stand on vessel alter course 10 degrees to starboard side is not enough, the choice of stand-on vessel to avoid collision further is continuing her turning to starboard side or paralleling to give way vessel's course. Contacting give way by VHF or whistle if possible.

⇒ If give-way vessel also alter course to starboard side the collision risk is resolved. In figure 7-03 left drawing, new collision position is at intersection point of white and red speed vector. Stand on vessel will pass this position at 4 minutes time from now, about 2 minute earlier. Give-way vessel will arrive this new collision point about 6 minutes later. 2 minutes difference had increased in TTC time to collision.

⇒ In figure 7-02, even give way vessel course 270^0 (T) had not changed, the collision position of stand-on vessel will shift to starboards side.

⇒ In figure 7-03 right drawing, give-way vessel had altered course 3 degrees (white dotted speed vector). The effect of stand-on vessel altered course 10 degrees to starboard side is 2 minutes difference had increased in TTC time to collision. If we remember "Figure 6-09: What ownship can do by alter course 3 degrees in 6 minutes ahead" the effect is give-way vessel will see stand-on vessel's stern when arrive collision position.

⇒ If both vessels alter course 3 degrees will not so much help to avoid collision. Alter course 10 degrees is only example here.

⇒ In both situations in figure 7-03, stand-on vessel altered course 10 degrees to starboard side will favor herself whether give-way vessel alter course 10 degrees or not.

7-04 是否慢速直航船向右轉向 10 度

⇒ 轉向永遠是最有效的避碰方法，這是對一個快速船隻而言。

⇒ 轉向時的限制是，太大的航向改變，超過 30 度時，就像是學者建議或是避碰法庭判決的要求，避碰的轉向要在 30 到 60 度的範圍，需要 3 分鐘才能完成。這個回轉需求的時間，就像我們在之前討論的，這就是船隻回轉所受到的限制。

⇒ 如果航向改變只有 10 度，那這個航向改變，可以在一分鐘時間內完成，在回轉的第一階段。

⇒ 事實上，5 到 10 度的航向改變，使用自動舵的航向設定鈕，是在避讓漁船的時候，資深船副最經常使用的方法。

⇒ 我們可以瞭解 10 度的航向轉變，功用就像前面的討論一樣，圖形 7-03 左圖藍色的虛線，是從原航線 090 度延伸出來的速度向量線，直航船原來航向 025 度是綠色的速度向量線，讓路船的速度 15 節。直航船的速度 10 節，向右轉了 10 度，紅色的速度向量線是 035 度。如果讓路船沒有改變航向，新的碰撞位置會沿著讓路船的速度向量線向東邊延伸（藍色虛線的終點）。

⇒ 使用目視比較，固定距離圈的寬度 0.25 海浬，新的碰撞位置是大約距離原來碰撞位置更遠一點，綠色的虛線長度約 0.26 海浬。

⇒ 這樣的碰撞位置，會給讓路船多 1.04 分鐘的碰撞時間,(0.26/15*60=1.04),才能到達新的碰撞位置。

⇒ 對直航船而言，新的碰撞位置，也是同樣向前移動，大約 0.15 海浬的距離。

⇒ 直航船延遲碰撞時間為 0.9 分鐘(0.15/10*60=0.9) ，如果直航船單獨向右舷轉向，這個碰撞危機仍然存在。

⇒ 這個碰撞情勢似乎是沒有改變，在直航船向右舷轉向了 10 度，只有得到多的 0.9 分鐘碰撞時間。

⇒ 最少直航船向右邊改變航向 10 度，並沒有造成碰撞危機的進一步惡化，或者我們可以說，並沒有受到影響，因為直航船向右轉的舉動。

⇒ 讓路船同樣得到多餘的 0.9 分鐘時間，在原來碰撞的時間之後，因為直航船單獨向右轉向 10 度。

⇒ 這一節的討論，都是直航船單獨右轉 10 度，但是讓路船並沒有航向改變，碰撞情勢只有延遲碰撞的時間，多了 0.9 分鐘的時間。碰撞前 6 分鐘，直航船單獨向右轉 10 度，只有延遲碰撞時間多 1 分鐘。

7-04 Should Slow Speed Stand on vessel A/C 10^0 to Starboard?

Alter course is always the most effective way to avoid collision for a fast vessel. The requirement is a big course change (more than 30 degrees course change as always required by COLREG court ruling) which will need 3 minutes time to complete the turn. As we discussed before: if the course change is about **10 degrees the course change can be finished within 1 minute time** in first stage of turn. Actually, 5-10 degrees course changes can be set by Auto-Pilot course setting which is most commonly used mathod in avoiding fishing boat by Senior OOW.

For example: In figure 7-03 left drawing, blue dotted line is extended from original course line 090^0 (T). Stand-on vessel speed 11 knots. Give-way vessel is about 18 knots. Stand-on vessel original speed vector course 025^0 (T) is green one. She had changed course 10 degrees to starboard side 035^0 (T) as red speed vector. If give-way vessel had not altered course, new collision position will shift along give-way vessel's extended speed vector (blue dotted line) to east. Speed vector is set to 6 minutes interval.

⇒ This collision position shifting will give give-way vessel about 1 minute more time (measured from the ratio of speed vector) to arrive new collision position.

⇒ Compared with range ring width by visual, new collision point is about 1 minute distance 0.26 nm further east of original collision position (blue dotted line length, 0.26 nm is measured from picture range ring = 0.25 nm).

⇒ New collision position for stand on vessel is also shift about 1 minute distance to East direction. (red dotted line length)

⇒ The collision time are both delayed by 1 minute if stand on vessel change course along (10 degrees to starboard side). The collision risk is still there.

The collision situation seems no change after stand on vessel alter course 10 degrees to starboard side.

⇒ Stand-on vessel only gain 1 more minute before collision (TTC time to collision).

⇒ At least, stand on vessel change course 10 degrees to starboard side had not jeopardized collision situation.

⇒ Maybe give way vessel had not influenced by stand-on vessel's movement to starboard side.

⇒ After all, give-way vessel also gain one more minute extra time before collision by stand-on vessel change course 10 degrees to starboard side.

7-05 如果直航船已經向右轉了 10 度

直航船已經向右舷轉向 10 度，碰撞的情勢急劇的改變，如果讓路船同樣也右轉 10 度，在碰撞 6 分鐘之前。

⇒ 在圖形 7-03 右圖，直航船的原始航向是 025 度，綠色速度向量線。現在直航船已經向右轉轉向 10 度到 035 度，紅色速度向量線。

⇒ 在圖形 7-03 右圖，在讓路船同時轉向 3 度到右舷 093 度，新的碰撞點位置（紅色速度向量線的端點）距離離開原始的碰撞點位置（綠色速度向量線的端點），大約是 0.2 海浬的長度，（0.2x 1852 = 370.4 meters）大約是 370.4 公尺，直航船在碰撞前 6 分鐘右轉 10 度後的正橫距離）

⇒ 在讓路船同時轉向 10 度到右舷 100 度，新的碰撞點位置（白色速度向量線的端點）距離離開原始的碰撞點位置（綠色速度向量線的端點），大約是 0. 3 海浬的長度,(0. 3x 1852 = 555.6meters)大約是 555.6 公尺，這是直航船維持原始航向是 025 度。

⇒ 現在直航船已經向右轉轉向 10 度到 035 度，直航船紅色速度向量線與讓路船白色速度向量線，沒有交點。沒錯，直航船現在安全了，在向右轉轉向 10 度之後，保險終於買到了。

⇒ 在第一個情勢，讓路船轉向 3 度向右轉到 093 度的真航向，直航船向右轉 10 度到 035 度，新的正橫距離增加大約是 370.4 公尺，碰撞危機就解決一半，是一倍船長的距離。但

是，我們是海員，我們開的是地表上最大的機械，碰撞危機仍然存在。我們需要兩倍船長的距離，大約 700 公尺的距離。

⇒ 如果讓路船希望保持 370.4 米的安全距離，然而直航船沒有轉向 10 度時，讓路船必須轉向幾度呢？1.5 Kts x 1852 x sin (ø0) = 370.4 meters. Ø = 7.7 degrees，結果是 7.7 度。依照同樣的邏輯，我們可以預期，想要得到直航船右轉 10 度，同樣的避讓安全距離的效果。讓路船就需要轉更大的角度 7.7 度。

⇒ 同樣，我們可以預期直航船轉向到右舷 10 度，會幫助減少讓路船必須轉向的度數，大概一半的數量。也就是原來讓路船必須轉向 30 度才能夠避碰的，現在只需要轉向 15 度（因為直航船已經轉向 10 度），就可以避免碰撞。

⇒ 讓我們使用新的碰撞位置跟舊的碰撞位置來做比較，得到的效果，就是安全的距離是增加了，370.4 米比原來的 145.4 米（1.5 Kts x 1852 x sin (30) = 145.4meters），再來就是讓路船轉向的角度是比較少，7.7 度比比 3 度，最後就是多出來的碰撞時間，1 分鐘時間。我們可以總結的來說，直航船向右旋轉向 10 度，是好過於讓他停留在原始的航向上。

7-05 If stand-on vessel altered course 10 degrees to starboard side already?

If stand-on vessel altered course 10 degrees to starboard side already, the collision situation changed dramatically after give-way vessel also alter course 3 or 10 degrees to starboard side.

In figure 7-03 right picture, Stand-on vessel's original course is green speed vector 025^0 (T). Now stand-on vessel had altered course 10 degrees to starboard side 035^0 (T) as red speed vector.

⇒ If give way vessel had A/C 3 degrees to starboard side 093^0 (T), the beam distance created **is about one ship's length** (1.1 nm x 1852 x sin (10^0) = 353.7 meters, **distance of new collision position to original collision position**).

⇒ The distance created by new collision position: stand-on vessel A/C 10 degrees starboard side to 100^0 (T) after give way vessel already A/C 10 degrees to 035^0 T (1. 8 nm x 1852 x sin (10^0) = 578.9 meters **is more than one ship's length.**

⇒ New collision position in 7-03 right drawing is stand-on vessel red speed vector's end intersected by give-way vessel's 3 degrees course changed blue dotted line.

⇒ In this situation, give way vessel A/C 3 degrees to starboard side 093^0 (T) and stand on vessel already changed course 10 degrees to starboard side 035^0 (T). If we were in TV game, the collision risk is over. However, we are seaman who driven biggest machine on Earth. The collision risk is still existing because collision potion on board is not symmetric. Sometimes, vessel length is over 353.7 meters.

⇒ If give way vessel want to create 353.7 meters safe distance, by her 18 knots speed, she will need to alter course **Ø = 6.09 degrees** (1.8 Kts x 1852 x sin ($ø^0$) = 353.7 meters).

⇒ Stand-on vessel alter course to starboard side 10 degrees will help to reduce the degrees of course change by give way vessel about half the amount needed. (course change from **6.09 degrees to 3 degrees)**

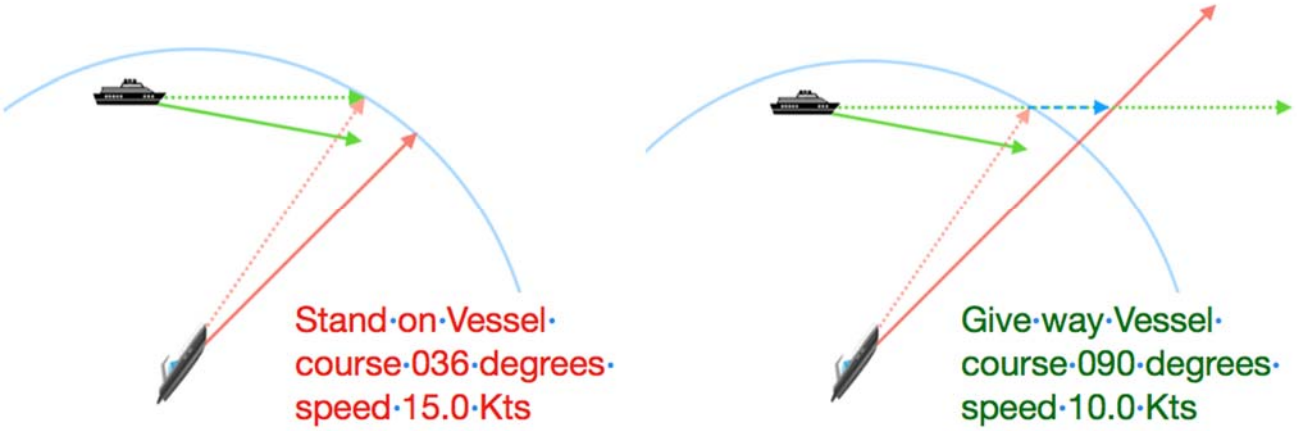
⇒ Stand-on vessel alter course to starboard side 3 degrees will create 174.5 meters beam distance. (1.8 Kts x 1852 x sin (3^0) = 174.5 meters)

If we use new collision position compared with old collision position

- the safe distance is more (353.7 m Vs 174.5 m) or
- alter course angle needed is less (6.09 Vs 3. 00) or
- extra TTC time to collision 1 minute more.

We can summarized as follow:

<u>Stand-on vessel A/C 10^0 to starboard side is better than she stand on original course.</u>



圖形 7-04: 快速的直航船，向右轉 10 度後碰撞位置的轉移

7-06 快速的直航應該向右轉 10 度嗎？

對快速的直航船（高速船）碰撞情勢變化非常快，高速的直航船改變航向 10 度，就像圖形 7-04 所看到的，直航船 15 節的航速，原始航向是紅色的速度向量虛線 036 度，紅色的速度向量線是向右轉 10 度，航向 046 度。讓路船的速度是 10 節，原始的航向是綠色的速度向量虛線，090 的航向，綠色的速度向量線是向右轉 10 度，航向為 100 度真航向，速度向量線是以 6 分鐘為設定。

- ⇒ 如果讓路船轉向 10 度到 100 度的真航向，直航船維持原航向，不轉向，原始碰撞位置（綠色速度向量虛線的終點）到新的碰撞位置（綠色速度向量線的終點）的距離， 10.0 Kts x 1852 x sin (100) x 6 minutes = 321.5 meters，等於 321.5 米。
- ⇒ 這個距離是大約 1 條大船的長度，321.5 米。
- ⇒ 新的碰撞位置沿著直航船原始的速度向量線的相反方向(036+180=216), 216 度的方向，移動 321.5 公尺的距離。
- ⇒ 碰撞的時間減少了 41.7 秒（321. 5 m= 15 knots x ? minute），這是以 15 節直航船的速率來計算的。
- ⇒ 如果直航船維持它原始的航向航速，而只有讓路船轉向 10 度到右舷 10 度，是不夠安全的，因為距離不夠，而且碰撞時間又縮短，難怪學者專家都說轉向 10 度不夠。
- ⇒ 如果直航船轉向 10 度到 046 度的真航向，讓路轉維持原航向，不轉向，新的碰撞點位置（藍色虛線的終點）與原來的碰撞點位置（藍色虛線的起點）的距離，大約是 0.3 海浬 1852 x 0.3= 555.6 meters（圖上量取的），等於 555.6 米，這是沿著讓路船藍色的虛線，大約是大型船隻 1 倍半的船長，如果直航船向右舷轉向 10 度，到紅色的速度向量線。
- ⇒ 如果讓路船希望保持 555.6 米的安全距離，在直航船沒有轉 10 度的情況下，要轉向多少度？才能達到 555.6 公尺的距離，1.0 Kts x 1852 x sin (ø0) = 555.6 meters. Ø = 18 degrees 這就是需要 18 度。
- ⇒ 快速的直航船向右舷轉向 10 度，是比慢速讓路船轉向 18 度有效率的多，然後延遲碰撞時間大約 1. 8 分鐘，這是由 555.6 米 10 節的速度來計算。
- ⇒ 有了這個瞭解，再看看安全相對方位的概念，在圖形 7-04，我們可以看到讓路船的速度是直航船的三分之二，讓路船的安全相對方位是 40 度，現在讓路船的相對方位 45 度，直航船向右轉轉向 10 度，讓路船的相對方位會變成 55 度，超出了讓路船的安全相對方位。
- ⇒ 換句話說，一旦本船將目標船放在安全的相對方位之外，直航船就不可能跟本船發生碰撞，除非他增加速度。

讀者可以試著使用你的分規，使用讓路船的綠色速度向量線，去接觸直航船新的速度向量線，也就是紅色的速度向量線，是否會產生交點。碰撞危機是不可能的，在直航船向右轉向 10 度之後，這使得讓路船的相對方位增加到左舷的 55 度 。

現在這裡的情勢是，快速的直航船向右轉 10 度，比維持原航向航速更安全，因為讓路船可能並沒有維持適當的瞭望，另外一個人為因素的風險。
綜合來說，這證明對於快速的直航船，向右轉 10 度，可以增加安全的因素，尤其是在多船隻相遇的情勢下。

7-06 Should Fast Speed Stand on vessel A/C 10^0 to Starboard?

For fast stand on vessel (HSC high Speed Craft) the collision situation changed dramatically after fast stand on vessel alter course 10 degrees to starboard side as 7-04 figure. Stand-on vessel 15.0 knots original course is red dotted speed vector 036^0 (T) and red solid speed vector is 10 degrees to starboard side 046^0 (T). Give-way vessel's speed 10 knots original course is green dotted speed vector 090^0 (T) and green speed vector is 10 degrees to starboard side 100^0 (T). Speed vector is in 6 minutes.
The distance of original to new collision position after give way slow vessel A/C 10 degrees to starboard side 100^0 (T)) is 10.0 Kts x 1852 x sin (10^0) x 6 minutes = 321.5 meters if stand on vessel don't alter course.

- ⇒ This distance is about one big vessel's length 321. 5 meters.
- ⇒ New collision position moving along stand-on vessel's original speed vector (orange dotted line) to SW (direction 216^0 (T) by 321. 5 meters distance).
- ⇒ Time to collision is reduced 41.7 seconds (321. 5 m= 15 knots x ? minute) by stand-on fast vessel's speed.
- ⇒ It is not safe for stand-on fast vessel to stand on her original course if give-way slow vessel course changes 10 degrees to starboard 100^0 (T).

If stand-on fast vessel alter course 10 degrees (red solid speed vector), the distance of new collision position to original collision position is 15.0 kts x 1852 x sin (10^0) x 6 minutes = 482.4 meters (moving along give-way vessel's green dotted line, about one and half ship's length for VLCS or VLCC).

- ⇒ If give way vessel want to keep 482.4 meters safe distance without give-way vessel A/C 10 degrees, she will need to alter course 1.0 Kts x 1852 x sin ($ø^0$) = 482.4 meters. **Ø = 15.1 degrees.**
- ⇒ **Fast Stand-on vessel alter course to starboard side 10 degrees is more efficiency than slow give way vessel alters course 15 degrees.** (10 degrees to 15 degrees) and delay the collision time about 1.5 minutes. (482.4 m= 10 knots x ? minute)
- ⇒ With the understanding of the SRB safe relative bearing, in figure 7-04 we can see give-way vessel speed in 2/3 of stand-on vessel. Give-way vessel SRB= 40 degrees. Now give-way vessel's Relative bearing is 45 degrees, if stand-on vessel alter course 10 degrees to starboard side relative bearing of give-way vessel is 55 degrees (blue solid line) which is more than her SRB 45 degrees.
- ⇒ In another words, once ownship put slow target vessel outside its SRB it is impossible for slow give-way vessel to collide with ownship (unless she increases her speed).
- ⇒ Reader can use your divider to try to reach ownship new speed vector (orange one) with give-way vessel green speed vector. The collision risk is impossible after stand on vessel alter 10 degrees to starboard side. (which make give way vessel relative bearing 55 degrees to port side).
- ⇒ The situation is **fast stand on vessel alter course to starboard side 10 degrees are safer than stand alone with possible risk of no lookout in slower give-way vessel, another human factor risk.**

In summary, it is proved that fast stand-on vessel alter course 10 degrees to starboard side can increase safe factors of fast stand-on vessel especially when multi ship meeting situations.
In this example, compared new collision position with old collision position

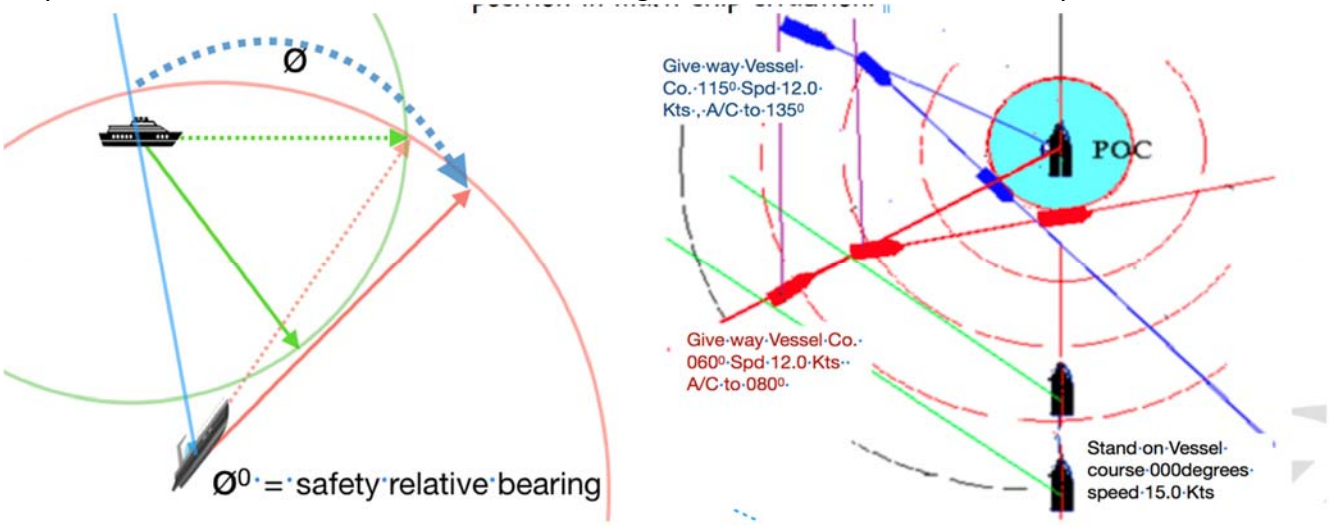
- the distance gained (321.5 Vs 482.4 meters) or
- alter course angle needed (15.1 Vs 10.0),

Fast Stand-on vessel A/C to Starboard is preferable than stand on alone.

Although fast speed vessel needs more room to maneuver, she has more option to avoid the collision especially in high-speed craft. Even if the speed ratio is only two third (give-way 15 Knots, stand-on 10.0 Knots in figure 7-03), give-way vessel course change needed for collision avoidance is less (3 degrees Vs 10 degrees, if stand-on vessel did not A/C to Starboard 10 degrees.)

Take a further look at the figure 7-04, fast stand-on vessel give way to slow give way vessel. About 10 degrees more to starboard side fast stand-on vessel will reach the point where give way cannot have any collision point with him(unless East bound vessel increase speed). This is what we said in Figure 4-15 Safety relative Bearing for High Speed Craft. When Stand on vessel 036^0 (T) did not A/C to Starboard 10 degrees the relative bearing of East bound vessel is 45 degrees port side. This east bound vessel 090^0 (T) will approach in this bearing and have a collision with NE bound fast vessel. When Stand on vessel 036^0 (T) do A/C to Starboard 10 degrees, the relative bearing of the East bound vessel increased to 55 degrees port side as the drawing (which have some degrees difference due to this sketch is not so precise). Please refer to figure 7-05 left picture to study.

COLREG is only meaningful when two vessels have collision risk. If HSC high speed craft can find the way to resolve the collision risk even in close range. It should be recommended by all.



圖形 7-05 直航船向右舷轉向 20 度，碰撞危機沒有惡化

7-07 多船相遇在原來的碰撞位置，創造一個新的禁航區

在圖形 7-05 右圖某黑色船隻航速 15 節是向北航行，如果他堅持原來的航向 000 度，當他遇到航向 060 度的紅色讓路船航速 12 節，這條紅色船隻向右舷轉向，在碰撞前 6 分鐘轉向 20 度，他們的碰撞點會沿著黑色船隻的速度向量線移動，如果他沒有改變 000 度真北的航向。

因為紅色船隻是慢速船，他的航向改變會移動碰撞位置的距離是 0.41 海浬，這是 12 節乘上 6 分鐘乘上 sin (20 度)等於 0.41 海浬。黑色船隻的碰撞時間減少了 1.64 分鐘，這是 15 節乘上 1.64 分鐘等於 0.41 海浬，就在此時，紅船仍然離開新的碰撞位置有 0.33 海浬，12 節乘上 1.64 分鐘=0.33 海浬=607 公尺。607 公尺的距離，應該對大多數避碰的情況，距離都足夠了。

就像我們在圖形 7-02 所討論的，黑色直航船向右舷轉向 10 度，會移動他們的碰撞位置向右，這兩條船的碰撞點，會更進一步向右邊去，這個呢就可以製造多出來的時間與空間，去評估會遇的情況，而不像直航船只能等待讓路船會採取行動。

直航船向右轉的功用，就像是讓路船減速，或是停車，反轉推進方向，兩條船都會有多餘的時間去評估情況，避碰規則建議：如果有必要避免碰撞，或允許更多的時間來評估情況，某船應該減速或是停車或是反轉他主機的推進方式。這是避碰規則的規定，如果我們研究圖形 7-05 跟 7-01 可以看到，如果強制要求直航船向右舷轉向，在多船交會的情況。就是安全區域擴大，創造更多的空間，讓每條船去操縱避免碰撞。在多船相遇的情況，每一條船都向右舷轉向，會創造一個新的禁航圓環，將原來的碰撞位置包圍在裡面，禁止進入，禁止碰撞。

圖形 7-05 直航船向右舷轉向 20 度，碰撞危機沒有惡化

如同圖形 7-05 右圖，三條船同時有碰撞危機，

⇒ 黑色直航船如果不向右轉 20 度，在這情況下，只能任人宰割，

⇒ 如果向右舷轉向 20 度，至少爭取到個別處理碰撞危機的機會，因為碰撞點已經分散。

⇒

任何情況下，直航船向右舷轉向，只有更多的益處，相比於他的壞處。一有碰撞危機，就強制右轉，

⇒ 在狹窄水道裡面，尤其可以節省快速船使用太大的舵角與航向改變角度可以減半，節省轉向需要的時間。

⇒ 對我們前面討論的，慢速船在避讓時的無力感，甚至無助，都有幫助。

這是長期以後，對各方來船都會得到益處。這些功效應該適用於避碰規則 1975 新的修正案上面，尤其是對多船隻相遇的情況，會有很大說明。就像圖形 7-01 。

7-07 Create a new no-go area around original collision position in multi ship situation

In figure 7-05 right picture, the black vessel North bound's situation is much more complicated if she stands on original course 000^0 (T) and speed 15.0 Knots when she met red vessel course 060^0 (T), 12 knots alter course to starboard side 20 degrees 6 minutes before collision. This red vessel had altered course to starboard side their collision point (red vessel on one nm range ring) will move along black vessel's speed vector if she did not change her course 000^0 (T).

- Because red vessel is in slow speed her course change will shift collision position 0.41 nm (12 knots x 6 minutes x sin (20) = 0.41 nm).
- Black vessel's TTC time to collision is reduced 1.64 minutes (15 knots x 1.64 minutes = 0.41 nm). By that time,
- Red vessel is still 0.33 nm away from new collision position (12 knots x 1.64 minutes = 0.33 nm =607 meters).
- 607 meters away should be enough for most case in collision avoidance.

As we discussed at figure 7-02, Black ownship alter course 10 degrees to starboard side will shift their collision point further to starboard side which will create more time to evaluate the meeting situation. The effect of Stand on vessel A/C to Starboard 10 degrees is like give way vessel had reduced speed or stopped engine to gain more time for ownship. Give way vessel are recommended by COLREG to

(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.

If we look into figure 7-05 and 7-01 we can see if stand on vessel is compulsory to alter course to starboard side in multi ship situation will enlarged the safety zone and make more room for every vessel to maneuver to avoid the collision.

Every vessel alter course to starboard side will create a new no-go area around original collision position in multi ship situation.

Figure 7- 05: Collision position shift after Stand on vessel A/C 20^0 to Starboard

In any way, stand-on vessel alter course to starboard side has more advantage than disadvantage. These effects should apply to New amendment of COLREG 1975, especially for multi ship situation as figure 7-01.

7-02 避碰的 BRM 或 HELM

7-08 案例探討：船藝與航運管理

在生命中經常會有一種情況發生，是非常不可預期，卻導致了一個無法避免的意外。在回想的時候，事情就會變得比較明顯，有些行動可以被採取，但當時卻沒有考慮到。也許該使用適當的方法來檢討這個案例，就是要請你，讀者，去思考在這個情況下，你會做些什麼？這個碰撞案例代表在國際航運界一個關鍵的兩難，因為事件的原因，被限定成兩個非常不一樣的解讀。在未來的時間，這樣只會引起更多的混亂與而且更大的風險。在 MAIB 英國海事調查局的報告集中在操作的事項，而海事法庭決定責任的分配，卻只有集中在法律的角度。大家可能會想像，這兩者至少會分享同樣的基本原則，事實上卻沒有。在等待了 4 年，沒想到上訴法庭的判決，進一步的延遲，還會發生。因為這個案件，現在還在最高法院上訴。

7 – 02 BHRM Bridge Human Resource Management in collision avoidance

7-08 Case study Seamanship and Traffic Management

Every so often in life a situation arises which is so unexpected that it leads to an unavoidable accident. In retrospect of course, it becomes apparent that there were actions which could have been taken, but were not considered at the time. Perhaps an appropriate way to review this case is to invite you, the reader, to consider what you would have done in this situation.

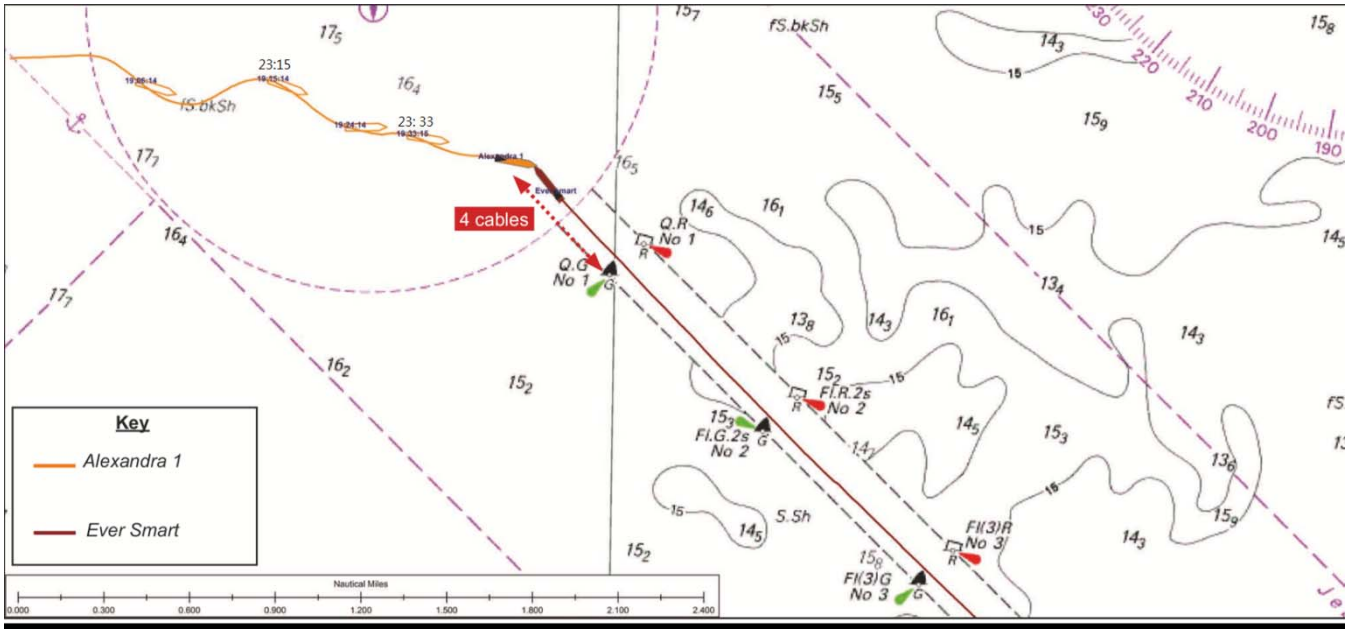
This collision also represents a critical dilemma for the international maritime community because the cause of the incident has been assigned two very different interpretations which can only lead to more confusion and therefore greater risk in future. The MAIB report (i) focused on the operational issues while the Admiralty Court (ii) seeking to apportion levels of liability concentrated solely on legal interpretations. One would like to think that both would share at least the same fundamental principles but currently they do not. Having waited three years to receive a ruling from the Court of Appeal, further delay is to be expected as the case is now to be challenged in the Supreme Court.

7-09 不適當的風險管理

我們相信這個案件真正的價值，是經由專業的研究跟討論，提供關鍵的資訊來防止碰撞跟意外防治，在未來發生的可能。這個案件獨特嗎？顯然不是。在最近的報告，“海事意外的成因在 2002 年到 2016 年”（iii）分析 693 個意外事故，來自於 6 個海事意外調查單位指出，不適當的風險管理是最經常被鑒定出來，事故的近因跟遠因。“通訊失敗”被鑒定出來是碰撞，撞碼頭，或是近接情況的第二原因，是擱淺最經常被鑒定出來的原因。

下面是事件敘述，

在 2015 年的 2 月 11 號英國籍的貨櫃船長慧輪與馬歇爾群島註冊的油輪亞歷山大一號，在接近浮標航道的進口發生碰撞，傑貝阿裡港聯合大公國。貨櫃船出港使用 12 節的速度，並且已經下了領港，油輪非常緩慢地向前移動，在等待領港從貨櫃船上下來登輪，這兩條船船頭都受到結構損傷，並無人員傷亡跟油污染的發生。



圖形 7-06 碰撞的位置在 2342 時

這事件發生在傑貝阿裡的港區範圍，領港跟港口管制員的小心服務，在規劃船隻在港區的通航與解決衝突，在這個案例裡，卻是無效。

7-09 Inadequate risk management

We believe the real value of this case is to be derived from professional study and discussion as this will provide the key to improved collision avoidance and accident prevention in future.

Is this case unique? Apparently not. In a recent report on "The causes of marine accidents in the period 2002-2016" (iii) it analysed 693 accident reports from six marine accident investigation boards. Inadequate risk management was most commonly identified as both an immediate and a contributory cause of accidents. 'Failure in communications' is the third most commonly identified cause. Communication failures are the

most frequent immediately identified cause of groundings and the second most common immediate cause of collisions, contacts and close quarters situations.

The Narrative

On 11 February 2015, the United Kingdom registered container ship Ever Smart collided with the Marshall Islands registered oil tanker Alexandra 1 near the entrance to the buoyed approach channel in Jebel Ali, United Arab Emirates. The container ship was outbound at a speed of 12 knots and had disembarked its pilot. The tanker was inbound and was moving very slowly ahead while waiting for the pilot from the container ship to board. Both vessels suffered major structural damage to their bows but there were no injuries or pollution.

Figure 7- 06: Collision position at 2342 hours

Please refer to figure 7-06, the accident occurred within Jebel Ali's port limits. The precautions of pilotage and the port's vessel traffic service, which would normally co-ordinate and de-conflict the movements of vessels in the port area, were ineffective on this occasion.

7-10 港務台 碰撞前幾秒的提醒

亞歷山大一號的船長誤解了一個 VHF 無線電的訊息，是給其他船隻的指示，以至於亞歷山大一號危險地接近浮標航道進口，造成 出港船隻非常危險的情況。他的速度非常慢，而且太接近航道進口，使得亞歷山大一號無法退出航道。

長慧輪的船長也沒有預期到，他計畫的出港路線，會被幾乎不動的船隻阻礙，這個船隻橫過他的出港航道，在出口 4 個 CABLE 的距離遠。他只有 8 分鐘的時間來評估這個危機，並採取緊急避碰的措施。在船隻減速下領港的階段，他的船隻已經被流水嚴重的推向左舷，船長也有自己的航行優先考慮，就是重新回到安全的水域，這需要增加 5 度的航向改變，來補償因為風力跟水流所造成的下風漂流。

這個碰撞是因為幾個因素引起的，特別是通航的安排，並沒有得到各方同意，或是傳達給這兩個船長。他們的行動都是基於假設跟揣測，亞歷山大一號是不必要的接近航道的入口，油輪船長的行動是基於不充分的 VHF 無線電資料。再來就是長慧輪的駕駛台團隊，並沒有保持適當的瞭望或是監控油輪的動態，只有在亞歷山大一號已經在船頭，港務台通知後，碰撞的前幾秒才被看到。

7-10 Seconds before the collision when alerted by the port control

The captain of Alexandra1 in misunderstanding a VHF radio message directed to another vessel approached dangerously close to the entrance of buoyed channel in such a way that his vessel created an extreme hazard to the outbound ship. His very slow speed and proximity to the entrance endangered his ship with no means of escape.

The captain of Ever Smart did not expect his exit plan to be blocked by a near stationary vessel lying across his track at 4 cables from the entrance. He had just 8 minutes to assess this risk and take emergency avoiding action. However, he having been set significantly to port whilst slowing down and discharging the pilot, he also had a navigational priority to regain safe water which needed an increase in speed and 5 degrees of course to compensate for the leeway caused by the wind and current.

The collision resulted from several factors. In particular, a passing arrangement was not agreed or promulgated and the actions of both masters were based on assumptions. Alexandra 1 was unnecessarily close to the channel entrance and the tanker's master acted on scanty VHF radio information. In addition, Ever Smart's bridge team did not keep a proper lookout or monitor the tanker's movement. They only realized that Alexandra 1 was close ahead seconds before the collision when alerted by the port control.

7-11 太早到航道入口而沮喪

在 2312 時，碰撞的前 30 分鐘，亞歷山大一號的船長看到雷達上面，長慧輪正在通過 8 號浮標，使用阿帕擷取貨櫃船的雷達目標，這使得它可以檢測出港船的動態，瞭解到長慧輪不會很快出

港。2314 時，碰撞前 28 分鐘，亞力山大一號俥鐘由“微速前進”改為停車，油輪是向東漂流，船位在一號浮標的 1.3 海浬遠的位置，船長對於太早到浮標航道入口感到沮喪。

⇒ 亞力山大一號的船長知道長慧輪的位置在浮標 12 號，在 2256 時與港口管制台的通訊後確認。

⇒ 如果以長慧論 12 節的船速來計算，12 號浮標到一號浮標的距離是 0.75 海浬乘上 11= 8.25 海浬，長慧輪需要 41 分鐘的時間，才能到達 1 號浮標，2256 時加上 41 分鐘是 2337 時到一號浮標。

⇒ 我們估計長慧輪到達一號浮標的時間，亞歷山大一號船長並沒有估計。長慧輪到 1 號浮標的時間是 2337，要比他被要求 2315 的時間晚 22 分鐘，表示油輪的船長反應不夠快，長慧輪還在浮標 12 號，並沒有估計到長慧輪要到 2337 時，才會到達一號目標出港。

7-11 frustrated at being off the channel entrance earlier than was necessary

At 2312 C-30, Alexandra 1's master saw by radar that Ever Smart was passing No 8 buoys. He selected the container ship's radar target using the automatic radar plotting aid (ARPA), which enabled him to monitor its progress. The master realised that Ever Smart would not be clear of the channel for some time and at 2314 C-28 he set the engine telegraph from 'dead slow ahead' to 'stop'. The tanker was drifting on an easterly heading 1.3 nm from No1 buoys and the master was frustrated at being off the channel entrance earlier than was necessary.

Situational awareness of "Alexandra" 1 is

⇒ Alexandra 1's master knew Ever Smart position is at buoy No. 12 at 2256 hours VHF communication with VTSO.

⇒ By the Ever Smart speed of 12 knots and the distance from No. 12 to No. 1 is 0.75 nm x 11 = 8.25 nm. Ever Smart will need 41 minutes more to No.1 buoy (0.75 x 11/12 knots x 60 min. = 41 minutes). 2256 hours + 41 minutes = 2337 hours at No. 1 buoy.

⇒ Alexandra 1's Master can estimate ETA of Ever Smart at No.1 buoy is 2337, 22 minutes later than his pilot boarding time 2315 hours.

⇒ By this 20 minutes delay understanding, Alexandra 1's master can reduce speed at 2256 hours.

7-12 當我們的意識等待潛意識的線索

在 2319 時，亞歷山大一號的船長呼叫傑貝阿裡港的管制台，確認領港梯架設的需求，就在現在，這個油輪距離 1 號浮標是 1.058 海浬，前進的方向是 126 度，速度是 2.2 節。

⇒ 船長已經停車，船隻仍然有 2.2 節的對地速度，

⇒ 在還要再等 12 分鐘，船速 2.2 節的速度下，亞力山大一號的船位會從距離一號浮標 1.058 海浬減少到 0.618 海浬。

⇒ 亞力山大一號與一號浮標的距離，是長慧輪可以航行運轉的空間。

在 2328 時亞歷山大一號的主機車鐘搖到微速前進，前進 1 分鐘後，一條拖船 Zakheer Bravo 呼叫傑貝阿裡港口管制台，在 VHF 的無線電上要求同意通過領港站的區域。

這條拖船跟他的駁船是在一號浮標西邊的 1.3 海浬，圖形 7-07 從 Jumerah 向東到傑貝阿裡的東邊，港口管制的員詢問這條拖船的船長，“你是否能看到大型的油輪在領港站等待？”，拖船的船長說，他看得到。然後港口管制台的官員指示他，從油輪後面的 1 海浬船尾通過。

亞力山大一號的船長聽到無線電通聯，然後假定港務台是對本船講話，船長假定如果要通過他的船尾，在長慧輪出了航道之後，應該要向左舷轉向。

亞歷山大一號的船長並沒有跟其他單位確認，那一條船要接受港口管制官員的這項指示？

⇒ 假設傑貝阿裡港口管制台是向長慧輪下達指示，這是基於聽來的資訊，這個就是第一個錯誤。

⇒ 船長並沒有跟其他船隻確認，這是第二個錯誤。

⇒ 船長假設，如果要通過他的船尾，長慧輪將會向左舷轉向，在離開航道之後，這個也是錯誤的假設。

⇒ 為什麼出港船必須讓路給進港船？這個並非是正常的實務，在這個事件，航道的出口位置與航道的進口位置相同，對進港船隻是一樣的。航路的優先應該是屬於出港船隻，這是第三個錯誤跟事件的原因。

混淆，是 1 個人為因素，在這個案件裡面，混淆是一個過程，是我們意識要等待潛意識的線索，像是需要線索來解決一個數學問題，然後就對號入座。在意識層面亞力山大一號的船長聽到港口管制官員的對話，亞歷山大一號的船長顯然希望長慧輪讓路，因為亞歷山大一號的位置，已經讓他無法調頭，再重新進入航道是有困難的。我們可以用圖形 7-08 拖船跟亞歷山大一號，在 2329 的情況檢查。

⇒ 亞歷山大一號的船長解決這個無法調頭操縱的困難，假設出港船會向本船讓路，這是下意識。

⇒ 所以這是一個內心的假設，是的，可以讓亞歷山大一號的船長在現在的位置上面，感到安全舒適，管他哪一個單位正在跟港務台通話？

⇒ 不必等待確認的需求， 因為他的安心就會消失 。

⇒ 假如亞歷山大一號的船長尋求港口管制官員的確認，那他心中的神秘工作，就能夠被解決。

7-12 When our conscious waiting the clues from our subconscious

At 2319, Alexandra 1's master called Jebel Ali port control and confirmed the requirements for the pilot ladder. By now, the tanker was 1.058 nm from No1 buoys, making good a course over the ground of 126° at 2.2 kts.

Situational awareness of "Alexandra" 1 is

⇒ Master had stopped the engine but vessel still have speed over ground 2.2 knots.

⇒ Another 12 minutes waiting (estimated time when Ever Smart will arrive No.1 buoy) with 2.2 Kts, the distance to No.1 buoy *1.058 nm* will decrease to 0.618 nm which is not enough for a sharp turn.

At 2328, Alexandra 1's engine telegraph was set to 'dead slow ahead'. One minute later, the tug Zakheer Bravo called Jebel Ali port control by VHF radio and requested permission to cross the pilot embarkation area. The tug and its tow were 1.3 nm to the west of No1 buoys (refer to Figure 7-07) and were on passage to Jumeirah to the east of Jebel Ali. The VTSO asked the tug's skipper "can you see the big tanker waiting?" The tug's skipper advised that he could and the VTSO instructed him to "cross 1 nm astern of the tanker". Alexandra 1's master heard part of this radio exchange and assumed that Jebel Ali port control was talking to Ever Smart. The master assumed that in order to pass astern of his vessel, Ever Smart would alter course to port on clearing the channel. Alexandra 1's master did not confirm with other party which vessel received instruction from VTSO.

Situational awareness of "Alexandra" 1 is

⇒ *assumed that Jebel Ali port control was talking to Ever Smart:* Wrong assumption based on hearsay information in VHF is her first mistake.

⇒ *Master did not verify which party replied back to VTSO* is second mistake. Master only chooses to hear something already inside his subconscious. Other conversations in VHF cannot make him more aware of the situation. This is not his neglect but continue monitoring VHF working channel is not part of his habit.

⇒ *Master did not confirm with another vessel or confirm with his OOW onboard:* is third mistake. The reason behind this may be very complicated. No good English. No good hearing. No confidence. No delegation. No set up organization in BHRM. No company bridge procedures ask OOW to do radio watch for Master.

⇒ *The Master assumed that in order to pass astern of his vessel, Ever Smart would alter course to port on clearing the channel.:* Assumption by his own without confirmation and against common practice.

⇒ Does outbound vessel have to give way to inbound vessel? Common practice is as follow (copy from Jebal Ali harbour traffic control manual)

In the event that the channel exit point of an outbound vessel is the same as the channel entry point of an inbound vessel, "Right of Way" shall be with the outbound vessel.

this is fourth mistake and cause of incident.

⇒ Confuse caused by uncertainty: this is always a human element in every case. Confuse is a process when our conscious waiting the clues from our subconscious like we wait for the clues to solve a mathematics questionnaire.

- Consciously, Alexandra 1's master heard conversation of Tug boat and VTSO.
- Subconscious, Alexandra 1's master wants Ever Smart to give way because Alexandra 1's position already too close to pilot station makes it hard to turn and entry the channel in a nice and easy manner.
- The root cause of this subconscious wish is Master lost control of arriving time in pilot station.
- To avoid this pressure of lost control and jump out conclusion, it is very important that In any means or with all efforts he had, Master should not arrive pilot station too early. This is the key point of our study in these cases. One point to solve all uncertainty and pressure and assumption and fear.

We can check figure 7-08: Tug boat " Zakheer Bravo " and Alexandra 1 at 2329.

⇒ Alexandra 1's Master solve this difficulty in maneuvering by assuming outbound vessel will give way to ownship in his subconscious.

⇒ This is an assumption which make Alexandra 1's Master feel comfortable waiting in current position.

⇒ The urge to make sure which party is communicating with VTSO is dismissed by his assumption.

⇒ If Alexandra 1's master seeks for clarification with VTSO he may get another instruction hard to accomplish.

⇒ Better waiting which is easy in maneuvering but dangerous in collision. Danger is not his mind now. Why? Master should have the awareness in this radar lookout situation: fear of collision.

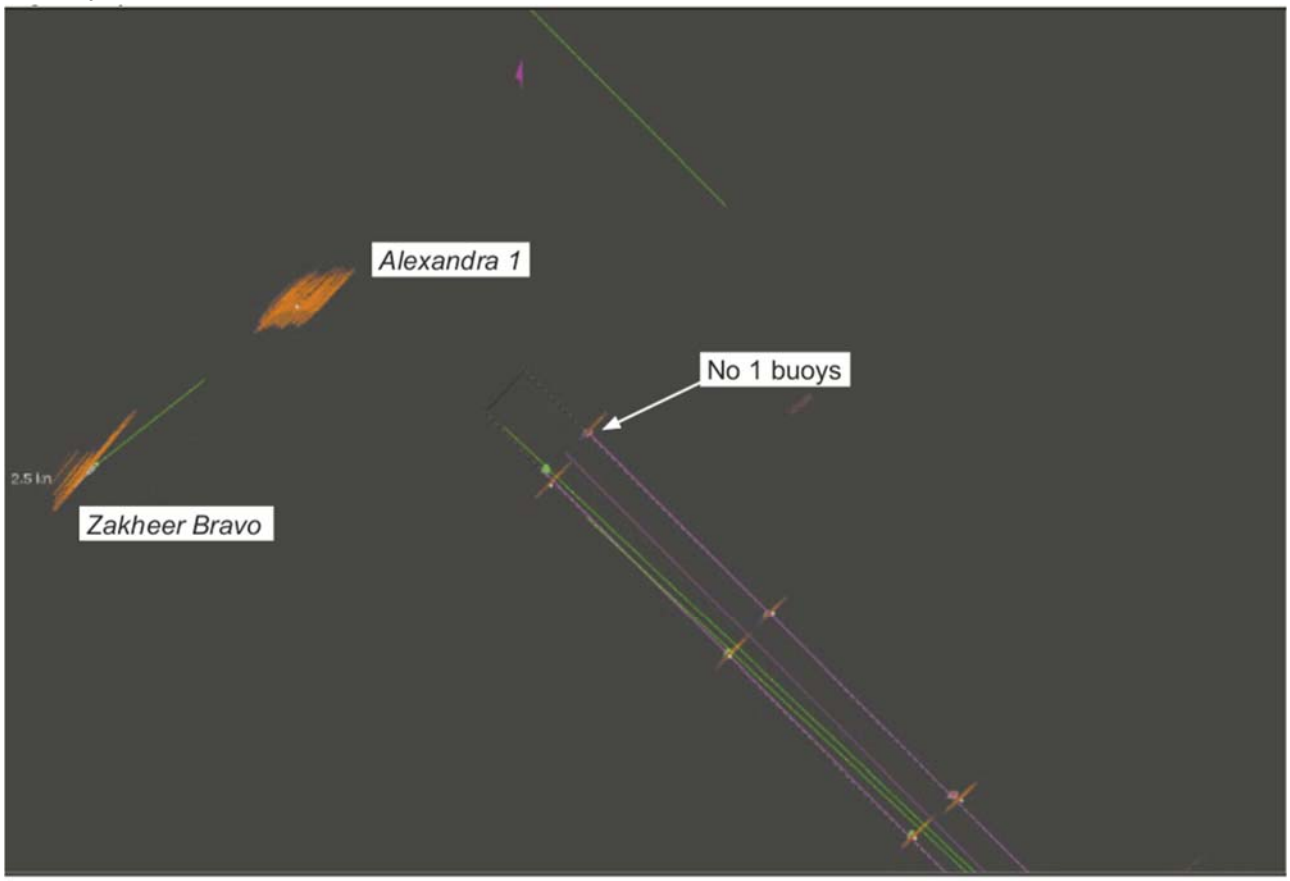


Figure 3: VTS radar showing *Zakheer Bravo* and *Alexandra 1* at 2329

圖形 7-08 拖船 跟亞歷山大一號在 2329 時的位置

7-13 維持本船在安全的船首向速度跟位置

⇒ 亞歷山大一號在 2315 時的位置是，進港船在等領港的正確位置。在圖形 7-06，這個位置在領港站的標記正橫的 4 個 CABLE。

⇒ 在 2315 時的位置，是一個可以接領港的完美位置， 2315 時，也是管制官員通知亞歷山大一號船長，領港要上船的時間。所以如果領港準時在 2315 上船，亞歷山大一號的船長，可說是完美的達成任務。不幸的是，領港卻要延遲 25 到 30 分鐘，才能上船。

⇒ 亞歷山大一號的船長心裡，從 22 點開始，當港口管制官員要求他，在 2315 的時候開到 1 號浮標，一直就都是打定主意 2315 上領港。

⇒ 一號浮標處是一個狹窄的入口，這也不是一個明智的事情。

⇒ 所以港口管制官員如果不肯估計正確的時間，給船長去遵循，只會造成港口的混亂與意外事件頻傳，港口管制官員的素質，會不會算 ETA，也是很重要的。

⇒ 亞歷山大一號等領港位置不對，要適當的操縱該船的船首向，保持船位等等，都造成亞歷山大一號船長的心理壓力，要避免這種潛意識的錯誤，就要任何時侯，都要將本船的船位處理的輕鬆又愉快。

⇒ 亞歷山大一號的船長能夠做的，就是離開一號浮標，保持同樣的距離，讓領港能夠順利登船。

⇒ 亞歷山大一號船隻如果在 2342 的時候，就在 2315 等領港的位置，船長就不必去猜出港船通過一號浮標以後，應該要做些什麼？還是會怎麼做？不論如何，港口管制官員給亞歷山大一號船長的命令，是在一號浮標上領港。亞歷山大一號船長應該做的事，是保持 1 號浮標同樣的距離，以策安全。

⇒ 在 2333 時船位是領港站標記的東南方 0.5 海浬，這是最後一個舒適的位置，來等待領港上船。在操船的時候，感到舒適，就要排除本船對船首向，速度跟位置，這些因素的不確定性。

⇒ 任何航向，航速或是船位的不確定性，就會造成潛意識的錯誤，船長應該設定好安全的範圍，並隨時檢查這些因素，來放鬆他在操船的壓力，或是指派瞭望的任務給當值船副，時不時的檢查一下。

圖形 7-08 拖船 跟亞歷山大一號在 2329 時的位置

7-13 Handle ownship in safe heading, speed and position

⇒ The correct position for inbound vessel waiting pilot is at 2315 hours Alexandra 1's position, in figure 7-06 is the position 4 cable distance Starboardside beam of pilot station marks.

⇒ 2315 hours position is a perfect position for pick up pilot and the time 2315 hours is exactly the time VTSO informed Alexandra 1's master pilot boarding time.

⇒ Alexandra 1 master's mind is set at 2200 hours when VTSO asked him sail to No.1 buoys at 2315 hours. Alexandra 1 arrived this position in time 2315 hours but pilot boat is not there at that time.

⇒ Pilot not available at 2315 hours increased mental pressure to Alexandra 1's master who have to keep ship's position and heading properly.

⇒ What Alexandra 1 master can do is keep some distance away No.1 buoys to facility pilot boarding.

⇒ If Alexandra 1's master waiting pilot at 2315 hours position all the time up to 2342 hours

- he doesn't need to guess what outbound vessel will do after passing No.1 buoys.
- Outbound vessel will have more space to sail outbound without any difficulty.
- Each vessel can go by COLREG easily

However, the VTSO give Alexandra 1 master order to board pilot at No.1 buoy. What Alexandra 1 master should do is keep some distance away No.1 buoys for safety. The position 2333 hours 0.5 nm SE from pilot station mark is last comfortable position to wait for pilot.

⇒ Any uncertainty of these elements in maneuvering: heading, speed or position will create subconscious pressure to remember.

- Master should dedicate or pay mor attention in checking these elements from time to time to ease his own tensions.

- Assign the visual lookout duty to OOW and check it from time to time.

Figure 7- 08: Tug boat " Zakheer Bravo " and Alexandra 1 at 2329

7-14 主張是我們的義氣

⇒ 相對于羞於詢問港口管制官員，船長可以主張他的權責，來修正聽聞的錯誤。

⇒ 船長可以詢問傑貝阿裡的港口管制官員，有如下述

⇒ "傑貝阿裡港口管制，亞歷山大一號呼叫，請確認你的命令，長慧輪要從亞歷山大一號船尾一海浬通過，是這樣嗎？請回答"。

⇒ 船長的權責是基於他對情況的專業瞭解，與對本船安全的關切，這些並不是港口管制官員所熟悉的東西。

⇒ 港務長是一個職稱，並不是一個工作的能力，跟海上的船長是不一樣的，我們應該堅持我們自己的安全，不至於被港口通航服務官員的指示而混淆。VTS 是一個對海員的服務，如果有如何混淆，船長應該儘快的詢問適當的港務台（權責機構），來澄清。

7-14 Assertive is our accountability

⇒ Instead of shame to ask VTSO, Master can assert his authority to correct the mistake of hearsay

⇒ By asking " *Jebel Ali port control,* Alexandra 1 calling, Please confirm your order " *Ever Smart to cross 1 nm astern of Alexandra 1, is that correct, over*".

⇒ Master's authority is based on his professional understandings of the situations and the concerns of his ownship which is not familiar by VTSO at shore base.

⇒ Harbour master is a profession title not a job function of a marine master. We should insist on our own safety without confuse caused by port authority's instruction. VTS is a service to mariner. If any confusion aroused master should ask quickest clarifications with proper authorities.

7-15 通聯中失去的環節

Pilot	*So captain, the time has come for me to go. Just follow the channel 所以，船長，我該走的時候已經到了，只要跟**著航道走**。*
Master	*Do you think I can go myself?* 你是否認為我可以自己走？
Pilot	*Yes, yes. There is this coming now. There is just the one ship. Only this tanker 是的，是的。那裡有一條現在進來，那只有這一條船，只有這個油輪。*
Master	*Yes, yes 好的,好的。*
Pilot	*It's coming. It will wait.... Anyway I go there before ....okay captain 它**要進港，他會等**……無論如何，我會先去那條船……好嗎**？**船長。*
Master	*Yes, yes 好的,好的。*

Table 4 – Conversation between the pilot and *Ever Smart*' s master at 2331 Image courtesy of Jebel Ali Port

在 2331 時的圖形 7-09，長慧輪接近 3 號浮標的時候，領港跟船長討論要下船的計畫（表格 4）。領港沒有給長慧輪船長清晰的指令，該怎麼做？在他下船之後。貨櫃船的船長與領港，顯示對情勢一些共同瞭解，但是亞歷山大一號的船長沒有被告知，在哪裡等待，或是長慧輪離開航道之後的動態。

*所以，船長，我該走的時候到了，只要沿著航道開。*傑貝阿裡港的操作手冊寫到，出港船長慧輪擁有航路的權利，在進港船亞歷山大一號之上。這個對一個熟練的航海家是常識，或是知識的一部分。

*我要走的時候到了：*也許領港監視進港船的動態很久了。當長慧輪在 3 號浮標的時候，領港想進港船已經夠近，讓他去登上進港船。跟進港船有多接近了？船長不知到是否注意到？或是領港在雷達裡面尋找什麼船隻？這是我們的警覺性，質疑與注意領港的一舉一動。

只要跟著航道走，這是領港給船長的指令，是在航道裡面行走而已，他並沒有說，離開航道之後，船長要怎麼走？想來那就不是他的管轄範圍。

⇒ 航道的終點都是比航道本身更危險，這個就沒有在領港的估計之內，這是船長自己要去處理的事情。

⇒ 領港並沒有指示船長應該注意進港船，因為出港船具有航路的權利。

⇒ 船長說道，你是否認為我可以自己走？船長是在詢問，任何不正常的情況，是否需要領港特殊指示。

⇒ 領港離船是基於他對進港船距離的判斷，在圖形 7-09 2331 時，進港船是在領港登輪標記南邊的 0.5 海裡，或是距離 1 號浮標 0.75 海浬，出港船是接近 3 號浮標，這兩條船的距離大約是 2.5 海浬，兩個浮標之間的距離是 0.75 海浬。

⇒ 如果船長具有這方面的知識，他會知道有一條進港船，在兩海浬的距離左右，他就會目視尋找這一條船，或是用雷達瞭望在尋找這條進港船。

*領港：是的，是的，在哪現在有一條來的，哪裡只有一條船，只有這條油輪。*領港並不知道進港船的船名，領港講：一句話分開講了三次，一條／油輪／要進來，卻不知道進港船的船名，叫做亞歷山大一號，這是壞習慣。

⇒ 他沒有概念，他等一下要上去的船，叫什麼名字？如果有任何緊急情況，領港就不知道，要如何呼叫進港船。

⇒ 這兩條船的距離是 2.5 海浬，以 12.9 節的對地速度，要 11.6 分鐘時間的航程，就是領港先生估計他可以用來登上另外一條船的時間，從出港船下船再上到進港船的時間。

⇒ 即使領港船的速度是 12 節，2.5 海浬 12 分鐘才能到進港船，領港還需要攀爬，爬上爬下兩條船領港梯跟樓梯所需要的時間，這兩條船將會在航道中相遇，而這兩條船都沒有領港在船，這對港口的營運也不是一個良好的實務。

⇒ 進港船接近航道的入口一號浮標已經太近，領港在出港船就會想要提早離開，從 3 號浮標之前離開出港船。

⇒ 作為一個進港船的船長，我們應該知道自己的位置，會刺激出港船的領港，產生提前離開的衝動，也就是進港船的船位不對，會讓領著出港船的領港，坐立難安，提早離船去登輪。

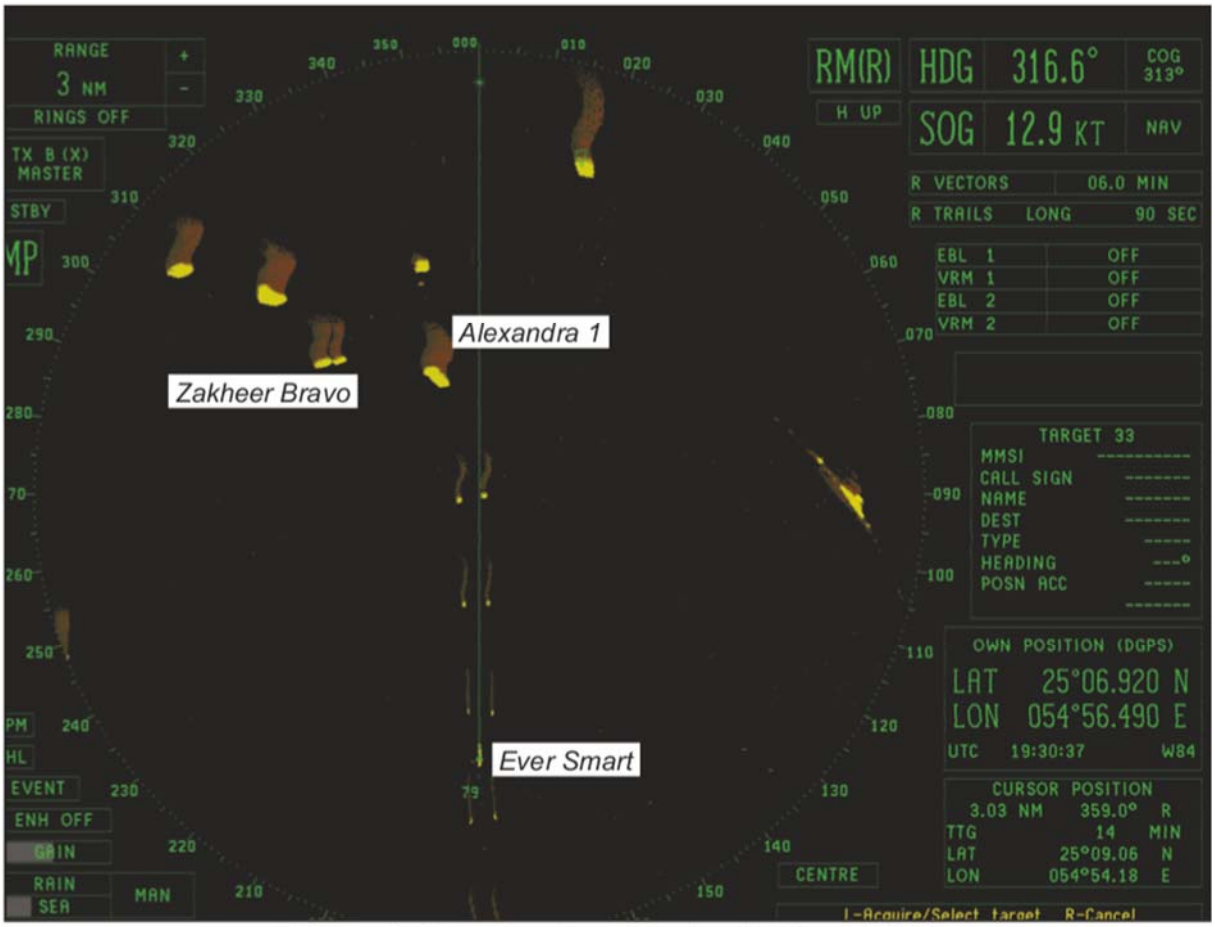


Figure 4: *Ever Smart* – port radar display at 2331

圖形 7-09 雷達畫面，當領港與長慧輪船長討論離船的計畫

船長說道:*好的，好的*。領港曾說，有一條船，雖然他並不是說的很清楚，船長並沒有詢問，這條船的名字，航向航速，方位距離，這條進港船的船位等等。

⇒ 船長能夠對領港這些碎碎念的敘述，感到滿意，這個答案就是在雷達的畫面上，圖形 7-09，講到進港船，每個人的注意力，都是看到右邊船頭，長長尾跡的目標，會立即被這個目標的雷達影像鎖定，而不是亞歷山大一號的目標，現在畫面上有加標注，在當時卻沒有，每個人都會產生這樣的錯覺。

領港說道：*他來了，他會等……不管怎樣我會先去哪裡，OK 船長*。

⇒ *他來了*，領港是說進港船有接近速度，就像領港在雷達上所看到的。對長慧輪船長而言，領港講的字句，是在確認長長尾跡的目標是進港船，他們兩個心裡面想的，是不一樣的船隻。

⇒ *他會等*，領港是在猜測進港船的意圖，雖然領港不知道進港船是會等？還是會直接開進來？

⇒ 事實上，領港並沒有給進港船任何指示，要停車或是等在他現在的位置上。

⇒ 進港船就是現在停車，要把他的距離固定下來，不再繼續前進，可能也是很難，因為他是圓船，會繼續向前滑行，平常在別的地方，慢速滑行沒有問題，現在滑行的每一公尺都是在航道裡。

⇒ *無論如何我會先去哪裡*，即使進港船繼續向港裡面航行，領港會去停止進港船向前面繼續開，這是領港的保證，卻不知道他已經來不及。

⇒ *OK captain，OK 船長*。可能是一個詢問？而不是向船長下的命令？要求船長接受。這個語氣不是聽到錄音帶，是分不清楚的，到底是疑問句？還是命令句？

⇒ 不管領港的意圖是什麼？船長可以堅持立場，認為有必要的時候。不管怎樣，船長的心理可能在想，右邊這條船才是領港所說的進港船。雖然那條船離航道很遠。

領港也搞不清楚，沒有給長慧輪船長清楚的指令，要做什麼？只有前面那一句老話，*沿著航道走，進港船會在那邊等待，即使他不等，領港也會去，這一條在進港，那只有一條船，只有一*

條油輪，他會等，不管怎樣我會先去。領港不知道進港船的名，距離方位跟航向，或是航速，長慧輪直到現在也還不清楚。

⇒ 當然領港可以打混，船長自己應該要做瞭望，尤其是在領港將要離船的階段，最可能的情形，就是長慧輪誤認為，另外一條船在右舷的是進港船。

⇒ 領港先生並沒有清楚交代，這些跟領港交換的對話，可能說的不是同一條船，領港的心思是設定在亞歷山大一號，長慧輪船長可能看的，是他右舷的另外一條船。

⇒ 想想領港說的話，也沒有什麼不對，因為從頭到尾就沒有說出，進港船的任何一項特徵，只有說到他是來了，在進港，是油輪，沒有將航向航速，方位距離，船位等等說出。

如果船長要求領港在雷達螢幕上面，指出來哪一條是進港船，就可以很簡單的解決這個問題。雖然不知道任何一項進港船的資料，船速多少等等？只要雷達螢幕上有標記進港船的回跡，長慧輪的船長就可以接續，做自己的觀察，他船的動向，這是領港該做的事，而不是口齒不清，詞不達意。

所以，這是我們在做**雷達瞭望，交接時候的一個很重要的實務，要把有利害關係的船隻，是用蠟筆在雷達螢幕上標出他的回跡**來，方便後續的同仁，其他的船長，領港，接班的船副等等去參考，光借著數位的資料是會越講越不清楚。

⇒ 圖形 7-09 阿帕畫面並沒有擷取任何目標，說到有一條進港船，很容易會假設就是右邊這個快速船，很難去聯想到左船頭的亞歷山大一號就是進港船。

⇒ 亞歷山大一號現在船的位置，一般可能是其他船隻拋錨的位置，只是錨拋的太接近航道，這是海員的想法。

⇒ 所以領港是交代不清，亞歷山大一號的速度太慢，並不是他避碰的優點，而是他造成出港船，誤解他是拋錨船的原因之一，因為他沒有回跡的產生，

⇒ 他也沒有開 AIS，所以阿帕的螢幕上，沒有可能與亞力山大大一號的碰撞標誌出現，這就是很愚蠢的事情，

⇒ 船速再慢，阿帕都可以自動計算出有碰撞危機，不開就等於是此處無船在航行，是違反 SOLAS 規定。

通訊的鏈結是從發送者的心裡->到發送者的嘴裡->接收者的耳朵->再到接收者的心裡，失去的環節是從發射者的嘴巴->到接受者的耳朵，這個環節呢需要更多的參考資料，來避免這兩個人員站在不同的立場，任何一方只要在雷達螢幕上，指出哪一條船是進港船，就是我們所需要的額外的參考資料，就可以將發送者跟接收者兩個人的思緒想法，結合在真正的進港船上面，而不是只有用簡單的“一條油輪”，讓大家去互相猜想與想像。

7-15 Missing link in communication chain

Pilot	*So captain, the time has come for me to go. Just follow the channel*
Master	*Do you think I can go myself?*
Pilot	*Yes, yes. There is this coming now. There is just the one ship. Only this tanker*
Master	*Yes, yes*
Pilot	*It's coming. It will wait.... Anyway I go there before ....okay captain*
Master	*Yes, yes*

Table 4 – Conversation between the pilot and *Ever Smart*' s master at 2331 Image courtesy of Jebel Ali Port

At 2331 hours figure 7-09, as Ever Smart was approaching No3 buoys, the pilot and the master discussed the pilot's disembarkation (Table 4). The pilot had given Ever Smart's master clear instructions of what to do following his disembarkation and he and the container ship's master showed a common understanding of the

situation. However, Alexandra 1's master was not told where to wait or the intended movement of Ever Smart on leaving the channel.

⇒ *So captain, the time has come for me to go. Just follow the channel*: The operation manual of *Jebel Ali port* "*as the outbound vessel, Ever Smart had 'right of way' over the inbound Alexandra 1.".:* This is common sense or prudent seamanship.

- *the time has come for me to go:* Pilot may have monitored inbound vessel's movement long time ago. Only when Ever Smart had sailed to No.3 buoys Pilot thought it is close enough for him to disembark and go to inbound vessel. Pilot had not informed he is to embark inbound vessel now? Had master notice one vessel is inside pilot station?
- *Just follow the channel*: Pilot had given his instruction to master to navigate inside the channel only, he had not said where to leave the channel. Usually, entrance of channel is more dangerous than channel itself which is not in his consideration.
- Pilot did not instruct master should beware of inbound vessel because he assune outbound vessel has "right of way".

⇒ *Master: Do you think I can go myself*? Master is worry about: Does pilot leave at buoy No. 3 complied with port regulation?

- *Pilot disembarked outbound vessel is based on his judgement of inbound vessel's distance.*
- By 2331 hours figure 7-09, inbound vessel is 0.5 nm south of pilot boarding mark on chart or 0.75 nm from no.1 buoys. Outbound vessel is approaching No.3 buoys. Two vessels distance is about 2.5 nm (two buoy distance is 0.75 nm).
- *If master has aware of pilot's intention, he will detect inbound vessel at 2 nm distance away.*
- He then will monitor this inbound vessel in visual or radar lookout.

⇒ *Pilot: Yes, yes. There is this coming now. There is just the one ship. Only this tanker.:*

- Pilot don't know inbound vessel's name. He said "One tanker coming now" with three sentences without saying in bound vessel's name "Alexandra 1".
- This is a bad habit he has no idea of what vessel he will boarding to take inside.
- In an emergency, pilot will have no way to call her in VHF effectively.
- Two vessels distance is 2.5 nm. By 12.9 knots speed over ground of Ever Smart, 2.5 nm is 11.6 minutes time run.
- Pilot boat speed usually is slower than 12 knots, and there is not enough time for a pilot to climb up and down two vessel's pilot ladder and walk all the way to their bridge when two big vessel approached each other.
- These two vessels will meet in the channel with no pilot on any one of them. It is not a good practice to port operation.
- If inbound vessel had already approached No.1 buoys too close, she should be warned by VTSO to keep clear.
- As an inbound vessel master, we must know ownship's position will cause the concern of outbound vessel directly.

Figure 7- 09: Radar Picture of Ever Smart when pilot and master discussed pilot's disembarkation

⇒ *Master: Yes. Yes.* Mr. pilot had said one vessel although it is not very clear.

- Ever Smart captain did not ask what the name, course, speed or position of inbound vessel?
- How can Master be so contented by Pilot's rambling statement?
- The answer is on radar screen figure 7-09. Talking about inbound vessel, everybody's attention is drawing to starboard bow long trail target immediately not Alexandra 1 as remarked on screen.
- Ever Smart captain must have mistaken the fast inbound vessel (long trail) as what pilot is talking about. So, Captain ask no more.

⇒ *Pilot: It's coming. It will wait.... Anyway I go there before ....okay captain.:*

- *It's coming.*
  - ✧ Pilot is saying inbound vessel has arrived already. (don't know which one but heard in VHF)
  - ✧ To Ever Smart master, pilot's words is confirming the long trail target is inbound vessel although they mean different vessels. (hearing the words he want to hear in subconscious like Alexandra 1 before)
  - ✧ They are not in same page.
- *It will wait....*
  - ✧ Pilot is guessing inbound vessel's intention which pilot don't know whether she will wait or come inside?
  - ✧ Pilot said to himself (self-reassurance) but did not give instruction to inbound vessel to stop.
- *Anyway I go there before ....* Pilot think he can control the situation by going to inbound vessel.
- *okay captain.* If "OK Captain" is a question mark ,not an order to ask Captain to accept, Captain can insist in his ground to ask pilot take the vessel safely outbound. However, Captain may give up his assertiveness because he may think starboard side vessel is the incoming vessel pilot is talking about.

⇒ The pilot had given Ever Smart's master clear instructions of what to do after his disembarkation.

- *Just follow the channel.*
- *There is this coming now. There is just the one ship. Only this tanker.*
- *It will wait.... Anyway I go there before.*

⇒ Mr. Pilot did not know inbound vessel name. Inbound vessel distance, bearing or course or speed are not known by Ever Smart. But Ever Smart Captain thought he knew.

⇒ In these conversations exchanged between Pilot and Captain we know they are not at same page. Pilot's mind is setting to Alexandra 1 and Ever Smart captain may look at another vessel on her starboard side, not dead ahead.

⇒ Asking pilot to show which vessel is the inbound vessel on Radar screen will solve this problem easily.

⇒ From figure 7-09, there are no ARPA acquired target. When Mr. pilot talking about one inbound vessel he will not be able to point it out by target's No. to Captain*?*

⇒ *Alexandra 1* radar echo look like an anchored vessel and they did not send AIS data as required by SOLAS.

Communication chain is from sender's mind -> sender's mouth -> receiver's ear -> receiver's mind. Usually the missing link is from sender's mouth to receiver's ear. This link needs more reference or cross check to avoid talking on wrong target or condition. "show me which vessel is the inbound vessel on Radar screen" is an extra reference or cross check needed to eliminate the error they are talking about.

7-16 不要將本船置於只有等待沒有選擇的境地

在 2332 時碰撞前 10 分鐘，亞歷山大一號主機的車鐘搖到停車，油輪現在的位置，距離航道的入口是 7.7 CABLE，1.8 節的速度向 110 度的方向前進（與進港航道的方向 135 度,差了 35 度）。

⇒ 亞歷山大一號的主機車鐘雖然是搖到了停車，但是對地的速度，仍然維持 1.8 節的速率前進，即時使用向兩舷改變航向 40 度，做迴圈舵的動作，這種重載的油輪是很難停止它對地的速度。

⇒ 亞歷山大一號的船長是等待要橫越航道，去通過長慧輪船頭，以右對右通過，基於這個假設，"長慧輪會橫越亞歷山大一號船尾後方 1 海浬"，這個假設會繼續存在，因為亞歷山大一號船長找到方法，合理化他的假設，就是儘量接近航道，讓長慧輪能夠橫越其船尾之後的一海浬來通過。

⇒ 如果這是亞歷山大一號船長的選擇，右對右通行，亞歷山大一號船長應該在長慧輪離開浮標航道之前，橫越過航道的方向，這樣才不會誤解。

⇒ 而不是在長慧輪剛剛要從航道出來的時候，才去橫越航道，這個意思就是說亞歷山大一號船長，如果下定決心要右對右通過，他應該開到航到的東北邊等待，而不是在出港船出港的時候才作橫越的動作。

⇒ 他沒有考慮到出港船轉向所需要的前進距離，以及萬一來不及轉向，就會發生碰撞的情勢。所以他就是猶豫不決，把操船避讓的責任，完全都交給長慧輪，自己把船檔在航道上，而且是船頭擋在哪裡，後面還有 300 米的船身長度，需要長慧輪去做正橫距離的避讓。

⇒ 亞歷山大一號船長並不希望放棄他現在的位置，就是在航道出口的中央，在這個位置是進港的位置，也是出港的位置，亞歷山大一號擋到出港船所有的方向，不管是出港船要向左轉，向右轉，還是向前走。

⇒ 亞歷山大一號把讓路的義務交給出港船，這是一個很傻的事情，就像是在桑吉輪的案例裡面，將避讓的責任交給長峰水晶輪一樣，另外一個原因就是油輪上面的貨物，是經不起碰撞的，現在他橫在航道前面，以等待對方的避讓來解救自己。避的過是運氣，避不開呢受傷害的就自己，很可能像桑吉輪一樣，自己的全船起火爆炸。

⇒ 這個油輪現在距離航道的出口是 7.7 個 CABLE ， 1.8 節的速度前進航向是 100 度，7.7 CABLE 離開航道的，就是等待領港最後的位置。以前的船藝，最後的位置叫做“不歸點”或是“半海浬前”，超越這個點就沒有回轉空間，可以讓亞歷山大一號或是長慧輪可以自由運轉，避免碰撞發生，就像兩部沒有煞車的汽車，在狹窄的巷道裡面發生碰撞。因為船的回轉是分三階段的，不能完成三階段完全的回轉，船隻就是坐在鐵軌上面的火車，只能呢向前滑行，完全沒有自主避碰的能力。

⇒ 最後的碰撞位置是離 1 號浮標，就是航道的出口是 4 個 CABLE，是兩條船在第一階段的回轉時。現在 7.7 CABLE，碰撞時是 4 個 CABLE，這 3.7 CABLE 的距離的差距，可以使這兩條船進入第二階段的回轉，來避免船頭對船頭的碰撞，如果他們的航向差 180 度，是相對的。

⇒ 亞歷山大一號擋到了出港船的航線，與製造不必要的側面積，需要長慧輪回轉到第三階段，才能有足夠的正橫距離去避碰，當他有很多的選項，在航道的外側等待，距離一號浮標 4 CABLE，並不夠出港船去採取適當的回轉來避免碰撞，不應該將本船置於沒有選擇，只有等待的境地。

7-16 Don’t leave ownship no choice but wait

At 2332 C-10, Alexandra 1’s engine telegraph was set to ‘stop’. The tanker was 7.7 cables from the channel entrance at a speed of 1.8 kts and maintaining a heading of 100° (T).

⇒ Alexandra 1’s engine telegraph was set to ‘stop’ but ground speed maintained 1.8 knots even with course change 40 degrees to both side, rudder cycling. Heavy loaded tanker is hard to stop over ground.

⇒ Alexandra 1’s master want to cross the channel to pass Ever Smart “Starboard to Starboard” in slow speed by the assumption of “ *Ever Smart to cross 1 nm astern of Alexandra 1.*”

⇒ The assumption carried on because Master finds the way (cross the channel) to let *Ever Smart* to *cross 1 nm astern of Alexandra 1.*

⇒ If this is a choice of Alexandra 1 master “to pass starboard to starboard” then **Alexandra 1 master should cross the channel before Ever Smart come out,** not crossing so late when Ever Smart arrived No.1 buoys.

⇒ Alexandra 1’s master did not want to give up the position he occupied (in center of outbound fairway).

- ✧ In this position, Alexandra 1 blocked the way of all outbound vessel and
- ✧ **Alexandra 1 leaves all obligations to give way to outbound vessel** which is a foolish thing to do as we discussed before **never arrive collision position earlier than other vessel**.

⇒ *The tanker was 7.7 cables from the channel entrance at a speed of 1.8 kts and maintaining a heading of 100° (T).*

- ✧ 7.7 cables from the channel entrance is the last proper position to wait for pilot. (as we had discussed before advance distance of turning circle)
- ✧ This is where old seamanship said “point of no return” or “half miles away”.
- ✧ Beyond this point there is no turning back space for Alexandra 1 or Ever Smart.
- ✧ The collision is due to happen like two cars crash inside narrow alley where no beam distance is available to avoid collision position.

⇒ Vessels are turning in three stages. Final collision position is 4 cables away from No.1 buoys when both vessels are at first stage of turn. In 2332 hours, with (7.7- 4.0 =) 3.7 cables distance to collision, these two vessels only had turn in first stage with bow to bow collision.

⇒ **Alexandra 1 blocked all way outbound vessel need to navigate while she has many options to wait outside the channel.**

⇒ 4 cables away from No.1 buoys are not enough to make a proper turn to avoid collision, not Ever Smart nor Alexandra 1.

⇒ **Don’t leave ownship in any ground where we have no choice but to wait.**

7-17 錯誤的接近位置與時機：非必要的接近航道入口

亞歷山大一號已經可以由長慧輪駕駛台看得到，這個油輪也顯示在雷達上，但是他的回跡並沒有被擷取，就像一個阿帕的目標。圖形 7-09 在 2334 時碰撞前 8 分鐘，亞歷山大一號的主機車鐘，再度推倒微速前進，與此同時，領港指示長慧輪船長減速到 10 節，並維持對地航向 314 度，同時重提油輪的船長會在航道的西側等待，亞歷山大一號離開 1 號浮標是 0.7 海浬。現在領港就與三副離開了駕駛台，船長下令舵工操縱 319 度，然後調整左舷的雷達顯示真北向上，用眼睛，他估計這條油輪可以通過貨櫃船的左舷，大約在 1.5 個 CABLE 的距離。

⇒ 在 1 號浮標到 13 號浮標，這個航道的軸線是 315 度/135 度，領港下令維持 314 度的航向去操船，並沒有注意到本船的船位，已經是在航道的左邊。船長下令舵工去操舵 319 度的航向，比這個 315 度的軸線還要多 4 度，這是正確的選擇，來抵抗流水的向左的推力。

⇒ 檢查圖形 7-09 我們可以看到 319 度的船首向，舵工的操舵，也僅僅只夠維持長慧輪繼續留在航道的左邊，如果如同避碰規則，在狹窄水道裡面的規則要求的，回到航道的右邊，長慧輪必須要再加個 5 度，操舵到 324 度，才有可能回到航道的右邊，不過這個是我們現在的後見之明。在現場，船長是不可能這樣子做，他一定是先加 5 度，檢查船位以後，看看不行，再加五度，要一邊走一邊修正，沒有辦法直接的得出正確的結論跟答案，要因時因地制宜。

⇒ 領港同時提醒船長，這條油輪會在航道的西邊等待，亞歷山大一號並沒有在領港所說的位置等待，浮標航道的西邊，然後亞歷山大一號主機的車鐘，再度搖到了微速前進，要

橫越航道，讓其他正在出港的船隻避讓本船，這是愚蠢的行為，因為他還沒有明顯的看到，他船轉向的動作，就自行假設採取行動。

7-17 Wrong approaching position and timing: unnecessarily close to channel entrance

Alexandra 1 was visible from *Ever Smart's* bridge. The tanker was also available on the radar displays but it was not acquired as an ARPA target (Figure 7-09).

At 2334 C-8, Alexandra 1's engine telegraph was again set to –. At about the same time, the pilot advised Ever Smart's master to reduce speed to 10 kts and to maintain a course over the ground of 314°. He also reminded the master of the tanker waiting to the west of the entrance to the buoyed channel; Alexandra 1 was 0.7 nm from the No1 buoys. The pilot then left the bridge, accompanied by the third officer. The master ordered the helmsman to steer 319° and adjusted the port radar display to 'north-up'. By eye, he estimated that the tanker would pass down the container ship's port side at a distance of 1.5 cables.

⇒ Between buoys 1 and 13, the channel's axis was 315°/135°. Pilot ordered 314^0(T) courses to steer he had not noticed ownship position is at port side of fairway.

⇒ The master ordered the helmsman to steer 319° (T), 4. degrees more than 315°(T) is correct choice to against current setting to port side.

⇒ Checking on figure 7-09, we can see heading 319° (T), 4 degrees more to 315°(T), is only enough to keep Ever Smart remaining inside the channel which is at port side now.

⇒ To go back to starboard side of channel as required by COLREG narrow channel rule, Ever Smart may need to apply another 5 degrees leeway to 324°(T).

⇒ Pilot also reminded the master of the tanker is waiting to the west of the entrance to the buoyed channel.

⇒ Alexandra 1's not at position pilot said (west of the entrance to the buoyed channel) and engine telegraph was again set to 'dead slow ahead' to cross the channel while Ever Smart is outbound.

7-18 沒有駕駛台資源管理的技術與忽視人為因素的影響

這個碰撞是由幾個因素造成，特別是通航計畫沒有得到同意，或者是讓其他人知曉，這兩條船船長的行動都是基於假設，亞歷山大一號是沒有必要的接近航道入口，油輪船長是基於不充分的 VHF 無線電資料來做的行動。加上，長慧輪的駕駛台團隊，並沒有保持適當的瞭望，或是監控油輪的動態。他們只有在碰撞前幾秒，亞力山大一號已經在正船頭，得到港務台警告，才瞭解到它船位置。長慧輪船長假定亞歷山大一號會保持遠離，他並沒有要求三副仔細的監控油輪的動態，而是自行在瞭望操船。

⇒ 長慧輪船長跟三副並沒有保持適當的瞭望監控油輪的動態，是因為船長在跟另外一個人在駕駛台聊天。

⇒ 事情總是像這樣，當船長跟非相關人員在駕駛台聊天的時候，船副也會覺得放鬆，從出港部署的壓力裡解放，這就是人為因素的層面。

⇒ 就人為因素而論，亞力山大一號不動作比長慧輪不專心更嚴重，亞力山大一號船長沒有聊天，卻一錯再錯，完全沒有保持正確的安全距離與無線電確認它船動態，沒有與任何外部單位做互動，才是最大的問題。長慧輪船長是一直受到領港錯誤資訊的誤導。

7-18 No BHRM skill and overlook human element influences

The collision resulted from several factors. In particular, a passing arrangement was not agreed or promulgated and the actions of both masters were based on assumptions. ***Alexandra 1 was unnecessarily close to the channel entrance*** *and the tanker's master acted on scanty VHF radio information. In addition,* ***Ever Smart's bridge team did not keep a proper lookout or monitor the tanker's movement.*** *They only realised that Alexandra 1 was close ahead seconds before the collision when alerted by the port control.*

Ever Smart's master assumed that Alexandra 1 would keep clear and he didn't take it upon himself or task the third officer to closely monitor the tanker (BHRM aspect).

⇒ Ever Smart master and third mate did not keep proper lookout and monitor tanker's movement due to captain is chatting with one person on bridge.

⇒ Things always like this when Captain is chatting with non-business person OOW will also relax from the tension of departure station on bridge (human element aspect).

⇒ ***Alexandra 1 was unnecessarily close to the channel entrance.*** When Alexandra 1 has no speed or very slow speed the collision position is where she is located. Keep away from the channel will keep away collision happened inside channel.

7-19 什麼樣的應變措施能夠解決這個情況

在 2340 時碰撞前兩分鐘，亞歷山大一號的船長看到長慧輪通過 1 號浮標後，開始擔心，貨櫃船並沒有向左舷轉向，就像他預期的一樣。又經過了 1 分鐘的觀察，在 2341 分 28 秒時，亞歷山大一號船長呼叫傑貝阿裡港務台，在 VHF 的頻道，請參考 TABLE 5。

⇒ 在 2340 時碰撞前兩分鐘，長慧輪通過 1 號浮標，這兩分鐘就是亞歷山大一號留給長慧輪去操船，採取避碰行動的時間，這個時間根本就不夠一個尖船回轉，亞歷山大一號船長看到長慧輪並沒有向左舷轉向，就是在這個時間，船長對於他自己現在所在的船位，感到不安。在前面的時間，他都認為自己是在正確的船位上，只有當出港船沒有左轉的時候，他才感到不安。

⇒ 亞歷山大一號是非必要的接近到航道的進口，這個就是他的疏忽，他沒有保留足夠的回轉空間給長慧輪，等於是進入了長慧輪太空船的空間，也就是進入長慧輪的碰撞面裡面，現在碰撞已經無可避免。

⇒ 這是對的，但是並不是全部的事實，真正的事實是亞歷山大一號根本就是把 1 號浮標出來的所有的路徑，都已經封死了。

⇒ 4 個 CABLE 的距離，只有兩倍的船長，本來就不夠回轉之用。這不是一個警急的計畫，當碰撞危機急迫的時候，亞歷山大一號船長對碰撞的時間，沒有概念，因為從 1 號浮標到他現在位置，碰撞時間只有兩分鐘，碰撞距離只有 4 個 CABLE，造成碰撞無法避免。

⇒ 亞歷山大一號的船長沒有航向的改變，需要 3 分鐘的概念。當有疑問的時候，亞歷山大一號的船長應該使用霧號，或是日間信號燈五閃光或是 5 短聲，來提供長慧輪直接的視覺和聽覺的信號，而不是向港務台抱怨。

⇒ 當有碰撞危機時，船長第一件事情，應該是要保護本船的生命財產安全。亞歷山大 1 號應該轉向 135 度來平行來船航向，應該轉向跟出港船航向相對來保護他自己。

⇒ 但是過了 1 分鐘，在 2 3 4 1 分 28 秒亞歷山大一號的船長卻去呼叫傑貝阿裡的港務台，這個寶貴的 1 分鐘被浪費掉，亞力山大一號船長應該是很瞭解，回轉至少要有 1 分鐘的時間才能啟動，碰撞前 1 分鐘是對船隻回轉最關鍵的階段，就像我們在 7-16 所討論的一樣。

⇒ 長慧輪現在操縱的航向是 319 度，這也不足以馬上回到航道的右邊，長慧輪現在船位是在航道的左邊，亞歷山大一號的船長認為長慧輪的意圖，是要通過本船的右舷。這就是為什麼亞歷山大一號船長開始使用主機微速前進，在 2334 時間。

2341:28	*Alexandra 1* (Master)	*Jebel Ali port control this is Alexandra 1 come in. Container not changing course. This is collision 傑貝阿裡港務台，這是亞歷山大一號請回答，貨櫃船沒有轉向，這是碰**撞***
	VTSO	*I told him. Are they clear of buoy No1 then you will be entering the channel I said 我告訴他，他們是否離開了一號浮標，然後你**會進入航道，我說過***
	Alexandra 1 (Master)	*He's going to collision to me now! 現在他將撞到我*

2341:28 hours 30 seconds before collision, Alexandra 1 master call VTSO and said "this is collision".

2341 時 28 秒碰撞之前 30 秒，亞歷山大一號船長呼叫港務台，然後說到，"這是碰撞"

⇒ 在 2256 時港務台官員已經有告訴船長，出港船隻的名稱是長慧輪，船長卻沒有很注意這個資訊，這也是不良的船藝。

⇒ 不知道出港船的名稱，亞歷山大一號沒辦法跟長慧輪通訊，來澄清出港船的意圖，是否要右對右通過，在平常時候不用心出港船的船名，而不是像現在緊急的時候，不知如何與外界聯絡，用海員的術語來說，亞歷山大一號並沒有適當的無線電當值。

⇒ 亞歷山大一號在 VHF 聽到的是，是通過油輪的船尾一海浬，為什麼亞歷山大一號船長認為，這是要求長慧輪去通過他的船尾，右對右通行。

⇒ 為了顯示船尾方位，亞歷山大一號保持航向 102 度，而不是 135 度，135 度是航道進港的方向，所以這個方向差了 32 度，增加出港船的困難，因為你增加了出港船需要避讓的正橫距離。

⇒ 怎麼亞歷山大一號都是做得很愚蠢的事情，不管長慧輪要從哪左舷還是右舷通過，你都應該儘量縮小本船可能被碰撞的面積，不管你是在航道的左側，還是右側？

⇒ 船長應該知道港務台的官員並不是上帝，他需要保留一些時間，才能夠理解你的敘述，如果是我，一個有經驗的模擬機碰撞訓練的講師，而不是這個港務台官員，就可以很容易確認這兩條船碰性質，碰撞的時間跟距離，以及碰撞的角度，利用這兩條船雷達的速度向量線，而你也應該能夠，如果你希望成為一個船長，或是適任的港口管制台官員。

⇒ 現在的情勢是長慧輪速度 11 節，船首向 319 度，而亞歷山大一號船艏向 102 度，以兩節的速度前進，要避免碰撞，保持相同航向，是這兩條船唯一的希望，因為他們的距離已經太近。

⇒ 如果要求長慧輪去轉向，平行亞歷山大一號，相對的航向是 282 度，這個是 102 度加 180 度，但這並不合理，因為航道出口的方向是 315 度，要轉到 282 度有困難，亞歷山大一號又太接近 1 號浮標，要求亞歷山大一號採取從 102 度轉到 135 度還比較合理，因為他在航道的外側，沒有水深的顧慮。

⇒ 當碰撞發生的時候，亞歷山大一號正在橫越航道，亞歷山大一號的抱怨是有用的，港口管制官員集中在對長慧輪的通話，雖然亞歷山大一號是在錯誤的航向跟位置，也就是港口管制台的官員並沒有監控到亞歷山大一號錯誤的船位跟船首向。

⇒ 亞歷山大一號呼叫港務台以後，港務台就把矛頭對準長慧輪，實際上是錯誤的，港務台應該是要求亞力山大一號要走正確的航向。

7-19 What contingency plan can solve this situation?

At 2340 (two minutes before collision), Alexandra 1's master saw Ever Smart pass between the No1 buoys and became concerned that the container ship had not altered course to port as he had expected. After one minute at 2341:28, Alexandra 1's master called Jebel Ali port control on the VHF radio (as Table 5 below).

⇒ *At 2340 (two minutes before collision):* These 2 minutes is the maneuvering time Alexandra 1 leave to Ever Smart to take action which is not enough for a sharp vessel to turn.

⇒ *Alexandra 1's master saw Ever Smart had not altered course to port.:* This is the time when Master feel unease of his own position. ***Alexandra 1 was unnecessarily close to the channel entrance.*** This is correct but not whole truth. Alexandra 1 blocked all way out from No.1 buoys as we learnt from vessel turning in three stages which need at least 3 minutes to finish.

⇒ This has not recognized as a contingency plan as collision risk is imminent. Alexandra 1's master has no idea of TTC time to collision is only 2 minutes, DTC distance to collision is 4 cables at his current position. (amazing)

⇒ Alexandra 1's master has no idea course change needs 3 minutes to create enough beam distance to pass each other.

⇒ When it is in doubt Alexandra 1's master should use whistle or ALDIS light 5 short blast/flashes to give visual and sound signal to Ever Smart directly, not complain to outside party who had no maneuvering ability to vessels.

⇒ First thing in mind is to protect ownship "Alexandra 1" and alter course to parallel with oncoming vessel to protect himself.

⇒ *After one minute at 2341:28, Alexandra 1's master called Jebel Ali port control.:*

- This one minute is wasted in waiting although Alexandra 1 master knows every ship's turning need one minute to start.
- The very minute before collision is crucial to ship's turning stage as we discussed in chapter 7-16.

- "Alexandra 1" has no way to go to another side of fairway by her own engine power (*dead slow ahead* now) for starboardside to starboardside passage.

⇒ Refer to figure 7-06 Ever Smart steered course 319^0 (T) is not enough to go back to starboard side of channel which may be mistaken by Alexandra 1 master as Ever Smart intention is to pass ownship's stern.

⇒ That's why Alexandra 1 master start the engine with '*dead slow ahead*' in 2334 hours.

2341:28	*Alexandra 1* (Master)	*Jebel Ali port control this is Alexandra 1 come in. Container not changing course. This is collision*
	VTSO	*I told him. Are they clear of buoy No1 then you will be entering the channel I said*
	Alexandra 1 (Master)	*He's going to collision to me now!*

2341:28 hours 30 seconds before collision, Alexandra 1 master call VTSO and said "this is collision".

⇒ At 2256 hours, VTSO had told Master outbound vessel's name "Ever Smart".

- Master did not pay attention to this. Bad seamanship.
- Without outbound vessel's name, Alexandra 1 cannot communicate with Ever Smart to clarify her intention to pass starboard to starboard in the early hours and in time of emergency like now. In mariner term, Alexandra 1 did not have proper radio watch.

⇒ What Alexandra 1 heard in VHF is "*cross 1 nm astern of the tanker*".

- Why Alexandra 1 master think this is asking Ever Smart to pass her stern?
- In order to show her stern Alexandra 1 have to keep heading as 102^0 (T) which will leave her in a vulnerable situation (ship's body open to coming vessel),
- not 135^0 (T) which is inbound direction to buoyed channel which can be treated as a Head-on vessel. (use ownship bow to meet coming vessel is more safer)

⇒ Master should know VTSO is not God.

- He needs some time to review your statements.
- If I (an experienced instructor of simulator collision exercises) were VTSO, I need to verify the collision situation of these two vessel's radar speed vectors and
- Find proper words to inform Ever Smart master of the collision situation I saw
- The situation now is Ever Smart in 11 knots heading 319^0 (T) and Alexandra 1 in 2 knots heading 102^0 (T).
- Advise both vessels how to avoid collision by establishing communication through VHF first.
- How can I (VTSO) know Ever Smart Captain can get correct understanding and take necessary in this close range?

⇒ To ask Ever Smart to alter course to parallel with Alexandra 1 reciprocal course 282^0 (T) (102^0 (T) + 180^0) is not reasonable as the channel is leading by $135^0/315^0$ (T).

⇒ To ask Alexandra 1 to alter course from 102^0 (T) to 135^0 (T) is more reasonable. Alexandra 1 is crossing channel at time of collision.

⇒ Alexandra 1’ s complaint is working. VTSO focus on Eve Smart and try to communicate, although Alexandra 1 had taken wrong place in exit of fairway already.

7-20 亞歷山大一號已在碰撞位置且占了航道出口

港口管制官員立即呼叫：長慧輪，領港還在領港船上跟亞歷山大一號的船長插嘴介入，表格 6。

2341:48	VTSO	*Ever Smart this is Jebel Ali port 長慧輪，這是傑貝阿裡港*
2341:52	*Ever Smart* (third officer)	*Jebel Ali port this is Ever Smart. Good morning … 傑貝阿裡港，這是長慧輪，早安…*
2341:55	VTSO	*Are you clearing to starboard please? We have the tanker there coming to enter the channel... [overspoken] 你**是否離開到右邊去，請**。我們這有條油輪要進到航道裡面……（被其他人的聲音打斷）*
2341:55	Pilot	*Ever Smart, Hard to starboard! Hard to starboard! Hard to starboard!* 長慧輪，右滿舵，右滿舵，右滿舵
2342	*Alexandra 1* (master)	*Hard to ******** starboard Hard to starboard. Ever Smart hard to starboard. 滿舵向……右，右滿舵，長慧輪，右滿舵*

在這些 VHF 的發送之間，亞歷山大一號主機的車鐘搖到“全速倒車”，甲板燈跟外部的住艙燈光，同時都打開了。23 點 42 分 12 秒，長慧船長“OK，右滿舵”，他然後感歎到，“那是什麼？”。3 秒之後 2342 分 19 秒，長慧輪跟亞歷山大一號，船頭對船頭碰撞。碰撞的位置離 1 號浮標是 4 個 CABLE。

⇒ 在 23 41 分 28 秒時，亞歷山大一號船長“這是碰撞，他現在要撞到我”港口管制官員並不知道亞歷山大一號船長的意圖與船位，但是他聽到有碰撞危機。

⇒ 在 23 41 分 48 秒港口管制官員呼叫“長慧輪，這是傑貝阿裡港”

⇒ 在 23 41 分 52 秒，長慧輪並不知道亞力山大一號船長的意圖，但是碰撞危機已經在等著，三副回答得很有禮貌，“早安”

⇒ 在 2341 分 55 秒，港口管制官員詢問長慧輪“是否離開到右邊去，請。我們這有條油輪要進來……”，與此同時，領港注意到碰撞危機，要求“長慧輪，右滿舵，右滿舵，右滿舵”

⇒ 23 時 42 分，亞歷山大一號船長知道長慧輪正在離開航道，同樣下了舵令給長慧輪，“滿舵……向右，長慧輪，右滿舵” 亞歷山大一號船長在這裡，聽到領港的右滿舵，應該是如雷貫耳，因為與他的預期不同，要再下令給長慧輪的時候，他是有點猶豫，因為他本來預期長慧輪要從他的船尾通過，也就是左邊通過，領港卻要長慧輪右滿舵，他只有叫長慧輪“右滿舵”，因為他認為指揮權還是在領港身上，然後他把自己的車鐘搖到-全速倒

車，並打開甲班燈光，準備迎接碰撞。他做的這些小動作，後來在法庭上證明，還非常有用。

⇒ 在這些 VHF 的發送中，亞歷山大一號俥鐘搖到-全速倒車，對海員來說，這是沒有用的，亞歷山大一號已經在碰撞的位置上，並且佔據了航道的出口，他剛剛還有-微速前進的速度，加上他重載，船是停不下來的。

⇒ 亞歷山大一號跟長慧輪的兩位船長，對哪裡是碰撞位置，並沒有概念，亞力山大一號進入領港站以後，並不知道本船已經在碰撞位置，而長慧輪不知道本船正在接近碰撞位置，有一條船已經等著他去碰撞。

⇒ 在 23 時 32 分 12 秒，港口管制官員，領港跟進港船，全部都叫道"右滿舵"，才看到船頭有船的甲板燈，長慧輪的船長才跟著下令"OK 右滿舵"。船長接著跟菲律賓三副感歎了一句，"那是什麼？"，這句英文，坐實了他不當瞭望的罪名。

⇒ 在 23 時 42 分 19 秒，長慧輪跟亞歷山大一號船頭跟船頭碰撞，這個碰撞的位置離開一號浮標 4 個 CABLE，請參考圖形 4-08 不同大小貨櫃船的使用滿舵回轉，長慧輪是藍色的船長，需要 600 米=3.24 CABLE 才能離開他原始的航向線。

7-20 Alexandra 1 already in collision position and occupied the exit of channel.

The VTSO immediately called Ever Smart. The pilot, who was still on board the pilot launch and Alexandra 1's master also intervened (Table 6).

2341:48	VTSO	*Ever Smart this is Jebel Ali port*
2341:52	*Ever Smart* (third officer)	*Jebel Ali port this is Ever Smart. Good morning ...*
2341:55	VTSO	*Are you clearing to starboard please? We have the tanker there coming to enter the channel... [overspoken]*
2341:55	Pilot	*Ever Smart, Hard to starboard! Hard to starboard! Hard to starboard!*
2342	*Alexandra 1* (master)	*Hard to ******** starboard Hard to starboard. Ever Smart hard to starboard.*

During these VHF transmissions, Alexandra 1's engine telegraph was set to 'full astern'; the tanker's deck lights and external accommodation lights were also switched on. At 2342:12, Ever Smart's master ordered 'OK hard to starboard'. He then exclaimed "what's that?" Three seconds later, at 2342:19, Ever Smart and Alexandra 1 collided bow to bow. The collision position is 4 cables from the No1 buoys.

⇒ At 2341:28 hours, Alexandra 1 Master *"This is collision" "He's going to collision to me now!".* VTSO did not know what Alexandra 1 Master's intention but he know the collision risk is there.

⇒ At 2341:48 hours, VTSO called *"Ever Smart this is Jebel Ali port ".*

⇒ At 2341:52 hours, Ever Smart 3/O did not know what Alexandra 1 Master's intention and collision risk is there. - He replied with polite *"Good morning ...".*

⇒ At 2341:55 hours, VTSO ask Ever Smart "Are you clearing to starboard please? We have the tanker there coming to enter the channel... ". - VTSO clarify the situation as usual.

⇒ At same time, pilot noticed collision risk and ask Ever Smart "*Ever Smart, Hard to starboard! Hard to starboard! Hard to starboard!"* – Pilot had (more experienced in radar and visual lookout) seeing and knowing immediately what have to do right now.

⇒ At 2342 hours, Alexandra 1 Master hesitated in Pilot's instruction (three hard starboard in a row) and called in VHF against his own will. "*Hard to ******** starboard Hard to starboard. Ever Smart hard to starboard."*

⇒ In this critical moment, Alexandra 1 Master knew Outbound vessel's name immediately. (why not early?) If he knew outbound vessel's name earlier, he will be able to communicate or clarify the meeting situation earlier. (pay No attention in VHF watch)

⇒ After these VHF massage exchanged, Alexandra 1's engine telegraph was set to 'full astern': this is useless as Alexandra 1 already in collision position and occupied the exit of channel. (but these can get some sympathy points in court's final verdict)

⇒ Alexandra 1 and Ever Smart both Masters have no idea where collision position will be. Alexandra 1 don't know ownship is in collision position and Ever Smart don't know ownship is approaching to it where one vessel is waiting her to collide.

⇒ *At 2342:12 hours,* VTSO, pilot and incoming vessel all called out " Hard to starboard", *Ever Smart's master ordered 'OK hard to starboard'.* (still have no idea what happened by his and 3/O visual lookout, they depend on AIS data in ARPA lookout)

⇒ *At 2342:16 hours, He then exclaimed "what's that?" w*hile Ever Smart master look ahead *the tanker's deck lights and external accommodation lights were also switched on.* (this exclamation before collision reveal his shock reminded us of what happened in Sanchi's case after collision)

⇒ *At 2342:19 hours, Ever Smart and Alexandra 1 collided bow to bow. The collision position is 4 cables from the No1 buoys.* Refer to Figure 4-08 different size container vessel turning with hard over rudder. Ever Smart is blue color size vessel which needs 600 meter (3.24 cable) to leave her original course line.

7-21 公開通訊環境裡的正向回饋

這個事件是在開放的網路，由錯誤的 VHF 通訊所引發的，這在 MAIB 的報告，說到"在繁忙的港口區域，清晰與正確的 VHF 通訊是很重要的，無論如何，因為缺乏 VHF 無線電通訊的紀律，是一個普遍的問題，在不斷地閒聊中，導致其他單位交換的訊息被話音覆蓋，是經常發生的事，結果就是遺失部分通訊的可能就增加了 。"

⇒ 在這個案子，這港口的工作頻道 VHF 頻道 69 非常繁忙，亞歷山大一號的船長並沒有聽到全部的訊息，在港務台與拖船 ZAKHEER BRAVO 之間的通訊，其結果就是雖然船長正確的假設，通話裡面講的油輪就是亞歷山大一號，他很明顯的不知道，這條拖船的名稱有

問題，不知道拖船名稱，是因為前面港務台告訴他，長慧輪的名字時，他也沒有注意，這個港口管制官員正在對話的船名，對他就是メメメ，不知所云。

⇒ 這個不知道港務台在說什麼的情況，船長也很沒面子，所以他選擇保持沉默，要他去澄清這樣的情形，不論是與港務台或是與長慧輪，他都做不到，只有基於不完整的訊息，自行採取錯誤的行動。

⇒ 要澄清這個情況，跟港務台或是長慧輪應該只需要 30 秒時間，在碰撞前 14 分鐘，多專心一點，或多問一下，就可以解決問題。這個主題對所有港口操作人員跟海員，都需要做當作是一個重大的事件。

⇒ 這裡還有其他的考量，當亞歷山大一號將他的 AIS 關掉時，對長慧輪來講，要識別進港船隻，就非常困難，而長慧輪卻是依賴 AIS 的雷達顯示，做為唯一有效的瞭望工具，這就造成對哪一條船是進港船的混淆？

⇒ 話說跑船沒有什麼應該是唯一的，要交互參照，重複核對才是優良船藝。

⇒ 長慧輪並沒有對領港的資訊，使用更多的交互參照，在雷達的畫面上清晰指認進港船，在開放的通訊環境之中，要確保使用正向的確認。

⇒ 領港告訴長慧輪有一條船進港，長慧輪船長並沒有確認他的瞭解，利用雷達指出進港船，或使用口頭確認。

Communications

7-21 Positive feedback in an open communication environment.

Communication failures are the most frequent immediately identified cause of groundings and the second most common immediate cause of collisions, contacts and close quarters situations.
This incident was triggered by a mistaken VHF communication on an open network. The MAIB report section 2.4 stated:-

"*In busy port areas, the clarity and accuracy of VHF traffic is essential. However, the lack of discipline on VHF radio is a common problem in some regions. Constant 'chatter' resulting in exchanges being over-spoken is a regular occurrence. Consequently, the possibility of missing transmissions or parts of transmissions is increased.* "

In this case, the port's working channel, VHF channel 69, was very busy and Alexandra 1' s master did not hear full exchange between port control and the tug Zakheer Bravo. As a result, although the master correctly assumed that the 'tanker' referred to in the exchange was Alexandra 1, he clearly did not know the name of the vessel the VTSO was talking to. In such circumstances, it would appropriate for the master to clarify the situation with either port control or Ever Smart rather than taking action on the basis of incomplete information".

To clarify the situation with port control or Ever Smart with VHF could be done within half minute time, 14 minutes before collision. We believe this subject is of vital concern to all port operators and mariners and needs to be addressed as a matter of urgency. There were other considerations. Alexandra 1 had her AIS turned off making ship identification more difficult and Ever Smart rely on AIS display as sole effective lookout

means which cause confusion about what was expected inbound vessel. And, Ever Smart did not confirm pilot's information with extra reference in radar screen. Clarity can only be secured by positive feedback in an open communication environment. Pilot told Ever Smart one vessel inbound but Ever Smart master did not confirm his understanding by indicating which one is inbound vessel by verbal or radar display.

7-22 專注於離開航道開始海上的航行

就在領港剛下船之後，長慧輪船長注意到油輪的位置，已經在航道的西側，也就是左邊，而他專注於要離開航道，開始海上的旅程。這可以由改變雷達的顯示，為真北向上，可以對港區外面的形勢，有所瞭解。他下令舵工操舵 319 度，然後增加船速。

⇒ 長慧輪的船長沒有注意長慧輪跟亞歷山大輪的接近距離，是下領港時，因為領港向他保證，亞歷山大一號會在浮標航道的外側等待，（很可惜，法庭並不承認領港的口頭承諾，認為是長慧輪不當瞭望），他被提醒到油輪的進港，在表格 4。

船長並沒有將亞歷山大一號作是一個阿帕的目標，他就是沒有注意到亞歷山大一號的動態，是接近航道的進口，而兩條船之間的最少距離正在減少，反而他是依賴早點的評估，油輪會從貨櫃船左舷 1.5 CABLE 通過。

⇒ 不幸的是，那是下領港的時候，下了領港以後，他就沒有多做注意這一條船隻。

⇒ 在表格式 4 的 VHF 通信，領港並沒有對這條船提出太多的資訊，MAIB 的報告寫到，只有斷斷續續說些“一條油輪正在進港”的三句話，並沒有提供其他進港船的位置，航向，航速，方位，距離等等。

⇒ 長慧輪沒有正面的回饋，長慧輪也不知道領港說的是哪一條船，也不知道要從哪裡開始問，船長的回答只能說“好的，好的”。

⇒ 2331 時，領港沒有進一步的資訊給長慧輪船長，長慧輪也沒有進一步的詢問任何事情，直到 23340 時，3 分鐘時間沒有一個單位尋求澄清，通訊的鏈條就是斷掉了，也就是領港跟船長之間的對話，就是各說各話，都沒解決問題，只有提供一些模糊混淆的資訊。

就在領港下船之後，常慧輪的船長注意力轉移到本船的船位在西邊，然後他必須儘快離開航道，開始海上的旅途，這是由他改變雷達的顯示為真北向上，下令舵工操舵 319 度，跟在車鐘上加車，都是放洋之前的準備動作。

⇒ 船長專注于在這些動作是好的，但是作為一個船長，需要照顧更多的事情，在此同時，我們需要一個 SOP 標準的作業程式，對於非常複雜的作業，出港就是其中之一。

⇒ 標準作業程式並不單是寫出所有應該要做的事情，如何做？以什麼樣的順序做？是否同時做？也是很重要的。可是這在書面的資料上，除了一二三四的順序以外，看不出個別重大的急迫性，“注意進港船”並沒有包括在出港標準的作業程式裡面，這個要求跟瞭望的需要，會被認為是航行當值常規工作的一部分，不會特別寫出來，這是跑船的本能直覺的一部份。

⇒ 所以沒有良好的工作習慣，也會失去部分的直覺，包括在駕駛台跟不相關的人員聊天，勿以惡小而為之，勿以善小而不為，說的就是習慣的重要。

⇒ 在這些 SOP，我們看到船長將雷達的顯示改為真北向上等等，有限的短期記憶就是每一個海員必須面對的人為限制，長慧輪的船長在狹窄水道裡面，是注意本船的船為航向，而不是注意進港的船隻，長慧輪的航跡顯示，流水將長慧輪推動的很快。

⇒ 長慧輪船長知道領港要離船，要上去進港船，這一條進港船，船長可以檢查領港船小艇前往的方向，就知道進港船是在什麼位置？雖然現在要求他知道進港船的船名跟船位，作為良好的情勢知覺的一部分，已經是奢求。因為他有本身船隻的狀況需要優先照顧，只要檢查一下領港的小艇開去哪裡？便知道哪裡需要注意什麼？船長可能沒時間去注意？

⇒ 這就是為什麼我們需要先確認進港船在那裡？在領港下船之前，因為領港離船時，船長就會太忙了，應該把其他的事情，可以先解決的，先解決辦好。

⇒ 知道了哪一條是進港船，我們就可以使用阿帕，或者授權給其他船副來監控這條進港船，船長並沒有將亞歷山大一號標注為追蹤目標之一，結果就是他並沒有注意到亞力山大一號的動態，是向我船接近，並且兩船之間的最近距離，正在減少。

⇒ 船長沒有注意到進港船的動態，在雷達螢幕上。不在現場，可能我們很難知道，是否有其他的拋錨船隻，海上油井，以及岸上的背景燈光，使得進港船的燈光，無法清楚目視，進港船是在航道外側，他是否已經進到航道裡面？船長如果沒有回頭望一下，出港航道的方向，很難在雷達上面或是目視做出清楚的判斷。

⇒ 船長依賴眼睛的評估，可以與出港船以 1.5 CABLE 的正橫距離通過，船長就沒有再注意進港船。從 2331 時，領港告訴他的時候，只要沿著航道開，就可以離開這個港口，而不是要避免跟開到航道中線的進港船碰撞。

⇒ 出港也沒有辦法使用右滿舵，在碰撞前 30 秒來避免碰撞，長慧輪船長完全沒有預料到，有一條船等待在他出港的航道上面。

⇒ 長慧輪船長合理的推測，亞歷山大一號的動態應該是要轉向到 135 度，這是進港的方向，亞歷山大一號卻維持 102 度的方向，繼續橫越航道，這樣才會發生碰撞。

⇒ 如果長慧輪提早向右轉，亞歷山大一號卻維持 102 度的方向，繼續橫越航道，很可能就會把長慧輪開腸破肚，死在當場，這個是進港船所造成的困境，長慧輪沒有及早發現這條船，是重大的失誤。亞力山大一號的錯誤，更多更大，法庭的看法卻是 80/20，長慧輪賠的多。

這個案件還有很多討論的空間。

Failing to keep a proper lookout

7-22 Focused on clearing the channel and commencing the sea passage.

During and immediately after the pilot's disembarkation, Ever Smart's master was aware of the container ship's position towards the western side of the channel and he was focused on clearing the channel and commencing the sea passage as soon as possible. This is supported by his change of the radar display to 'north up', his order to the helmsman to steer 319° and the increase in speed. "

Ever Smart's master does not appear to have paid similar attention to close passing distance between Ever Smart and Alexandra 1. He had known that Alexandra 1 was waiting at the end of the buoyed channel and he had been reminded of the tanker's presence by the pilot ***(Table 4)****. However, the master did not select Alexandra 1 as an ARPA target. Consequently, he was unaware of its movement towards the channel entrance and the reducing CPA. Instead, he relied on his assessment by eye that it would pass 1.5 cables down the container ship's port side".*

⇒ In table 4 of VHF communication, Pilot did not convey so much information as MAIB report stated. Beside "one tanker is coming in", no other information of inbound vessel's name, position, speed and course are given as positive identification.

⇒ Pilot did not receive positive feedback from Ever Smart. What captain's reply are "Yes, Yes" in table 4 at 2331 hours. Pilot give no further information to Eve Smart and Captain did not ask anything till 2334 hours.

⇒ In these 3 minutes time, no party seeks for clarification or identification; the communication links is broken. They are not in same page now.

During and immediately after the pilot's disembarkation, Ever Smart's master was aware of the container ship's position towards the western side of the channel and he was focused on clearing the channel and commencing the sea passage as soon as possible. This is supported by his change of the radar display to 'north up', his order to the helmsman to steer 319° and the increase in speed.

⇒ Master *focused on clearing the channel and commencing the sea passage* is good.

- But being a master, he has much more to take care at departure time. It is why we need a SOP for very complicated operation.
- Amongst these departure SOP, beware of inbound vessel will not be included because this requirement will deem as part of navigation routine job.
- In these SOP we see master had *changed of the radar display to 'north up', his order to the helmsman to steer 319° and the increase in speed.*

⇒ Limited short-term memory is the limitation every seaman will face. Ever Smart master attention is naturally on his ship which is inside a narrow channel not on incoming vessel.

⇒ The outbound track on figure 7-06 showed current setting to west is very strong.

- Although captain ordered steering to 319^0 (T), applied 4 degrees leeway to original course 315^0 (T).
- Vessel track is still in portside of the fairway which were
- challenged in court verdict as not comply in COLREG requirement Rule 9 keep to starboard side of fairway when collision risk is imminent.

⇒ Ever Smart master knew pilot is leaving and been informed of an inbound vessel. He should find out where is this inbound vessel or his name, position or …… to keep the communication link open.

⇒ That's why we should positive identify inbound vessel before pilot disembarkation. During and immediately after the pilot's disembarkation, Ever Smart's master workload will increase quickly.

⇒ Then, we should use BHRM to share the workload to other OOW.

- Master had not acquired Alexandra 1 as an ARPA target.
- This lookout duty can easily be accomplished by OOW.
- Actually, after 3/O see pilot off and return to bridge, 3/O should acquire target nearby as a precaution and part of bridge procedures.

⇒ *Consequently, he was unaware of its movement towards the channel entrance and the reducing CPA.*

Ever Smart master was unaware inbound vessel's movement in Radar screen.

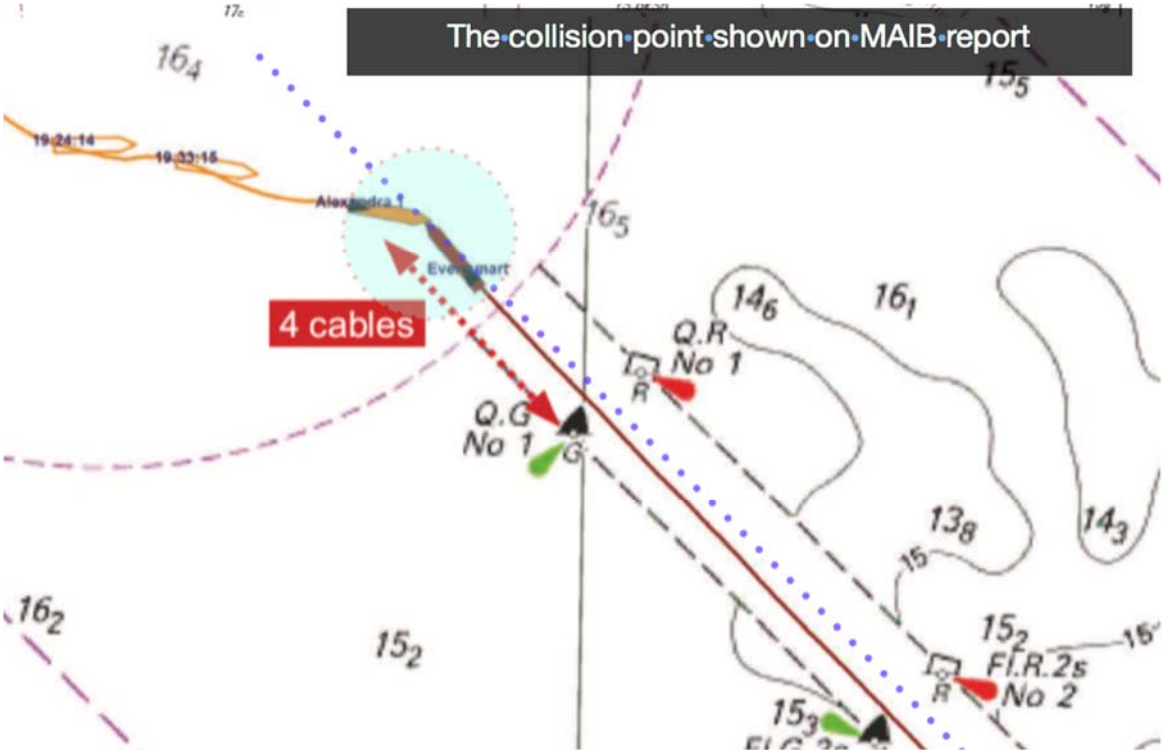
- By visual lookout, it is hard to examine inbound vessel's position already block the exit of fairway unless master looking back to buoyed channel to make sure the direction of 315^0 (T) ahead.

⇒ It is also hard to determine inbound vessel' s movement for her slow speed and course change which might be thought as an anchored vessel occupied channel exit.

⇒ *He relied on his assessment by eye that it would pass 1.5 cables.*

- Master did not notice this inbound vessel from first time pilot told him in 2331 hours.
- He just sailed along the channel as pilot ordered to leave, not prepared to avoid the collision in the centre of buoyed channel where he cannot make the "Hard Starboard" turn.
- He had not expect one vessel waiting him in his way out.
- The reasonable guess of Alexandra 1 movement is to alter course to 135^0 (T) while her inbound maneuvering.

At no time did the master or pilot discuss the option of altering course to leave Alexandra 1 on the container vessel's starboard side.



圖形 7-10 碰撞位置在 MAIB 報告，在 2342:19 時

7-23 在只有 2.5 倍船長的距離，碰撞是不可避免的

在碰撞前兩分鐘，當長慧輪離開浮標的航道，亞歷山大一號距離貨櫃船的左船頭，只有 4 個 CABLE ，這個碰撞點顯示在海事局的報告上面，報告指出“*依照長慧輪的相對操縱性，【1.4.4】這個貨櫃船可以向左或向右轉向來離開航道，來避免亞歷山大一號*【2.5】 “。
我們畫出的兩條船的航跡，並使用國際海事組織的迴旋圈資料在兩條船的航跡上，這個船“長慧輪“有 40 米的寬度跟長度 300 米，當亞歷山大一號在只有四個 CABLE 的距離，離開航道入口。這個距離對 300 米長的長慧輪，只有 2.5 倍船長的距離，碰撞是無法使用滿舵回轉避免的，在長慧輪離開航道的時候，就已經進入不歸點裡面。請看圖形 7-11，相對的操縱性，長慧輪在 2340 時。如果亞歷山大一號沒有擋到長慧輪的航道，碰撞就不會發生。

工作負荷

以這兩條船的工作負荷來說，亞歷山大一號在 25 分鐘之前，就到達領港站，也就是浮標航道外，然後慢速的移動橫越浮標航道，到只有四個 CABLE 離航道的入口，在碰撞前兩分鐘的位置。亞歷山大一號從領港站移動到碰撞，長慧輪的駕駛台團隊，都沒有監控亞力山大一號的位置跟動態，這是因為相信領港所說的，這條船會等待，或是在航道外等待。這兩條船雖然是同時發生碰撞，但是駕駛台的工作量卻不一樣，長慧輪專注於下領港與操船，對抗水道裡面強勁的流水。而亞歷山大一號的船長卻是有很多的時間，可以檢視他的進港航跡，航向航速，可能的通行計畫，或與港務台官員再做確認的動作。
為什麼要將操船轉向的責任，交給出港船，因為長慧輪高速出港，要求他停車減速倒車，都沒有用，反之，亞力山大一號是慢速接近，又拉了倒車，雖然我們知道也是沒用，但是對法官來說，是足夠了。

Relative Maneuverability

7-23 In just 2.5 ship lengths distance, a collision was unavoidable.

In figure 7-10, as Ever Smart left the buoyed channel two minutes before collision, Alexandra 1 was only 4 cables fine off the container ship’s port bow (the collision point shown on MAIB report above). The report states that “*Given Ever Smart’s relative manoeuvrability [1.4.4], the container ship could have turned to either port or to starboard on leaving the channel in time to avoid Alexandra 1*” …. *[2.5]*

We plotted the tracks of the two vessels and applied the IMO turning circle data to both vessels. The ship Ever Smart had a beam of 40 metres and a length of 300m. With Alexandra 1 just 4 cables from the entrance to the channel, this distance for 300 meters long Ever Smart is just 2.5 ship lengths (741/300= 2.47). In just 2.5 ship lengths distance, a collision was unavoidable even the rudder was placed hard over on leaving the channel. See below Figure 7- 11: Relative Manoeuvrability of Ever Smart at 2340 hours.

- If Ever Smart put rudder to "Hard Starboard" or "Hard Port" at No.1 buoy, it will be too late to create enough beam distance to clear original course line 315^0 (T).
- The consequence of collision as drawing shown:
  - if turning at No.1 buoy to port side with Hard Port rudder, Ever Smart will hit Alexandra 1 midship part
  - if turning at No.1 buoy to starboard side with Hard Starboard rudder, Alexandra 1 will hit Ever Smart midship part
  - No turning, bow to bow collision. Maybe this is the best luck they had in this collision.
- If Ever Smart noticed collision risk inside the channel she may use hard over rudder before buoy No.1.
  - The timing to use hard over rudder is important because too early ownship will hit No. 1 buoy portside or starboardside.
  - The penalty of damage to buoy No.1 will surely blame on Ever Smart's captain no matter of his contest or contradict of emergency avoidance to collision.
  - If Ever Smart captain want to alter course inside the channel does he know where is the correct position to give "Hard Over Rudder" order to quarter-master? The timing to use hard over rudder is important because turning too early ownship will hit No. 1 buoy.
  - By close study of ownship's turning characteristics posted on bridge wall, captain can have the idea of one or one and half ship's length before no. 1 buoy.
  - The best situation Ever Smart alter course inside No.1 buoys is vessel can finish 1st stage turning when vessel abeam No.1 buoys. (the green vessel shape in no.1 buoys' center)
  - This best wheel over position can be estimated by ownship shape on ECDIS if the displayed scale is large enough to show ownship's shape. (one or one and half ship's length before no. 1 buoy)
  - The meeting situation with Alexandra 1 will be: Ever Smart finished turn in 3rd stage and Alexandra 1 been hit by her stern (worse) or clear by very close distance (better), depends on luck. (judging by the drawing of figure 7-11)
  - Use hard over rudder before buoy No.1 to avoid collision is still very risky.
- If Ever Smart noticed collision risk before buoy No.2 she may sailed outside the channel.
  - The buoys are spacing at 0.75 nm distance which is considered as enough to alter course between two consecutive buoys. (0.75 x 1852 = 1389 meters, 1389/300 = 4.63 ship's length of Ever Smart)
  - Sailed outside the channel don't need 90 degrees turning but have to beware of the water depth outside the channel.

Workload

Alexandra 1 arriving off the buoyed channel 25 minutes earlier and slow-moving across the line of the buoyed channel just 4 cables from its entrance two minutes before collision. Bad timing. During the 8 minutes from the pilot's disembarkation until the collision, Ever Smart's bridge team did not monitor Alexandra 1's position and movement.

⇒ Two ships collided in same time but the workload are different.
⇒ Ever Smart concentrate in disembark pilot and steer against strong current in narrow channel
⇒ While Alexandra 1 master have lots of time to examine and think about his approaching plan and confirm his passage plan with VTSO.
⇒ All these uncertainties are accumulated in his mind which create more and more tension and fear with no any help to ease the situation.

⇒ Just doing something to clarify the situation will be a great help in this simple situation.

事件的關鍵

7-24 亞歷山大一號不應該在航道的中間等待

亞歷山大一號依賴不充分的 VHF 資訊，（這不是重點，擅做假設才是）*而長慧輪船長未能保持適當瞭望，並監控亞歷山大一號的動態是事件的關鍵*。亞歷山大一號船長聽到的訊息，在 VHF 上面，而不是由港務台官員或領港給的指示，“右對右”的字句也沒有包含在這些頻道的通訊裡。這個領港卻有指示長慧輪船長，這個油輪會等待長慧輪離開航道，船長太相信領港，造成事故。

可能在開始的時候，長慧輪輪船長沒有正確識別亞歷山大一號，如果沒有正確識別亞歷山大一號，在船長的敘述中，長慧輪船長應該承認這個錯誤。就像亞歷山大一號船長承認他在聽到部分的訊息，亞歷山大一號的船長做了很多的錯誤的事，在他錯誤的假設之後，但是只要他說出他這樣做的理由，是要保持右對右的通行（違反常識常規），後來所有的錯事，就似乎變成是合理與可以理解的行為。

這是不對的事情，因為碰撞的主因，就是亞歷山大一號船長做出右對右的抉擇，其實他要做右對右的通行，他也要考慮到對方出港船，能否配合他的船位。長慧輪的船長並沒有承認，他的錯誤是沒有正確識別亞歷山大一號船隻在哪裡？這是在領港告訴他，有一條進港船的時候，可能他就誤認了，但是船長堅稱他眼睛有看到，並且判斷它可以通過他的左舷 1.5 CABLE，如果是這樣的話，船長就不可能沒有繼續觀察亞歷山大一號的動態，這是不可理解，無法原諒的行為。

事件的關鍵是，長慧輪船長不知道亞歷山大一號在哪裡？從開始他就可能誤認，到後面他又堅決不承認，但是又不知道對方船隻在哪裡？前後的矛盾，造成他的錯誤。這個律師團不知道怎麼教他的，誤認是小錯，沒有瞭望是大錯，殺小賠大。事件的關鍵是亞歷山大一號錯誤的船位，並且長慧輪沒有認出哪一條是進港船？亞曆大一號可以在航道的東邊，或是西邊等待大船出港，但是他不能在航道的中間等待。長慧輪應該正確識別哪一條是進港船。隨然碰撞無法避免，但是責任要分清楚，有錯要承認，才知道誰錯得更多。

圖形 7-11 長慧輪相對操縱性，在 2340 時

The pivotal fact of this accident

7-24 Alexandra 1 should not wait in the middle of buoyed channel.

The reliance of Alexandra 1's master on scanty VHF information and the failure of Ever Smart's master to keep a proper lookout and monitor Alexandra 1's movement were pivotal to this accident.

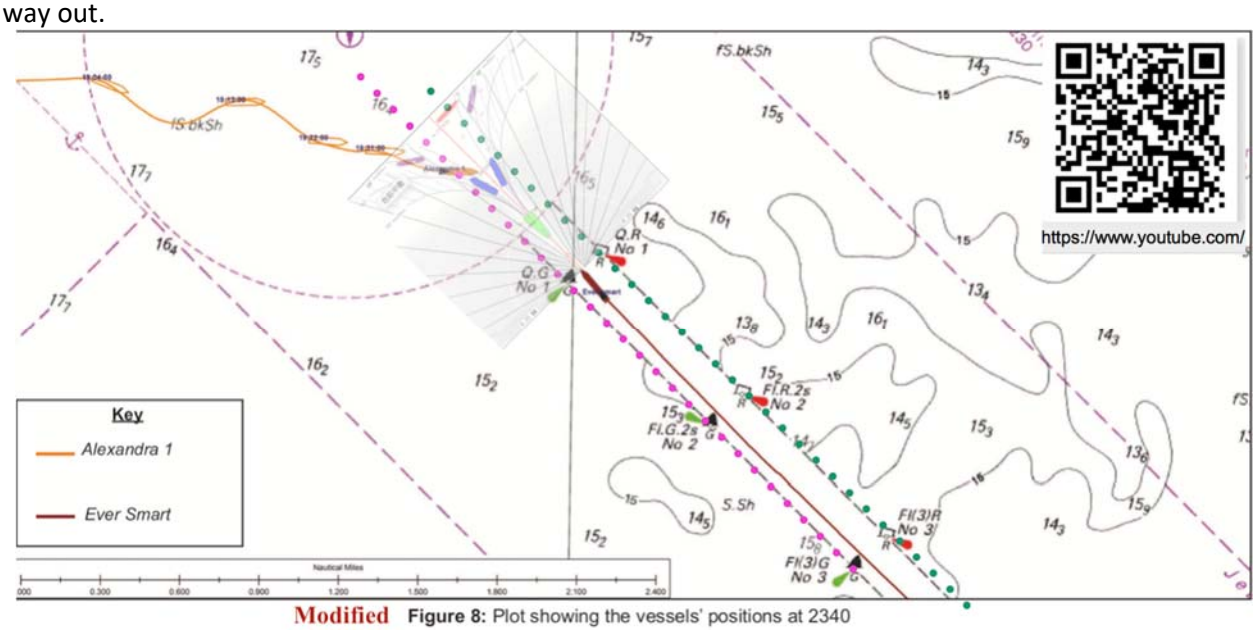
⇒ *The reliance of Alexandra 1's master on message overheard on the VHF* was not an instruction from the VTSO or pilot direct addressed to him.
⇒ These messages had no “starboard to starboard” wordings inside.
⇒ Failure in clarify these uncertainties is 1st mistake
⇒ Make assumption by hearsay is 2nd mistake
⇒ Alexandra 1's master occupied exit of channel is 3rd mistake and
⇒ Hope other vessel to give way to him is 4 mistake.
⇒ Did not align her vessel to direction of channel 315^0 (T) is 5th mistake.
⇒ The pilot had informed Ever Smart master that the tanker would wait for Ever Smart to clear the channel. This is a direct statement to Ever Smart.
⇒ If Ever Smart's master had not positive identifying Alexandra 1 in the beginning, he should admit this mistake in the statement like Alexandra 1 had admit mistake in overheard VHF message.
⇒ Ever Smart's master had not kept a proper lookout is 2nd mistake.
⇒ Ever Smart's master had not monitor Alexandra 1 is 3rd mistake.

Alexandra 1's master had done a lot of wrong things after his assumption but all thought reasonable when he said it is for "starboard to starboard" passage. Ever Smart master did not admit his mistake of no positive identifying Alexandra 1 in the beginning. *Failure of Ever Smart's master to keep a proper lookout and monitor Alexandra 1's movement were pivotal to this accident.*

⇒ The pivotal point to this accident is wrong position of Alexandra 1 and no alternative if collision risk exists. Alexandra 1 can wait in West side or East side of buoyed channel, but not in the middle of buoyed channel.

⇒ Ever Smart should seek for clarification of which is inbound vessel and keep a sharp lookout.

Collision takes two vessels. If Alexandra 1 has not occupied exit of channel, Ever Smart will not have a collision in his way out.



Modified **Figure 8:** Plot showing the vessels' positions at 2340

圖形 7-11 長慧輪相對操縱性，在 2340 時

碰撞能否避免？

7-25 導入緊急迴圈舵實際操作的訓練

我們要對這一個案件做一些觀察，思考可能避免碰撞的方法。

⇒ 在這麼短的距離，唯一可能避碰的方法，是兩條船互相以 315 度/135 度的相對航向，也就是迎艏正遇互相通過。

⇒ 亞歷山大一號已經在浮標的出口 4 個 cable ，無論長慧輪向左轉向來遠離亞歷山大一號的船尾，或是向右轉向來通過亞歷山大的船頭，都是幾乎不可能的事，在他 2.5 倍船長的前進距離內。

⇒ 以長慧輪來講，想得到航行安全，在領港下船之後，就必須要擷取所有港外阿帕目標，碰撞的前 8 分鐘，阿帕設計是減少連續測繪的工作量，作為情勢知覺的一部份。

⇒ 就像我們前面提到，船長可以合理的假設，亞歷山大一號將會進到航道，然後在本船 1.5 海浬的左舷通過，變成是錯誤的推測，要使用緊急的操作，才能夠避免碰撞，從合理的假設變成錯誤推測，其中就是情勢知覺不夠。

⇒ 船長可能假設亞歷山大一號會是航向 135 度，而不是 102 度，這個就需要先減慢速度，在浮標的航道外面，開始大角度的回轉，這個意思就是說，進港船在一定距離外，如果沒有把他的進港航向調整到 135 度，實際上他是沒有辦法開進浮標航道裡面，所以亞力山大一號現在這一個位置，無論從任何角度來看，都應該是轉向完，正再轉向到 135 度的位置。

⇒ 除非長慧輪的船長做的推測不合理，要不然合理的假設的話，不會認為亞歷山大一號會維持 102 度的航向。

我們還有更多的事需要考慮，航運界發生非常嚴重的油輪擱淺事件之後，採取嚴格的風險評估與航行計畫訓練，但是並沒有導入實際的操船訓練，緊急操船與迴圈舵，只是把書面計畫視為唯一解決的方法，而沒有真正練習這兩個保護傘。

⇒ 真正發生錯誤的時候，沒有訓練緊急應變的迴圈舵技巧，這個結果就是船長在緊急的時候，不知道要如何操縱船隻，在平常這種無風無浪好好的進港，他都不曉得操船需要的要素是什麼？本船需要的前進距離?跟需要的轉向時間，都沒有概念，以至於無法控制事故的發生。

⇒ 在平常兩條船通行的時候，也不知道保留一些足夠的水域，讓對方船隻可以利用來交互通過，在緊急的狀況，船長不知道本船是否來得及做迴圈舵的操作，來避免危險。

⇒ 在這樣限制的水域，要一個人去監控和控制這麼重要的操船，是很困難的。雖然駕駛台資源管理的訓練被廣泛的應用與公約的要求，船長跟他的船副，卻很少參與這些關鍵操作的資料跟實際技巧的訓練。

在我的書籍，海上避碰管理 2007 年出版與本人 YOUTUBE 上面的展示（QR CODE 在圖行 7 之 11 上），我們討論到目標的擷取與操船，想要尋求可以處理的解決辦法，避免船隻進入不歸點陷阱，當讓路船卻沒有讓路的時候，所必須做的警急操作。

這個技巧有三個主要的部分，

⇒ 1. 什麼是碰撞的位置？這是發生在兩條船速度向量線的交點，簡單，但是很重要，對於碰撞危機的評估，也是我們雷達瞭望的一部分，要知道在碰撞時間是否有其他船隻，跟航行的險阻，就要知道碰撞的位置在哪裡？

⇒ 2. 監控碰撞的時間，利用檢查本船速度向量線上碰撞點的位置，如果長慧輪的速度向量線設定是 6 分鐘，碰撞交點發生在速度向量線的中點，那這就是 6 分鐘的一半，也就是 3 分鐘之後。這意思是說碰撞的時間是，由碰撞點在本船速度向量線的前後，決定碰撞的時間是多少？

⇒ 3，要採取避碰的措施，至少要在 7 倍的船長之前，在碰撞點之前的 7 倍船長，是對本船來講，這是一個固定的距離，所以我們在平常的時候，就可以先決定在速度向量線上面，7 倍船長的位置，應該是在哪裡？可以來預估本船回轉時，所需要的前進距離是否足夠？

一條 300 公尺的船隻，7 倍船長就是 2100 米，等於是 12 個 CABLE，操縱大型船隻一定要有事前的計畫，我們也要有這樣的知識概念，而不是一味的接近領港站或是防波堤入口，導致無法調頭回轉的困境。

Could the Collision be avoided?

7-25 Practical training in rudder cycling maneuvering

We would like to make some observations on this case. One possible solution to avoid collision is passing in 315^0 (T)/135^0 (T) reciprocal course as head-on situation. When Alexandra already occupied exit route of buoyed channel, for Ever Smart to alter course to port to clear Alexandra 1's stern or alter to starboard side to clear Alexandra 1's bow is already impossible in distance of 4 cables/2.5 ship's length.

For Ever Smart to regain navigational safety, he should acquire all targets by ARPA outside the channel immediately after disembarking the pilot 8 minutes before collision. After all, ARPA is designed to reduce continue plotting efforts needed for situational awareness.

As mentioned before, captain assumed Alexandra 1 was planning to enter the channel to pass clear by 1.5 cables port to port in his court statement. In this statement, Captain assumed in bound vessel will be in course 135^0 (T), not 102^0 (T). This would require Alexandra 1 to slow down to a safe navigational speed and turn outside the buoyed channel under very controlled conditions.

There are, however, more issues need to be considered. Our industry has, after some very serious tanker groundings, concentrated on risk assessment and passage planning. It had not introduced practical training of emergency manoeuvring: rudder cycling. The result is master cannot understand his vessel in safe distance/ ample sea room in manoeuvring. In emergency case, master don't know ownship can make it or not in rudder

cycling. In restricted waterway, it would be difficult to monitor and control a critical manoeuvre at night. Although bridge resource management training is widely provided, masters and their officers very seldom collect these critical manoeuvring data and practical skills.

The technique has three essential components,

1. To know where is collision location (collision happened at crossed point of two vessel's speed vector). Quite simple but very important for collision risk assessment in radar lookout, to know whereabout other vessel **will be** and navigational hazards around it.
2. To assess and monitor the collision time by checking collision point in own ship's speed vector.
3. To take avoiding action at least seven ship lengths (Yes, 7 SL) before collision point (7 SL is an advance distance ownship have to know in specified speed which can be represented by speed vector length).

7-03 避碰時考慮的操作事項

在這個案件，長慧輪 12 節的船速，6 分鐘的前進距離是 1.2 海浬，就是大約他 7 倍船長的距離。任何碰撞位置在這 6 分鐘速度向量線之內的，就已經是在不歸點之內，也就是很難避免碰撞。無論如何，我們一定要指出簡單的解決方法，並不是我們一般避碰訓練的教導，而是需要練習雷達瞭望跟實際操船技術。

港口規則變成避碰規則

7-26 當地規則是高於避碰規則或港口規則

第一個問題是，船長應該遵照什麼樣的規範，去解決這樣關鍵的情況？

> *傑貝阿裡港口管制員發出的指示。在這個時間，當出港船航道出口點，是與進港船航道的入口一樣，"航路的權利" "Right of Way"應該是要給出港的船隻。*
> *船隻具有"航路權利"，應該保持它現在的跟航向航速，仍然應該尊重國際避碰規則的相關規定。*

這個情形呢就有解釋上的問題，在什麼時候？港口的規則要讓路給避碰規則，是應該由誰來決定？我們這邊的討論是，

⇒ 避碰規則一，"此規則任何事情不得干涉特殊規則的作業，是由適當的主管機關規範的港口，河流，湖泊，內陸水道跟公海相通，可以供海船航行區域"。這一條是稱為至上條款，凌駕於所有的避碰規則條文之上。但是法庭卻依照避碰規則判案，引用一百年，50 年的判例，將至上條款精神於不顧。

⇒ 如果港口規則是高於碰規則，在傑貝阿裡港口的範圍內，當值船副需要讀過讀通所有的本地規則才能進港，知道港務台在他的操作手冊上面有做過規定，這是不可能的，國際海員跑這麼多國際港口，不可能全部都自己讀過當地的法規，對其有適當的瞭解，所以一般的海員船長船副都是聽從領港，或是港務台管制官員的指示來決定行動，長慧輪應該遵守港務台給的指示。

給亞歷山大一號在 VHF 的訊息，在 22 點 56 分時是這樣的，"一但長慧輪離開，你就可以進入航道"，領港先生給長慧輪在 23 點 31 分時的指示是，"只要沿著航道走，一條油輪進港，它會等"，這些當地給的指示高於避碰規則的權威，這是當地的港口規則，和船長有高過任何國際公約或是私人契約，做的警急處置一樣，船長有最高的許可權。這是一般的實務，在港口運作要跟隨當地的指示，不管呢任何公約。當地官署是具有完全的責任，保護他們港區的設施安全，所以他的指示是凌駕於一切國際公約，或是任何私人契約，他們也許還具有另外的考量，基於安全的，但是沒有時間，向所有使用港務台服務的單位來解釋。

⇒ 長慧輪作為出港船，具有"航路的權利"，應該保持它現行的速度跟航向，依照港區規則，

⇒ 長慧輪應該保持它現有的航向航速，這是橫越的情況，這是依照國際避碰規則，

⇒ 應該航行在航道或是狹窄水道的右邊，這也是國際避碰規則的規定。

⇒ 亞歷山大一號船長認為右對右的通行，是與一般航運的慣例跟避碰規則左對左的精神不合。

⇒ 亞歷山大一號作為進港船，應該讓路給出港船，這是依照港區規則，也是優良船藝。

⇒ 亞歷山大一號是橫越船，應該要讓路，這是國際避碰規則。

7 – 03 Some considerations in collision avoidance

In this case of Ever Smart 12 knots speed, six minutes run is 1.2 nm which is about her 7SL (1852x1.2=2222, 2222/300=7.4 SL). **Any collision location inside 6 minutes speed vector is within point of no return** which is hard to avoid collision. However, we must point out, that this simple solution is not generally taught as part of collision avoidance awareness and needs to be practiced and rehearsed.

PORT Rules turn to COLREG rules

7-26 Port Rules have overriding authority over COLREG

Question 1 What guidance should be followed to resolve this critical situation? The instructions issued by the Jebel Ali Port Authority state"

> *In the event that the channel exit point of an outbound vessel is the same as the channel entry point of an inbound vessel "Right of Way" shall be with the outbound vessel.*
>
> *The vessel having "Right of Way" shall maintain her present speed and course but shall respect the International Regulations for the Prevention of Collision at Sea."*

In this case there is a question of interpretation. At what time PORT Rules change to COLREG rules and who decides this?

Discussion

⇒ According to COLREG rules No.1 "*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.*"

⇒ If PORT rules are superior than COLREG, OOW will need to read all local rules in each port's calling.

⇒ Usually, Master let Mr. pilot or Jebel Ali Port Authority VTSO to decide which rules should be applied.

⇒ VTSO give instruction to Alexandra 1 in VHF message at 2256 hours "*Once Ever Smart is clear then you can enter the channel.*" Mr. pilot give instruction to Ever Smart at 2331 hours "*Just follow the channel. One tanker is coming. It will wait.*"

⇒ **These instructions from Local parties should have overriding authority over COLREG just like Captain have overriding authority over any international convention or private charter party in emergency disposal.**

⇒ **The right of way should be with outbound vessel.** In district court verdict, this principal had not been respected.

⇒ **It is common practice in port operation to follow local instructions for they have full responsibility of their facilities' safety.**

⇒ **They may have another safety concerns cannot explain fully to all parties using port service.**

⇒ Ever Smart as outbound vessel has "**Right of Way**" shall maintain her present speed and course by Port rule.

⇒ Ever Smart should maintain her present speed and course in crossing situation by COLREG.

⇒ Ever Smart should navigate to starboard side of fairway in narrow channel rule by COLREG.

⇒ Alexandra 1 as inbound vessel should give way to outbound vessel by Port rules. Alexandra 1 as crossing vessel should give way to outbound vessel by COLREG.

⇒ The conclusion is Ever Smart has 2 out of 3 rules to maintain present course and speed and Alexandra 1 need to give way in both port and COLREG rules.

VTS 船隻通航服務

7-27 是否港口管制官員必須指示船長改變他們的計畫

問題二港口管制官員是否已經認知發展中的情況，並且應該及早的介入？補充一點，是否港口官員必須通知這些船長去改變他們的計畫？是否所有在此區域裡面的船隻，都需要打開他們的AIS?

討論

⇒ 港口管制官員應該要認知發展的情勢，並且及早的介入，這就是他們的工作。

⇒ 有些港口就是這樣做，如果他們對他們自己的建議有信心。有的港口卻沒辦法做到這樣的工作。

⇒ 事實上，就是港口管制官員可能並不具有雷達瞭望的技術，就像我們在第二章所討論的一樣。不知道哪裡是碰撞位置？碰撞時間？或者是距離？碰撞還有多遠？

⇒ 港口管制官員也許也沒時間去跟這些船長討論，如何改變他們的計畫，管制員能夠做的就是提供簡短而精確的指令，給這兩位元船長，像是“保持遠離前面的油輪“，”避免右船頭的船隻“，”讓路給橫越船“等等，儘量保持無線電靜默，作為警急的用途。

⇒ 要求 AIS 信號 24 小時發送，這是 SOLAS 的要求，作為所有人類生命財產安全的海上母法，在法庭的判決，應該要加以考量，予以更 多 的 比 重。

Vessel Traffic Services VTS

7-27 Does VTSO have to instruct either master to change their plans?

Question 2 Should the VTSO have recognised the developing situation and intervened much sooner? Supplementary to that. Would the VTSO have to instruct either master to change their plans? Should it be a requirement that all vessels in the area of the port authority should have their AIS switched on?

Discussion

⇒ VTSO should recognise the developing situation and intervene much sooner. It is their job. Some ports have done this if they confident with what they are suggesting. Some ports are not capable of these jobs. The truth is VTSO might not have Radar lookout skills as we discussed in Chapter 2. If they don't know where is collision position, TTC or DTC……, they will not have the ability to suggest Master what to do to avoid the collision.

⇒ VTSO may have no time to discuss with either master to change their plans. What VTSO can do is giving short and precise order to either Master like "Keep clear of tanker ahead" "Avoid starboard Bow vessel", "give-way to crossing vessel", etc…or ask vessel nearby to keep their radio as silent as possible for emergency communication.

⇒ AIS switched on at all times is a requirement in SOLAS which is mother law for all human life safety at sea, court ruling should take more weight in collision liability. We would wonder district Court judge will accept this statement or not?

領航

7-28 在通訊上面的主張：要求領港去做某些我們擔憂的事情

問題三：是否領港提早離船，帶走了關鍵的安全因素？是否他駕駛台的存在，可以確認前面的危險，做出進一步的避碰策略。

討論

⇒ 領港提前離船，應該是在下列的情形下：“領港先生覺得滿意，船長有能力完全控制情況，沒有任何問題。“在這個案件，領港先生離開出港船，沒有給出清楚的進港船的指令與說明，進港船會在哪裡接領港？會走什麼航向？不要橫越航道等。

⇒ 領港在駕駛台應該控制情況。這兩條船隻的船長應該對他們的憂慮，作出主張，像長慧輪應該這樣說“你是否認為我可以自己走？”，領港回答“是的，是的，有這個現先要進來。只有這一條船，只有這條油輪。”，

⇒ 領港的回答，並沒有正面的確認，哪裡 哪一條是油輪進來。船長應該主張他的詢問，要得到正面的回答。

⇒ 船長應該說：“不要好的，好的，哪裡是進港船？是什麼航向航速多少？”。

⇒ 領港說道：“他來了，他會等……無論如何，我先到哪裡，OK 船長”，領港本人對進港船的動態，都還有疑問？說不出進港船現在在哪裡，會在哪裡等待，要解決這個混亂的

方法，就是他說的，“無論如何，我先到哪裡”。事實上，他沒有先到，也沒有指揮監控進港船的動作。

⇒ 船長應該要堅持他的主張，也就是他原來的問題，繼續問？應該說“他現在在哪裡？會在哪裡等？通知他停車”。

使用不是太粗魯的技巧，在我們的主張，就是加上我們的感受，試 試 看 這 樣 子 ，

- 把”不要好的，好的“改成”我感覺不對勁“，
- “哪裡是進港船？”改成“我擔心進港船在哪裡？”
- “進港船的名字是什麼”改成“我不知道他的船名，航向跟航速？”，
- “他從哪裡來？”，改成“我怕他會從哪裡出現？”
- “他會在哪裡等？”改成“我怕會開到他在等待的地方？”
- “他會停在現在的位置？”改成“我恐怕他沒辦法停在他現在的位置上？”
- “擋住我的出港航道”改成“我希望這條船遠離我的出港航道？”

正向的溝通是說，“我需要什麼？”或是“我感覺到什麼？”，而不是“你應該要做什麼？”，

⇒ 這是把“我”的主觀想法跟願望，帶入到我們的對話之中，讓人家尊重我的職權，跟我的存在，而不是單純的要求他要做什麼？

⇒ 一般人最缺的，就是自我反省，人不會看不起自己，人不是理性的，人只會合理化自己的任何動機與行為。

⇒ 我是不會覺得自己不對，最不會懷疑的就是自己。所以應該是把我們自己的顧慮，想法，要求說出來，

⇒ 注意所有在這些敘述裡面，所提到的“我”，這一個主體，這是一個良好的習慣，可以在緊急的時候，可以節省很多溝通的時間，

⇒ “我恐怕……“是比“我擔心……”還要有力的多，不必用什麼，“請你……”，“能不能請你……”，“你是否能……”來要求領港的善意，只要要求他對你的主體的感覺與許可權，做出回應。

主張是一種習慣，在人為因素的課程裡，我們說海上的事故，關鍵在一分鐘內，需要練習警急溝通的技巧，寫下你的要求，然後加上主觀感覺的層面，就會變得無法拒絕或無法忽視。練習主張的技巧，在我們的例行工作上，以備在緊急時候的用途。

Pilotage

7-28 Assertion or positive communication: “Urge Pilot to do something we are worry about”.

Question 3 Did early disembarkation of the pilot take away a critical safety factor from the scenario? Would his presence on the bridge can help to identify the danger ahead and facilitated an advance avoidance strategy?

Discussion

⇒ Early disembarkation of the pilot should be made under one condition” Mr. Pilot should satisfy himself that outbound Master had the ability to fully control the situation without any question”. In this case, Mr. Pilot leave outbound vessel without giving clear instruction to inbound vessel who are worry about speed control for Pilot embarkation, align heading to steer, outbound traffic, not to cross channel etc…… .

⇒ Inbound vessel seldom has problem to understand the outbound vessel intention because outbound vessel is within port limits which restrict them movement severely. This case is inbound vessel had not keep in a proper position to embark the pilot.

⇒ Pilot presence on the bridge should control the situation for both Masters. Master should assert their worry like Ever Smart: *“Do you think I can go myself?”*

- Pilot: *Yes, yes. There is this coming now. There is just the one ship. Only this tanker,*

➢ Pilot’s reply did not positive identify which one or where is this incoming tanker. Captain should assert on his request for positive identification.

- Master: “No yes, yes, where is incoming vessel ? Can you show me in radar screen?”. No yes, yes is to break pilot’s self-assurance. It is a big question. Then pilot will take care Captain’s concern more seriously.
- Pilot: It’s *coming. It will wait.... Anyway I go there before ....okay captain.*
- Pilot himself has some questions about incoming vessel’s movement. He cannot say where this incoming vessel will wait for safe passage. His solution to this chaos is “*Anyway I go there before*”. Master should continue his assertion:
- Master: “Where she is now? Where to wait? Please ask her to stop.”
- If master had not insisted his concern, Ever Smart Captain believed in pilot to solve the problem. Captain should keep tracking pilot boat’s movement to identify which one is inbound vessel.

⇒ The skill of “not so rude” in our assertion is by adding our worry (in this letter style =>). Try these

- No yes, yes, => I don’t feel alright, where is incoming vessel ? Can you show me in radar screen?
- where is the incoming vessel? => I am worry where is the incoming vessel?
- What’s her name, course and speed? => I don’t know What’s her name, course and speed?
- Where she is coming? => I am afraid where she is coming?
- Where she will wait? => Will I come to Where she is waiting?
- Please ask her to stop where she is now => I am afraid she cannot stop where she is now.
- Keep clear of my way out => I want this vessel to keep clear of my way out.

⇒ Positive communication is saying “What I want? ”or “what I feel?”. Not “What you should do”. It’s a good habit to save time in emergency.

⇒ I am afraid is more powerful than I am worry. Don’t use "Please, Can you, Would you: to ask Pilot’s kindness. Just ask his response to your worry.

⇒ Assertion is a habit which need practice to perfect its skill. In BHRM class, assertation to pilot is practiced by following guide lines:

- The priority of communication is decided by the time remained to the danger, just like our avoidance action is decided by TTC time to collision. Generally speaking, if the time remained is sufficient the tone in asking is polite and mild. If the timing is eminent, the speaking tone will be change from asking to commanding. For example:
- TTC 12 minutes before collision: or DTC 2 nm distance away by 10 knots harbour speed. Mr. Pilot, I am worry about this vessel. (point outside or in radar screen, address the party to response, add my feeling)
- TTC 6 minutes before collision: or DTC 1 nm distance away by 10 knots harbour speed. Mr. Pilot, this vessel has big problem, I want reduce speed. (address the party to response, add my worry, ask for advice or action I want)
- TTC 6 minutes: or DTC 1/2 nm distance away by 5 knots harbour speed. This is collision, stop engine or full astern. (no party to address, all alert, what danger is, action to take)
- TTC 3 minutes: or DTC 1/2 nm distance away by 10 knots harbour speed. Stop engine or Full astern. (no party to address, command to all bridge team, command action to take, no communication to pilot at all)
- Write down your request and add some emotional aspect to make it undeniable.
- In the last stage, Captain gives command directly all parties on board.
- Practice assertion skill in our routine work for emergency time.
- Reader may not have ability to figure out the scenario by himself. It is the responsibility of shipping company or training centre to use real case to simulate the communication exercise.

人為因素

7-29 推給權威就可以鬆懈我們的警戒，多多少少。

問題四，是否所有的單位，對這一事件都太過自信？期待是基於我們港務系統的整體有效性而來，所以港務系統的行動是安全的，不必再做核對。

討論
過度自信
期待是基於對於港區管理系統的整體有效性，領港跟港務台管制員可能並不可靠，但這是他們的母港，他們熟悉這裡的作業程式，就會使得他們的警覺性，多少會降低一點。
作為一個船長，我們必須遵守他們的命令，如果是清楚有主見，我們不必擔心他是不是合理？港口管制單位對於的營運事項，是有其被賦予的許可權，這是其他單位沒有辦法質疑的，但是有關本船安全的顧慮，這就是船長要做的主張，提出我們的懷疑。正面的表達我們的關切，否則船長就會收到罰單或是罰金。

The Human Element

7-29 Refer to authority will relax their own vigilance.

Question 4: Did all parties to this incident have over confident expectations based on the overall reliability of port management systems that their actions were safe and did not need checking?

Discussion

⇒ *over confident expectations based on the overall reliability of port management systems*: Pilot and VTSO may not be reliable but it is their home port. They are familiar with its operation procedures which will relax their vigilance more or less. This is not over confidence as no parties aware of the danger. This is a habit to let other party to have safety concern for them which called "refer to authority". This is a habit to let go all our worry by unappropriated bridge procedures.

⇒ As a master we have to follow authorized party (pilot or VTSO) orders if it's clear and feasible. If their orders are not reasonable, Captain has to assert our worry. Positive communicate our concerns to authorized party otherwise Captain will have extra risk or their penalty ticket.

⇒ Nowadays, CCTV monitor on bridge is popular, company person in charge of vessel navigation safety can have these images of bridge through their mobile phone. The sign of relax in both radar and visual lookout can be shown when pilot on board (checking frequency are less when pilot come on bridge).

當值船副跟駕駛台資源管理

7-30 船上安全文化是我們的義氣

問題 5：是否公司的當值命令，以及工作的實務，當船長對船隻負責操控的時候，要求當值船副提供一個監控跟溝通的角色？是否當值船副應該負起避碰的責任，不必等待來自船長的指令？或者檢查通航計畫？一個當值船副在駕駛台應該做的，就是協助船長，是否這是公司的一種文化？這是一個在駕駛台資源管理的上面很大的問題與議題，

當值船副應該做什麼？"依賴" 的安全文化

⇒ 當值船副的工作，"應該做什麼"，是依照公司規則，是被動需求，是來自於當值命令跟工作實務。這些是為實習生跟資淺船副準備的，他們並不熟悉這些規則，即使他們已經有適任證書的執照。如果船長有一個當值船副不熟悉他們應該做些什麼？船長必須監控這個年輕人的每一項工作職務，與他在駕駛台上面做的事情。這些規則指派工作職務給當值船副，對船長不是一種說明，反而需要額外的指導，跟監控船副的工作素質，必須照顧這些年輕人，當他對船隻在航行的風險，負責任的時候。"是否當值船副開始避碰的角色，而不必得到船長的許可？"，這個答案是"不"，他還沒準備好，還不適任。

⇒ 當值船副做不到他們最好的程度，來保護公司的利益。他們做的工作，只是依照船長的要求，或是船長的指示，在駕駛臺上，這些當值船副不能，或者不想去再多做其他的工作。

⇒ 這樣的安全文化在船上，是基於"依賴"，依賴船長的適任去控制每一件事情。有經驗的當值船副可能在駕駛台，能夠獨立作業，但是與船長之間並沒有相互的瞭解，船長不能或者不想去信任當值船副。

⇒ 船長並沒有授權，把避碰的責任交給當值船副，如果船長是菜英文，表達溝通上面有問題，當值船副會做的事情，甚至於更少。船上的安全實際是基於船長的能力，依賴的安全文化，也就是安全都是靠船長。

⇒ 公司的規則指令是可以說明這些當值船副，加強他們對在駕駛台職務上面的警覺，但是他的工作態度取決於公司的可靠與否。

⇒ 船務公司的可靠是當值船副對這一家公司的想法？如果公司對當值船副很好，當值船副就會做的比公司預期的還要多，如果公司並沒有把當值船副的福利，小心的照顧，當值船副就只會做他們被告知的事情，而不會主動去負責處理。

⇒ 公司對船上的通告，經常是對當值船副作為的一些懲罰與警告。在駕駛臺上，當有意外或事件發生，對當值船副要有個公平清晰的說明跟做法，公司希望你要做什麼？在這個事件中，或是事件發生之後。

⇒ 應該執行嚴重的處罰，來改變當值船副的工作文化，跟對公司的態度。公司負責對當值船副的認可，把他導正到安全的面相。

⇒ 不管船長在不在駕駛台，都要去幫助船長，這就是這一條船的當值船副應該做的。應該做什麼跟會做什麼是不一樣的，即使應該做的，當船長不注意的時候，他可能故意的忽略，當值船副也可能提醒船長，在船長不注意的時候。

當值船副會做什麼？“獨立”的安全文化

應該做什麼？或是採取必要的行動去避免立即的危險，“獨立”的安全文化，這是一個主動的態度，對於本船的安全，人員的可靠不可靠？就是這些人講不講義氣。公司對船員是不是講義氣？公司如果讓當值船副覺得很可靠，船副就會在駕駛台上面，主動的付出更多。

⇒ 同樣這個船長講不講義氣？有沒有照顧到船上船副的福利等等，都會影響到駕駛台上面，這位船副的表現，船長願意輔導船副超過公司的要求，跟訓練這些船副在他們的專業，以及照顧他們的心情，船長個人與每一位船員的連結，就是他的義氣。

⇒ 這是人為因素領導管理的技巧，這個可以使這些船員希望立刻的幫助船長，就像良好的兄弟情宜一樣，他們的衝動去改正錯誤是自動的發生，而不是因為任何人的要求，或是規則的規定，也就是主動負責，修正錯誤，注意安全這就是船上獨立，或是主動的安全文化。

⇒ 那這個對外國人來講，是不是很繞口，對中國人來講，就是我們需要一種講義氣的船隊文化，船長對船員講義氣，船員對公司對船上講義氣，沒有任何規則指令或者規範，可以照顧到船上各種不同的情況，但是船員可以將這些複雜性，作為他個人的舞臺（專業），表明他個人對於這個行業與船員的義氣。

在船上有三個階層的安全文化，

當值船副應該做什麼？

以規則來驅動，那這個還是被動的行動，被上級所要求的，其代價就是不必受到懲罰，獎賞就是這樣，這是一種“依賴”的安全文化。那這個都是由公司來規範的，因為公司會規範處罰的標準是什麼？

當值船副會做什麼？

這就是他對這條船的感覺來驅動，那這是一個主動的行動，來保護所有船員之間共同的利益，那他得到的就是，對於工作的滿足，從工作得到的滿足感，這是“獨立”的安全文化，是為了這一條船的個人，自己而做的。

第三個階段就是**當值船副希望做什麼？**

一個當值船副希望去做的是，個人與船長之間的連結，他對船長的義氣，或者是對其他的船員之間的義氣來驅動，那這個就是自動的行動，自動自發的行動，不必再提，“閒話一句”，就是講都不必講，就會主動去做，用外國人的話講是，“在對方的希望上，看到自己的責任”，她想要讀大學，我就拼命賺錢，或是船長要安全，我就全心全意檢查。代價是保全他人，犧牲自己。自我犧牲是“自動”的安全文化，主要是為了公司或者這條船而做，這些安全的文化是他們相互之間的義氣，使其在政府組織之間，在他們的社會關係中，每個人都有無限的責任，去證明他的忠誠。

對於船公司組織性的缺點，如果現在要處理，這個主題太大，這個人為因素領導管理 HELM 的訓練，他有五個面向，仁義禮智信，這些我稱為“人文航海”的世紀（全部公佈在我的 YouTube 上），尤其是在多國籍船員的船上，在這裡呢我們就不再多做探討，只有一個概念，知道他對船上的作業，會產生哪些的影響，就夠了，除非以後有進一步的訓練要求，再做探討。

The Watchkeeping Officers and BHRM

7-30 Safety Cultures on board are their Accountabilities.

Question 5 Did the company standing instructions and working practices provide a monitoring and communications role for watchkeeping officers during stand-by duties when the master had charge of the ship? Would the watch keeping officers have been expected to initiate a collision avoidance role without instruction from the master as well as checking progress with the passage plan?

Discussion

⇒ What an OOW should do on the bridge to help Master depend on safety culture of the company? Big issue in BRM. “What an OOW should do” is a BHRM issue by his initiative. What is “OOW’s job function should be” is a passive requirement by company’s rule (standing instructions and working practices). These standing instructions and working practices usually are prepared for Cadet or junior OOW who did not familiar with these rules even he already has a COC licence. If master have an OOW who did not familiar with what they should do master should monitor this young man of each job function he is doing at bridge. These job functions assigned to OOW by company’s rule is not a help to master if this OOW is a new man. Extra mentor or monitor work master have to take care of this young man while he is in charge of ship’s navigation and collision avoidance.

⇒ Will OOW “initiate a collision avoidance role without instruction from the master”?

- The answer is “No” if he is not competent yet.
- The answer is “Depends” if company have no specific instruction. This the part company should take care of.
- The answer is “Yes” if he is a chief mate and ready for master job.

⇒ New OOW cannot do their best to protect Company’s interest. The jobs they done is just what Captain said or asked. No extra jobs will initiate by these new OOW at bridge. The safety culture on board now is based on OOW’ s competence to control everything. Some experienced OOW may play independent role on bridge due to their mutual understanding between master and OOW. If Master cannot or don’t want to trust OOW, he will not delegate collision avoidance role to OOW. If Captain had problem in English expression/communication these OOW will do even less. The safety culture on board is depend on master’s abilities of leadership and communication. This is “depend” safety culture. Leadership is to teach new OOW. The communication is express their concerns. The effectiveness of communication depends his teaching(leadership) to OOW in routine watch.

⇒ Company standing instructions can help the awareness of their jobs on bridge but

OOW working attitude depends on company’s accountability.

⇒ The accountability of company is what OOW think of this company. If the compony treat OOW good OOW will do better than company expected. If the company did not take OOW’s welfare carefully OOW just do what they are told.

⇒ Company’s circular to the fleet regarding the punishment of undoing of OOW on bridge while incident/accident happened should be fair and clear to OOW what company want you to do in and before incident/accident. Severe penalties should be exercised to change the culture of OOW working attitude toward the company. Beside the Master on board, company is also responsible to OOW’s accountability toward safety.

⇒ What an OOW will do on the bridge to help Master is the culture of the ship? What OOW should do is not the same as what OOW will do. What OOW should do? OOW in his bad mood may ignore deliberate while master is not aware. Or, OOW in his good mood may raise the issue with master

while master overlooked. To remind master what should be done or initiate necessary actions to avoid immediate danger "depends" on safety culture which is an active attitude toward ownship's safety. What changed OOW's mind to help master depends on their opinions to this ship. Is this ship master or OOW willing to help each other or to receive advices or to take care of everybody's safety depends on their relationship to each other?

⇒ What an OOW want to do on the bridge to help depends on leadership of the master? Is this master willing to offer more help than Company request to mentor or train these OOW in their competence and welfare? His personal binding with each crew is his accountability or BHRM skills or leadership which make these crews want to help him immediately, just like very good brotherhood. Their impulse to correct the mistake of this ship is automatic induced, not by any one's request or rules. This kind of initiative is the safety culture based on "interdependent" or "Proactive".

⇒ No rules or instructions or guidelines can cover the diversities situation involved in shipboard operations. However, the crew take these complexities as their stages to manifest their personal sensations of this vessel and Crews. There are three levels of safety culture on board:

- What an OOW should do: is by bridge procedures of company which are passive actions requests by superior. The price is "no punishments". This is "by the vessel" safety culture done by company policy.
- What an OOW will do: is the willingness of OOW to protect mutual interest of this vessel which are active actions. The willingness comes from his personal initiative of "job satisfactions" or company's policy encouraged. This is "for the vessel" safety culture done for this ship.
- What an OOW want to do: is by personal binding with Master or another crew which are proactive actions goes without saying. When he sees something wrong, this OOW will go to correct it without second thought. The price of his proactive is "self-satisfaction" of himself. OOW thought the vessel is of his own and the crew on board is his brother. He is not only doing by company rule, for the reward afterward, it is his personal urge. It is "of the vessel" safety culture done for himself.

⇒ These safety cultures on board are their accountabilities to each other. Accountability is a concept used in NGO where in their social relations everyone has unlimited responsibility to prove his honest and diligent to the organization. In our BHRM concept, accountability is Captain's leadership and his personal bound with crew on board. In short, if crew thought Captain are treat or teach them good they will do whatever he can in return.

⇒ Well. This topic is too big to handle now. It is the aims of BHRM training. It has five aspects: personal relationship, organizational accountability, surging emotions, cumulative expertise, mutual trustworthy as my studies which need another book to cover its details.

亞力山大一號的駕駛台資源管理

7-31 亞歷山大一號的安全文化

在馬歇爾群島海事安全指南 No10-15（Marshall Islands MARINE SAFETY ADVISORY NO. 10-15）

⇒ 駕駛台團隊對領港站的無限電指示，太過依賴，且錯誤的假設其與安全航行相一致……

⇒ 缺少有效的通航計畫以及準備，在駕駛台團隊要上下領港時。

⇒ 駕駛台團隊的管理無效：船長對當值船副清楚授權的猶豫，跟確認當值船副的角色，具有一些障礙，對於監控本船的位置，與其他船隻航行狀況的責任不清楚，處理船舶避免進入不可進入的區域，或是其他船隻的航道等等。

就這些缺失來看，船上的安全文化，亞歷山大一號是一個依賴性的安全文化，這是很明顯的。要改進這種不重義氣的狀況，需要 5 個層面，也就是個人關係，組織的可靠，還有個人的衝動，個人專業跟互相信任。我們仔細探討這個案件，已經發生的原因，這些面向對我們就會更為清晰。

BRM in Alexandra 1:

7-31 Safety Cultures on board "Alexandra 1".

Extracts from Marshall Islands MARINE SAFETY ADVISORY NO. 10-15

- *The bridge team's over-reliance on the pilot stations' radioed advisories and wrongly assuming that they were consistent with the safe navigation. ….*
- *Lack of effective voyage planning and preparation by the bridge team to embark or disembark a pilot. …*
- *Ineffective bridge team management. It has been noted that Masters appear reluctant to clearly delegate and identify the Officer of the Watch's (OOW) role and responsibilities regarding monitoring the ship's position and other vessel traffic or to handle the ship in order to avoid "no go" areas or other vessel traffic. …(go read the report for yourself)*

The safety culture on board Alexandra 1 is in "by the vessel" level is obvious. Everything is done as they are told. The ways to improve this weak accountability have 5 aspects: personal relationship, organizational accountability, surging emotions, cumulative expertise, mutual trustworthy. By looking into the case already happened these aspects will become more profound to readers.

長慧輪上面的人為因素跟領導管理

7-32 長慧輪上面的安全文化

因為這是條英國船，他們還注重一些人為因素的層面。

⇒ 第一，瞭望不會花太多的時間，是這一個案件我們得到的教訓，不要依賴任何人給你的指示，你應該自己用眼睛去看一看。

⇒ 第二，是否現在船員已經下意識的養成一種錯誤的安全感，我們被習慣動作的經驗所束縛，以至於疏忽。雖然習慣性動作是我們專業的關鍵，不幸的是，它反而會讓你對周遭情勢的知覺，變得遲緩。簡單的說，就是人的短期記憶有限，任何事情只要養成習慣以後，我們能夠注意到的事項就會越少，而把我們的多餘的心思，用到以前沒有注意到的東西上面。

⇒ 第三，保持警覺就是保命的第一要件，對碰撞的情景，繼續保持我們的想像，重新檢討你每日當值的實務，借由閱讀相關的題材與案例。

⇒ 第四，在這領港下船到碰撞發生的 8 分鐘之間，長慧輪的駕駛台團隊，並沒有監控亞歷山大一號的位置跟動態，三副唯一出現在這一個案件的場景，就是回答了港務台的呼叫，道了一聲早安，其他呢沒有什麼實質的動作。這條船上面的文化，也是有很大的問題，因為船長相信領港，這個油輪會等長慧輪離開航道，才進來。

長慧輪的船上安全文化，也是依賴型的，這兩個船長都是非常依賴領港與港口管制官員的指示，沒有再檢查他們的真實性，使用他自己的瞭望實務。事實真相就是，領港與港口管制官員他們的工作不力，不能監控亞歷山大一號接近航道的程度，就像英國海事調查局報告在他結論指出來的，這兩個船長都變成領港跟港務台官員的犧牲品，只是因為船長們並沒有確認他的正確性。

長慧輪應該提高警覺，當領港開始對他的問題，回答的不清不楚，這是我們對情境的警覺之一，把一條油輪要進港，分成三句話來講，吞吞吐吐，那個這個，就是有很大的問題。那船長雖然不耐煩，但是要知道事情已經不太對勁，所以也不能打馬虎眼，除非自己看到的進港船，要求領港再說清楚，那裡是進港船？

當領港說到"他來了，他會等待，不論如何，我會先到哪裡，OK 船長"，這些訊息裡面，並沒有揭露三件事情，進港船的船名，位置跟他的動態。長慧輪的船長應該知道，此時已經有點不太對勁，並要找出這三樣的資料，不論是經由領港，還是他自己的目視。

兩個人 DOUBLE CHECK 一下，是不是講的同一條船，來確保本船通行的安全。這麼一個簡單確認的動作錯誤，就可以避免公司損失 3 千萬美元。

HELM in Ever Smart

7-32 Safety Cultures on board "Ever Smart".

⇒ Lookout won't take you too much time. This is the moral of this case. Don't just rely on the instructions of any authority give to you. Go see for yourself.

⇒ Have mariners now been subconsciously lulled into a false sense of security? Our bridge procedures are bounded by our habitual rituals. The rituals of bridge procedures have the tendency that 10 years ago we have 10 things to do by company rule, after 10 years we only do one thing by our rituals. Take short-cut is human nature. Habitual rituals although is the key of professionalism. Unfortunately, it will kill your danger awareness too.

⇒ Keep Alert is Keep Alive. Keep the imagination of collision scenario in mind and re-examine your daily work by reading relevant articles.

⇒ *During the 8 minutes from the pilot's disembarkation until the collision, Ever Smart's bridge team did not monitor Alexandra 1's position and movement. The pilot had informed Ever Smart master that the tanker would wait for Ever Smart to clear the channel.*

The safety culture on board Ever Smart is in "by the vessel" level also. Both captains are true believer of pilot and VTSO instructions without checking their fidelity by their own lookout duty. Also multi-nationality crew are part of reason due to the unfamiliar to each OOW's culture and power distance. It turns out pilot and VTSO are not so good at their works to monitor progress of Alexandra 1 into the entrance as MAIB report had indicated in its conclusions.

Captains become victim of their instruction because captains did not verify its correctness.

Ever Smart should raise his alert when pilot begin murmuring at his question? (situational awareness)

Pilot: Yes, yes. There is this coming now. There is just the one ship. Only this tanker

Master: Yes, yes. (this could be a question if the voice is raising at the end or a confirmation if the voice is firmly at the end)

Pilot: *It's coming. It will wait.... Anyway I go there before ....okay captain.*

In pilot's massage he had not revealed or missed three things, inbound ship's name, position and his movement?

Ever Smart captain should know something had missed by then and find out these three by himself to ensure the safety of his own ship.

One single mistake cost 30 million US dollars loss of Company.

7-33 航運安全的關鍵是船長在人為因素管理領導的訓練

安全的文化在這兩條船長與領港，以及港務官管制台官員之間，如同他們自己船上的一樣，是"依賴"的安全文化，是在同一個階層的。他們並沒有採取主動的澄清，從港務台官員或是領港那邊所得來的資訊，只是接受，在海上跟在岸上，這都不是一種健康的情況。無論如何，**海事安全的主要人員都是船上的船長**，如果對船上的船長要求人為因素的訓練，能夠改變船上的安全文化，成為一個主動維護安全的行為，甚至於是自動的文化，船長就會主動去詢問港務管制台的官員或是領港，變成很自然的事，不會有任何的猶豫。因為船上的安全，就是船長最大的責任。他如果把船上的安全視為第一，那他個人跟這些官員的溝通困難，還是需要額外的時間跟精力，或更努力，就都不成問題，只要覺得船上的安全受到威脅。

航運安全的關鍵角色就是船長，對在這一方面人為因素的訓練，在我從事 HELM 訓練 這三年中，我們看到很多的船長，有些船長瀟灑，有些非常謙虛，也有的非常驕傲，就像這一個案件的船長一樣，這些呢不奇怪，但是有的船長反應很慢，有些船長容易情緒化反應，有些緊張，有些反應快卻不正確，有的呢就是拖延更久，總是讓別人替他做決定，這些人也都可以做到船長的職位。雖然領導的的五個面向，仁義禮智信有一些缺點，但是也是能夠被其他的人格特質所彌補。

在這個 21 世紀，有更多的挑戰，需要海員去面對，如果有公司的支持，對船長的人為因素訓練，作為組織可靠性的一部分，公司主動彌補船長人格缺點，在這個時代，對這個行業，可以起到重大的作用。那些船公司不能夠瞭解到這一點的，遲早會被時代所消滅，慢慢不斷的付出他們的代價。

7-33 The pivotal role in Maritime safety is the training in HELM aspects.

The safety lever (Accountability) of these two Masters with Pilot/VTSO is exactly the same as their own ship. They did not take active actions to clarify the instructions they received from VTSO/Pilot. It is not a healthy

relationship on board and in their outsider communication on shore. However, the key of maritime safety is always the Master. If BHRM training to shipboard Master had changed safety culture on board into a proactive lever, Master will raise their questions to VTSO/Pilot without any hesitation as their OOW will ask Captain when they feel anything abnormal. The pivotal role in Maritime safety is the training in BHRM aspects. In all these years in shipping company, we see some Captains are smart, some are humble, some are proud (like the master in this case), these are no surprise to us as they have different personality. But some Captains are slow, some are emotional, some are nervous they also can be promoted to Captain position after some years delay. We all have some kind of deficiency in 5 aspects above. However, those deficiencies can be compensated by other qualities in our personalities. Usually, the proud one is quick in his reaction but overlook many things. The slow one is humble to crew and take other opinion willingly. However, beside the good man manner, he may not yield any decisive decision when we need most. In this 21 century, Mariners faced more challenge than before especially in new equipment's application. Proper supports of company to Master's personalities training as organizational accountability become an important role in this industrial. Those company cannot realize this will not be able to eliminated the accidents and incidents which had no precedents before, like vessel stuck Suez Canal passage over one week.

結論

7-34 三個主要架構影響船隻動態的決策

這一個碰撞案件可以再多加研討，經由英國海事局的報告，或是海事法庭及上訴法院的判決，能夠提供我們不同的資源，不論對海員的專業，還是立法者，也是同樣有所啟發。這有三個主要的架構影響到，對操船動作的決策，我覺得

- ⇒ 第一，就是規則的架構，避碰規則裡面提供適切的指導，有關於早期的避碰探測，與優良船藝，確認角色跟責任，借由轉向，減速等行動避碰。不過大部分關切的，都是開放水域，沒有提到在限制水域，與其他需要關心的事情。
- ⇒ 第二，在港口或港區附近相關船隻動態，但是使用不同的原則。在這裡必須使用通航管理的技巧，來確保最大的安全，與準時安排到達/離開的船隻。在港區裡面，這大部分是經由船期的安排，跟通行速度的控制，在這些水道裡面，有很多的變數要去考慮，例如風向流水的效應，船隻在碼頭的開航的狀態，領港人員，拖船數量足不足夠，貨物的複雜作業，限制水域裡面，其他船隻的航向航速，或是否有挖掘，港口保養，故障等等。在這樣複雜的港口管制，就成為一個總和性的管理作業，這要依靠港區操作單位的共同理解與默契。港內進行通訊是非常重要的磨合的過程，需要能夠準時，正確及有效率。
- ⇒ 第三，當損害發生的時候，需要有一個對等的方法來分配這些責任，與來自契約的義務，這些責任義務跟保險的風險，有直接的相關。在這個主題呢，我們還要看最高法院如何判決？在下一個章節，我們會檢視海事法庭的判決書，但是我們要先請你，對這案件的責任跟損害，你個人的評估是如何？

Conclusion

7-34 Three principal frameworks concerning ship movements decisions.

This collision, which can be studied in more detail through the full MAIB report and the provisional Admiralty Court and Appeal Rulings, provides an unparalleled training resource not only for maritime professionals but also for maritime legislators. Currently there are three principal frameworks which influence the way decisions are made concerning ship movements.

- There is the regulatory framework embedded in COLREG which provide appropriate guidance concerning early detection, prudent seamanship, identified roles and responsibilities and avoidance through altering course and or slowing down in an 'open water' encounter.
- In port approaches related area, different principles are applied. In these areas, vessel traffic management will involve their techniques to ensure the optimum safe and timely arrival and departure of ships. This is mostly achieved through arrival / departure schedule and speed control. But in such waterways, there are many more variables to consider such as the effects of wind and tide, berthing and unberthing schedule, pilotage, tug availability, cargo complications, sea room in confined

waterways, dredging, port maintenance, breakdowns and so on. In this context, **VTSM becomes a co-operative management exercise upon a mutual understanding of the port's operational practices.** To work smoothly by VTSM VHF coordination, communications are an essential component of this process and have to be timely, correct and effective.

- **When damage occurs, there has to be an equitable way of assigning liability,** which will be related to contractual obligations which have a direct relationship to insurable risk. In next paragraphs, we will review the Admiralty Court proceedings, but first we would ask you to consider how you would have apportioned liability for damages in this case.

7-04 法庭對避碰的一些看法

7-35 主要的議題是橫越規則的適用性

在前面的討論，是基於提供的資訊，那你會如何分配過失責任的比例，關於這個碰撞，跟其他的專業的同事討論的結果（英國領港的看法），這個責任的分配，亞歷山大一號的責任是介於80%到 50%，而 20%到 50%屬於長慧輪的過失。但是對比海事法庭的判決，判的是 80%的責任是長慧輪，而亞歷山大一號只有 20%的責任，這相對於法律的術語來講，是長慧輪造成的碰撞。在 CHRIS BORDAS 船長的文章發表在 Seaways 2018 年 12 月所寫的，"瞭解避碰規則在限制與特定的情況的適用性是很重要的，我沒有信心，這個判決達到這一個目標"，海事法庭的判決是被上訴法院所支持的，下面這些是海事法庭的判決書，編號 2018 年 1W CACIB 2173，這個判決書的法官 TEARE J 在 2017 年 3 月 13 號判決書上面列了幾點，

1. *就大範圍而言，TEARE J 總結出，亞歷山大一號接近這個挖掘的航道，也就是狹窄水道，這個橫越規則並不適用，沒有義務讓路給長慧輪。*
   - 換句話說，難道有義務要讓路給亞歷山大一號，就是長慧輪嗎？這是不可能的，因為長慧輪在狹窄水道裡面，怎麼可能去讓路給在航道外面的船隻，除非是減速停車，那在狹窄水道裡面，有流水的強烈影響，這個也是很危險的事情，所以是非常的不合理。
2. *橫越規則不適用於亞歷山大一號，是因為其不是在一個足夠穩定的方向或是船首向，可以認定為他的航向，他正在等待上領港，而不是表示當時他在任何航向中。*
   - 在避碰規則裡面，並沒有等待的條款，或是義務，與相遇的狀況。
   - 這個意思是說，橫越規則只有指出，讓路船見它船在其右舷，必須讓路。這個就是橫越規則，並沒有本船在等待期間，就不適用避碰的橫越規則。
   - 我們知道如果本船完全沒有船速，很可能是沒有碰撞危機的。
   - 船之所以有碰撞危機，就是代表本船有一定的前進速度，不管多慢。
   - 另外就"航行中 Underway "來說，未系岸，未錨泊，未擱淺，就是在航行中，就需要遵守避碰規則。
3. 法官 TEARE J 繼續舉證，

(1) 長慧輪的錯誤是在幾個方面，違反狹窄水道規則，沒有航行在航道的右側，

- 沒有航行在航道的右側，是事實，那是流水與領港的影響，那是碰撞之前在他自己的航道內，並不是在航道外發生碰撞的主因，

(2)保持不良的雷達跟視覺瞭望，基於不充份的資料所做的假設，

- 這是很嚴重的指控，卻是事實，不能說不良的瞭望，要說沒時間瞭望，因為要做的事情太多，對方船又沒有像本船這麼忙。

(3)過高的速度下前進，這是一個直接的原因，造成其無法保持一個良好的瞭望。

- 這個呢就是把 12 節的速度，看成是賽車，如果要像賽車手一般，手忙腳亂，速度呢應該最少是 30 節到 40 節，當海上所有船隻都比本船慢，無法評估他船的動向，而不會因為船速 12 節，就無法保持適當的瞭望。

  相對的亞歷山大一號的過失，是沒有保持一個好的聽覺瞭望造成的，結果就是隨著誤聽，誤解的 VHF 通話，他沒有向右轉向航道方向，反而直接向前開，造成航道入口被阻礙。

4. *以相對的過失來說，長慧輪是比亞歷山大一號更有過失。*

- 這也是誤解，前面我們說過，亞力山大一號雖然是慢速，航向不定，但是是他擋住了長慧輪所有的出路，左轉右轉直行，長慧輪只要從 1 號浮標離開航道，就會發生碰撞。長慧輪如果只能從 1 號浮標離開，他也沒有什麼選擇，都會造成碰撞，原因就是因為亞歷山大一號先占了碰撞位置。

5. *第五不論如何，對於長慧輪的不安全速度，應該對所造成的碰撞，造成的損害負更多的責任。相較於亞歷山大一號的低速，就是長慧輪造成碰撞的損害是遠遠大於亞歷山大一號。*

- 這個是以行動來決定碰撞的責任，就是誰的動作比較危險，誰就要負較大的責任，這是不對的，應該是什麼原因造成碰撞？亞力山大 1 號違反航運界慣例，避碰規則精神，不但沒有避讓，反而先開到碰撞點，造成長慧輪來不及煞車轉向而碰撞，沒有避讓又慢速接近碰撞點，應該就是誰的責任。亞歷山大一號航向不對，位置不對，速度也不對，因為他早點開走，開到航道對面去，都可以避免碰撞。

基於這些結論，法官認為長慧輪對此碰撞，應該負擔 80%的責任，而亞歷山大一號是 20%，在上訴法院，沒有人對法官的主要事實認定有所挑戰，主要的議題是對，是否適用於橫越規則，也就是避碰規則的 15 到 17 條的適用性。單就規則是單純一點，但是上訴裡，沒有提到錯誤認定港口的指示，沒有積極澄清它船的意圖，而且時間更長，也是不良瞭望，沒有避讓又慢速接近碰撞點，擋在碰撞點，讓它船無路可走，不論其動機為何？。

7 – 04 Some legal considerations in collision avoidance

7-35 The principal issue goes to the applicability of the “crossing rules”.

In previous discussion, on the basis of the information provided, “How would you allocate the percentage liabilities assigned to the collision?” The discussions with professional colleagues assigned between 80% and 50% liability to Alexandra1 and 20% to 50% to Ever Smart.

By contrast the judgement from the Admiralty Court apportioned 80% liability to Ever Smart and just 20% to Alexandra1. This is the nearest to a legal statement that Ever Smart caused the collision, a conclusion which Pilot Captain Chris Bordas in his feature published in Seaways Dec 2018 stated

“*It is more important to understand what collision avoidance rules apply in defined and specific circumstances. I am not confident that this judgement has achieved this objective.*”

The Admiralty Court Judgement supported by the Court of Appeal.

The Admiralty Court Proceedings Neutral Citation Number: [2018] EWCA Civ 2173

The judgment of Teare J, dated 13th March, 2017 (“the judgment”)

1. *In the broadest outline, Teare J held that* **the crossing rules did not apply,** *so that when ALEXANDRA 1 approached the dredged channel ("the narrow channel"), she was not under a duty to keep out of the way of EVER SMART.*

⇒ In another words, It is Ever Smart under a duty to keep out of the way of Alexandra 1.

⇒ But how, when Ever Smart is inside the channel his duty to give way will have to be done by limiting his speed while he is sailing outbound the channel.

⇒ Giving the consideration of strong current in the channel, Ever Smart may have trouble to keep his course properly.

2. *Furthermore,* **the crossing rule was inapplicable because ALEXANDRA 1 was not on a sufficiently constant direction or heading to be on a course;** *she was waiting to embark a pilot rather than herself being on a course at the relevant time.*

⇒ The crossing rules is COLREG’s rule. In COLREG, there are not waiting terms, obligations or meeting situation. The crossing rule has no exception for ***constant direction or heading to be on a course.*** The crossing rule is applied by relative position of two vessel, not the course.

3. *Teare J went on to hold that EVER SMART was at fault in respect of: (1) breaching the narrow channel rule by not keeping to the starboard side of the narrow channel; (2) keeping a defective radar and visual lookout and making assumptions on the basis of scanty information; (3) proceeding at an excessive*

speed, a direct consequence of her failure to keep a good lookout. In turn, ALEXANDRA 1 had been at fault by failing to keep a good aural lookout, with the result that, following a misheard or misunderstood VHF conversation, she did not turn to starboard towards the channel and instead headed so as to cross the approaches to the channel.

⇒ Ever Smart is in three faults and ALEXANDRA 1 had fault in one sentence. *(1) at fault by failing to keep a good aural lookout, (2) following a misheard or misunderstood VHF conversation, (3) he did not turn to starboard towards the channel.*

4. In terms of relative culpability, the faults of EVER SMART were much more culpable than those of ALEXANDRA 1.

5. However, having regard to the unsafe speed of EVER SMART, she contributed far more to the damage resulting from the collision than the very much lower (and safe) speed of ALEXANDRA 1. It followed that the causative potency of EVER SMART's fault was greater than that of ALEXANDRA 1.

6. In the light of these conclusions, Teare J held that EVER SMART should bear 80% of the liability for the collision and ALEXANDRA 1, 20%.

On appeal there is effectively no challenge to the Judge's primary findings of fact. The principal issue goes to the applicability of the "crossing rules", i.e., rules 15-17 of COLREG will have very clear division of narrow channel rule's three applicable situation by the supreme court verdict.

⇒ Rule 15 had not mention 'course' at all. How come the court will came out with this conclusion?

⇒ The key criterion in COLREG is whether the vessels are on steady bearings;

⇒ if so, and it is not a head-on or overtaking situation, the crossing rule will apply. Don't forget rule 9 narrow channel is ahead of crossing rule 15.

⇒ '*Approaching*' *does not mean the vessels have to be heading towards each other; it simply means they are getting nearer* [55]. This point is what we discussed before. Collision is caused by two vessel's distance reduced to zero.

操作性議題

7-36 要使用國際避碰規則或是傑貝阿裡港的操作規則

所有操作者在特定的時間，一定要知道使用哪一種規則？沒有這些共同的瞭解，不可能安全地運作。在這個案件，當然應該檢視避碰規則 1 的正確性，*（b）在這些規則裡,不應該干涉到特殊規則的操作，當由適當的權責單位，對於他的航道，港口，河流，湖泊跟內陸水道，與公海連接，並可供海船航行的操作規則，這些特殊的規則儘量跟避碰規則符合。*

傑貝阿裡港的運作規則，有下面的記載，

"對一條出港船的航道出口點，與對一條進港船的航道的進口點相同時，在這種情形，"航路權利"應該屬於出港船。"
"船隻有航路權利者，應該保持它現有的航向航速，並應該尊重國際避碰規則的相關規定。"

法官 TAERA 在他的判決書寫到，因為亞歷山大一號是在港區，而且在碰撞發生時，實際上是不動的，（這也是他個人觀點，兩節的速度叫做不動的船隻），規則 15 作為一個橫越船並不適用，所以他沒有義務，依照上面的規定，他沒有義務去行使避碰，因為他固定不動，而且只有四個 CABLE 在航道的出口之前，那有一條非常大的船正在離開。

⇒ 亞歷山大一號是在港區是沒錯，所以傑貝阿裡港的規則應該適用，而不是在港區內，適用國際避碰規則，航路權利應該是屬於出港船，亞歷山大一號在港區內停止不動，或是在錨地，是 OK 的。在航道的出口之處下錨，完全沒船速，都不是優良船藝，何況他還是航行中，還想要動車橫越航道，造成碰撞，後面的倒車，對避碰毫無意義。尤其是一條大型船隻長慧輪正在離開，或是在領港站著，就並不 OK。

⇒ 長慧輪得到港口管制官員的離港許可，領港還沒離船時，就加上 5 度向右的流水修正，要繼續回到航道的右側，領港離船之後，才加車直接向外海前進。
⇒ 在這個階段，只有航道管制官員知道這條油輪的名稱，亞力山大一號又把 AIS 關掉，可能領港也是要看 AIS 資料，才知道進港船船名，雷達上看不到，他才會吞吞吐吐，說不出來。
⇒ 然後沒有人在這個系統裡，知道亞歷山大一號船長心裡面，想的是什麼東西？當其誤認長慧輪離開航道時，會向左轉向，沒有任何單位能修正他的錯誤。
⇒ 長慧輪再往右舷前進，想回到航道的右側，雖然長慧輪加了 5 度的 Leeway 到右舷，在 2334 時他的航跡，仍然是在航道的左邊，經過 8 分鐘的流失修正，當他離開一號浮標，在 2340 時也是，這是不可抗力。
⇒ 實情並不是船長希望他的船隻待在左舷，或是左邊，造成法官說他的罪狀是，違反狹窄水道規則，要靠在右側航行。在狹窄水道裡面，這個是“不可抗力”造成，船位不在中線上，船長只能做的最好估計，但是他永遠不可能確定，本船能夠修正到什麼程度，因為流水是隨時在變的。
⇒ 法官說長慧輪船長沒有保持在航道的右邊來避免碰撞，但是他要保持船隻在航道裡面航行的安全，在狹窄水道裡面的安全。航行安全是比避碰更重要的事情，因為擱淺，可能造成的損害，比碰撞要大得多。
⇒ 航道裡面的碰撞安全是由交通管制來確保，航行的安全只有船長能夠掌握自己船隻的特性，這就是為什麼航路權利，應該交給出港船。
⇒ 開始重新加車，是希望能夠直接開向外海，長慧輪原來在航到裡面的速度，是十二節，
⇒ 長慧輪速度已經減到 10 節下領港，在領港離船之後再加俥，當他通過一號浮標，船速已經加到 11 節，快速的通過，可以減少橫越的時間。
⇒ 快速的穿越，可以減少在狹窄水道裡面的時間，同樣可以減少船隻的航跡，被風力流水的影響，推出航道。
⇒ 通行速度在港務局所允許的範圍之內，就不應該認為是超速，不是速度引起碰撞，碰撞的危險，不是以通航速度來規範，而是以航路權利來作規範，否則在港區裡，來往船隻都以減速慢車航行，避免責任，港口營運完全沒效率。
⇒ 有航路權利的船隻，應該保持現在的航向航速，長慧輪已經得到港務管制官員的離港許可，正在重新回到航道的右邊，和他原來的速度。

這個法院實際上責罰長慧輪，對每一個法官想像違反的避碰規則，實際上，解除亞歷山大一號的未讓路義務，不論是地方規則或是避碰規則上的義務。

這一節，講得不清不楚，實際上亞力山大一號的過錯，都被他的慢速合理化，安全速度比安全的位置重要嗎？亞力山大大一號的位置不安全，速度也許是安全的，還是發生碰撞，可見碰撞與船速無關，與船位有關。長慧輪離開航道跟碰撞點之間的距離關係，讓他無法採取有效的轉向避碰行動，也沒有足夠的轉向時間，這些，我們會在後面，再做詳細的討論。

The Operational Issues

7-36 Which rules to apply: “COLREG” or rules of Jebel Ali Port?

All operators must know which rules should be applied at any given time. Without this common understanding it is not possible to function safely. In this case, let’s examine Rule 1 (b) first: *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 will conform as closely as possible to these Rules.*

The rules of Jebel Ali Port are *special rules made by an appropriate authority* clearly stated as follows:

In the event that the channel exit point of an outbound vessel is the same as the channel entry point of an inbound vessel “Right of Way” shall be with the outbound vessel.

The vessel having "Right of Way" shall maintain her present speed and course but shall respect the International Regulations for the Prevention of Collision at Sea.

Justice Tear in his judgement stated that because Alexandra 1 was within port limits and was effectively stationary at the time of the collision, Rule 15 as a crossing vessel did not apply and therefore by inference, she had no obligation to act to avoid the collision which the collision had caused by being stationary just 4 cables directly in front of the exit channel where a very large ship was departing.

- ⇒ Alexandra 1 was within port limits (pilot station): The rules of Jebel Ali Port should be applied. "Right of Way" shall be with the outbound vessel.
- ⇒ Alexandra 1 was effectively stationary at the time of the collision: Alexandra 1 being stationary outside port limits or within anchorage is OK. Being stationary just 4 cables directly in front of the exit channel where a very large ship was departing or in pilot station is not OK. This position blocked the way out (no space and abeam distance for a full rudder turning) and caused this collision.

On the other hand, Ever Smart having been given clearance by the VTSO through the departing pilot proceeded to regain the starboard side of the channel (applying 5 degrees leeway to starboard side) as she gained speed with a view to proceeding directly out to sea. At this stage only the VTSO knew the name of the Tanker who had switched off their AIS and nobody (in this close loop of communication) knew Captain in Alexandra 1 was erroneously expecting Ever Smart to alter course to port on exiting the channel.

- ⇒ Ever Smart proceeded to regain the starboard side of the channel. Although Ever Smart applying 5 degrees leeway to starboard side at 2334 hours, her track still in port side of the channel after 8 minutes leeway applied when she finally departed No.1 buoys at 2340 hours.
- ⇒ This track is not what Master want her ship to be at "starboard side or port side of narrow channel". It is driven by the current from East "force majeure" which means a master can do his best estimation but never sure of where his ship will be after he applied leeway to steer.
- ⇒ Ever Smart master is not intending to keep to starboard side of channel to avoid collision but to keep her vessel inside the channel safely without grounding. Actually, inside the narrow channel safely navigate afloat is more important than collision avoidance. That's why *"Right of Way" shall be with the outbound vessel because Captain's attention will mostly concentrate on course keeping, no time for collision avoidance*.
- ⇒ Ever Smart proceeded to regain the speed with a view to proceeding directly out to sea. Original speed inside the channel is 12 knots. Ever Smart had reduced to 10 knots to disembark pilot and regain her speed after pilot disembarked to 11 knots when passing No. 1 buoys. Fast transit speed can minimize the transit time inside the channel which will also reduce the transit time when ship's track may carry away by wind or current influences. Channel speed allowed by port authority will never be deems as excess speed which will have great danger in collision. Collision Avoidance is not regulated by transit speed but *"Right of Way"*.
- ⇒ The vessel having "Right of Way" shall maintain her present speed and course. Ever Smart having been given clearance by the VTSO is doing so to regain the starboard side of the channel and her original speed (regain her present speed and course).

The court laid the blame on Ever Smart for every imaginable violate of the Colregs but discharged the obligations of Alexandra 1 to keep out of the way both through the Colregs and the port rules.

避碰規則內沒有港口管制員 與領港的角色

7-37 領港對於"航路權利"是有最高的權責，

這是在港區的規則。避免碰撞的情勢，是由四個單位的互動所構成的，但是在法庭上，就被窄化到兩個船長之間的責任，在判斷如何適用避碰規則，跟應該怎樣被解讀。

兩個船長是航行在 2 度空間的海面上，使用避碰規則，有時候因為下霧或是能見度不佳而盲目。港口管制官員是使用港口雷達，從上面第 3 度空間的鳥瞰圖，來俯視監控他們的動態，然後發出無線電的指令，沒有從船上人員的干擾。港口管制官員就像在看模擬器畫面的講師，對

在港區內通行船隻的動態，碰撞情勢有更清晰的瞭解，就像是上帝之眼，他們對碰撞情勢，比在船上的船長還要瞭解，因為他是從船外的三度空間的監控。
在避碰規則 1，適用（b）避碰規則不應該干擾到適當權責關於操作的特殊規則，……
DP World 集團 操作手冊在傑貝阿裡港是 2013 年修正的，包括呢下面的敘述：（摘自 MAIB 的報告 1.6.5 節）

> *航路權利 "Right of Way" 應該屬於出港船。*
> *領港牽涉到航路權利的情況，應該採取及早明確的行動，使他們的意圖清晰。*
> *領港可以授權航路的權利給港口管制官員，港口管制官員應該提供必須的資訊以平順的執行。*

航路權利的情況，領港具有最高的權責，依照港口規則。因為港口管制官員也許並不是海員，不具有足夠的海上經驗，領港對港區內的所有危險，都具有比較充分的經驗，知道如何處理。

- ⇒ 無論如何，領港可以把他的航路權力交給出港或進港船，或是港口管制官員，也就是授權給他們去處理。
- ⇒ 有航路權利的情況發生，也就是有船要讓路，港口管制官員可以提供的必需資訊，來使得這個航路權利的行動，可以平順的執行。
- ⇒ VTSO 港口管制官員就是被認為是港口的權責機構，被船上的船長認為是權責單位，他們給的消息，被視為指示或是規劃好的方式。
- ⇒ 兩個船長的通訊，關於他們航路權利的決策，經常是會被港口管制官員所尊重。也就是如果兩個進出港的船長已經協調好了，港口管制官員是不會再多加干涉。
- ⇒ 在多國籍船隻上面，VHF 的通訊在這兩條船上，經常被船長避免，特別是在遠洋船隻跟近洋船之間的 VHF 溝通。最後的結果，就是船長只有等待從港口管制官員來的指示，而不是呢自己去跟它船交涉航路權利的情況。

No VTSO and pilot parts in COLREG 1972?

7-37 The Pilot has utmost authority in "Right of Way" situation by port rules.

The collision situation consisted of four parties' interactions. But in court it narrowed into two captain's liability in judgement of how COLREG should be interpreted. Vessels are sailing in two dimensions' sea surface with COLREG (sometimes they are blind due to fog or poor visibility) while VTSO overlook from port radar monitor and give radio instructions by vessel's relative position and applying his local rules of navigation. Ship's master and VTSO are working at same time with different aspect of applicable rules in their port area. Traffics inside port limits overlook by VTSO is like bird view in God's eye if they familiar the true motion speed vector's usage in radar lookout. They will have better comprehension of collision risk than masters on board.

COLREG. Rule 1 Application
(b). Nothing in these Rules shall interfere with the operation of special rules made by an appropriate authority ......
DP World's Operations Manual for Jebel Ali (revised in 2013) included, (MAIB report [1.6.5.])

- *.... "Right of Way" shall be with the outbound vessel.*
- *The pilots involved in a "Right of Way" situation shall take early and positive action and make their intentions clear.*
- *Pilot can relinquish his "Right of Way". VTSO shall provide necessary information to smoothly execute "Right of Way" situation.*

The Pilot has utmost authority in *"Right of Way" situation* by port rules. Because VTSO may not a seaman with necessary sea experiences, pilot have more experiences in all kinds of danger inside port limits. However, pilot can relinquish (give up) his "Right of Way" to outbound or inbound vessel or VTSO. When "Right of Way" situation happened (which party have the right to arrange the way) VTSO shall provide necessary information to smoothly its execution. VTSO is regarded as port authorities by masters. Its information is regarded as instruction or coordination. Two captain's communication of their discretions in right of way situation usually is respected by VTSO. With so much multiple national ship's flag vessels, VHF

communication between two vessels usually avoid by master especially in ocean going vessel to coastal vessel because the accent and pronunciation problem. In the end, master will expect to receive instructions from VTSO to proceed not to negotiate “Right of Way” situations by themselves any more.

港區內所有單位的指揮鏈

7-38 將航路權利交由船長判斷

1.領港在航路權利的情勢下，應該採取及早明確的行動。
2.領港可以將航路權利交給管制官員，港口管制官員接手後，應該提供必需的資訊，也就是指示來使得航路權利的情勢，得以順利執行。
3.港口管制官員未得授權或領港不在時，也必需提供資訊，如進港船或是出港船的船名跟動態給兩位元船長。
4. 進港船和出港船隻可以經由港務局指定的 VHF 工作頻道，建立通訊，使航路權利情勢能夠在港務管制員的監控，來順利執行。
在這些執行航路權利的指揮鏈，最有效的就是由兩位船上的領港來做的決策，他們應該要記得進出港船隻的名稱，不管是進港或是出港船。在這個指揮鏈裡面，最弱的一環，就是港口管制員跟船上船長之間的通訊與授權，一般來說，船長對於進港或出港船的船名，沒有足夠的資訊，除非他們有非常好的英文，而且對港務管制員的通話，非常注意港務台跟什麼船在對話？船長的英文好，還不夠，近洋船常會有一個本地口音或是本國發音的船名，使得其船名沒有辦法，被遠洋船的船長清晰的分辨。或是正確的呼叫

Chain of command at port all mariner used.

7-38 Relinquish their “Right of Way” situation to masters.

1. The pilots involved in a “Right of Way” situation shall take early and positive action.
2. Pilot can relinquish his “Right of Way”. VTSO take over the command should provide necessary information (instructions) to smoothly execute “Right of Way” situation.
3. VTSO provide necessary information: inbound or outbound vessel’s Name, location and movements to two vessels to smoothly execute “Right of Way” situation.
4. Inbound or outbound vessel established communication through port control VHF working channel under VTSO supervision to execute “Right of Way” situation.

In these chains of commands regarding “right of way” situation, the most effective one is made by two vessel’s Pilots. They should remember the vessel’s name whether inbound or outbound. The weakest link of this chain of command is between VTSO and ship’s master. Usually, master have no idea of inbound or outbound vessel’s name unless they have very good command of English and pay a lot attention in VTSO’s communications with other ships. Sometimes, the master’s English is not enough. Those coastal ships usually have a local pronounced ship’s name which is impossible to read by foreign master if he has the concern of their movement with own ship’s path.

使用於橫越規則或是狹窄水道規則“

7-39 避碰規則需要檢討跟修正使用新的技術跟理論，

在 1972 年的避碰規則的目標是避免碰撞。在這規則 “碰撞” 字眼出現了 19 次，大部分是碰撞危機，或是碰撞，避碰規則沒有一次提到任何“碰撞位置”或是“碰撞時間”。因為在 1972 年，雷達仍然是船上的一個奢侈品，而電子海圖或是自動識別儀還沒有問世。碰撞危機是由規則 7 第 1 項：這種危機應該被認為存在，如果來船的羅經方位，並沒有明顯的改變。這個定義並不是很精確，下面規則自己又做解釋，第二項：碰撞危機有時候可能存在，即使來船的方位有明顯的改變。規則 7 在當時算是非常實際的規則，因為這是一個良好的當值船副，在駕駛台用眼睛可以看到，判斷的情勢。
物理對於碰撞的定義：<u>是兩個物體，在同一時間，通過同一個位置</u>。避碰規則並沒有採用這一個定義，是因為這不是船副在駕駛台用目視就能夠發現的，碰撞的三個參數：碰撞的位置，碰撞的距離跟碰撞時間，必須經由圖紙上面來測繪計算，船副要算還算不出來，要用畫的。在那時候 1972 年，對兩條船來講，要知道本船跟他船的航向航速都很難，即使是對本船的航向航

速，都不太能掌握，因為那時候連電羅經都不太穩定，隨時會故障，想到以前過太平洋的貨櫃船，天冷的時候，二副還要拿棉被把電羅經包住，因為電羅經是液態漂浮的，冷縮熱脹，裡面的轉子浮不起來。一條船有一部雷達與電羅經都不得了了。在 2020 年，本船跟目標船的航向航速，與碰撞位置，對航海家已經不是問題，因為有 GPS 可以幫我們決定的上述三種參數。在雷達上面的顯示航向航速，也比較精確，在電子海圖上面，還可以帶入他船 AIS 發送的識別與資訊，這些也就是港口管制官員與領港最需要監控的事項。

進港船的船名，方位與距離這三個資訊，就是領港跟港口管制官員並沒有交給長慧輪船長，清晰指出來的（本來進港船的 AIS 可以提供），當他們將航路權利交給船長去處理。瞭望的職責跟目標的識別，就交給這個非常繁忙的出港船船長。這個遲早就會有麻煩，尤其是在忙碌的港口，像是新加坡的船隻通航服務 VTS，我們可以得知這些資料，由兩個駕駛台的來源，被雷達探測出來的，或者是他船主動發射的 AIS 資料，使用雷達的瞭望，船長與當值船副應該具有的能力，可以預測哪裡是碰撞位置？而不是只有單純的碰撞危機意識。

利用視覺，在 1972 年避碰規則要決定碰撞位置，必需使用雷達人工測繪，很容易產生錯誤，即使是非常有經驗的當值船副來做雷達測繪。45 年已經過去了，現在碰撞的位置，可以很容易就由阿帕和電子海圖的螢幕上，使用兩條船速度向量線的交點，得到正確的位置。

我們已經有這些工具，但是我們還在使用 45 年前的航運實務，避碰規則必須檢討修正，使用新的技術跟理論，當我們航運界已經有碰撞位置的概念，我們就能夠輕易的決定，什麼樣的避碰規則，應該適用？當一條船在狹窄水道，另外一條船並不在狹窄水道裡面。

碰撞位置可以幫助當值船副決定，那一條規則適用？規則 15 橫越，或是規則 9 狹窄水道，當一條船在狹窄水道內，一在狹窄水道外。

為什麼我們在避碰規則，需要兩種規則的概念，是因為可供船隻操作的水域來避碰，是受到限制的，這是被各方所同意。

當我們知道哪裡是碰撞位置？在狹窄水道裡面？或是狹窄水道外面，檢查這個碰撞位置附近，可以運轉的海域，就知道哪一條規則應該使用？

如果大家都具有同樣的知識基礎，就不會發生混淆，也不會讓法官在那邊外行判案，

如果在碰撞位置附近可供運轉的水域夠大，是在狹窄水道之外，橫越規則就應該適用。

換句話說。如果碰撞位置是接近一個狹窄水道，不夠大，那這兩條船其中之一條，並沒有可供運轉的空間來採取避碰行動，那狹窄水道的規則就應該適用。

Applicability of the “crossing rules” *or* “narrow channel rules” ?

7-39 COLREG need to review and revise with new technologies and theory.

COLREG 1972 is aimed to preventing collision. In this convention the word of ‘collision” show 19 times mostly are “collision” or “collision risk”. Not once COLREG had mentioned about “collision position” or “collision time”. This is because by 1972 radar are still a luxury equipment and ECDIS and AIS are not at scene. Collision risk is decided by Rule 7 (i). *such risk shall be deemed to exist if the compass bearing of an approaching vessel does not appreciably change*; this definition is not so precise so followed by Rule 7(ii). *such risk may sometimes exist even when an appreciable bearing change is evident,…..* This rule 7 is very practical because compass bearing is what a good OOW can detect by visual at bridge in 1972.

The physical definition of collision is “two objects passing same position at the same time”. COLREG did not adopt this definition because there are not able to decide collision position (same position) or same time(collision time). The collision position and collision time have to calculated from maneuvering board with radar echo been detected. Who’s know what is our and his course and speed now? These have to be decided after we have precise ship’s position from past 15 minutes. In 2020, ownship and target vessel’s course, speed and position are not a problem to Mariner by introductions of DGPS. These three are exactly what Pilot or VTSO had not clearly indicated to Ever Smart master when they relinquish their “Right of Way” situation to him. The lookout duty and target positive identification then rest on a very busy outbound master and their team on bridge. This practice will be a big trouble soon or later especially in a busy port like Singapore VTS. Now, we can have these crucial data from two sources at bridge, passive detected Radar and proactive transmitted AIS. Master and OOW should have the ability to predict where is collision position by radar

lookout, not only rely on visual sense of risk of collision, by visual lookout (rule 7). In 1972, "collision position" has to be calculated manually by radar plotting which can easily mistake even a very experienced OOW did it. 50 years passed, now collision position can simply identify at ARPA or ECDIS screen as "the intersection point of two vessel's speed vectors". We have the tools at hand but we are still doing 50 years old practice at sea. The COLREG need to review and revise with new technologies and theory.
When our industrial have collision position concept we can easily decide which COLREG Rule should applied when one vessel is in narrow channel and the other is not. The position of collision can help OOW decides which rules to apply, rule 15 crossing or rule 9 narrow channel. The concept of why we need two rules in COLREG is because the maneuvering space needed to take avoidance actions is limited, also their obligation is varied. This principle is agreed by all parties in 1975. If we know where is the collision position and whether it is inside or outside narrow channel and its maneuvering space around this position, these all can be applied to decide which rule is applicable.

If maneuvering space outside narrow channel around collision position is available, cross rules should be applied. In another words,

If collision position is near a narrow channel and these vessels has no maneuvering space to take avoidance actions, narrow channel rules should be applied.

7-40 避碰規則的至上條款：諮詢船上的領港或是傑貝阿裡港口管制官員

引用：The Admiralty Court Proceedings Neutral Citation Number: [2018] EWCA Civ 2173

英國海事法庭的判例 2018 年 EWCA Civ 2173 號
第 79 條，在這事件，給資深船長的問題，是以下面的條件提供：
"某些環境中：1.某船從傑貝阿裡狹窄水道出港，2.某船（也就是進船）接近狹窄水道的入口，從東邊以大致向西的航向，3.一個碰撞危機在現場兩條船存在，在狹窄水道的入口附近，什麼樣的行動，你預期對一個熟練的航海家，以符合一般海員常規的實務，（1）出港船跟（2）對進港船，會採取什麼行動？

⇒ 附注：這一個問題，本身問的似乎是不對，因為這個航道的軸線是 315 度，不是西也不是東，是西北對東南走向。法官要的答案，是由這些假設的問題，去類比出他結論。
條款 80：資深船長給出的答覆，有如下述："熟練的航海家在這出港船，在這個情形之下，會
1.保持敏銳瞭望
2.確保符合規則 9，保持在航道的右側，以安全速度前進
3.及早擷取東邊來的船隻，作為一個阿帕目標，然後觀測其的方位來決定碰撞危機
4.諮詢領港和傑貝阿裡港務台，有關這條船的識別跟意圖（就是他的船名跟動態）
5.及早與他船聯絡，使用 VHF 告知本船在狹窄水道的限制，與下領港時的意圖。

條款 81 條：*傑克先生對於這個答案，提出一個有力的批評。這個問題不清楚，是否資深船長（Elder Brethren）會認為這個假設性的相遇，是被橫越規則所管轄？除非橫越規則是適用的，這個答案（在假設性由東向西的情形）缺少清晰以及明確在這個判決上，（實際上，是由西向東的情況）。這些答案不是要回答，那一條規則優先？，這個只是"如何進行工作"，而不是解決碰撞的方法。他依靠使用 VHF 與對方船長聯絡，當做解決碰撞方案，這個方法有潛在的困難，而且一直以來，就受到以前法庭的詬病。進一步說，想要以此判定亞歷山大一號過失的方法，所以要求法官對該案過失判決的比例要重新修正。*

⇒ 這個傑克先生的表達不清（大約是長慧輪律師）。
⇒ 法官假設性的問題是進港船由東向西，本船出港見他船由東向西接近，本船是讓路船，難怪上面資深船長的回答要靠右，減速，詢問領港，向對方聯絡，表明自己的意圖。
⇒ 實際上，進港船是由西向東的情況。見進港船船由西向東，本船出港是直航船，本船該做的是保持航向航速，航行的概念完全不同，直航船要做事的優先，也不同。
⇒ 直航船依靠使用 VHF 與對方船長聯絡，當做解決碰撞方案，這個方法有先天性的困難，而且一直以來，就受到以前法庭的詬病。進一步說，資深船長的理由完全不支持法官的

意圖，想要以此判定亞歷山大一號的過失（首先，提出錯誤的問題，就是把直航船與讓路船弄錯了，就會得到錯誤的答案），要求法官對該案過失判決的比例要重新修正。

⇒ 首先，提出錯誤的問題，就是把直航船與讓路船弄錯了，就會得到錯誤的答案。

⇒ 法官要用讓路船的行動來要求直航船，完全弄錯。

條款 82：塞罷拉婻小姐的回應，*資深船長的答覆，完全符合他給法官的提示，“……下列這兩組答案顯示，橫越規則並不適用於一個狹窄水道的入口”。這個建議長慧輪應給予許可去上訴，對於責任分配的問題，因為這個回答是“超乎尋常且嚴重的瑕疵”*

停止引用

上訴許可

這個方案件發生在狹窄水道的入口，就像法官在 82 條所寫的“*這兩組答案顯示，橫越規則在狹窄水道的入口，沒有用處*”，

⇒ 這個法官的結論，與 79 條的問題並不符合。法官問的是什麼樣的“行動”？你預期一個熟練的航海家會採取什麼行動，以符合一般海員的常規？

⇒ 這部分的回答，在 80 條裡面，熟練的航海家在出港船，在這樣的情況下，會採取的是

- 1.敏銳視覺瞭望，
- 2.靠右：保持在狹窄水道裡的避碰需求，減速：唯一避碰的手段。（還要保持本船的操控性能，速度不能太低）
- 3 雷達的瞭望，
- 4.詢問領港與管制員，它船的船名與意圖。（先問主管官署，表示他們的意見優先於他船與本船的意願）
- 5 建立 VHF 的通訊作為最後避碰的手段。

⇒ 一般的實務，在海上是先詢問船上的領港，想要如何安排通航的意圖（以領港的意見優先，領港決定以後，會去做後續的安排），然後盡可能的配合他的這些行動。

⇒ 第一條第二條第三條跟第五條列出來呢是當做優良船藝的一部分，第四條的行動才是解決這個情勢的真正關鍵。

⇒ 它被避碰規則的第一條至上條款所支持，當地主管官署／規則優先，

⇒ 亞力山大一號是沒有，也不瞭解港口管制官員與領港希望他去做什麼？或是要求他應該怎麼做？如果海員不能夠瞭解港務管制官員，是港內碰撞主要負責解決的單位，還是試圖用他自己的理解來解決問題，將會造成很大的混亂，造成更大的時間，環境，金錢，生命的損失。

條款 82 的結論是不相關的，“*因為這兩組的答案顯示，橫越規則在狹窄水道的入口，是起不到什麼作用*”，

⇒ 法官根本就沒有問到哪一條規則，在狹窄水道的入口可以使用？只有問到照一般的海員常規，船長們會採取哪些行動？

⇒ 資深船長的回答，沒有引用到狹窄水道規則，就說狹窄水道規則沒用。因為資深船長是海員，不是律師，不習慣引經據典，是行動派，不是理論派。

⇒ 問題是要採取什麼樣的行動？這是在第 80 條，不是“要使用哪一條規則？”然後結論就變成狹窄水道規則不適用。

⇒ 法官如果要這樣子問的話，就可以直接達成結論，就是避碰規則在狹窄水道入口，完全不適用。哪根本就是違反國際慣例，如果要做結論，應該有問正確的問題，

⇒ 提供給資深船長的問題，至少要像這樣一句，“哪一條避碰規則的規定，你認為離開狹窄水道的船隻，應該要使用？”

⇒ 法官結論是狹窄水道規則與橫越規則，都不適用，所以船隻應該使用安全速度航行。

⇒ 這個規則適用性的結論，跟一般的海員常規要做的事情是無關的，這個法官不是一個海員，在真實的世界，熟練的航海家接近狹窄水道，是由領港或領港的代理人來執行航路權利，進港船和出港船港口管制的工作，這是由 VHF 的工作頻道，港務官員的監督下，來行使“航路權利”的情勢。

如果問題是什麼樣的規則？應該適用在狹窄水道的入口，這個答案，就會像 CAPTAIN CRISPATA 在 Seaways 2018 年 12 月寫的”一致同意的就是,橫越規則永遠都應該適用，當幅合將要發生在狹窄水道的限制水域之外。“（幅合 Convergence 這就是前面我說的，碰撞危機應該要用兩船的距離越來越近來定義）

Applicability of the “crossing rules” or “narrow channel rules” ?

7-40 COLREG Paramount clause: consult the onboard pilot and Jebel Ali VTS/port control.

Quoted

from The Admiralty Court Proceedings Neutral Citation Number: [2018] EWCA Civ 2173

Article 79. In the event, the question posed to the Elder Brethren (“the Question”) was in these terms:

“ In circumstances where:

1. A vessel is proceeding outbound in the Jebel Ali dredged channel (‘the narrow channel’);

2. A vessel (‘the incoming vessel’) is approaching the mouth of the narrow channel from the East on a broadly Westerly heading;

3. A risk of collision between the two vessels exists in the vicinity of the entrance to the narrow channel;

what actions would you expect from a prudent mariner in accordance with the ordinary practice of seamen on (a) the outbound vessel; (b) the incoming vessel?”

Article 80. The answer given by the Elder Brethren (“the Answer”) was as follows:

“The prudent mariner in the outbound vessel in such circumstances would:

- *keep a sharp lookout*
- *ensure compliance with Rule 9 by staying on the starboard side of the channel and proceed at a safe speed*
- *acquire the vessel coming from the east as an ARPA target at an early stage and watch its bearing to determine the risk of collision*
- *consult the onboard pilot and Jebel Ali VTS/port control re the subject vessel’s identity and intentions*
- *make contact with the other vessel on VHF at an early stage to advise own ship’s constraints in a narrow channel and his intentions when dropping his pilot*

Article 81. Mr Jacobs launched a vigorous critique of the Answer. It was unclear whether the Elder Brethren considered that the hypothetical encounter was governed by the crossing rules. Unless the crossing rules applied, the Answer (in the hypothetical East-West situation) lacked clarity and certainty as did the judgment (in relation to the actual West-East situation). There was no rule of priority; it was more a “work-around” than a solution. It relied on a VHF solution, which was fraught with potential difficulty and had been criticised by Courts in the past. Further, the reasoning of the Elder Brethren had completely undermined the Judge’s approach to the faults of ALEXANDRA 1 so requiring the Judge’s apportionment to be revisited.

Article 82. Ms Selvaratnam’s response was that the Answer was entirely consistent with the advice given by the Elder Brethren below to Teare J, “...as both sets of Answers show that the crossing rule has no role to play in the approaches to a narrow channel”. The suggestion that EVER SMART interests should be given permission to appeal on the question of apportionment in the light of the Answer was “extraordinary and deeply flawed”.

Unquoted

Permission to appeal

This case happened at approaches to narrow channel which of judge stated in article 82 “*...as both sets of Answers show that* ***the crossing rule*** *has no role to play in the approaches to a narrow channel.*….”

⇒ The conclusion of judge is no match with his question.

⇒ The question in article 79 asked for "*what* ***actions*** "*would you expect from a prudent mariner in accordance with the ordinary practice of seamen on ……*

⇒ Part of the answer is in article *80. "The prudent mariner in the outbound vessel in such circumstances would……."* These were things an outbound master will do at bridge. *1. Visual lookout 2. Keep navigation safe inside narrow channel* (may not for collision avoidance purpose) *3. Radar lookout 4. Ask Pilot what is their arrangement of passage* (but in wording change to: consulting) *5. Establish VHF communication as last resort to avoid collision.* Normal practice at sea is asking on board Pilot's intention of passage plan and follow it as possible. Actions 1,2,3 and 5 are listed as good seamanship. Actions 4 is real clue to this situation and it is supported by COLREG rule 1 Paramount clause. The faults of Alexandra 1 are not clear of what VTSO or pilot want him to do. If mariner cannot understand port control's instruction, they will always try to solve the situation by their own understanding of the situation. It will be a big chaos with even greater risk in every aspect and loss of time / money.

⇒ The conclusion in Article 82 is irrelevant "*as both sets of Answers show that* ***the crossing rule has no role to play in the approaches to a narrow channel***". The judge had not asked "***what rule has to play in the approaches?***" The judge had asked : "***what actions… in accordance with the ordinary practice of seamen?***"

⇒ The question is "What kind of actions?". He got the answer in article 80. Then conclusion is "what kind of rules should apply?".

⇒ This conclusion should be derived from asking correct question to *Elder Brethren* "According what COLREG rule you will apply while departing *a narrow channel*?".

⇒ This conclusion has nothing to do with *ordinary practice of seamen.* The judge is not a seaman.

⇒ In the real world, *prudent mariner* approaching *a narrow channel* by ship's master along is like we discussed "Inbound or outbound vessel established communication through port control VHF working channel under VTSO supervision to execute "Right of Way" situation." somethings more or less like actions 5 given in article 80.

The judge made irrelevant conclusion. EVER SMART interests should be given permission to appeal in the light of the Conclusion was "extraordinary and deeply flawed"

If the question is "*which rules shall apply in the approaches to a narrow channel*", the answer will be as Captain Chris Bordas stated in Seaways 2018 Dec. "the consensus is that the Crossing Rules should always apply when convergence (collision position) is going to take place outside the confines of a narrow channel".

7-41 避碰規則的至上條款：所有規則都必須適用

⇒ 為什麼這兩組答案都沒有提到適用什麼規則？是因為船長有很多事情要擔心，而不是只想到該用什麼樣的規則。

⇒ 所有規則都應該適用，避碰規則第一條 A 項"這些規則應該適用於所有船隻，及在公海上所有水域與海相通，可供海船航行之用。"，海員被訓練去接受所有可能的碰撞危機，包括背離本規則的危機。就像規則 2 責任（b）在使用與解釋這些規則時，應該考慮到對所有航行的危險，以及碰撞危機，或是任何特殊情況，包括船舶本身所受的限制，這些可能使得背離本規則是必須的，以避免立即的危險。"

⇒ 狹窄水道的入口，應該被認為是狹窄水道的一部分，原因是受到船隻操縱的限制，圖形 7-11 長慧輪相對操縱性，在 2340 時。不幸的是，即使是英國海事局的報告，不能澄清有關相對的操縱性的觀點。

圖形 7-12，在 2342 分零 7 秒的碰撞位置

⇒ 在圖形 7-12 上，我們使用兩條平行的指標線，指出浮標航道的方向，碰撞的位置是在 1 號浮標的東北方，雖然亞歷山大一號的船首像是 102 度，加上東南向的流水少於一節的速度，它的航跡顯示 3 分鐘前的位置，這三分鐘他都在航道上近乎不動，長慧輪的瞭望，未免太差了。

⇒ 碰撞時，他正在等待長慧輪去讓路，長慧輪本身卻是要保持它的航向航速的航路權利的情勢。亞歷山大一號的船體，佔據的航道出口有 3 分之 2 的寬度。

⇒ 長慧輪的相對操縱，不具有足夠的距離，只有 2.5 倍船身長度的距離去回轉（還沒扣掉船身 2 CABLE 的長度），無論向右舷或是左舷去回轉，都會擦撞到，圖形 7-11 長慧輪相對操縱性。

⇒ 亞歷山大一號留下的反應時間，去回轉的時間是兩分鐘，這個時間也許是足夠，但是這個前進的距離，並不夠。

⇒ 我們看到一個小船正在繞過亞歷山大一號的船尾，那條就是領港船，他還沒有靠上亞歷山大一號。

規則 2 責任的分配：條款（A）*本規則的任何部分，都不能豁免任何船隻，船東，船長和船員任何疏忽的後果，疏於符合這些規則，或是疏於任何注意事項，為一般海員常規所需求的，或該案件的特殊情況*。”

⇒ 一條船在狹窄水道裡面，一條船在狹窄水道外面，兩條船同時使用狹窄水道，或是兩條船同時使用橫越規則，都不合理，一定是在狹窄水道裡的適用規則 9，水道外的適用橫越規則。出了狹窄水道就適用橫越規則，誰該讓路看幅合位置在那裡決定？

⇒ 兩條船都不適用狹窄水道，這就是很大的矛盾，現在法官的判案，就是認為資深船長給的答案，沒有提到任何狹窄水道與橫越規則的部分，規則 9 與 15 就都不適用。況且法官還把讓路船跟直航船的位置對調，來求解答。

⇒ 規則 9（d）某船不應該橫越狹窄水道或是航道，如果這樣的橫越，會妨礙到只能在狹窄水道裡面安全航行的船隻。

⇒ 亞歷山大一號擋在 2.5 倍船長的前進距離，橫在狹窄水道的入口，就像圖形 7-12，而且他也妨礙出港船的航行與避碰的操縱。

⇒ 船隻無法在 2.5 倍船長的前進距離內回轉避碰，是海員的常識，也是亞歷山大一號沒有注意，違反常規的一部分。

規則 15，……*船隻當有他船在其右舷，應該讓路，而且應該如果事件的環境許可，避免橫越它船的船頭。*

⇒ 長慧輪是在亞歷山大一號的右舷，所以亞歷山大一號應該要讓路，應該避免橫越長慧輪的船頭。

⇒ 船隻應該使用規則 15，橫越規則，如果他們的位置是在狹窄水道之外。使用規則 9，一但他們進入狹窄水道。

⇒ 在這個案件，兩條船的碰撞位置是在狹窄水道之外，所以規則 15 橫越的規則應該是適用。

⇒ 這是駕駛台的標準作業程式 SOP，不管是否有碰撞發生，如果某船在狹窄水道裡面航行，接近的船隻並不讓路，這樣並不合理，因為在狹窄水道外的船隻，具有更多的選項避碰，可以停車，改航向，或是更改他的船位，而在狹窄水道裡面的船，他能夠避免危險的空間與選項都比較少。

機長“薩利”這部電影裡，飛機駕駛員被指責沒有採取正確的行動，並且危及乘客的生命。因為機長有足夠的時間，可以降落在最近的機場，這是以飛行模擬器操作的時間來估計，時間是足夠的，如果不必考慮，或者檢查其他的可能性。

⇒ 事實上，千金難買早知道，人員在現場，不可能立刻就知道原因與解答。海員並不是坐在法庭裡面，去判斷哪一條規則可以使用。

⇒ 我們相信規則一，沒有任何規則禁止長慧輪船長須符合規則 9，保持在航道的右側，亞歷山大一號要符合規則 15，在等待區域內讓路，每條船都有他自己應該要適用的規則，依照她所在的位置。

最不可原諒的事情，亞歷山大一號做的，就是擋住了出港船的航路，當他可以在航道的東邊等待，如果他確實相信右對右的通行是港務台的意思，他也不應該擋在航路的正前方。

7-41 COLREG Paramount clause: All rules should be applied.

The reason why both sets of Answers did not mention which rules to apply is because Master has many things to worry about then thinking what rule to apply. "All rules should be applied" as COLREG Rule 1 "(a). *These Rules shall apply to all vessels upon the high seas and in all waters connected therewith navigable by seagoing vessels*." Mariner is trained to accept all possibilities in collision risk as Rule 2 Responsibility (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.* The entrance to the narrow channel should be deems as part of narrow channel due to limitations in maneuvering of the vessels involved as figure 7-12. Unfortunately, even the MAIB report cannot clarify this point of relative maneuverability as we had discussed.

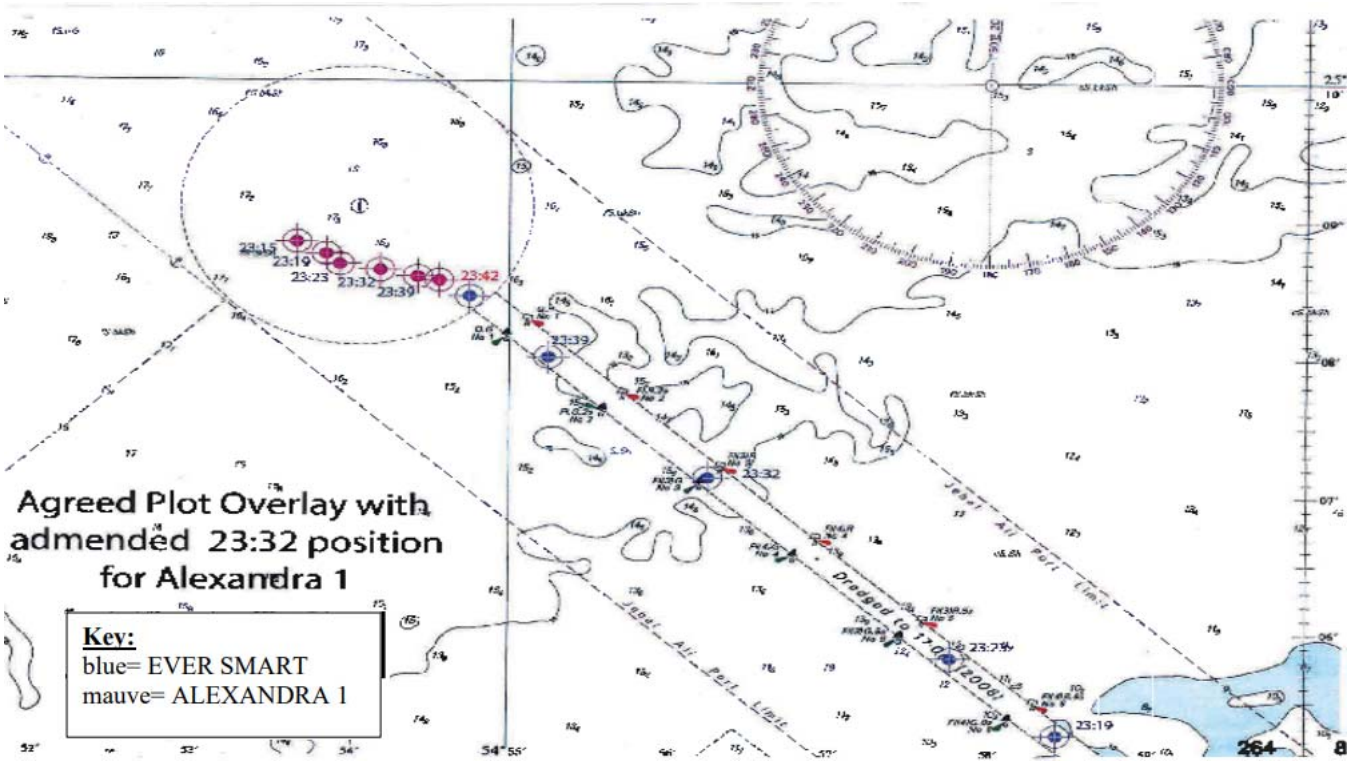


Figure 7-12: Collision position at 2342:07 hours

In figure 7-12 at 2342:07 hours collision time, we put two parallel index lines to mark the buoyed channel direction. Both vessels positions are at NE direction of No.1 buoys. Although Alexandra 1 was heading 102^0 (T) together with tidal stream south-easterly at less than 1 knot her 3 minutes trail show her position are there 3 minutes before. She is expecting Ever Smart to give way while Ever Smart is expecting to maintain her course and speed as "right of way" situation. Alexandra 1 ship hull occupied two third of channel exit width. Relative maneuvering of Ever Smart did not have enough distance (only 2.5 ship's length) to turn to starboard side or port side without the danger of scratching Alexandra 1. The reaction time Alexandra 1 leave for Ever Smart to turn is 2 minutes which might be enough for a hard over turn (2 minutes may be enough for a tanker to make the turn) but the advance distance is not enough (vessel need abeam distance to clear of collision). We can see a small boat go around Alexandra 1's stern. That's pilot's launch which still not alongside Alexandra 1 yet.

Rules 2 assign responsibility to (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 precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.* We cannot understand why Rules 9 and 15 cannot be applied together. Rule 9 (d).

A vessel 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.

- ⇒ *At the point of collision, ALEXANDRA l's bow was on about the centre line of the channel, projected forward from No 1 buoys. The port bow of EVER SMART struck the starboard bow of ALEXANDRA 1 at an angle of about 40 degrees leading Page 8 aft on EVER SMART.*
- ⇒ Alexandra 1 did cross the entrance of narrow channel as figure 7-12 and she did impede passage of a vessel which cannot give-way in 2.5 ship's length advance distance.
- ⇒ Vessel which cannot give-way in 2.5 ship's length advance distance is *ordinary practice of seamen.*

Rule 15 …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.

- ⇒ Ever Smart is on her starboard side that will be enough for her to give way. Alexandra 1 should avoid crossing Ever Smart's head. Below are condition listed by supreme court JUDGMENT GIVEN ON 19 February 2021
  - ✧ Vessels should apply rule 15 if their positions are outside narrow channel and she is not intended to enter the channel.
  - ✧ If vessel is to enter the channel but her course is not aligned with the channel, she should apply rule 15 crossing rule.
  - ✧ If vessel is to enter the channel and her course had aligned with the channel, she should apply rule 9 narrow channel rule.
- ⇒ If both vessels' positions are outside the channel, Rule 15 should apply.
- ⇒ In this case, Alexandra 1 is outside the channel and her course had not aligned with channel.
- ⇒ Ever Smart is inside the channel when collision risk is detected, rule 9 should apply.

This is the SOP of Master at bridge with or without collision happened. It is not reasonable that if one vessel inside narrow channel, approaching vessel should not give-way while she has more option outside the channel to stop, to change heading or position…. In the movie "Sully". Air pilot was accused of not taking correct actions and endangering passengers' lives while the reaction time is enough from flying simulator to landing on nearest airport. Without second thoughts or checking by operation procedures, mariner have no time to judge which rules is applicable. We believed in Rules 1. No rules should be exonerated while Ever Smart comply with rule 9 to keep to starboard side of fairway and Alexandra 1 comply with rule 15 to give way in waiting area. The most unforgivable thing Alexandra1 did is to block the way of outbound vessel in last three minutes when she can still wait at East side of buoyed channel if she believe in starboard to starboard side passage.

所有航行與碰撞的危險，船隻所受到的限制

7-42 避碰規則 2 的責任條款：所有的航行與碰撞的危險

避碰規則 2 的責任條款（b），要求在適用與解釋這些規則時，應該考慮到所有的航行與碰撞的危險。

- ⇒ 長慧輪的船位並不是在航道的右邊：這是被流水跟風力，不可抗力推到左邊去的，並不是船長要違反規則 9，不應該視為過失。船長已經使用了向右 5 度的流水修正，航向 319 度，這與領港給的指示，走 314 度，並不符合。在過去的 8 分鐘，違背領港的指示，當船長被指責並沒有良好的視覺與雷達瞭望，主要工作是保持本船在航道裡面。
- ⇒ 領港也許潛意識希望，在狹窄水道裡面，將船位保持在左邊一點，方便他從右邊的領港梯裡離船，這是領港個人的需求，把船隻保持在水道的左邊，所以也不應該視為是船長的過錯。
- ⇒ 即使使用 5 度的流水修正向右，長慧輪的位置，仍然沒有開到航道的右邊，顯然是流水繼續把船隻推向航道左邊，這也不是船長個人的意願與選擇，不應視為船長的過錯。
- ⇒ 所有在碰撞之前的危險，照規則 2 的字面，就是航行的安全，可能在任何時候，航行都會發生錯誤。船長的責任應該是照顧他的船隻安全第一，而不是碰撞危機。

⇒ 當領港說進港船會等待，經由他們適當的安排，這個碰撞危機，應該就不那麼急迫，雖然最後發生碰撞的結果，船長工作的優先順序，也是需要探討的。

All dangers of navigation and collision, the limitations of the vessels involved?

7-42 COLREG Responsibility clause: All dangers of navigation...

Rule 2 Responsibility (b) required " *In construing and complying with these Rules due regard shall be had to all dangers of navigation and collision ….".*

⇒ Ever Smart's position not at starboard of channel is pushed by current or wind as Force Majeure not violation of rules 9 although the evidence shown Captain had chatted with someone else on the bridge.

⇒ Captain had applied 5 degrees leeway from 314 to 319 degree to starboard side against pilot instruction of 314 degrees over past 8 minutes when he is accused of no proper visual and radar lookout.

⇒ Pilot may subconsciously want to keep to a little bit to port side of the channel for himself to disembark in starboardside pilot ladder. This is pilot's requirement to keep the vessel a little to port side of channel.

⇒ Even with these 5-degree leeway applied to starboardside Ever Smart position is still not in starboard side of the buoyed channel after 8 minutes try.

All dangers of navigation come before collision in Rule 2 wordings which implied navigation duty may go wrong in any minute. Master's responsibility should take care of his navigation safety first to avoid grounding instead of collision risk. When pilot said inbound vessel will wait the collision risk is not imminent by their arrangement.

橫越規則不適用，因為亞歷山大一號並不是在足夠穩定方向，或是船首相，可以認為是在一個航向

7-43 橫越規則：足夠穩定方向，或是船首相？

避碰規則 15：*橫越的情況，當兩條動力船隻正在橫越，並有碰撞危機時，船隻見它船在其右舷，應該讓路，如果情況的環境許可，應該避免橫越其他船隻的船頭。*

⇒ 這一條規則並沒有提到任何一次"方向，船首向或是航向"，而是使用"船隻見他船在其右舷"來界定避碰責任。

⇒ 海員適用的避碰規則，在駕駛台是利用視覺的瞭望，（不管法官了不瞭解），或是 1975 年老式的雷達瞭望。

⇒ 其他船隻的方向，跟船首向，在 1975 年雷達上面要得到的這些資料呢，不是不可能，要有適當的訓練與學識，不是每個人都可以，只有到 1995 年的阿帕，或是 2010 年的 AI S 才有他船方向出現。

⇒ 單純的航向從來就不是，也沒有用來判斷碰撞危機的一種，只有航向資料，並不能指出是否有危機？或是責任義務的分野？為什麼法官會對碰撞危機，有這種錯誤的想法？

⇒ 我們一定記得避碰規則是從帆船時代來的，帆船永遠都不可能在一個足夠穩定的方向，或是船艏向上航行。風向是多變，磁羅經方向多變，船首向也是多變，船隻只能配合行駛大約的方向，如果某船不能保持一個航向，就能夠從避碰規則 15 裡面豁免，這是不合理的。即使是帆船沒有穩定的船艏向，也是要遵守避碰規則。現在的船隻在沒有足夠穩定的航向下航行，受到強烈的海浪或是風力影響之下，就能夠自動豁免避碰規則，僅用安全速度航行，那這個顯然法官的引用是有問題的。

AIS 信號在 SOLAS 公約上的使用規定，是 24 小時強制開啟

長慧輪沒有保持適當的瞭望，使用雷達跟目視是事實，在前面我們說過，這個事實是基於兩個理由，遵守領港的指示與使用 AIS 的訊號作為主要的瞭望工具。這兩個因素就是亞歷山大一號所缺乏的部分，

⇒ 領港給亞歷山大一號的指示，是等待在航道外，並沒有被亞歷山大一號船長所遵守，船長得雖然沒有進到航道裡面，可是在航道外面，自行採取行動橫越航道，又不幹不脆，剛好停在航道口子上。

⇒ 第二個發送 AIS 的資料，在海上人命安全公約上面是強制 24 小時開啟。但是亞歷山大一號並沒有發送 AIS 資料，海事法庭應該要對此多加著墨，海上人命安全公約應該是與避碰規則具有同樣的效力，船隻沒有開啟 AIS 的信號，在 2017 年已經造成兩條美國海軍艦艇的碰撞。

The crossing rule was inapplicable because ALEXANDRA 1 was not on a sufficiently constant direction or heading to be on a Course.

7-43 COLREG Crossing clause: sufficiently constant direction or heading...

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.

This rule did not mention of any "direction or heading or course". Only used "*the vessel which has the other on her own starboard side*". When mariner applied COLREG at bridge sometimes by visual and 1975's old fashion Radar lookout, other vessel's direction or heading is not readily available at 1975. These data only available in modern ARPA or AIS from 1995 or 2010, etc. which should be used as an indication of collision risk and obligation. Why the judge has this wrong idea of collision risk? We must remember COLREG is derived from sailing boat age when sailing boat can never be a sufficiently constant direction or heading, but the collision risk is still existed. If one ship cannot keep a constant course then he will exonerate from Rule 15 is unreasonable. In this logic, vessels or sailing boats have no constant course during strong swell or wind will automatically exonerate from their COLREG obligation.

SOLAS requirement: Operational AIS signal is compulsory 24 hours...

Ever Smart had not kept proper lookout by Radar and visual is truth. In last article we said this fact have two reasons: Followed pilot's instruction and use AIS signal for major means of lookout. These two factors are exactly what had missed in Alexandra 1 part. Pilot's instruction to Alexandra 1 is "to wait" which had not followed by master. Operational AIS signal is compulsory 24 hours in SOLAS but Alexandra did not put in use. Admiralty court should give some weight to it too. SOLAS should have same legal weight as COLREG as well. Vessel did not put AIS signal in use had caused two US naval ship collisions in 2017.

狹窄水道的出入口就是在領港站

7-44 領港的登輪區域非常不適當

領港登輪的區域在航道的盡頭是非常不適當。

⇒ 每一條船出港都可能會自動產生碰撞危機，因為很可能有船隻等著進港，如果把領港登輪的區域，移到浮標航道的右邊，就可以立刻解決所有的問題。

⇒ 不要忘記"莫非定律"，如果有可能出錯，就會有錯。不要讓船隻在領港登輪區等待，避免擋到其他船隻的通行，應該是優良船藝。

⇒ 船隻沒有權利去擋在航道的出入口，尤其是狹窄水道，就像不可下錨一樣，這是海員常規。

⇒ 船隻也不可以豁免規則 15，或是豁免規則 9 狹窄水道，或是任何規則，當本船在狹窄航道外面，規則 15 應該適用，讓路，停車，改變航向，或是改變船位。當本船是在狹窄水道裡面，規則 9 應該適用，保持本船在行道的右側，這個就是規則 1 的至上條款。

⇒ 我們不應該太接近浮標航道，超過領港站標記的位置，這樣會使得船長操船的距離不夠，領港所需要的回轉距離不夠，依照經驗所歸納出來的，浮標航道到領港站的安全距離最是 1.5 海浬，對大型船隻來說（這也是一般 SEA BUOY 到浮標航道入口的距離）。小型船隻是半海浬。

⇒ 這是說從領港站，從登輪區到進入航道至少要保持 1.5 海浬（對大型船隻），方便領港調整適當的航向進入航道，對於小船是半海浬，如果少於這個距離，領港就沒有辦法順利的把船開進航道裡面，這個是船隻操縱的物理限制。

The entrance to and exit from the narrow channel were in the pilot boarding area,

7-44 Pilot boarding area is unappropriated.

Pilot boarding area in the end of narrow channel is unappropriated. Every vessel outbound will have collision risk automatically. Moving pilot boarding area to port side of buoyed channel entrance will solve all problems immediately. Don't forget Murphy law: " if it is possible for something to go wrong, it will go wrong ".
Vessel waiting or maneuvering in pilot boarding area

⇒ Should apply good seamanship to avoid block another vessel's movement. This is seamanship.
⇒ have no right to block entrance to and exit from the narrow channel.
⇒ Has no right to exonerate from Rule 15 (inapplicable) or Rule 9 or any rule.
⇒ When ownship is outside the cannel rule 15 crossing should apply, give-way or stop or change direction or position.
⇒ When ownship is outside the cannel and align with channel course, rule 9 should apply. Keep ownship to starboard side of channel.
⇒ Should not go to buoyed channel nearer than pilot station marked distance of 1.0 nm which is the maneuvering distance needed by pilot as experience had summarized (at least 1 nm for big vessel or half mile for small vessel to make large course change to enter or exit the buoyed channel).

不安全速度：從船頭受損部位說起

7-45 更安全的速度少於二節，烏龜贏得了比賽

在條款 116 條，法官引述另外一個案子，“影響到這個碰撞的唯一過錯，一定要仔細評估，而且過錯必須要由此來衡量，誰比較要責備，有過錯，造成損害是因何疏忽的行動。”

⇒ 任何的速度，如果不能夠採取適當有效的行動，去避免碰撞，並且將船停止，就不是一個安全的速度。
⇒ 亞歷山大一號的速度是慢，但是並不安全，因為他以緩慢的速度，擋到了出港船的計畫航道，因為他的速度慢，沒有留下夠的海域，讓出港船可以安全通過，避免碰撞。
⇒ 出港輪的速度是快，但是並不一定是疏忽的行動。出港船保持原來的航向航速，在出港的時候，可以維持更好的舵效，是優良船藝的一部分，也是顧及航行危險，所要採取的船速。
⇒ 這個法官可以詢問亞歷山大一號，他預期長慧輪在下領港之後，將會採取什麼樣的速度？只要做過幾年船長的回答，一定是 12 節的速度，原始航道的速度。除非船長覺得有安全的顧慮，當他們從 13 號浮標開出港，出港時就是 12 節的速度。
⇒ 這個碰撞是因為碰撞位置引起，由亞歷山大一號所造成的碰撞位置所引起的，不是因為出港船的速度。
⇒ 港口的作業並不能讓任何船隻隨意接近狹窄或是浮標航道的出入口，“航路權利”應該要先分清楚，才來分誰的速度是安全不安全？如果責任不分的話，只是看誰的速度比較慢，就有航路權利，那港口作業就完全癱瘓。
⇒ 大家都不可以把船隻隨便到處開，否則任何出港船隻從狹窄水道出來，都必須減速到兩節，就像進港船的速度一樣，這樣才能避免過失的責任。
⇒ 兩節的速度在航道裡面，沒有顧及港口的營運跟航行的安全，只要流水大於兩節，這條船就失去控制，只因為更安全的速度是比 2 節更慢，這是完全錯誤的判例。
⇒ 這也不是一個航海者應有的知識跟行動，然後烏龜就贏得了比賽，只因為他永遠最慢。如果這一個案子一成立，以後會變成一個長期的笑話。

unsafe speed: by looking at the damage done to the bows

7-45 More safer speed slower than 2 knots. Turtle wins the game.

Article [116] the judge cited from another case "Only fault which affected the collision must be assessed, and fault must be measured by blameworthiness, causation and *by the damage caused by the negligent conduct*." Any speed which cannot take proper and effective action to avoid collision and be stopped is not a safe speed. *Alexandra 1* speed is slow but not safe because she blocks the exit plan of *Ever Smart* and she has no way to avoid the collision by her speed when collision is imminent. *Ever smart* speed is fast but it is not an "*negligent conduct*" because outbound vessel keeps higher speed without pilot to maintain better steerage is his seamanship. The judge can ask Alexandra 1 what speed she will expect Ever Smart have after pilot disembark. For master with some years the answer is 12 knots, the original channel speed requested by port regulation when they sailed outbound from No. 13 buoys. This collision is caused by "collision position" created by *Alexandra 1*, not because of speed. Port operation cannot allow any vessel approach entrance of narrow or buoyed cannel without any obligation to give way. Otherwise, any vessel outbound narrow channel will have to reduce speed to 2 knots as inbound vessel. This slow speed 2 knots in channel traffic will jeopardize port operation and navigation safety etc.… because there will always have more safer speed slower than 2 knots. Then, the turtle wins the game. The precedent set in this case will become a joke for a long time to go.

人為因素

7-46 主動的安全文化是基於駕駛台團隊的適任性

作為一個人為因素課程的講師，我希望能強調兩個重點，

第一沒有人希望犯錯，如果他們知道他們正在犯錯。一個錯誤只有在經過事件發生之後，我們才會人為的合理化我們所犯的錯誤。船長不知道他正在犯錯，如果沒有人提醒他。

第二，如果船長依照他認為是正確的資訊而行動，但結果卻是不可靠的訊息，船副就很難在現場挑戰船長的判斷。在緊急時，船長要解釋他做決策背後的理由，在現場是並不可能的。

安全文化是基於駕駛台團隊的能力與適任性。如果船長平時在航行操作之中，沒有教當值船副他在做什麼，也就是給予當值船副足夠的知識，當下次決策錯誤發生的時候，也就是他對事實的認定有所錯誤，當值船副也不能瞭解他的錯誤在哪裡？也就是當值船副也不可靠（不講義氣 No accountability），也沒有辦法及時糾正船長，給予船長一些意見，也就是修正的計畫或是行動。

天氣好的時候，耐心的教導就變成當值船副可不可靠？在緊急的時候，是否會提醒船長？也就是平常肯教導，在緊急的時候，船長才會得到提醒，這就是義氣的來源。

⇒ 如果船長並沒有提升他當值船副的能力，他就不會從他們身上，收到任何的建議，或者提醒。

⇒ 作為港口管制官員是有責任去檢查跟確認船長的意圖，以安全的目標來確認船長的意圖，確保港區範圍內，一個安全有秩序的船隻航行狀態。

⇒ 在這個案件，只有這個港口管制官員知道進港的油輪的船名，在碰撞發生之前，他應該具有一個更好的位置，可以建立 VHF 的通訊來糾正亞歷山大一號。

不幸的是港口管制官員經常工作量超載，尤其是繁忙的港口，或是懶散的小型港口，在以前的日子，有些港口權責單位會給進出港船隻 ETA 的船期表，預估到港時間的船期，或是清晰的指令給領港，關於船隻的資料，船上的船長也能夠取得這一張船期表，經由領港或是代理行去取得，以瞭解本船進出航道時候的他船動態，作為我們的注意事項。

The Human Element

7-46 Proactive safety culture is based on competency of bridge team.

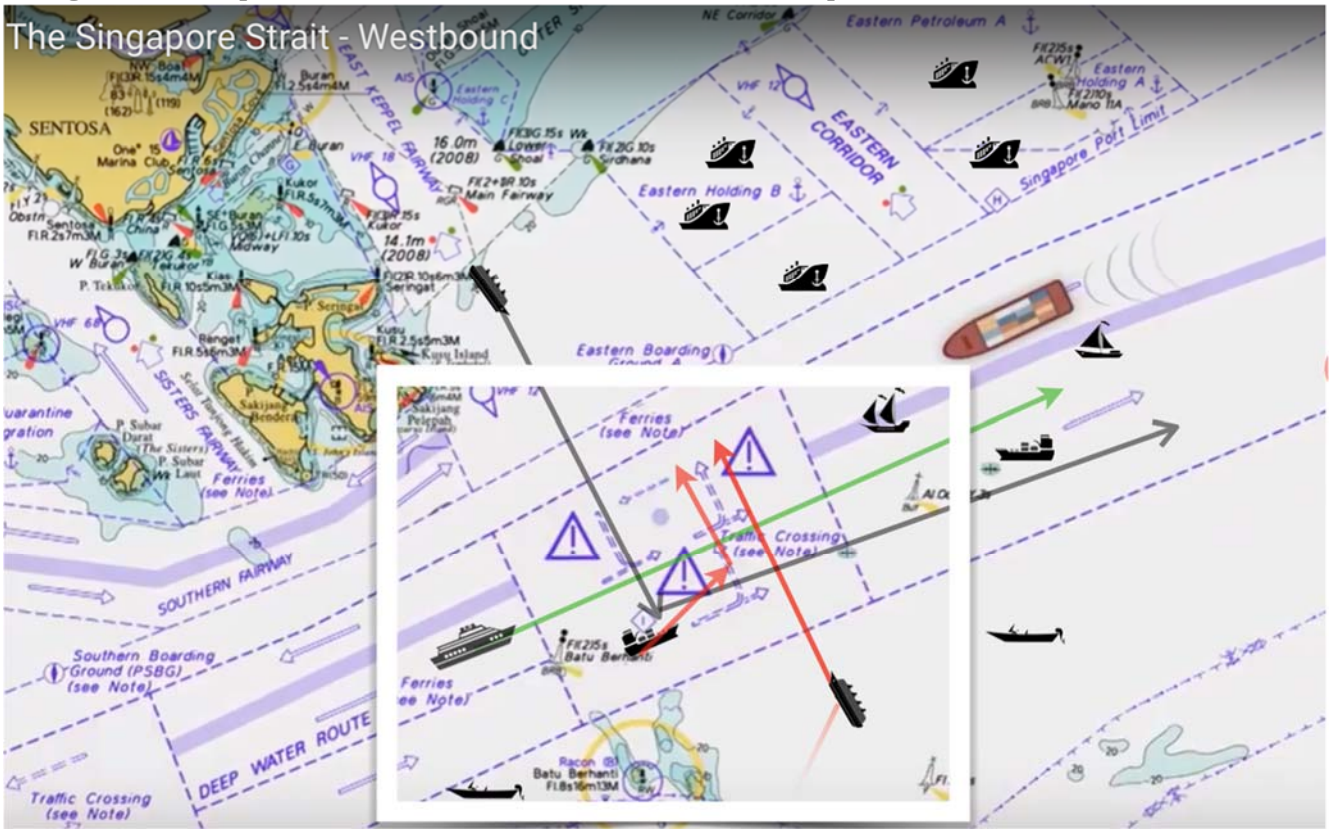
As a human element HELM instructor and without interviewing everybody, I want to emphasize two key points. First, nobody wants to make mistakes. If they knew they were making a mistake it would not be a mistake. It is only after an event that a realization can be made that a mistake was made. Master don't know he is making mistake if nobody reminds him. Second, If master acts on information which they thought was true but turns out to be unreliable, it is difficult for OOW to challenge captain's judgement at scene. Explain the

reasons behind his decision is not possible at scene. **Proactive safety culture is based on competency of bridge team.** If Master have not taught OOW of what he is doing in his routine work (the knowledge), when the misjudgment time comes (wrong perception or skill) OOW cannot recognize the mistake (no competency) and give some feedback to Master (action plan). What a captain can teach to his OOW is the first link of communication when the bridge team need in an emergency. Other link will be the understanding of OOW in what Captain is teaching (listening) and the advises he can give in Captain's vocabulary (talking).

Master patiently teaching in good days become accountabilities of OOW to remind master in emergency. This is the spirit of Accountability.

If master had not elevated his OOW competence he will not receive any suggestions or reminders from them in an emergency.

The VTSO has a responsible position to check and verify the intentions of master to ensure a safe and orderly navigation of vessels in his port limits. On this case, only the VTSO actually knew the name of inbound tanker before the collision he is in better position to establish VHF communications and coordinate the traffic. Unfortunately, VTSO usually overloaded with their works in busy port or less diligent in small port. In old days, some port authorities will give vessels ETA schedule or clear instruction to pilot about vessel's particular in print when the working day begin. Shipboard master should have the access to this schedule table through internet or pilot to understand the movements when ownship is in or out of channel.



圖形 7-13 船隻通行新加坡水道的碰撞危機

7-05 狹窄水道裡的防衛性航行

7-47 規劃靜態的航路來消除動態的碰撞危機

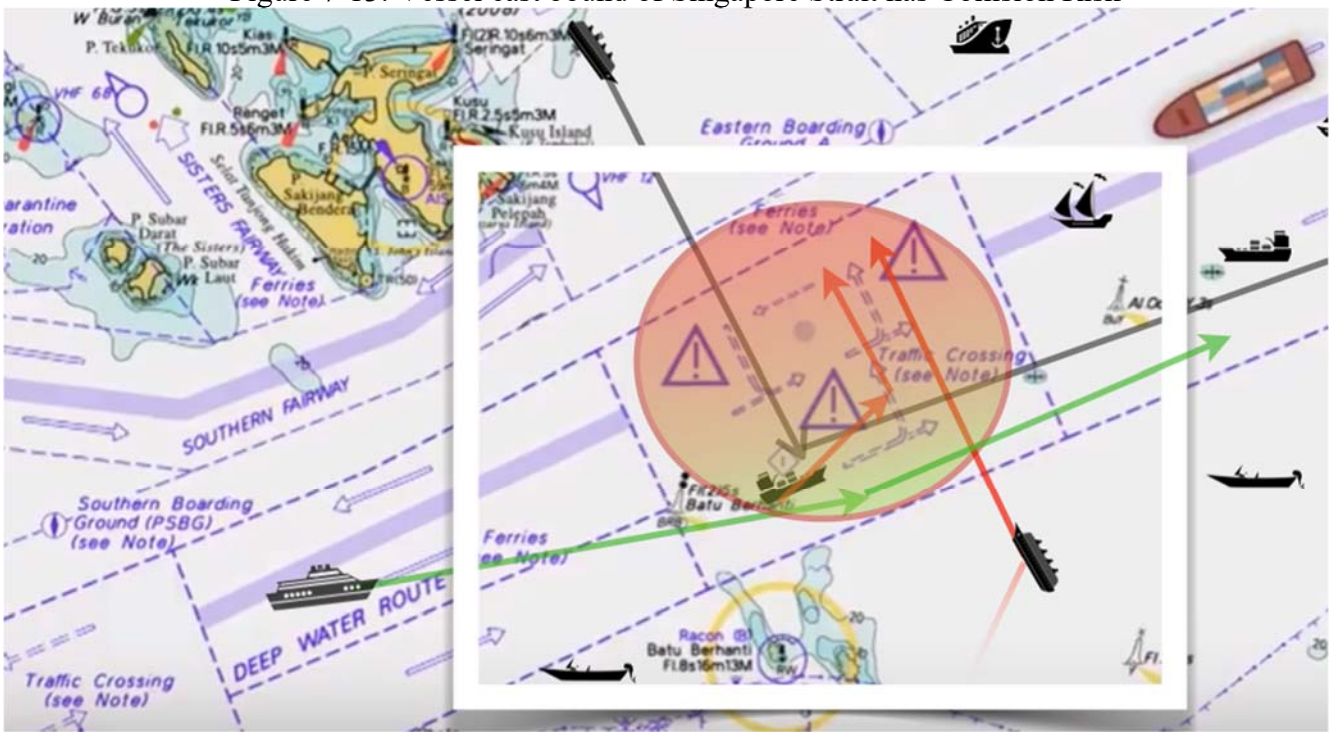
經過這些章節的討論，船長可能已經注意到，微小航向的改變，是在近岸航行時候的關鍵技術。當航行的水域，並不是對每條船都非常足夠的時候，所有我們在注意區域所進行的動態航行操作，或是碰撞熱點附近，都是在創造 1 倍或是兩倍船長的正橫距離，可以讓本船避碰與安全通過。當我們在做靜態的航路規劃，為什麼我們不保留這些寶貴的空間？而不是等到我們滿身大汗的在避碰現場，才去想到如何利用這些空間呢？聰明的人航行，只有傻瓜才在找路走。勇敢並不是基於我們的勇氣，而是我們如何避免危險的知識，這是勇氣的來源。

7 – 05 Defensive Navigation in Narrow Channel

7-47 Making static voyage planning to get rid of dynamic collision risk.

After these chapters discussed, Captain may notice that small course alternation is cardinal skill in coastal navigation when sea room is not enough for every vessel. All our maneuvering around the precaution area or collision hot spot is to create abeam distance of one or two ship's length to navigate through. Why not save these precious spaces beforehand at static voyage planning rather than at dynamic collision scene? "Wise men sail, only fool rush in". Our bravery is not based on our courage but our knowledge to avoid the danger.

Figure 7-13: Vessel east bound of Singapore Strait has Collision Risk



圖形 7-14 東航船隻通過注意區域的安全一邊

7-48 碰撞仍然發生在好船長的指揮之下

在圖形 7-13 某船具有綠色的速度向量線，他是向東航行要回到遠東，在深水航道裡，他有三個航路權利的情況，追越跟兩邊的橫越情況，船長已經

⇒ 備便引擎，
⇒ 及時減速，小心前進，
⇒ 使用目視與雷達瞭望的技巧觀測，經常檢查橫越船的動態，
⇒ 當值人員也都雙重配置，
⇒ 瞭望與船副也沒有忽略任何在 VHF 通訊裡的抱怨，

可以說呢船上可以用的資源，所有熟練航海家可以做的，應該做的，通通都已經被船長動用。可惜，不幸的是一陣雷陣雨忽然經過他的船頭，阻礙了它所有駕駛台資源管理所做的努力，目視跟雷達的瞭望通通失效，這可以說是呢不可抗力。雖然船長已經做了萬全的準備，忽然目標都失去了蹤跡，

⇒ 船長試著調整雷達的增益跟雨雪雜斑，來維持大型船隻的回跡，可以繼續在雷達螢幕上，加以辨識。但是小型目標已經在雷達上，找不到蹤影。
⇒ 因為雨雪雜斑的調整，本來安全的相對方位，可以使用小型目標的速度來決定，並用來避免任何意外，如果我們知道他的速度。這個意思呢就是說，
⇒ 看到小型船隻，我們就要對他的船速跟他的安全相對方位，先有個概念。如果遇到雷陣雨的時候，才能夠能知道以什麼樣的角度來脫離？
⇒ 霧號已經施放，現在可能是一個很好的主意。

碰撞還是在這一個好船長的指揮下發生？為什麼上天要這樣子來測試一個忠實誠懇的船長？他可以使得航行計畫更為可行，從陣陣雷陣雨經過的區域，安全的脫離。在圖形 7-13 上面的這些船隻附近航行，船長要脫困，這個呢似乎是有點不可能。

新加坡水道大約是 1 海浬的寬度，在這個區域，也就是 Alfa 東領港登輪區，本船現在已經太接近右舷孤立危險的浮標，

7-48 Collision still happened in Good Master's command.

In figure 7-13, one vessel with green speed vector eastbound to Far East in deep water route: she has three situations, one overtaking and two crossing from both sides. Captain had stand-by the engine for immediate maneuvering, reduced speed in time, proceeded with extreme caution, constantly check crossing vessel's movement with visual and radar and double the lookout and OOW and all a prudent navigator can do to navigate and ignore the complaint overheard from VHF (captain had exhausted all resources to maintain navigation safety). Unfortunately, the passing shower ahead hinder his BHRM efforts and lookout by visual and radar screen also blurred due to rain clutter (Force Majeure as we recognized). All targets had lost their track on radar, Captain try to adjust the radar gain and rain clutter to keep large vessel visible on radar screen but small targets are nowhere to be seen at radar screen after rain clutter adjustment. Safety Relative Bearing may be determined by small target's speed and apply to avoid any accident if we know her speed now. Sounding the fog signal may be a good idea now. After all these efforts, Collision still happened in Good Master's command. Why God test a faithful seaman in this way? Can Master make a sailing plan navigable in heavy passing showers to pass these three vessels on figure 7-13? It is almost Impossible. Singapore strait is about 1 nm width in this area (Eastern Pilot Boarding ground Alfa). Ownship is already too close to isolated danger buoy in starboard side now. Sharp turn to starboard side is impossible now.

Figure 7-14: Safe Side of precautionary area for Eastbound Vessel

對通行船隻如何抵抗不可抗力的解決方案

7-49 橫越區有推薦的航線安排

⇒ 這個，對不可抗力的答案就是在圖形 7-14 裡面，似乎注意區域 precautionary area 已經改變名稱，為橫越航行區域 traffic crossing zone，現在還有推薦航路的安排（虛線的箭頭）。

⇒ 如果我們還記得兩條船的航向線的交點，會產生一個碰撞危機，這些印在海圖上的航向線，就是暗示可能的碰撞位置在那裡。

⇒ 如果船長能夠改變航向，到航道的週邊或是本船的右邊，盡可能安全與實際的情況下，大部分的船隻相遇，不會發生。

⇒ 無論如何，航向的改變應該在足夠的距離之外，像是兩海浬，6 分鐘速度向量線的長度之外，這就是先前所討論的

⇒ 橫越航行區域基本上是一個圓環的概念，如果兩條船隻在相互橫越之前，每條船都要向右舷調整船位，不要通過同一個碰撞點，這對每條船都是好的，可以用較小的航向改變，產生更好的避碰效果，就像我們在這一章開始所討論的圓環，來取代交叉相遇的概念。

⇒ 這些圓環區域的大小，應該由船長自己決定，由這些橫越航行區內，船隻的多少來決定要離多遠，這就是為什麼本船應該改變船位，去接近航道的外側。

⇒ 當船長估計很多船會在橫越航行區裡面，在此同時，本船應該立即轉向，調整船位去靠近航道的外側，這就是我們的直覺或是技術的一部分，需要我們的經驗來反應。

⇒ 我們知道這些橫越航行區，在一個開闊水域，不是主要的問題，如果兩條船以固定的速度來橫越。

⇒ 然而在港區附近的橫越航行區，經常靠近領港登輪區域，這就不是開放水域。進港船也許需要減速去接領港，對通航的船隻，會引起橫越的問題。

⇒ 路過的船隻希望取保持原始的速度，但是被這些上領港的船隻，在本船的船頭方位，在接近領港站或是減速，或是轉向的操作所阻礙，就像我們看到圖形 7-14 有條船他要左轉進港去接領港。

⇒ 我們可以看到注意區域，或是圓環區域是有他安全的一邊，就是在航道的右邊，就像圖形 7-14 所顯示的，在右邊的船位，只有一條橫越的船隻從南而來，需要考慮，相較於被慢速橫越的船隻，阻擋到本船航路的圖形 7-13。

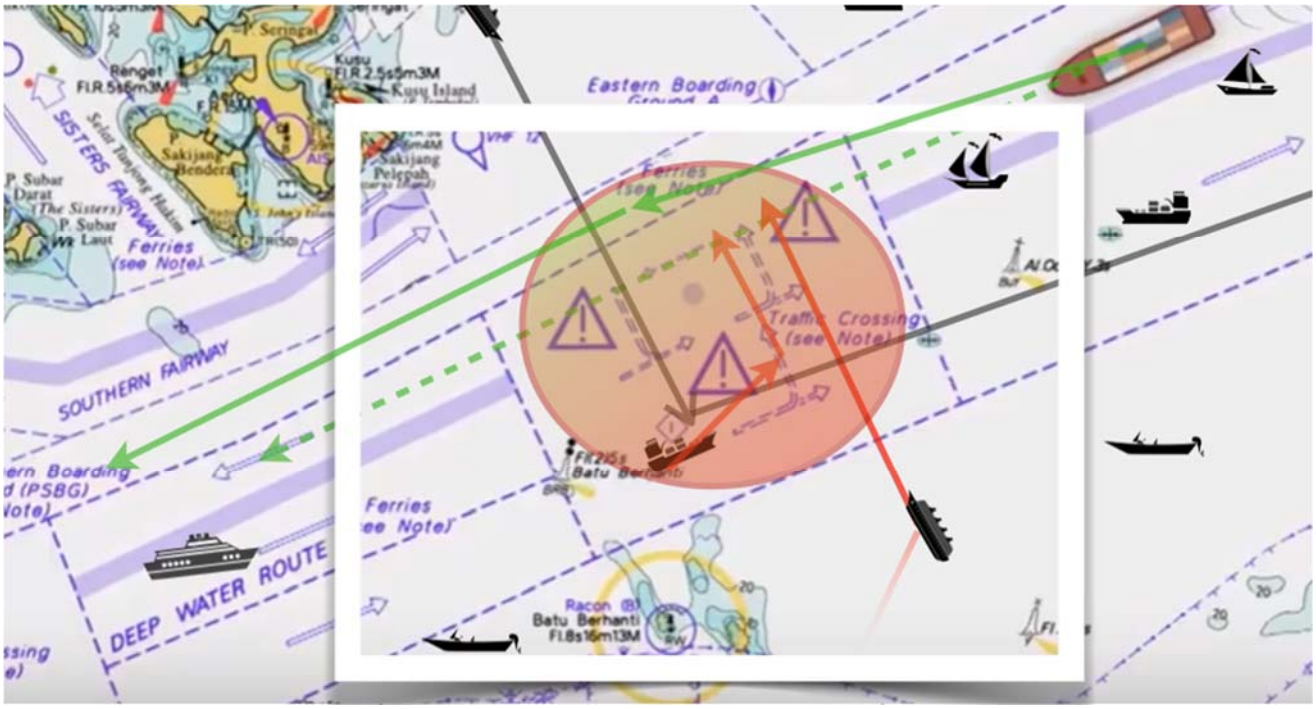
Answer to Force Majeure for east bound vessel

7-49 Traffic crossing zone with recommended course line arrangement.

Well, the answer to counter Force Majeure is laid down on figure 7-14. It seems the precautionary area had changed name to traffic crossing zone now with the recommended course line arrangement. If we remember two vessel's course lines intersected will create a collision risk these printed course line (doble dotted line) may imply possible collision position around these traffic crossing zones.

- ⇒ If Master can change course in her current position *as near to the outer limit of the channel or fairway which lies on her starboard side as is safe and practicable*, most meeting situation will not happen. However,
- ⇒ The course change should at enough distance away like 2 nm (6 minutes speed vector's length) as we discussed before.
- ⇒ Traffic crossing zone basically is a roundabout concept for vessel crossing each other or an effort to make every vessel alter course to starboard side (and not to pass at same point) which is good for every ship as we discussed at beginning of this chapter.
- ⇒ These roundabout areas should be enlarged by captain's own decision if the traffic is heavy inside traffic crossing zone. That's why ownship should change course *as near to the outer limit of the channel.*
- ⇒ When master estimate many ships are inside the traffic crossing area at the same time with ownship we should change course as near to the outer limit of the channel *immediately. This is the skill or instinct as our experience will demonstrate itself.*
- ⇒ We know these crossing traffics are not major problem if both vessels are at constant speed to cross as in open sea.
- ⇒ These crossing traffics are near pilot boarding area is not at open sea where inbound vessels may need to reduce speed to pick up the pilot and outbound vessels will increase to their sea speed at the same time.
- ⇒ It is a waste when we try to figure out what speed these inbound or outbound vessels will have after 3 or 6minutes.
- ⇒ This cause major problem for transit vessel who want to keep original speed and not to impede by their maneuvering to approach pilot station or reduce speed/alter course ahead of ownship.
- ⇒ The better way to cope with their change is not to cross their way out or way in. No collision point will not have collision risk. The green line is the course recommended *as near to the outer limit of the channel.*

We can see the precautionary or roundabout area has its safe side in starboard side as figure 7-14 shown where the green side has only one crossing traffic from south to deal with. If this vessel is about to cross the channel, she will pass the eastbound traffic lane already although its slow speed.



圖形 7-15 橫越通行區安全的一邊

西航船只對不可抗力的解決方案

7-50 路過靠近的橫越航行區

⇒ 對西航前往印度洋的船隻在新加坡水道，在他的右舷有從新加坡出來的出港船，距離很近。

⇒ 在圖形 7 之-15 橫越通行區安全的一邊，是取決於哪邊是他的原始碰撞位置，如果這個碰撞位置，在綠色的虛線 245 度上有三個，是很多的。

⇒ 本船被推薦轉向到 252 度，儘量靠近航道的外側，

⇒ 對於十八節的船隻在 6 分鐘之前的距離是 2.2 CABLE，1.8 x 1852 x sin (70) = 406 meter = 2.2 cables。

⇒ 2.2 CABLE 是橫越目標船的正橫距離，如果他不增加船速，他的速度向量線不能夠與本船相交。

⇒ 對一個進港的船隻而言，它的船速很可能在減少之中，因為他要接領港，如果它已經有減速，他要維持一定的速度。

⇒ 這兩條呢左舷的橫越目標是比本船慢，以安全相對方位的概念，本船向右舷轉向是好的，因為這兩條船可能隨時都會轉向去避讓漁船，漁船不在我們的瞭望清單之內，也就是可能會超出我們對其他船隻避讓漁船的預期。

⇒ 對於右舷的出港船，本船必須確保出港船有足夠的水域，讓本船通過，也就是他們會及時通過本船的船頭，本船是路過，希望保持原始的速度，所以本船的航向線如果靠近分道航行線的隔離線的話，出港船比較可能會在隔離線附近轉向，（如果它是要東航），造成更多的延誤與本船的困擾。所以我們選擇靠近港區，再看它是東航還是西航，來決定轉向或是減速。

本船呢應該使用真運動的速度向量顯示，來確認我們對碰撞位置在哪裡的瞭解？這樣子比較容易在避碰時候做判斷。如果碰撞位置不能移到目標船的船尾，移到出港船的船尾，是否本船具有機會能夠通過出港船的船頭？

⇒ 要加船速對本船並不實際，對一個路過船隻，就像本船一樣。

⇒ 減速使用迴圈舵是一個好的選擇，或是利用主機的轉數，或是車鐘來減速也是可以。通常我們沒有加車加速的選項，只有減速有可能。

⇒ 正常的時候，應該不要進入隔離區或是橫越隔離線，除非在緊急避免立即的危險。

⇒ 如果碰撞危機在西航船只兩邊都有，本船應該考慮立刻減速來讓其他船隻先通過，來清除障礙。

永遠要記得速度向量線是我們的金箍棒，碰撞的探測器。只要沒有速度，就是接近於沒有碰撞。速度向量可以利用減速縮短，以減少碰撞危機，或者改變航向去跟目標船平行，避免與其他船隻的速度向量線相交，產生碰撞點，我們應該最佳的利用金箍棒，把我們的碰撞危機降到最低。更詳細的分析在下一章。

Answer to Force Majeure for westbound vessel

7-50 Transit Traffic crossing zone close by.

For vessels westbound to India ocean in Singapore Strait, Pilot station is in its starboard side and outbound vessel from Singapore are much closer. In figure 7-15,

⇒ The safe side in traffic crossing zone depends on where is its original collision position.

⇒ If the collision positions are many at green dotted line course 245 degrees (deep water route),

- ownship are recommended to alter course to 252 degrees as near to the outer limit of the channel as possible.
- for an 18 knots vessel 6 minute before, 1.8 x 1852 x sin (7^0) = 406 meter = 2.2 cables,
- 2.2 cables is the safe distance away from port side crossing target where her speed vector cannot intersect with ownship if she does not increase speed. For an inbound vessel her speed is more likely to reduce.
- These two port side crossing targets are slower than ownship. By SRB concept, ownship alter course to starboard side is good. They may change course anytime to avoid fishing boats which are not in our lookout priority.

⇒ For starboard side outbound vessel, ownship have to make sure outbound vessels have enough sea room for ownship to pass her stern (well pass ahead of ownship in time).

⇒ If ownship's course line near traffic separation line outbound vessel is more likely to alter course to ownship's opposite side when ownship is approaching her.

⇒ As our understanding of turning advance distance required is at least 6 ship's length for outbound vessel in an sharp turn and the traffic lane is only half NM width, her outbound course will commence the turning even she is still inside the harbour area for a cautious captain.

⇒ Although crossing traffic lane with right angle is recommended in COLREG, it is easier for outbound master to enter west bound traffic in this way.

⇒ Ownship should use true motion speed vectors to make sure where is the collision position with these targets.

⇒ If the collision position cannot shift to target's stern for outbound vessel does ownship has the chance to pass by its bow? Increase speed usually is not practicable for a transit vessel. Reduce speed by rudder cycling is more like a good choice but will confuse the vessels around.

⇒ A vessel shall not normally enter a separation zone or cross a separation line except: in cases of emergency to avoid immediate danger.

If collision risk come from both side westbound vessel should consider speed reduction immediately to clear all smoke.

Always remember the speed vector is our golden stick for collision detection. No speed is almost no collision. Ownship's speed vector can be shorten by reducing speed and changed direction to parallel with target vessel to avoid intersect with another vessel. We should make best use of it to minimum our collision risk.

在防波堤發生的碰撞

7-51 永久分開航道的出入口

圖 7-16 港區進口的導航燈與不同的出港航線

傑貝阿裡港的操作手冊 2013 年修正版，包括下述：

一條出港船在航道的出口點與一條進港船航道進口點相同的時候，航路權利應該交給出港船。那是基於下述理由：

⇒ 出港船隻需要更高的速度，來達到他海上全速。

⇒ 如果出港船讓路並減速，會延長兩條船相遇的時間，以及相遇的情況，或是兩條船可能在狹窄水道裡面迎艏正遇，造成了航行困難，以及船隻間的交互作用。

⇒ 沒有規則是沒有例外的，港口規則並不能解決所有的案件，規定再明白，也會有人弄錯，最好的政策，就是把航道的出口點跟進口點，永遠的分開。

⇒ 有些基本的原則，可以運用到航道的入口，像是導航的燈光，進港船需要導航的燈光，比出港船呢還要緊急。

⇒ 進港船隻需要比出港船更精確的控制，這樣才能進到防波堤的入口 。

在圖形 7-16 的左圖，進港的航線跟出港的航向線是同樣的，船長也許會想這一個港口，不需要太過小心，因為進出這個港口的船隻不是很多，如果有任何船隻在相對的航向出港，到時候可以向右邊轉向一點，來避免發生碰撞。

⇒ 如果有兩條或 3 條船同時進出港，我們會怎麼樣呢？我們是否能夠分別哪一條船是比較緊急，或是需要多少度的航向改變？才能避免危險。

⇒ 這跟我們在避碰規則裡面的想法一樣，認為這是兩條船的問題，其實不然。

⇒ 使用優良船藝去分開進港跟出港的航路，就像圖形 7-16 的右圖，航路應該儘量靠近航道的右邊。

⇒ 在一般的港口，經由管制站，領港，或領港船的安排，經常會規劃，或是排解在港口出入口與狹窄水道的交遇，利用船隻通行時間的規劃。

⇒ 船隻通行服務的官員 VTSO 也許並沒有適當的訓練，來認知危險的情況，與正在發生的危險，以及如何去反應。

對碰撞危機的反應，就像在長慧輪的案件裡，出港船經常是沒有選擇，只有跟著導航燈光的航向線，利用一些流水的修正，去克服流水和風力的影響。

進港船相對的具有更多的選項，可以安排他們的航線，即使是已經偏離了導航燈的方向，流水很強的區域。如果流水強勁，出港船不用導航燈，也許是不好的實務，使得出港船沒有選擇，必須依賴導航燈光。

如果進出港船隻，都需要導航燈，進出港都需要用到同一條導航燈的航道，港口管制就不能光靠船上的努力來克服，港口管制官員應該要規劃進港跟出港船隻的時間順序，利用船期的不同，來排解碰撞危機。

在別的地方，將出港船與進港船的航路分開，是一個安全的實務，來避免單一航道碰撞的危機，對於進出港船隻的船期安排，經常的就是規定單向通行，某一個時段只准進港，另外一個時段只准出港（也許配合潮汐的時間），來避免船隻眾多，互不相讓的情況發生。

現在船隻都具有可靠的 GPS 船位，任何時候，在出港的時候只能依賴導航燈光的情況，應該已經減少很多。

Collision Located in breakwater entrance

Figure 7-16: Leading lights for harbor entrance and different outbound course line

7-51 Separate channel exit point and entry point permanently.

Operations Manual for Jebel Ali (revised in 2013) included, in the event that the channel exit point of an outbound vessel is the same as the channel entry point of an inbound vessel "Right of Way" shall be with the outbound vessel. The reason for this is because

- ⇒ Outbound vessel needs higher speed to reach his sea speed.
- ⇒ If outbound vessel gives way and slow down will prolong the meeting situation or
- ⇒ two vessels may meet head on inside a narrow channel.

Give way to outbound vessel is not a curtesy. It is better for both parties inbound and outbound. No rules without exception. Port rules cannot solve all case. The best policy is separate channel exit point and entry point permanently. Same principle may apply to harbour entrance with leading lights. Usually, inbound vessel needs leading lights more urgent than outbound vessel because inbound vessel needs more precise course control than outbound vessel to enter breakwater entrance or narrow. In figure 7-16 left picture, inbound and outbound course line are identical. Master may think this port don't need too much attention for calling vessel is not so often. Any vessel in reciprocal course head-on situation ownship can alter course to starboard side a little to avoid it. What happen if two or three more vessels came in and out at same time? Are we capable to discriminate which one is urgent and how many degrees course change is suitable? It is not difficult by apply some precaution in navigation but it will need some extra effort to do it. When fishing boat is gathering the course will hard to keep as we planned. This is the same logic when they drafft COLREG in 1975, collision is two vessel's problem. Use good seamanship to separate inbound and outbound route as figure 7-16 right picture *as near to the outer limit of the channel* as possible. Leave inbound leading light to inbound vessel is prudent.

In normal port control, arrangements of pilotage and port's working vessel service which would normally co-ordinate and de-conflict the movements of vessels in the port area by VTS,

- ⇒ the VTS officers VTSO might not have adequately trained to recognize when hazardous situations were developing
- ⇒ and how to respond accordingly as Ever Smart case.
- ⇒ Inbound vessel usually has no choice but to follow leading lights' course line by applying some leeway to counter current or wind forces.
- ⇒ Outbound vessel usually has more option to arrange their course line deviate from leading lights direction.

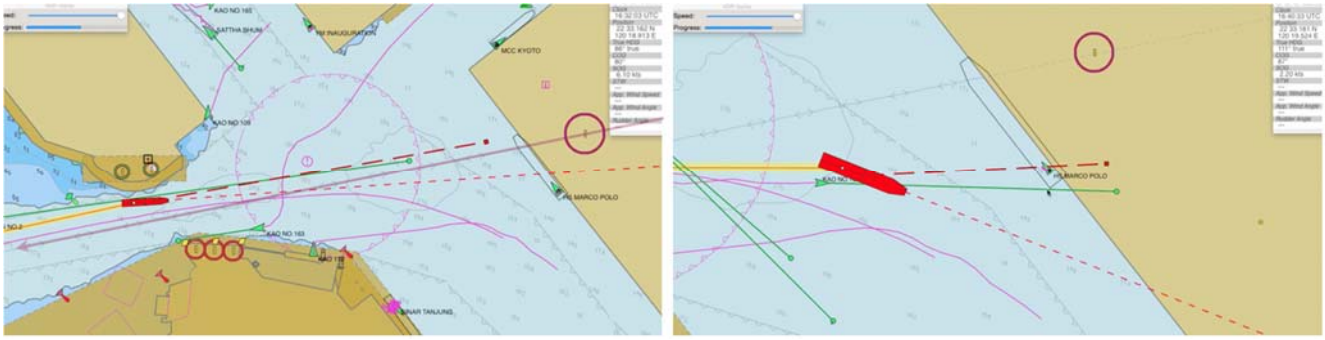
In strong current area, outbound vessel did not use leading lights may be a bad practice. If strong current makes outbound vessel have no choice but rely on leading lights route. In this strong current situation, navigation safety depends on VTSO who should regulate inbound and outbound vessel passing schedule in break water entrance. In other parts of the world

have ownship's outbound route away from inbound vessel is a safe precaution to avoid further collision risk

Now, ownship have reliable GPS position anytime during outbound. The reliance on leading lights may not so desperate as before.

在碼頭的碰撞

7-52 本船在內港防波堤的入口位置錯誤



圖形 7-17 導航燈光的方向是 078.5 度

有很多的港口具有內港的防波堤，可能是以前舊的港區結構，或是雙重安全的措施來對抗強勁的海流跟湧浪，如果本船不能保持在進港導航燈的方向，本船可能會遭受不適當的岸推力，作用在船體上面，就像圖形 7-17 導航燈光的方向是 078.5 度，在這港區紅色進港船，就是本船，在左邊的圖形 16 時 32 分 03 秒本船的船首向是 086 度，對地航向是 080 度，船速是 6.2 節，船位太靠近北邊，也就是那個進口處的左舷，船長可能感覺到有點沮喪，無法使用右滿舵，要避免本船船尾，進一步被推到北邊。

在右圖 16 時 40 分 33 秒，8 分鐘之後，本船的船首向是 111 度，現在回轉的速率是每分鐘 3 度，這個高雄港是一個很好的天然港，領港先生忍耐性也是太好，對地的航向是 087 度，速度是 2.2 節。漂流角是 24 度，發現本船向右轉很難，有些力量抵消了舵效。

本船的船體現在是受到什麼樣的力量？作用在哪裡？天氣狀況良好，不是風力，也不是流水作用在本船。

- ⇒ 雖然船首向已經向右轉了 25 度的航向，對地的航向只改變了 7 度，在這 8 分半鐘的時間。
- ⇒ 漂流角現在是 111 度減掉 087 度等於 24 度。這比 1632 時的左圖的漂流角，更多了 18 度。
- ⇒ 本船撞到了碼頭上面船隻的船尾，世界上當時最大的貨櫃船，公司的檢討裡面，很容易分析出來。就是因為超速，或者說是在 1632 時候的超速（左圖：內防波堤口子上），所以本船呢不能及時把前進的速度停住，發生碰撞。
- ⇒ 真正的問題其實是本船的回轉速率，沒有辦法及時建立，本船無法與碼頭船隻的方向平行。
- ⇒ 光看漂流角越來越大，就知道舵效根本就沒來，只有船首向改變，船隻的對地航向仍然改變不大，繼續向碼頭向前沖，本船最後避碰的機會，就是將本船的船首向，跟碼頭平行。
- ⇒ 這不光是船首向要平行，最好是對地航向，也要跟對方的方向相同，也要跟碼頭的碼頭線平行。

八分鐘的時間是足夠本船停止前進，但是停止船隻並不是領港的意圖，領港想要及時轉向，讓船隻向前進，到前面的碼頭靠岸。

- ⇒ 如果本船能改變航向到 130 度，任何多餘的速度，都不會造成傷害，或是損害，也就是如果本船的回轉及時的話，跟碼頭上的船隻與碼頭，就不會發生碰撞。
- ⇒ 如果本船不能夠平行在碼頭上的船隻，我們就會跟碼頭上的船隻發生碰撞，因為我們的速度向量線顯示對地航向 087 度，就像右圖的 16 時 40 分 33 秒，正是指向碼頭上船隻的船尾。
- ⇒ 所以要監測回轉速率，在我們靠碼頭的時候，需要某些當地的知識跟船藝。

我們在討論的是作用在船體上面的力量是什麼？確實的說，是作用在本船的左船尾的力量。本船在內港防波堤的時候，在我們的左船尾是有什麼地方不對勁嗎？當時本船太靠近北岸，受到強大的岸推力，船首向被推向左邊，現在我們知道為什麼向右轉到 130 度，在這一次回轉是這麼困難，原因就是本船在內港防波堤入口的位置，是錯誤的。

Collision in berth

Figure 7-17: Leading lights 078.5 degrees inside the harbor

7-52 Ownship has in wrong position at entrance of inner harbour

Many ports have inner harbor which are remaining of historic port area or double security measures against severe current or swell. If ownship cannot keep in inbound leading lights direction ownship may suffer undue force of bank pushing on ship's hull. As figure 7-17: Leading lights 078.5 degrees inside the harbor(purple line through near bacon). Red vessel inbound is ownship.

- ⇒ At left picture 16:32:03 UTC, Ownship heading 086^0(T), Course over Ground 080^0 (T) Speed 6.2 Knots.
- ⇒ Ownship's position is close to North (port side) of harbour entrance.
- ⇒ Pilot may feel reluctant to use hard starboard rudder to go back to center of channel (avoid ship's stern further push to north bank.
- ⇒ At right picture 16:40:33 UTC 8 minutes later, Ownship had heading 111^0(T) now.
- ⇒ Rate of turn in heading is 3 degrees per minutes. Although Kaohsiung is a very good nature harbour, Mr. Pilot's patient is too good to be astonished.
- ⇒ If we check the COG course over ground change in these 8 minutes, the finding is astonished. From 082 change to 087 ^{0} (T) in these 8 minutes while using hard starboard side rudder and tug boat, the inertia of the vessel has even slower changed which caused a collision to pier. (see red lone dashed line).
- ⇒ As we discussed before, the turning includes 4 stages. The last stage is the inertia alignment.
- ⇒ Course over Ground 087^0 (T), Speed 2.2 Knots, drifting angle 24 degrees. Ownship found it hard to make starboard turn by hard over rudder effect.
- ⇒ Some force had counter rudder effect and work on ownship's hull now. What force and where? The weather is good, it is not wind or current forces acted on ownship.
- ⇒ Although heading had changed 25 degrees to starboard side, course over ground COG changed 7 degrees only through 8.5 minutes time.

Drifting angle is 111- 087 = 24 degrees which is 18 degrees more than left picture 1632 hours, 8 minutes ago. Ownship collided another vessel berthed on dock, biggest container vessel in the world at that time. In company's review, it is simple to analyze: collision is speeding or over-speed at 1632 UTC so ownship cannot reduce ahead speed in time.

The Real problem is ownship's rate of turn (especially the inertia direction) cannot establish in time.

Even we have problem to align our inertia direction with the dock, we still have to option to align our heading parallel with the dock (in the same context as collision avoidance with other vessel). Ownship missed the chance to avoid collision by paralleling ownship's heading with MARCO POLO at dockside. 8 minute's time is enough for a container vessel to stop in harbour speed. However, stop ownship is not Mr. Pilot's intention. He had not used all astern power to stop ownship. He wants to berth ownship behind this big container ship on dock.

- If ownship can alter course over ground COG (not heading) to berth direction 130 degrees (T), any excess speed will not cause any harm with this vessel on dock.
- If ownship cannot parallel with vessel on dock ownship will have a collision position with docked vessel. By ownship's speed vector in COG 087^0 (T) now, we pointed at docked vessel stern which is exactly the part we hit. See right picture at 16:40:33 UTC.

To monitor rate of turn while berthing needs some experience of ownship's characteristics and local knowledge. We cannot discussed with pilot what force acted on ship hull (or precisely ownship's port quarter) while ownship is at entrance of inner harbour. What is wrong of ownship's movement in that time? It is too close to north bank which create strong bank cushion at our port quarter (counter the rudder effect we applied) and push ownship's heading toward port side. We now know why starboard turn to 130^0 (T) was so hard in this voyage. Ownship has in wrong position at entrance of inner harbour.

如何決定港區的回轉速率

7-53 避免與碼頭上船隻碰撞

回轉速率是從進內港防波堤頭到與碼頭平行位置的距離，與進靠速率來計算，得出我們有多少的時間可以回轉，然後由這個時間除上需要回轉的角度，就知道在靠這一個碼頭需要的回轉速率是多少？要決定

一般呢在河道的設計，回轉速率是每分鐘 10 度，在港區裡面的回轉速率設計，是以每分鐘 20 度為設計的標準。這裡我沒有參考到任何的文獻，在這邊是依照經驗所做的估計。在海上的同仁，可以再試試看。好，下面我們來舉些例子，

- ⇒ 在這一個案例，從內港防波堤的入口到平行碼頭船位的距離，distance 是 1852 公尺，將近 1 海浬。
- ⇒ 這個碼頭是 130 度的方向，導航燈是 079 度，需要回轉的度數就是 51 度。
- ⇒ 過口子的速度是 6.2 節，從 1852 公尺的距離外接近，1852 公尺需要 9.68 分鐘的航行時間。
- ⇒ 以 6.2 節進靠，這是講這個船隻沒有減速，或是來不及減速，一直維持 6.2 節向前進，還有 9.68 分鐘做船首向的改變，需要的是 51 度的回轉，回轉速率就是 51 度除以 9.68 分鐘等於每分鐘 5.23 度。
- ⇒ 9.68 分鐘是將轉向的時間，把它縮短了，一般是靠碼頭，配合船隻的減速與轉向，同時進行。
- ⇒ 一般回轉配合減速，回轉速率應該是更小，所以每分鐘 5.23 度，連一般河道回轉的每分鐘 10 度都不到，可見高雄這個碼頭是非常的寬大，是個天然良港。
- ⇒ 每分鐘 5.23 度的回轉速率，慢到讓人沒有辦法注意到，但是這個是我們在這個港口所需要的回轉速率，這個就是引起碰撞的問題所在，以同樣的邏輯，船隻的速度如果是 4 節，在 14 時 32 分零 5 秒需要的回轉速率就是 4.25 度/每分鐘。

在港區裡面需要前進的距離是固定的，計算回轉速率，我們需要知道的是接近速度，也就是接近碼頭的速度，來決定回轉的時間有多少？

- ⇒ 如果我們的接近速度比較高，我們就需要比較快的回轉速率，如果需要的回轉速率無法建立，本船的速度，就算是超速。
- ⇒ 所以船隻在港裡面，是否超速？就是以他的回轉速率來決定的，達不到我們要求的回轉速率，那本船就是超速了。
- ⇒ 如果需要更多的時間來回轉，我們就必須要把我們接近的速度，把它減下。
- ⇒ 我們需要把船速減到 3 節，或是 4 節，然後立刻檢查本船的航跡，看看是受到風力或是流水的推動，或是什麼原因造成回轉遲緩。

如果拖船服務是已經有了，應該用它來協助調頭，所以這個重點就是，要建立回轉速率來跟碼頭平行，或是與靠在碼頭的船隻平行，否則呢就會容易與碼頭，或是靠碼頭的船隻，發生碰撞。

How to decide rate of turn in harbour turning

7-53 Collision with dock or docking vessel

Rate of turn we need can be decided by **heading change** needed to complete the turn **divide by the time** ownship had to sail the distance from breakwater entrance to parallel position before dock. For example, in this case:

- ⇒ From inner harbour entrance to parallel with docked vessel distance is 1852 meters,
- ⇒ the dock is at 130 degrees direction, leading lights is 079^0 (T) degrees.
- ⇒ Ownship speed 6.2 knots for 1852 meters distance run need 9.68 minutes.
- ⇒ Heading change needed for turning is 130 – 079 = 51 degrees.
- ⇒ Rate of turn 51 / 9.68 = 5.23 degrees per minutes.

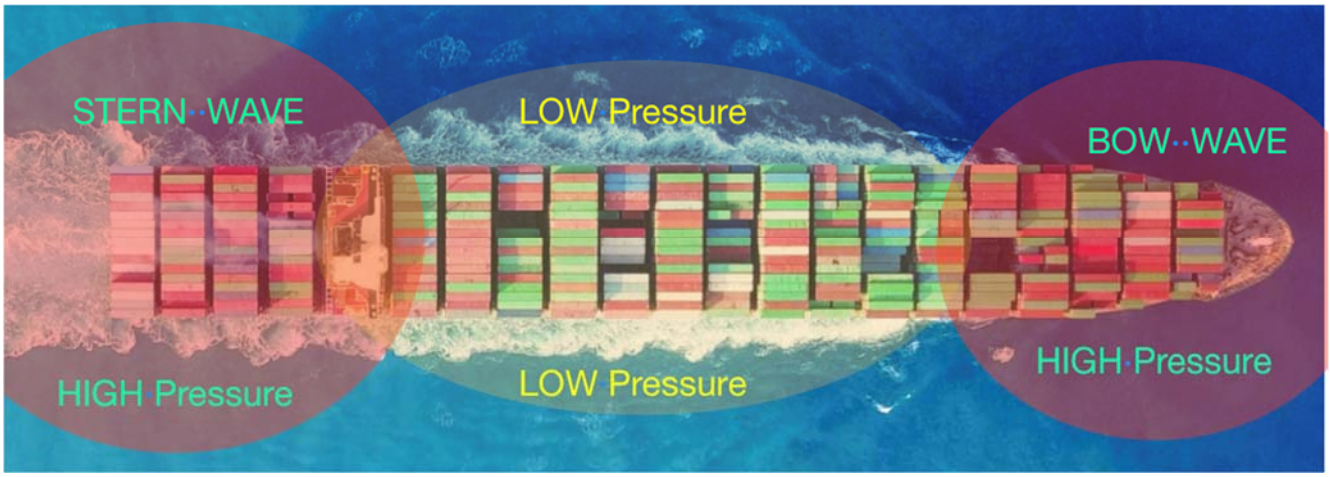
Almost unnoticeable rate of turn 5.23 degrees per minute but this is the minimum rate we need to align with the berth. Maybe this is the problem caused the collision. For same logic, ship speed is 5 knots at 14:32:05 hours. The required rate of turn is 4.25 degrees per minute. The distance inside the harbour is fixed. The rate

of turn we need depends on our approaching speed. If our approaching speed is higher, we will need more quicker rate of turn.

If required rate of turn cannot establish ownship speed is too fast.

To buy more time to turn, we will need to reduce our approaching speed. If required rate of turn cannot be established, we need to reduce speed immediately. As we calculated, if our speed is 5 knots now and rate of turn cannot reach 4.25 degrees per minute, we will need to reduce speed immediately then check ownship's track or wind/current setting etc.…. to find out what is going wrong. But the speed reduction is accompanied by reducing Main Engine RPM and expel current to rudder which will reduce rudder effect as well (not favorable). It is not a good solution to help our turning rate too slow. If tug boat service is available, captain or pilot should use it to help the turn. So, the point is to establish rate of turn to parallel with dock or docking vessel otherwise there will be a collision with dock or docking vessel. If the rate of turn is too slow (not enough as required by our calculation), the reasons may be many. Some reasons are easy to identify as wind or current, some are not so easy to know. In any way, if the rate of turn is not enough, master should check the advance distance is enough or not? Increase rudder effect with available means (engine speed or tug assistance) or stop the vessel immediately will be a big decision to be made by master and pilot. Although the choice is limited the principle is simple, safety first. If Master cannot make sure what to do, stop the vessel comply with all seamanship requirement except the time lost.

船頭浪與船尾浪的損害



圖形 7-18 航行中船體四周的水壓

7-54 衝擊損害是廣義的碰撞

前面的章節，我們談過船頭浪與船尾浪，那是海上目視瞭望時候，距離的一個指示。在這裡我們要探討船頭浪船尾浪可能造成的衝擊損害，船頭浪是由船體向前推進的壓力所造成，當我們船體在港區或是河道前進的時候，會造成船頭的水壓升高，也許外表看起來，並不像海上的波浪一樣，會有水花四濺，還是其他明顯的高低起伏。但是它就是一個壓力場，在我們的船頭前面向前推進，在河道寬的時候，可能這個壓力的差別並不大，但已經可以把小型船隻的船體從碼頭邊推開，或是從他現有的水面提升，甚至是在一海浬遠的小型船隻，都會被接近船隻的船頭浪影響。甚至可以穿透其他小型船隻碼頭的防波堤，進入到內港，造成了小船的系泊纜繩斷裂，或是互相碰撞衝擊，當兩條小船靠在一起的時候。

- ⇒ 這個船頭浪的壓力，由尖船或是圓船的船頭形狀而有不同，尖船他的船頭比較尖，造成比較小的船頭浪，但是如果船舯的寬度占到河道的寬度，占的比例非常多的時候，向前面推進的壓力場，就會變得非常強勁。
- ⇒ 快速的船隻會製造更高的波浪高度，在他的船頭區域，較高的船頭浪高度，就會在他的船頭很遠的位置，產生強大的水壓力。
- ⇒ 一般的實務，是在大船接近小型遊艇碼頭的時候，應該要減速，來避免衝擊的損害，也就是表示小型船隻，會被大船造成的大浪所衝擊損害。

下面的引述一段事故報告，“就在進入航道的一段，有些船停在碼頭上，這個領港下令船隻的速度從全速前進減到半速前進，在經過這些碼頭之後，船速再一步增加到全速前進，稍晚油輪的船長，就接到通知，他被指控造成在碼頭上的散裝船的衝擊損害。在一個河邊的碼頭上，因為他以過高的速度前進。損害包括住艙梯的損害，幾條系泊纜繩的斷裂，由於散裝船被前後向推擠，當這個油輪通過的時候。”

這個是從發生的案例，所學到的衝擊損害，是由於過高的速度所造成的。這是 UK P I CLUB 的記載，所以衝擊損害可以看成是廣義的碰撞。

⇒ 經過這些事件之後，在經過這些碼頭，領港下令從全速前進減到微速前進。

⇒ 慢速的圓船經常具有豐滿的船頭形狀，造成高度不穩定跟渦流的船頭浪，像油輪他的船頭浪不是尖形的，但是他的船舯區域是比貨櫃船還要寬，就會推動更多的水壓向前，造成很嚴重的衝擊損害。

船尾浪是水流流入船舯，補充船舯經過後，所留下來的真空。船頭浪的水流是向前推進，船尾浪的水流是因為海水要大量加速補充船舯的真空，以較本船船速更高的速度，沖出船尾。

⇒ 船舯真空的位置，由這些水流快速流入，流到船尾之後，在船尾的螺旋槳後面，造成一定的高度。

⇒ 因為本船船邊的水流流到船尾地區，水流的速度是高於本船的速度，所以船尾浪的水流是沖出去的，流出去的水流是被在船尾的靜水壓所推擠，造成船尾的高壓區域。

在船頭浪跟船尾浪的中間，就有一個低壓區域，因為流水沖到船尾去補充，船舯經過所造成的真空，我們必須瞭解這些水壓在船體四周的作用，是避免壓力差，所引起的碰撞。

Bow wave damage or Stern wave damage

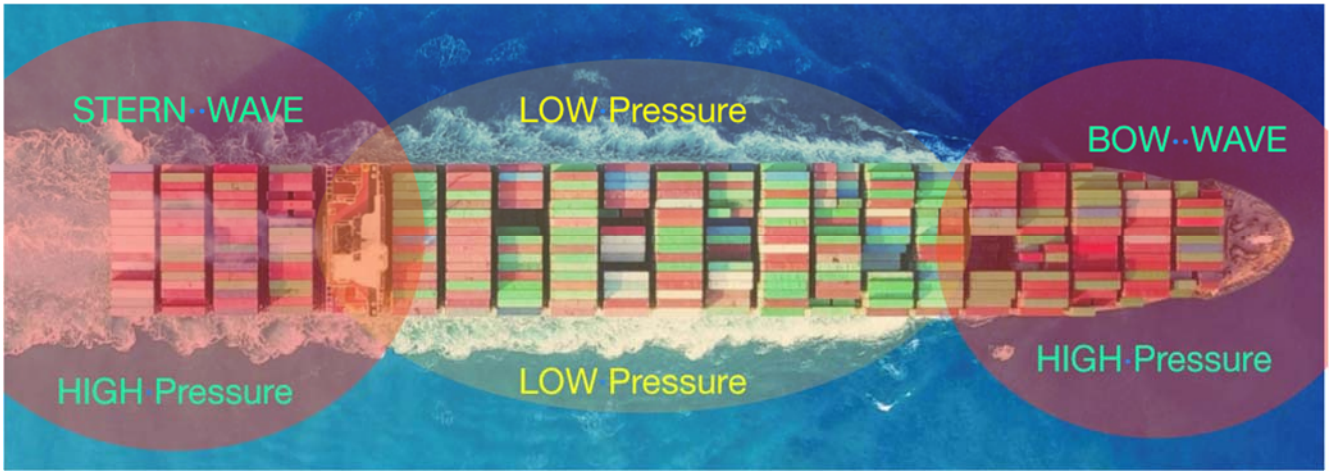


Figure 7-18: Water Pressure around ship underway

7-54 Wash damage is kind of collision

The bow wave is water pressure generated ahead of ownship when we advance along harbour area or river. Bow wave is not necessary in a wave form as we can see in open sea. It could be in an unnoticeable water form change (moderate elevated and wider range level change) which will push away or lift up small vessels even one nautical mile ahead or penetrate into a closed basin where small vessels' mooring lines will break or crush to each other when they moored side by side.

⇒ The bow wave pressure varies by shape of ship's bow and width of channel

⇒ Sharp ships with fine bows shape generate small bow waves outward. However,

⇒ If ship width is big relative to fairway or river's beam section the pressure pushed ahead become very strong by ship's advance speed.

⇒ Fast Ship create higher wave height on her bow area. Higher bow wave creates higher water pressure ahead his ship.

⇒ It is normal practice to reduce speed before big vessel approaching small Yacht area to avoid the wash damage which means small vessel been washed by strong current.

"*Shortly before entering a stretch of the channel with occupied river berths, the pilot ordered the vessel's speed to be reduced from full ahead to* ***half ahead****. After passing the berths, the speed was again increased to*

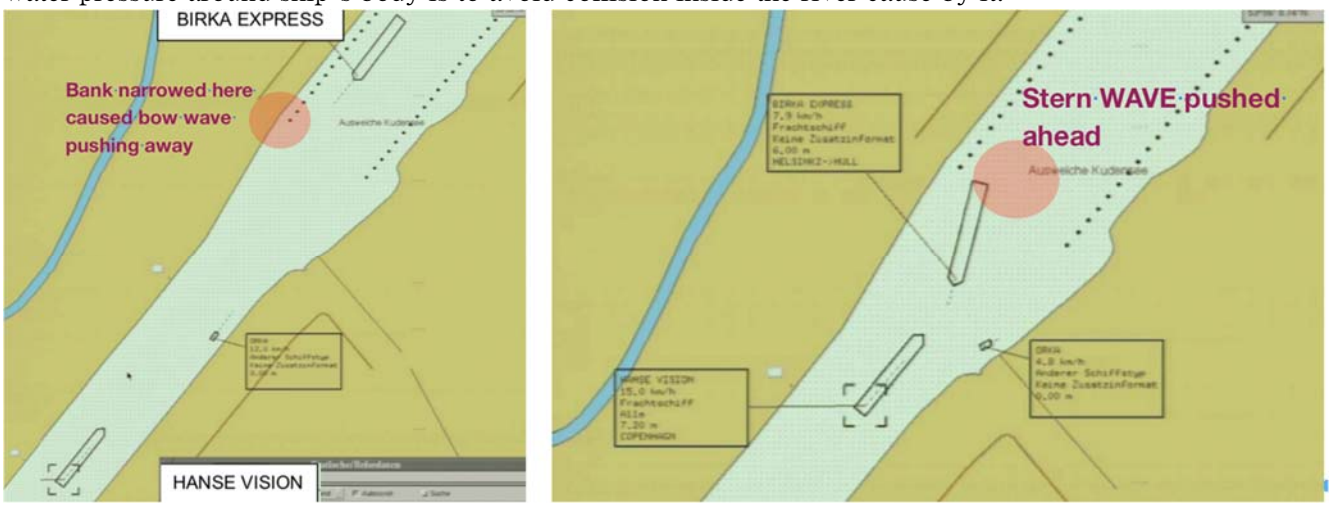
full ahead. Later that day, the tanker's Master received notice that his vessel was alleged to have caused wash damage to a bulk carrier alongside one of the river berths due to proceeding at excessive speed. The damage included the destruction of the accommodation ladder and the parting of a number of mooring ropes due to the bulk carrier ranging forward and aft when the tanker was passing." Quoted from Lessons Learnt: Wash damage due to excessive speed - UK P&I.

Wash damage is kind of collision in broader term.

⇒ After that, *the pilot ordered the vessel's speed to be reduced from full ahead to* ***dead slow ahead.***

⇒ Slow speed ships with blunt bows create highly unsteady and turbulent breaking bow waves. Like tanker vessel her bow wave is not in sharp form but her midship section area is big than container ship which will push more water ahead her ship's hull caused serious wash damage.

The stern wave is the water flow out the vacancy generated by ship hull in midship section. These water flow from ownship's side into stern area with speed higher than ownship's speed. And these higher speed water blocked by same speed waters astern of ownship's hull which create a high pressure wave. In between BOW and STERN wave, there is low pressure area in midship section. The reason we need to understand these water pressure around ship's body is to avoid collision inside the river cause by it.

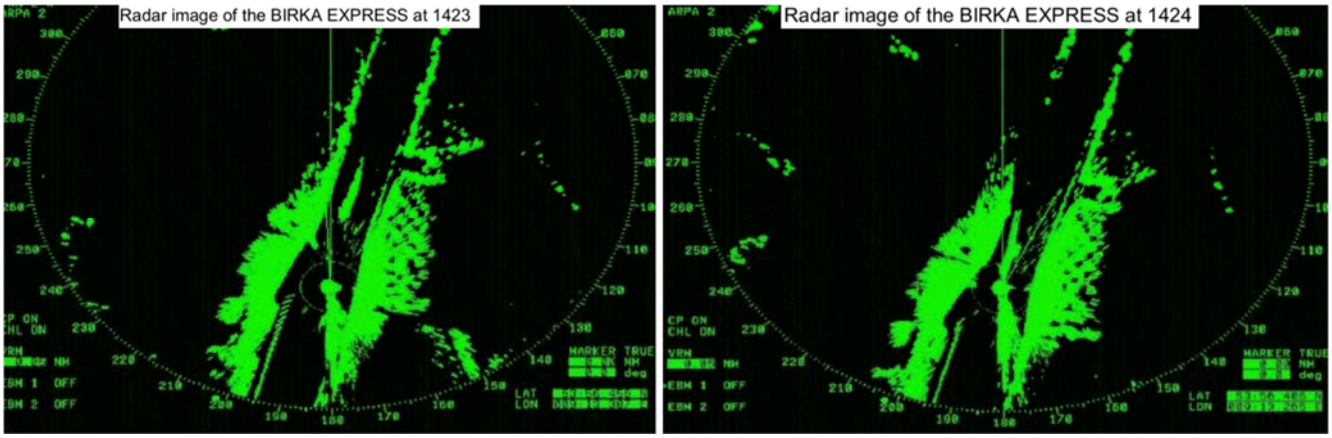


圖形 7-19 船首向改變由船頭浪引起，船尾浪推動

7-55 河道內的碰撞位置

"BIRKA EXPRESS"輪是一條左轉的可變螺距船 left-hand controllable pitch propeller,，當他打倒車的時候，他的螺旋槳是是左轉，跟一般的的單俥固定螺距的船隻是一樣的。在 1331 時的 UTC，該輪的領港被迫將船停在河道中，（可變螺距的角度是 0 度，然後再打到 50%的倒車角度），這個船隻突然停止是超出領港原先的預期，在這個等待區域的第二部分，要確保另外一條船 HANSA VISION 可以在等待區通過，當領港下達半速倒車的時候，BIRKA EXPRESS 這條船正在等待區域前進，動態的水流壓力在船體下開始作用，使得這條船的船尾被推向右邊。然後 BIRKA EXPRESS 遭遇到不可預期的強烈回轉（動態水壓影響了船尾明顯的回轉，加上它的風力，使它向左回轉），進一步被西南風所增強。在 1324 的 UTC，雖然做了後續的操作，這個還是沒有辦法避免發生碰撞"。

"*不可能讓 BSU 來確切的決定，為什麼 BIRKA EXPRESS 會突然向左轉，這可能是因為操舵錯誤，或是這個船被"吸到"岸邊，然後被推走向左轉。我們發現這兩條船沒有技術上的錯誤*" 引用 BSU 的調查報告 20/09 在基爾運河的碰撞 1 月 12 號 20 09 年。



圖形 7-20 船首向因船頭浪而轉向左舷

⇒ 這兩條船應該在運河的等待區域交會，這是當地的法規。BIRKA EXPRESS 先到達等待區域，然後想辦法將它的船跟右岸等待區的邊線對齊。

⇒ BIRKA EXPRESS 就像規則 9 狹窄水道的要求一樣，要靠右，但是他到的實在太早，就像圖形 7-19 的左圖，太靠近等待區的出口。

⇒ 在靠右的這個位置（左圖），BIRKA EXPRESS 太早受到岸壁的效應，船頭被船頭浪高壓推到左邊，因為船頭太接近運河的岸壁。

⇒ 在這邊運河的岸壁又收縮成一個角度，所以船頭就順著這個收縮的方向，向左邊移動，再 1424 時 BIRKA EXPRESS 的船頭，順著收縮的這個河岸區域，船頭浪的壓力，開始左轉（船到橋頭自然直）。

⇒ 因為前面的水域變窄，船頭壓力就變大，在 1422 時將他的船首向向左舷推去，（左圖紅色的區域就是岸推力效應最強的地方）。

船尾浪的速度，一般是跟船隻向前的船速一樣，船尾浪的高壓，一般也是同速隨著船隻向前移動。

⇒ 在 1421 時，BIRKA EXPRESS 是 8 節的船速，忽然在兩分鐘之內減到 4 節。

⇒ 在 1423 時，造成這 8 節的船尾浪追上水下面的船體，然後把船尾向前面推進。

⇒ 這個是在 1424 時，右圖紅色區域，就是船尾浪追上本船的地方。

⇒ 在 1423 時因船首向，已經呢被船頭浪推向左邊，在一分鐘過後 1424 時，船尾浪又追上他的左船艉，造成 BIRKA EXPRESS 橫過航道，發生碰撞。

- 船頭浪在船頭作用，當船隻太靠近某一邊的岸邊。
- 這個岸推力增加，當河岸的邊線，在本船的前面收縮。
- 船尾浪會追上本船，當本船呢的速度減得太快。

當本船的船首向與岸壁不平行的時候，像是運河縮減的地方，這個船頭浪會大量增加。這一個案子最大的問題，就是太早通過這個等待區域，船頭已經要進入等待區域的出口，也就是由寬變窄的部分，他船頭太靠近這裡，造成船隻的船頭浪船尾浪與岸壁的聯合作用，把他推到河對岸去了。

⇒ 所以要避免這個碰撞，就是你要及早減速，慢慢減速，保持良好的等待船位。

⇒ 你的反應不過來，看到前面已經沒有路了，還繼續用高速前進，那你就是去找麻煩，問題不是碰撞，就是你去撞到碼頭。

船頭浪會將船頭推向橫越河道的另一方。船尾浪也可以推動船艉，總的來說，BIRKA EXPRESS 的船位是錯誤，在這個案件裡面，到的太早又離開的太快，應該在等待區的前段，儘量靠右邊的航道等待。開始的時候，被船頭浪所推開，然後船尾浪又追上船體，造成船首向橫越航道，領港將本船置於太靠近岸邊，然後又離開等待區域太早，也是太早接近等待區的出口。船隻的碰撞發生在圖形 7-20 1424 時。

Figure 7-19: ship heading change caused by bow wave first then stern wave

7-55 Collision in a river passage: Bow wave and Stern wave

"*The* BIRKA EXPRESS *is driven by a left-hand controllable pitch propeller, which acts* (in same direction) *as a right-hand propeller when moving astern. At 1321 UTC, the pilot of the* BIRKA EXPRESS *being compelled to bring the vessel to a standstill (the pitch of the propeller was reportedly set to 'ZERO' and then to 50% astern) more abruptly than he had originally intended in the second half of the waiting area, so as to ensure that the passage with the HANSE VISION would be executed in waiting area. As the command 'HALF ASTERN' was given by the pilot while the BIRKA EXPRESS was moving ahead in the waiting area, hydrodynamic forces began to act on the underwater hull,*

which led to the stern of the vessel being pushed to starboard.

Therefore, the BIRKA EXPRESS experienced an unexpectedly strong turning motion due to this caused hydrodynamic effects (The hydrodynamic effect of this pronounced astern manoeuvre and the increasing wind pressure moved the vessel to port). This turning was further exacerbated by the south-westerly wind. At 1324 UTC, in spite of all the subsequent manoeuvres, it was not possible to prevent a collision."

"*It was not possible for the* BSU *to determine conclusively why the BIRKA EXPRESS made a sudden turn to port. It may have been due to a steering error or the vessel being 'drawn-in' to the embankment followed by her turning away to port. It was found that neither vessel involved in the accident had a technical fault.*

" Quoted from BSU Investigation Report 20/09 Collision on the Kiel Canal 12 January 2009.

Figure 7-20: ship heading change to port side by bow wave in line with bank direction

These two vessels should meet inside the waiting area (wider part of the canal) by local rule. Birka Express arrived waiting area too early and had to maintain her position inside the waiting area.

⇒ As figure 7-19 left picture, Birka Express is staying too close to starboard side as rule 9 required. In seamanship, correct waiting area is in the center of waiting area where no bank effect from each side will generate unexpected force to ownship.

⇒ The danger of too close to starboard side is Birka Express will feel bank effects from starboard side which will create unnecessary force acted on ship's hull.

⇒ Ship bow may push away the bank by bow wave to port side because ship's bow too close to canal bank when the bank line began inclined to ownship's bow at the end of waiting area (as red mark in figure 7-19).

⇒ When Birka Express bow approached shrink bank section bow wave pressure increased enormous at 1422 hours push heading to port side. (Left picture red mark is the place were bank cushion effect strongest.)

⇒ The stern wave usually travelled with vessel in same speed: at 1421 hours, it is 8 knots.

⇒ Speed of Birka Express reduced to 4 kts in 2 minutes at 1423 hours. Stern wave in 8 knots had not reduced speed which catch up vessel's aft part and push it at 1424 hours. (right picture red area is where stern wave in original direction catch up ownship, unfortunately on port quarter in this case)

⇒ Because ship's heading already pushed by bow wave to port side at 1423 hours, stern wave catches up at her port quarter at 1424 hours cause Birka Express across channel and collision.

⇒ Bow wave act on vessel's bow will be experienced when vessel's bow too close to one side of the bank.

⇒ This bank cushion force increased when bank alignment narrowed in front of ownship.

⇒ Stern wave catches up vessel whenever ownship speed reduced too quickly.

⇒ Ownship's heading pushed away by bow wave to cross the channel is in danger of collision or grounding.

⇒ Stern wave can also push ownship stern to one side.

After all, Birka Express's location and timing inside the canal are wrong in this case. She arrives and leaves too early in waiting area. She located too close to starboard side of canal when no vessel around. At first, her heading pushed away by bow wave then stern wave pushed across the canal further. Pilot had placed ownship too close to bank side and leaving waiting area too early. Vessel collision at figure 7-20 1424 hours.

7-56 河道航行的碰撞位置：河道的瓶頸

⇒ 大船 VASI 追越小船以 8 節的速度在運河最窄的地方（在橋下），這是水流速度最快的地方，請見圖形 7-21 的二號位置。

⇒ 依照動態水壓學，任何流體在經過瓶頸的時候，都會加速，然後呢他的側壓力會降低，產生吸力。

⇒ 就是流速越快，然後側壓力越低，因為同樣的水量，要通過瓶頸的區域，水流要加速通過，才不會有真空。

⇒ 就在追越剛剛完成，在 0259 時，小船 BIRTHE THERESA 以 9.29 節的速度向前沖，他本來的速度只有 4.8 節的速度，那等於是速度增加了快 1 倍，然後黏在大船的船舯部位請見圖形 7-20 位置 3。

⇒ 這兩條船互相吸引，經過 6 分鐘之後，雖然這兩條船各自減速，最後在河道轉彎的地方分開，因為大船的船頭浪，或是岸推力的作用，從大船的船頭把這兩條船的之間的低壓（吸力）消除掉，如同圖形啊 7-19。

⇒ 大船 VASI 的載重噸位是 13000 噸，BIRTHE THERESA 是一個 5000 噸的小船，大概差了兩倍多。

⇒ 這兩條船都沒有預期到，會有這種吸力的過程，還會經過 6 分鐘之久，他們的追越過程是沒有問題，是完美的結束。

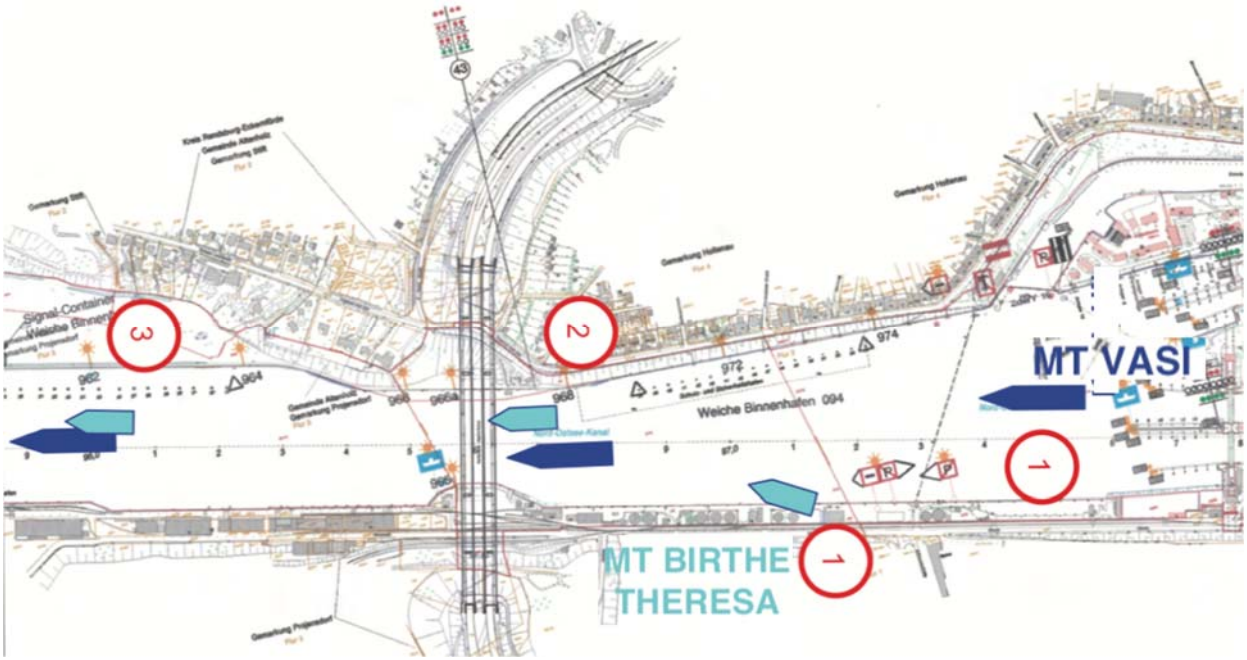
⇒ 問題是在兩條船間動態水壓效應，動態水壓效應增加了這兩條船的交互作用，還有進一步，被這個狹窄水道的瓶頸效應加強。

⇒ 這個吸力非常強，小船被吸的加速向前，速度增加非常快。

⇒ 那這兩條船連在一起航行，是因為船舯的低壓，與兩邊的水壓不平衡。

⇒ 航道的狹窄處，總是深水區，這個部分動態水壓流速快，側壓力也比較低，這種案件是非常少，而且傾向於發生在某些特殊的地點。

航海者或者領港也許知道以前在哪裡發生過，至於怎麼會發生，還是沒有辦法適當地用現代的技術來加以測量，“這個聯邦的海事事故調查局使用一些測試，當然包括一些理論上的探討，電腦的模擬，跟船模實驗，縮小船模等，在現階段正在努力將船隻大型化的趨勢，來加以考量。



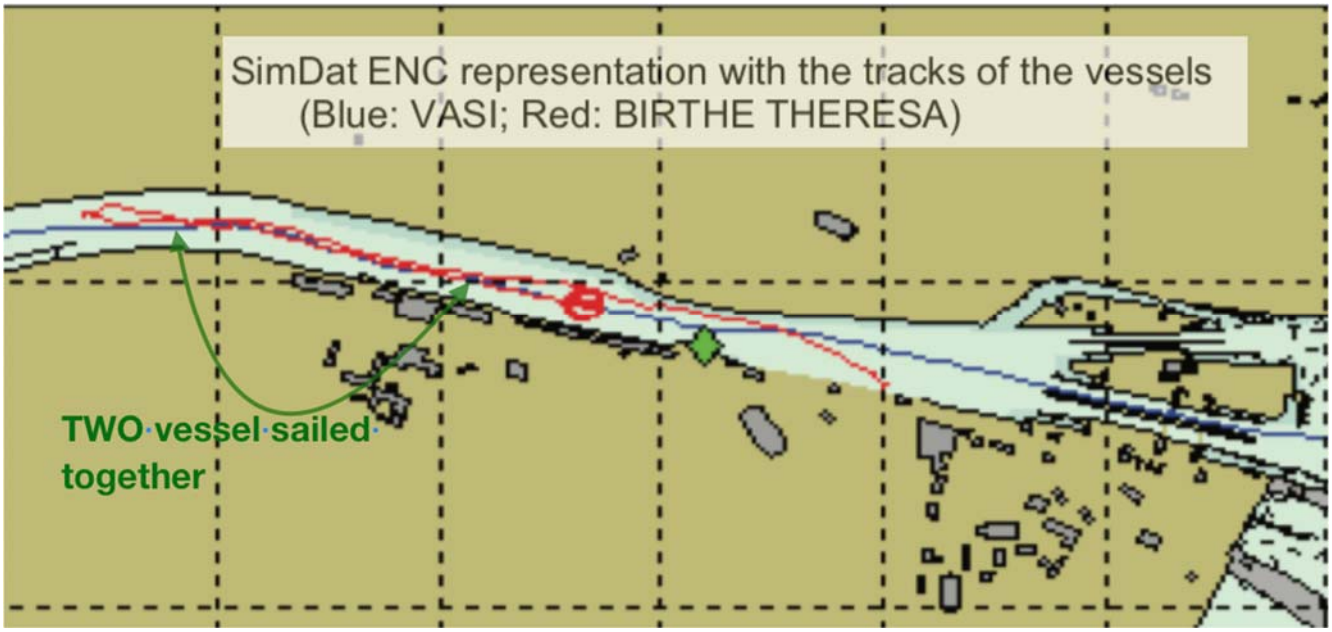
圖形 7-21 因交互作用而無法動彈的船隻

“這條大船 VASI 以 7.56 節的速度，也就是平均每小時 14 公里的速度，在追越小船 BIRTHE THHERESA，以每小時 10 公里的速度推進，也就是 5.4 節的速度。

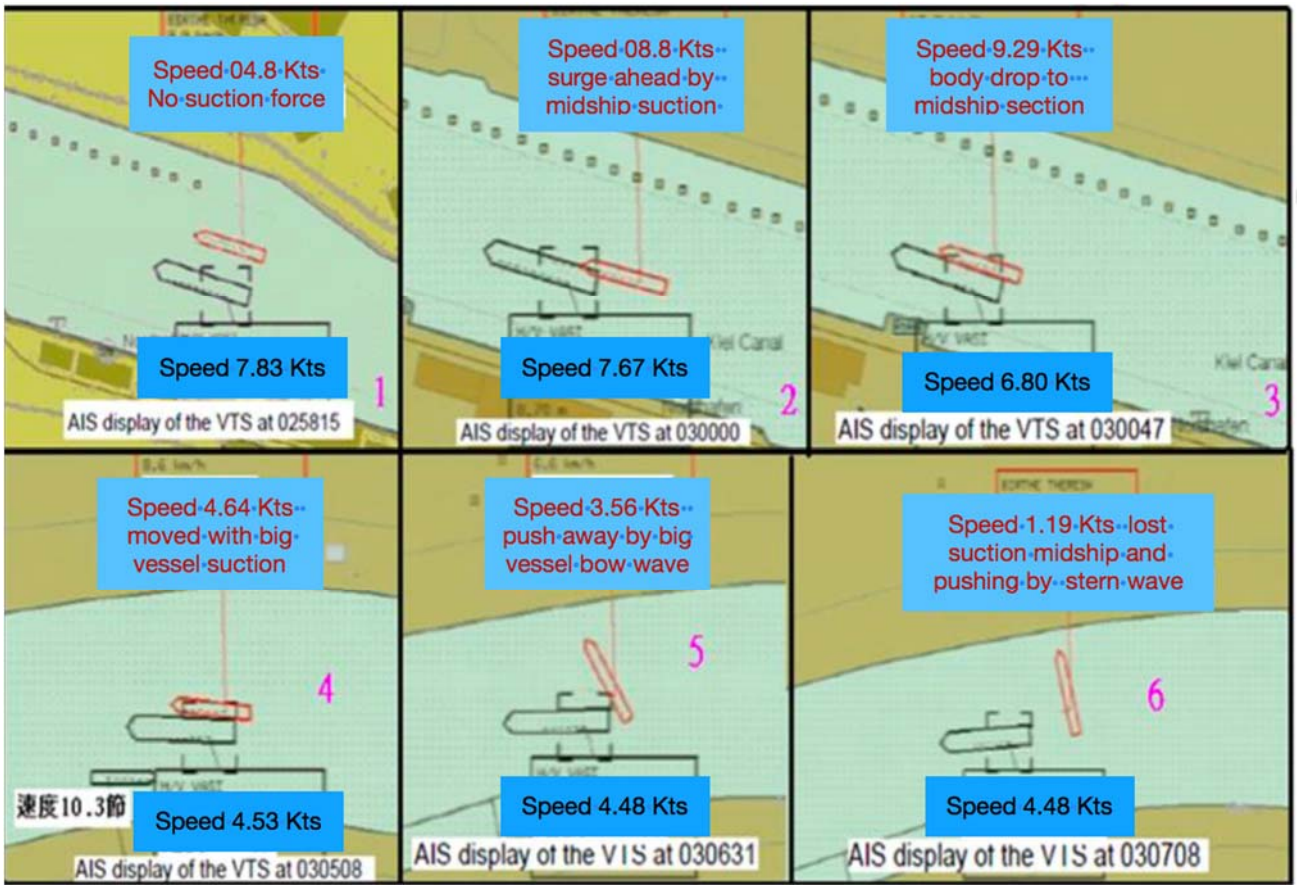
在 0259 時，這個追越的行動，可以認為是已經結束了，但是，忽然間船隻間開始相互吸引。BIRTHE THHERESA 的速度加快並無預期的向左轉。

在 0300 時，1 分鐘之後，這兩條船的船體開始互相接觸，然後呢保持這樣的狀態直到 6 分鐘之後，

到 0306 時。船隻繼續合體前進，雖然他們已經各自減速，但是船體也沒有各自分開。再 0305 時，他們就這樣兩條船連在一起，與另外一條對開的船隻迎艏正遇通過。
在 0307 時，小船 BERTHE THERESA 的船頭開始向右轉，開到北岸上 “。
這個是 BSU 的調查報告 41/09 在基爾運河碰撞 2 月 12 號 2009 年 “



圖形 7-22 被合體無法動彈的小船



圖形 7-23 船隻合體的可能原因

Figure 7-21: ship unmovable due to ship’s hull interaction

7-56 Collision in river passage: bottleneck in channel’s bridge

“The VASI overtook at an average speed of 14 km/h (7.56 Kts) and the speed of BIRTHE THERESA remained at approx. 10 km/h (5.40 Kts). At 0259, the overtaking manoeuvre could be regarded as finished. However, immediately afterwards the vessels began to gravitate towards one another. BIRTHE THERESA picked up speed and turned unexpectedly to port. At 0300, the two hulls came into contact and remained so

until 0306. The vessels continued 'in a packet' and although they reduced their speed, they did not separate from one another. At 0305, they passed an upcoming vessel in this manner. At 0307, the bow of the BIRTHE THERESA turned away to starboard and she sailed into the northern embankment." Quoted from BSU Investigation Report 41/09 Collision on the Kiel Canal 12 February 2009.

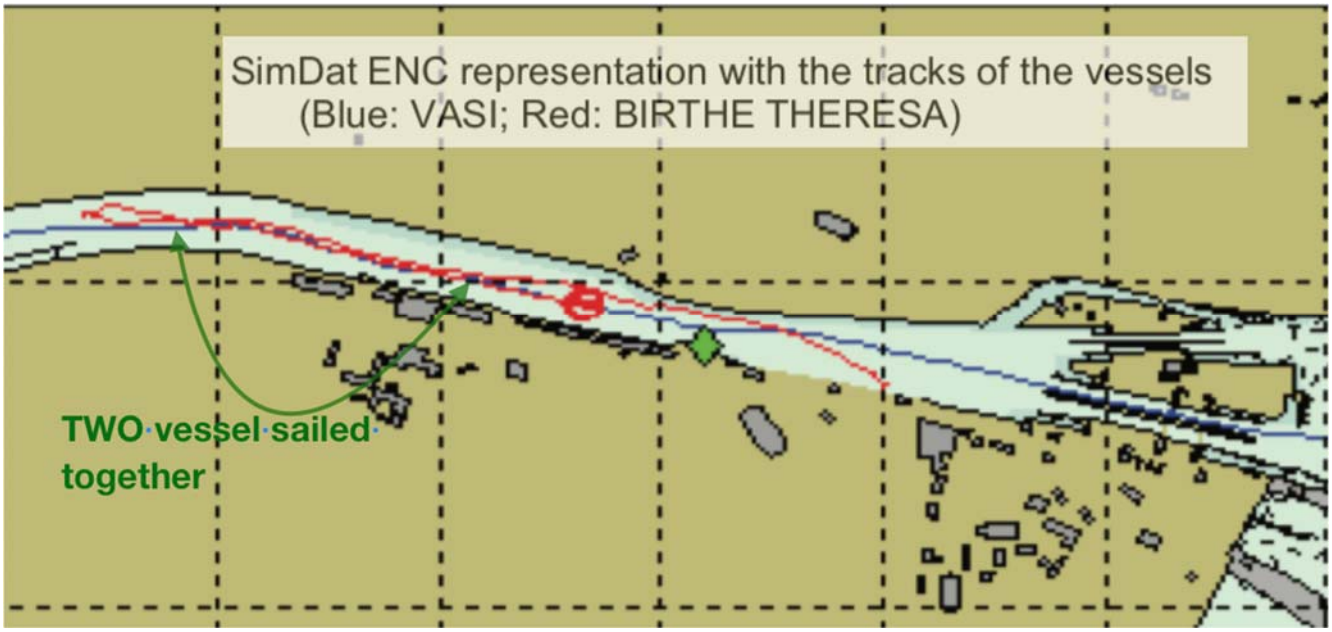


Figure 7-22: vessels stick together in the straight part of the Canal

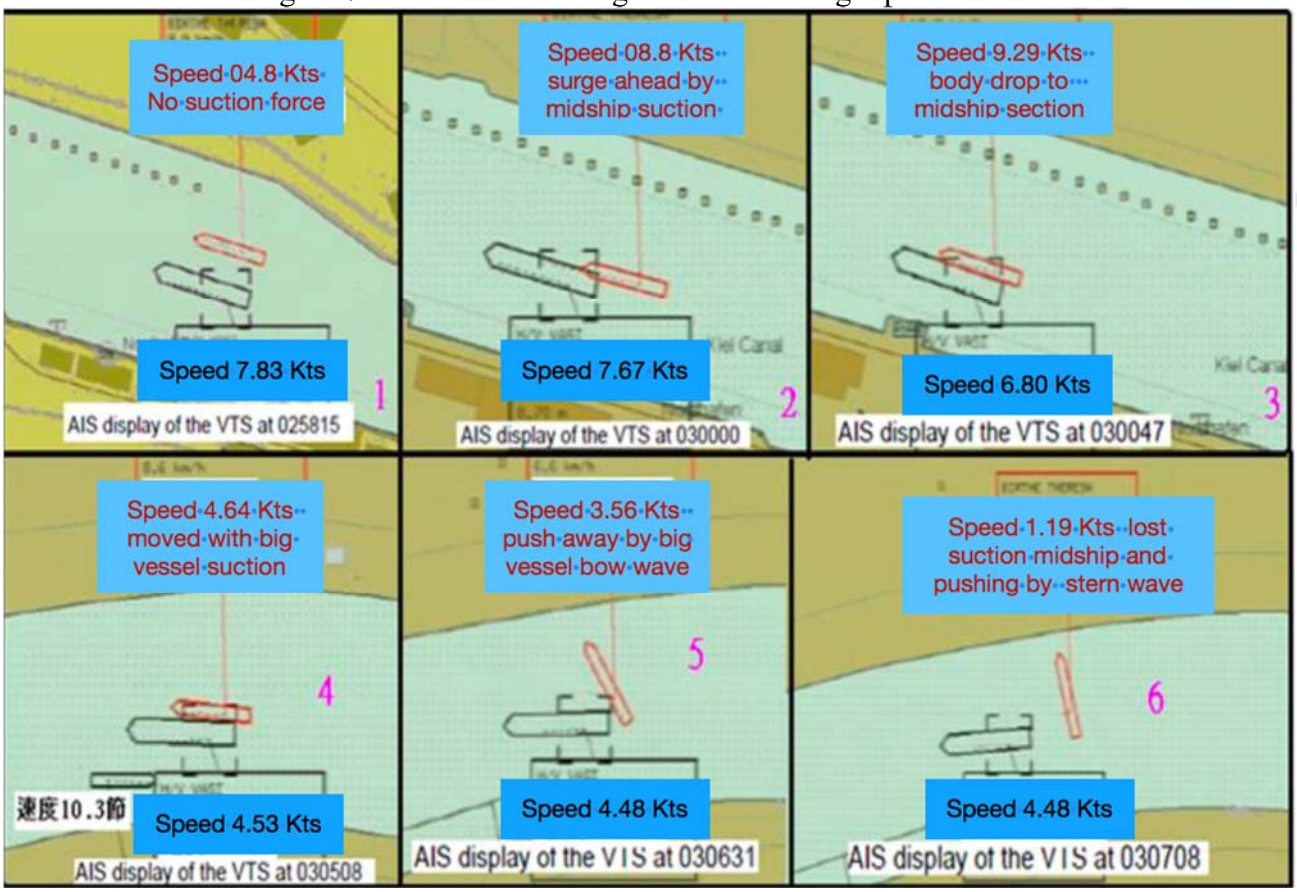


Figure 7-23: Possible cause of vessels sticks together

Big vessel VASI departed the lock in position 1 in figure 7-21 when small vessel BIRTHE THEESA just leave her berth.

Big vessel VASI overtakes small vessel at 7.83 knots at narrowest part of the canal (bottleneck in the canal which under the bridge) where the water flow is fastest than any other place in Figure 7-21 No.2 position. In hydrodynamics theory, any fluid flow through bottleneck will increase speed and their side pressure will reduce.

Just after overtaking finished at 0259 hours small vessel BIRTHE THERESA surge ahead with 9.29 kts (her original speed is 4.8 knots only and faster than 7.83 knots big vessel ahead) and be sucked in midship section of big vessel in Figure 7-20 No. 3 position.

⇒ In Figure 7-22, These two vessels sailed together about 6 minutes (section marked by green arrow line) although both vessels reduced speed. They fall apart at turn of the bank when straight section finished by bow wave or bank cushion force felt as last section discussed.

⇒ Big vessel VASI deadweight is 12,923 Tons and BIRTHE THERESA is 4979 Tons.

⇒ Both vessels did not expect of this suction process will last 6 minutes. There is no problem with the overtaking which finished in good order. The problem is the hydrodynamics effect increased two vessel's interaction effect which exonerated by bottleneck effect in narrow channel.

⇒ The strongest suction force is experienced at big ship aft quarter part.

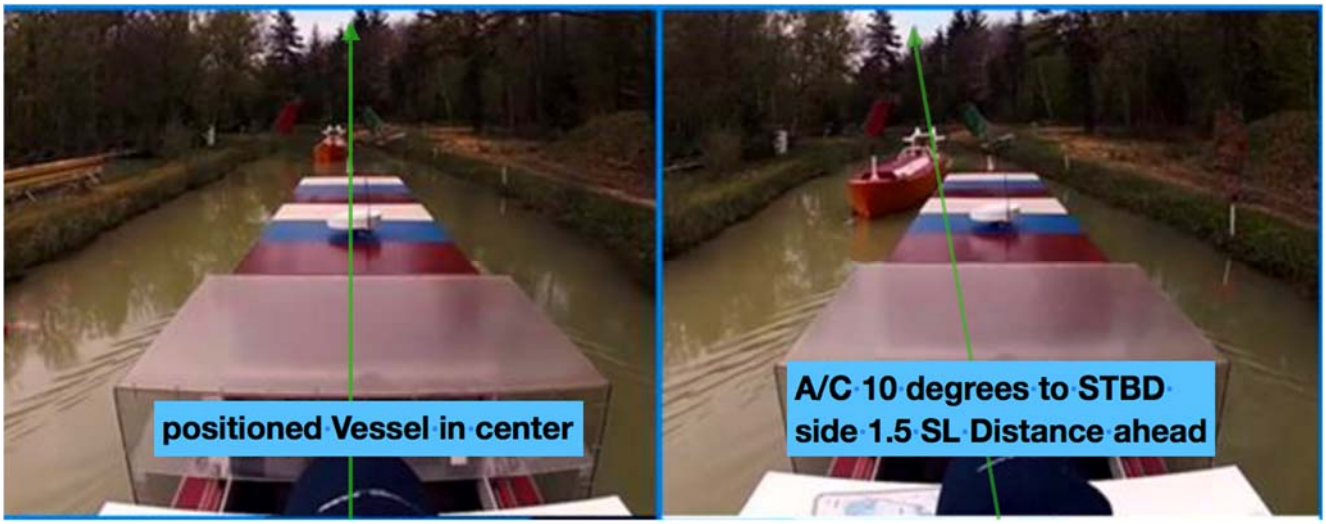
⇒ In this case, small vessel BIRTHE THERESA increased speed and surged ahead after overtaking had finished by the suction force of big vessel's starboard quarter.

⇒ These two ships sailed together are due to unbalance water pressure on both side of their ship's hull.

⇒ The narrow part of cannel is always the deepest part where water depth increased due to fast water flow and hydrodynamics is strongest to ship's hull.

These kinds of case are very rare and tend to happen in some particular location. Navigator or pilot may know where it happened before. "The Federal Bureau of Maritime Casualty Investigation recommends series of tests, which incorporate theoretical approaches, computer simulations and model experiments with present, scaled vessel models for its ongoing efforts to take current developments in relation to larger vessel dimensions into account."

7-57 河道航行的碰撞位置:迎艏正遇



圖形 7-24 河道的中間就是在運河通行的最好位置

（畫面是：巴拿馬運河領港的操船訓練）在漫長的河道航行，像是密西西比河需要 7 個鐘頭，兩條船的迎艏正遇是無法避免的事，基本的概念，就是要好好處理船頭浪跟船尾浪的問題。

⇒ 突然的主機停車，在運河裡面，會使得船尾浪追上本船，去推動本船橫過運河，就像我們在圖形 7-19 右圖所看到的。

⇒ 在運河裡面最佳的船位，就是在河床的中間，在這裡，船隻兩邊的水流壓力是差異最小，在圖形 7-24 綠色的線，就是這條河的中線。

⇒ 起始，我們的看到兩條船都在河道的中線，以相對的航向前進。此時，兩條船都應該待在河道中間的位置。

⇒ 如果在這兩條船交遇之前，其中的任何一條船提早轉向，然後離開河道的中線太早，船頭就會感覺到岸推力，作用在船體上，就像圖形 7-17 的左圖。BIRKA EXPRESS 這條船就是太早離開中間，來到河岸邊 ，岸推力把船頭推向左舷，然後擋到了來船的水路。

兩條船的距離要接近到 1.5 倍船長的時候，才開始兩船交遇的操作。

⇒ 轉向點 1.5 倍船長的距離之前，是正常轉向的時候，用舵的時機點，

⇒ 在這個距離，領港會向右轉向 10 度，或使用右滿舵來啟動這個回轉，就像我們前面的討論，10 度的回轉可以在第一階段的回轉裡面完成，也就是這時候，大部分都是船尾被舵板推動轉向，而不是因為船頭的動態水壓的影響，也不是船體阻力產生的影響，純粹就是舵板的側推力，將船尾推向河道的另一邊。

⇒ 打右舵也就是將船艉推向河道的左邊，舵板的作用在船尾，就像圖形 4-07 瞭解船隻回轉的階段。

⇒ 舵效作用在本船的船體，是將本船的船艉向左邊推進，當開始使用右舵的時候。

⇒ 本船會向右轉向 10 度，在第一階段的回轉，就像圖形 7-24 的右圖，船首向是 10 度偏離河流的中線，跟岸線相差 10 度，與綠色的河道中線不同。

本船的船體仍然是在河道的中間，經過右轉 10 度，使得本船的船頭受到岸推力的影響，來船的船頭浪，這時候也進入最高壓的區域，圖形 7-24 運河通行的最佳船位，在河道的中線。

圖形 7-25 左滿舵來抵銷船頭浪，右滿舵來抵銷船艉浪

⇒ 在通航的時候，當兩條船的船頭開始交會，船首向已經向右邊改了 10 度，當兩條船在圖形 7-25 左圖交會的時候。

⇒ 船頭的岸推力與來船船頭浪的推力，同時作用在本船船頭的時間，幾乎是當兩條船互相接近的時候，舵角這時候改為左滿舵，用來抵銷來船的船頭浪，或者是使用左滿舵，使得本船的船艉向右舷推動，方便來船通過。

⇒ 實際上只有本船的船艉，會向運河的右邊移動，就像圖形 7-25 的左圖。

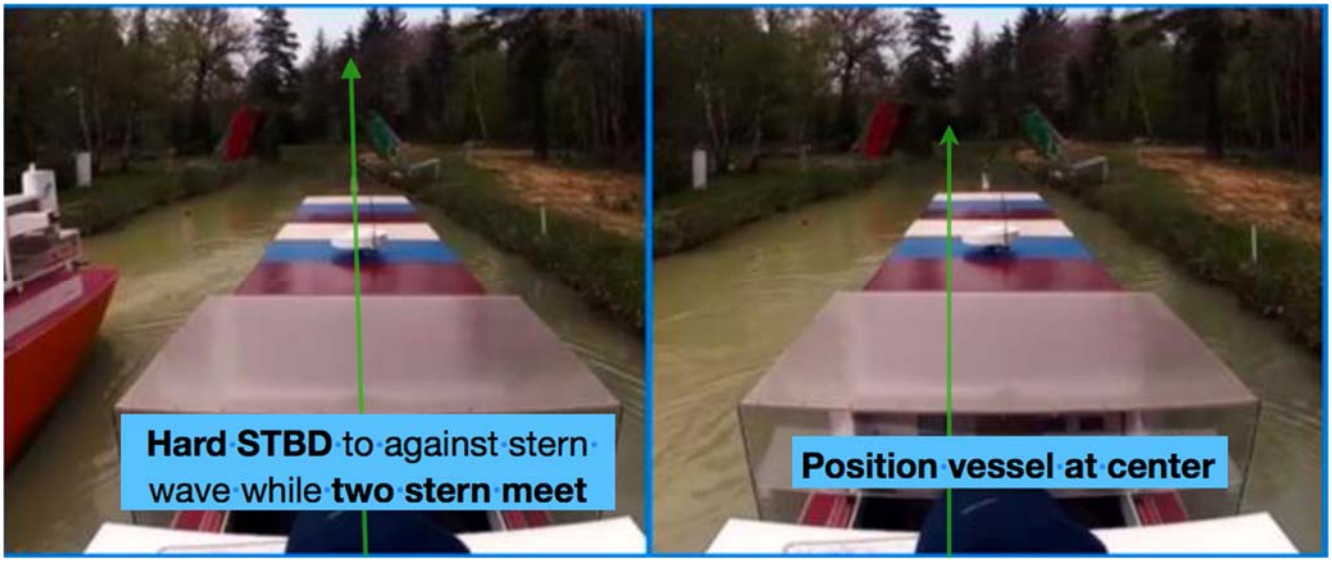
⇒ 本船需要持續打左滿舵，在領港認為船頭浪還沒有通過的時候，就要持續，因為來船的船頭浪，會將本船的船頭壓向右邊，使用左滿舵一邊可以使船艉靠右，讓出船位給來船，另外一方面，可以抵抗來船的船頭浪的壓力。

⇒ 然後本船的船首向開始回復到原始的河道中線的方向，跟河岸平行。當兩條船的船舯部位相遇的時候，就像圖形 7-25 右圖。

⇒ 也就是我們先使用右滿舵，讓出船頭方向，再使用左滿舵，把船艉推到右邊的岸邊，方便兩條船相互通過。

⇒ 當本船船首向回到原始航向，用舵的舵令，就會改成穩舵，也就是穩定在運河河道的方向，領港此時會將船隻交給舵工，去穩定在河道的方向，也是為了抵銷剛剛打左滿舵的時候，產生的向左回轉的動量。

⇒ 停止船隻船首向向左轉，領港也許會用右舵來穩定本船的船首向。



圖形 7-26 右滿舵去避免橫越航道與對抗船艉浪

來船的船頭浪遇到本船的船艉浪，就像圖形 7-26。

⇒ 本船船頭非常快速的回到河道中央，去彌補對方船身經過所引起的真空。

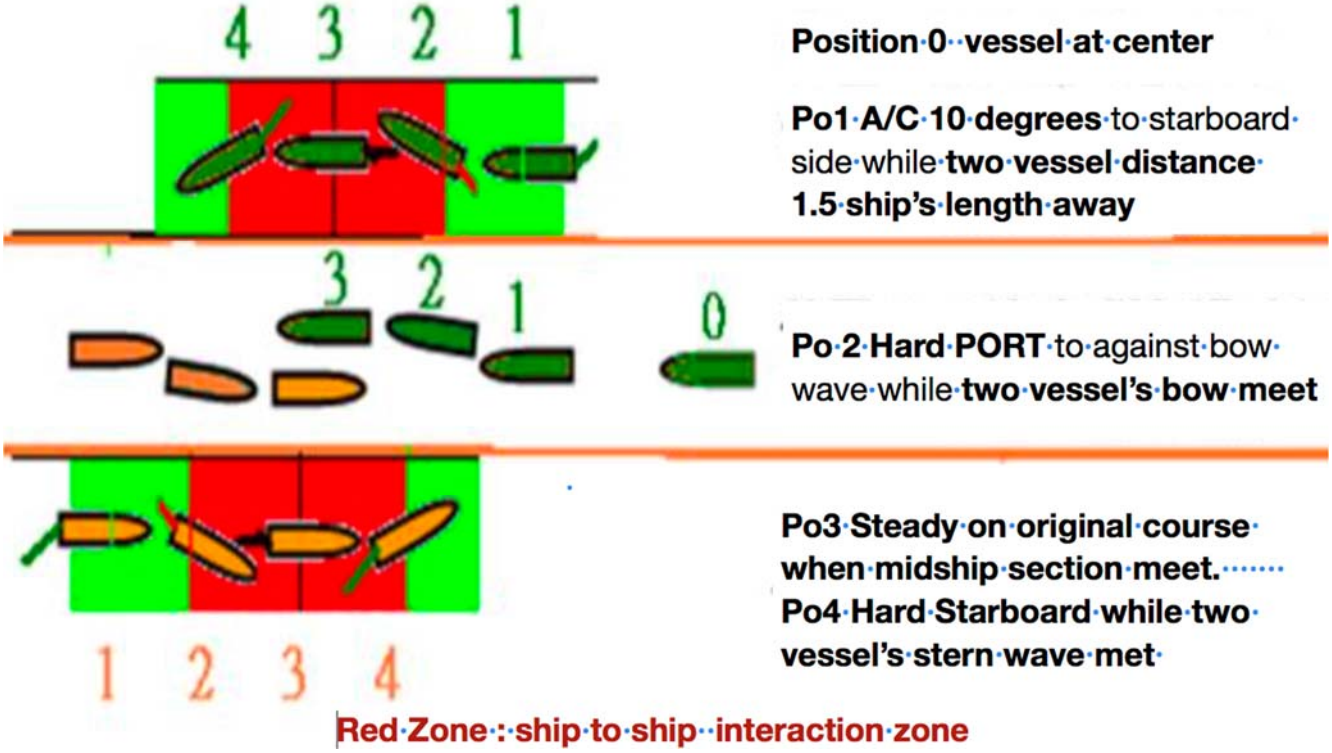
⇒ 舵令改為右滿舵，只要領港認為經過船隻的船艉浪，還在影響著本船。

⇒ 有時候領港需要使用大車來推動舵板，來維持本船在河道的中間，

⇒ 當本船的船頭開始回到右邊，舵令就會改為 STEADY 穩住在河道上原始的航向，此時就會交給舵工去抵抗動態水壓，在本船船體所造成的回轉力量。

⇒ 在經過右滿舵之後，船身慢慢回到河道的中線，來繼續下麵的航行。

在河道的航行，操船需要考慮岸壁效應，淺水效應向，船隻的動態水壓效應，跟床船岸之間的交互作用，船跟船之間的交互作用，風力流水效應，所有這些造成意外的共同因素。



圖形 7-27 河道航行時迎艏正遇

雖然河道領港已經具有 200 年的歷史跟航行的傳承，這些河道是沒有數學的模式，或是理論可以去精准的形容，在這些船岸水裡面的交互作用。無論如何，安全速度永遠都是任何不可預期事件的最後手段，然而太慢的航行速度，對所有河道的使用者，都是一種痛苦的折磨。領港可以慢慢增加速度，來測試他的安全通行的全速為何？來節省可能的時間跟燃油消耗。

但是必須具有下面的知識跟感覺，

⇒ 船底跟岸壁的交互作用：不同的潮流潮汐狀況下，會有很大的不同。

⇒ 本船在河岸邊不同的位置，會影響經過本船邊的水流。
⇒ 船體的移動與大海裡面的航行是不一樣的。
⇒ 舵工的操作技術是最基本安全航行的保障。

有經驗的舵工比有知識的領港有用，實務上，領港會帶著當地的舵工上船，船公司要省當地舵工的費用，可能會因小賠大。

7-57 Collision in river passage: head on situation

Figure 7-24: centerline is best position for canal passage

(Courtesy picture of "ACP: PANAMA CANAL PILOTS AT PORT REVEL")

In long river passage like Mississippi River (7 hours passage), two vessels meet in end on situation is inevitable. The basic concepts are taking care of "Bow Wave" and "Stern wave". Any abrupt engine stop inside the canal may cause stern wave to overtake and push ownship quarter as we see in figure 7-19 right picture. The best position to sail inside a canal is in center line of river bed to minimize the unbalanced hydrodynamic force in ship's side.

In figure 7-24 green line is river's center line, we see two vessels meet in reciprocal course in center of the canal.

⇒ Both vessels should stay in centerline of the channel before two ships meet.
⇒ If any vessel alter course to starboard side and leave the centerline too early it will feel the bank cushion too early like figure 7-17 left picture Birka Express which will push her bow into port side and block oncoming vessel's waterway.

Only when two vessels distance close to 1.5 ship's length., the maneuvering start.

⇒ 1.5 ship's length distance ahead is the position of wheel over point for course altering.
⇒ Because this distance is often used in ship's maneuvering it is advisable to take this distance into our situation awareness which should be able to be detected by our visual instead of checking in ECDIS or RADAR.
⇒ At this distance, pilot will either alter course 10 degrees to starboard side or use starboard rudder angle to begin the turn.
⇒ As we discussed before, 10 degrees turn can be finished within first stage of turn by rudder effect along.
⇒ Ship's hull only has rudder working on ownship stern as Figure 4 - 07 Understand the turning stages.
⇒ Its effect on ownship's hull is to move ownship's stern to opposite side (port side) when starboard rudder is used
⇒ Ownship will alter course 10 degrees to starboard side in first stage of turn as figure 7-24 right picture. Ownship's heading is 10 degrees off to the bank, not same as green river center line.
⇒ Ownship's pivot point is still in the center line of the river.

Alter course 10 degrees to starboard side, ownship may feel bank cushion pressure on ship's bow and oncoming vessel's bow wave at the same time.

Figure 7-25: Hard Port rudder to counter bow wave, Starboard rudder to counter stern wave

Two vessels' bow meet each other in passage, In figure 7-25

⇒ When two vessel's bows met, Course already changed 10 degrees to starboard side.
⇒ Bank cushion effect and oncoming vessel bow wave cushion at ownship's bow at the same time when two vessels close to each other.
⇒ Pilot or master will order "course again" or rudder angle to "Hard Port" to counter oncoming vessel's bow wave which is stronger than bank cushion.
⇒ By their order, only ownship's stern will move with "Hard Port" rudder to starboard side of canal as figure 7-25 left picture.
⇒ "Hard Port" for as long as pilot think bow wave had not past yet. And,

⇒ Ownship's heading begin to course again to parallel with canal bank when two vessel midship section meet as figure 7-25 right picture.
⇒ Rudder order of "Steady" on channel's original course is given for helmsman to counter the port turn momentum of ownship after "Hard Port" rudder.
⇒ The timing to stop portside turn of heading is not always very precise as we stated. Thus, how many starboard side rudder used or "steady the vessel" will be more or less decided by the quarter master's skill (steering AB's).

Figure 7-26: Hard Starboard rudder to avoid across channel and counter stern wave

Oncoming vessel's bow wave meet ownship's stern wave as in figure 7-26.

- Ownship bow fall into center of channel (port side) strongly to fill up the vacancy left behind passing vessel.
- Rudder order to "Hard starboard" for as long as pilot think passing vessel stern wave influences already past.
- Sometimes, pilot will need to use kick ahead engine to steady ownship on center of channel.
- When Ownship's bow begin to come back to starboard side Rudder order of "Steady" on channel's original course is given for helmsman to counter the hydrodynamic forces on ownship's hull after "Hard Starboard" rudder.
- Position ownship at center line of the channel to continue the transit.

In the river passage, Bank effect; shallow water effect; ship hydrodynamics; ship-bank interaction; ship-ship interaction; wind and tidal current; shiphandling all are accounts of navigational accidents.

Figure 7-27: Head on situation in Channel transit

Although river pilots have 200 years' experience and heritage in navigating these rivers no mathematic module or theory is available to describe what exactly had happened inside these water's interaction around ship's hull and bank. Anyway, safe speed is always the last resource to avoid any unexpected incident. Too slow transit speed is a torture to all river user. Pilots and navigators may increase the speed little by little to test it safe passage for possible time and cost saving. We should have the sense of

⇒ The interaction of ship's hull and canal bank will vary a lot in tidal current.
⇒ The proximity of ownship to river bank will influence the bank affect severely.
⇒ Ship response is different from deep-sea in the rudder we used.
⇒ Quarter master's steering skill is the first safety guard we had in river transit.

7-06 在狹窄水道內的防衛駕駛

7-58 在分道航行制內的行為準則

在避碰規則 10 裡面，有很多的關於位置的文字描述，在每個位置都會有相對應的行為準則：例如（b）船隻使用分道航行制應該：

⇒ *在航行巷道*（位置），*以一般流通方向前進，*
⇒ *盡可能的遠離隔離區與分道線*（位置）
⇒ *從分道航行制的終點*（位置）*進入或是離開，*
⇒ *應該在進入或是離開分道的兩邊*（位置）*的，應該以最小的角度與一般行到流通的方向進入或離開。*
⇒ *船隻應該可能的避免橫越分道航行制*（位置）
⇒ *如果必須這樣做，盡可能實際的以直角方向，橫越航道的一般流動方向。*

在這些分道航行制的位置裡面，他的準則就是如下：

⇒ *以航道的一般流通方向前進，*
⇒ *船隻應該盡可能實際避免橫越，*

⇒ *被迫橫越的時候，應該盡可能實際，採取船首向跟一般流動方向成直角，*

⇒ *船隻從事捕魚，不應妨礙其他船隻在航行巷道內地通行。*

⇒ *船隻少於 20 公尺的長度，或是帆船，不應該妨礙動力船隻在航行巷道裡面的通行。*

分道航行制隔離區（位置）的行為準則應該如此：

⇒ *實際可行時遠離*

⇒ *船隻不是橫越的時候，或船隻不是在加入或離開一個航行巷道時候，不應該進入或是橫越分道線或隔離區，除了避免緊急的危險，或是在隔離區內從事捕魚*

在接近航行巷道的終點（位置）的行為準則是如下：

⇒ *一般加入或離開航行巷道，從航行巷道的終點。*

⇒ *當離開或是加入任何一邊的航行巷道，應該盡可能與一般流動方向成最小的角度進行。*

⇒ *船隻在分道航行制的終點區域附近航行，應該要特別小心。*

近岸航行區（位置）的行為準則如下：

⇒ *某船不應該使用近岸航行區，當他可以安全的使用，在附近的分道航行制。*

⇒ *如果船隻小於 20 公尺，或是帆船，或是從事補魚的船隻，可以使用近岸航行區。（所以這裡說的清楚，近岸航行區是給小於 20 公尺的船與漁燈，帆船使用的，其他大船應該儘量使用分道航行制。）*

⇒ *下面船隻可以使用近岸航行區，當前往或是離開，位於近岸航行區裡面的*

- *一個港口*
- *或是外海的設施*
- *領港站*
- *或是任何其他地方*

船隻就有權進出近岸航行區，以到達這些目的地。

⇒ *避免立即的危險，*

分道航行制（位置）行為準則是：

⇒ *以一般流動方向前進*

⇒ *接近分道航行制的終點，應該要特別小心*

⇒ *船隻應該盡可能實際，避免拋錨在分道航行制內，或是接近分道航行制的終點區域*

⇒ *船隻沒有使用分道航行制者，應該盡可能的遠離分道航行制*

⇒ *船隻運轉力受限制，當從事保養維護航行安全，在分道航行制內，豁免於遵守本規則，直到必要的程度，可以進行他的工作。*

⇒ *船隻運轉力受限制，正從事某項作業，施放，維修與回收海底電纜，在分道航行制內豁免於遵守本規則，直到必須執行其工作的程度。*

7 – 06 Defense Navigation inside Traffic Separation Scheme

7-58 Code of conduct inside Traffic Separation Scheme

There are many words in COLREG rule 10 about the location. In each location there will be some code of conduct, for example:

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

(i). proceed in the appropriate traffic lane (location) *in the general direction of traffic flow* (action code) *for that lane;*

(ii). so far as practicable keep clear (action code) *of a traffic separation line or separation zone* (location);

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

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

Within these locations: ***In traffic lane, code of conduct are***

- *proceed in the general direction of traffic flow for that lane,*
- *A vessel shall, so far as practicable, avoid crossing,*
- *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.*
- *A vessel engaged in fishing shall not impede the passage of any vessel following a traffic lane*
- *A vessel of less than 20 metres in length or a sailing vessel shall not impede the safe passage of a power-driven vessel following a traffic lane*

In traffic separation line or separation zone, code of conducts are

- *so far as practicable keep clear*
- *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: in cases of emergency to avoid immediate danger;*
- *except: to engage in fishing within a separation zone.*

In the termination of the lane, code of conducts are

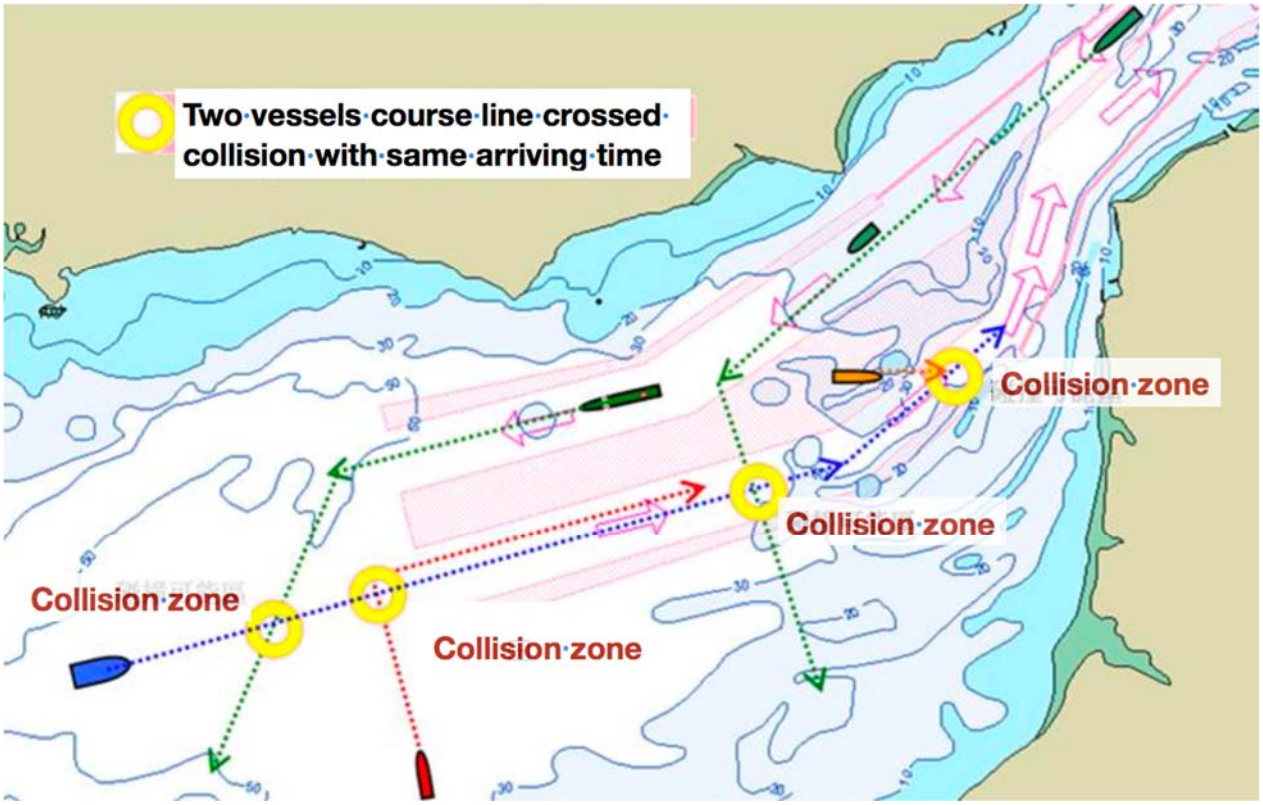
- *normally join or leave a traffic lane at the termination of the lane*
- *when joining or leaving from either side shall do so at as small an angle to the general direction of traffic flow as practicable.*
- *A vessel navigating in areas near the terminations of traffic separation schemes shall do so with particular caution.*

inshore traffic zone, code of conducts are

- *A vessel shall not use an inshore traffic zone when she can safely use the appropriate traffic lane within the adjacent traffic separation scheme.*
- *However, vessels of less than 20 metres in length, sailing vessels and vessels engaged in fishing may use the inshore traffic zone*
- *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.*

Traffic separation scheme, code of conducts are

- *proceed in the appropriate traffic lane*
- *A vessel navigating in areas near the terminations of traffic separation schemes shall do so with particular caution.*
- *A vessel shall so far as practicable avoid anchoring in a traffic separation scheme or in areas near its terminations*
- *A vessel not using a traffic separation scheme shall avoid it by as wide a margin as is practicable.*
- *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.*
- *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.*



圖形 7-28: 在分道航行制附近的可能碰撞區域

7-59 利用航線安排解決碰撞衝突

在分道航行制內的一個位置附近，一個船長能做的事情，或是不能做的事，是由規則所界定。有些規則定的良好，可以解決可能的碰撞危機，與速度向量或是航線安排的概念相似。如

- 盡可能的遠離分道線和隔離區，在圖形 7-14 ，15 注意區域的安全邊，保持遠離隔離區可以避免不必要的碰撞（與剛剛橫越隔離區，加入本船同向的航行巷道的船隻）。
- “要求船隻的航向與一般流通方向平行”，減少追越船或是被追越船隻的碰撞點，在圖形 5-18 碰撞危機的開始，是當航向轉到 135 度時，跟原來一般流通方向 090 度的航向，有 45 度的差異，所造成的碰撞危機，這個是我們在轉向時候，一定要有的觀念。
- “加入或離開一個航行巷道，要在航行巷道的終點”，目標就是避免有任何橫越船隻的通過。
- “當加入或離開巷道的兩邊，應該盡可能以一般流通方向最小的角度進行”，這也是要將分道航行區外的船隻航線，調整到跟航行巷道裡面的船隻航線相同。
- “船隻在航行巷道的終點附近，應該要特別小心航行”，這個就是碰撞危機的熱區，因為所有的船隻，都會匯合到這個位置，不單是要小心，最好是轉向點不要設在分道航行制的終點區域，因為就像我們前面講的一樣，一開始轉向，就會產生新的碰撞危機，將所有的轉向點，儘量延長到分道航行制的終點區域之外 1， 2 海浬，再視情況轉向。在大船最好就是，終點區域三海浬五海浬外再轉，因為不差這個路程。
- 當深吃水或是快速船隻使用分道航行制裡面的內側航路是正常的，所以本船，如果只是路過，或不是快速船隻，應該避免使用航行巷道內側的航路。因為在那裡，我們會一直被追越，造成碰撞危機。因為我們沒有辦法跟他們採取同樣的速度。
- 當深吃水和快速船隻在橫越中間的隔離區或分道線時候，有很大的風險，本船應該安排我們的航線遠離。就像圖形 7-14 跟 15 注意區域的安全邊，對東航跟西航的船隻都一樣。
- 避免航行經過橫越通行區域的內側航路，可以擁有更多的海域，來觀測橫越隔離區的來往船隻。
- 在隔離區和分道線附近來往船隻的動向，船隻如果會穿越在分道航行制中間的隔離區，或是分道線，只有兩個目的，一個就是直接橫越到分道航行制之外，另外一個呢就是要加入本船這一邊的航行巷道，這種船隻會在隔離區之前或是分道線之前，就開始要進行

回轉的動作，所以要看他的轉向點在哪裡？應該就知道他未來的動向如何？因為船隻回轉是很笨重的（需要一海浬）。

- 注意在分道線附近航行的船隻，他們可能隨時都會橫過航行巷道，不論是任何理由，也許只是讓路給小型船隻，只是我們可能看不到這條小船，可是他知道，所以他的航行動向對本船，就變得不可預測。
- 任何船隻航向的改變，就是改變我們的碰撞危機，碰撞位置跟碰撞時間。所以每一次轉向，都要認為是項新的挑戰。
- 設定本船的航線要小心，在圖形 7-28 可能的碰撞區域，在航行巷道裡面，就是那些兩條船航線的交點（四個黃色的圓圈），碰撞發生，就是當兩條船同時到達這個碰撞點。
- 就像我們討論過的，當兩條船有碰撞危機，兩條船都必須避免碰撞，此時小角度的航向改變 3 度，就會有很大的幫助。所以有時候，你不能猶豫不決，你就是要先轉個 3 度，5 度，這跟我們避碰規則要求的是不一樣的，結果卻是大不相同，所以這個是高級的操船動作，只能適合這個船長級的讀者操作。
- 在這些可能的碰撞區域，如果我們的航路規劃，航線的安排，可以創造更多的海域，本船會有的碰撞危機，就比較少，跟其他船隻發生碰撞危機的機會，就比較少。
- 經由航線的安排，可以創造更多的海域，在有碰撞危機時，不必大角度轉向。

在圖形 7-28，我們發現 4 個可能的碰撞區域，

- 紅色船隻進入分道航行制，使用 90 度的航向改變，就是違反了規則 10（b）(iii)。
- 綠色船隻離開分道航行制，太靠近分道航行制的終點區域，這個不行，可能會跟進出分道航行制的船隻發生碰撞危機，因為違反了盡可能的以小角度進入或離開的規則。
- 綠色船隻在橫越隔離區。
- 漁船在分道航行制區域內作業。

Figure 7-28: Possible collision zone inside Traffic Separation Scheme

7-59 Deconflict collision inside TSS by radar lookout concepts

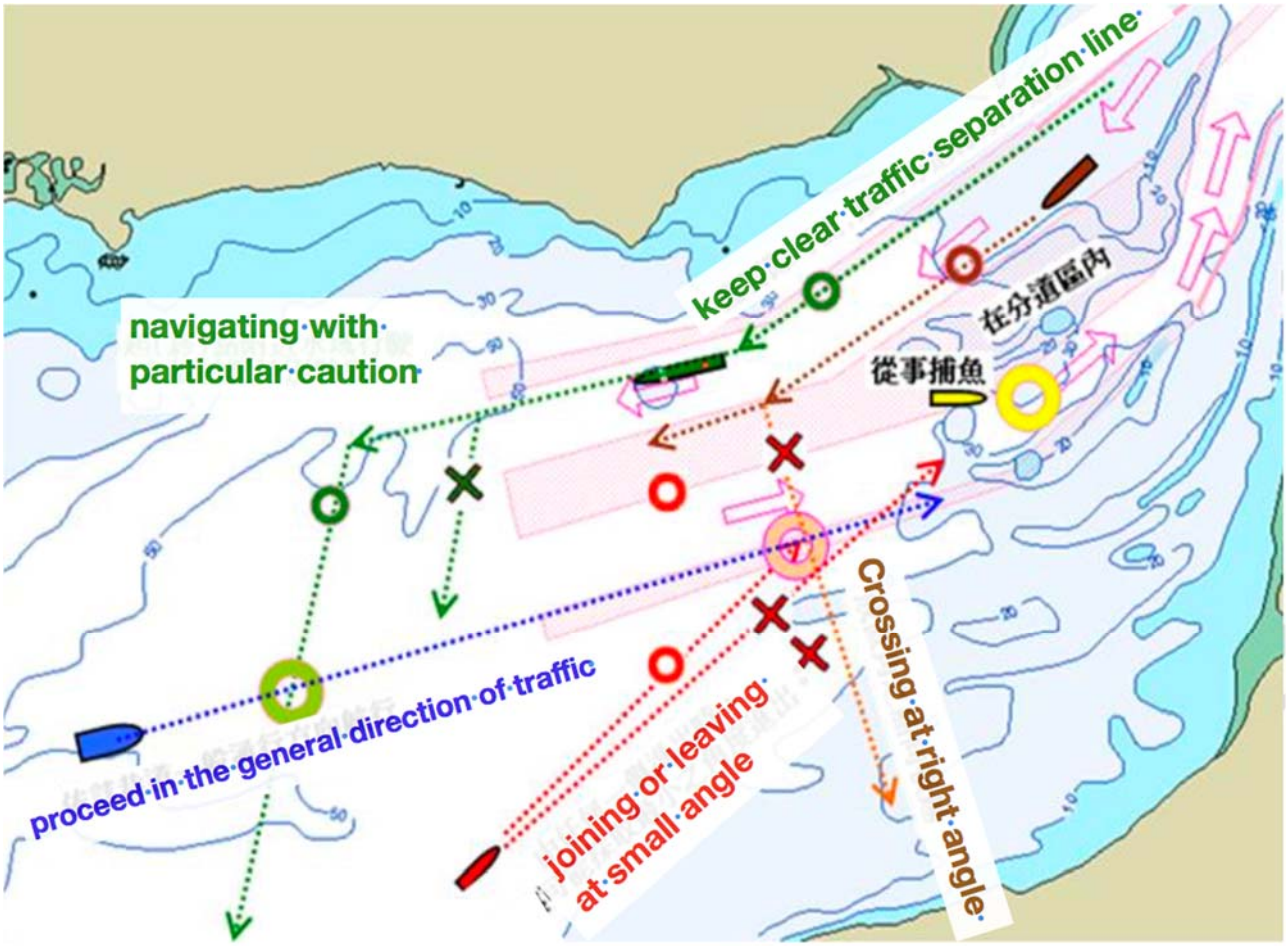
In figure 7-28: Possible collision zones inside Traffic Separation Scheme are those cross point of two vessel's course line (4 yellow circles). The collision happened when two vessels arrived at same time. As we discussed before when two vessels have collision risk both vessels are obliged to avoid collision even a small amount of course (3 degrees) or speed change will help a lot. If our voyage planning (course line arrangements) can make more sea room in these possible collision zone ownship will have less collision risk with other vessels. In figure7-28, we find 4 possibilities of collision zone:

1. Red vessel joined the TSS with 90 degrees course change which is violation of Rule 10 (b) (iii).
2. Green vessel departed TSS near the terminations of traffic separation schemes.
3. Green vessel crossing separation zone.
4. Fishing boat operation inside TSS.

In each location around TTS, what master can do or cannot do is defined by the rules 10. Some rules are well organized to deconflict the possible collision risk by radar lookout concepts to examine

- "*so far as practicable keep clear traffic separation line or separation zone*" . As figure 7-14 and 7-15: Safe Side of precautionary area, keep away from separation zone can avoid unnecessary collision point with those vessels have to cross separation zone when they join or leave same general direction as ownship.
- "*proceed in the general direction of traffic flow for that traffic lane*" To parallel with target's course as general direction of traffic flow will reduce collision point with overtaking or overtaken vessel. As figure 5-18, collision risk begins when course change to 135^0 (T) which is 45 degrees (T) different from general direction of 90^0 (T) .

- "*normally join or leave a traffic lane at the termination of the lane.* " which is aimed to avoid crossing traffic.
- "*when joining or leaving from either side shall do so at as small an angle to the general direction of traffic flow as practicable.* " To parallel with vessel's course inside TTS as far as possible to avoid collision point.
- "*A vessel navigating in areas near the terminations of traffic separation schemes shall do so with particular caution.* " This is the hot zone of collision point as all vessels' speed vectors are converged here.
- When deep draft or speed vessel take inside route of traffic lane ownship avoid these inside routes will avoid collision risk.
- When deep draft or fast vessel transit *crossing traffic area* they have great risk than ownship, we should arrange our course line out of collision hot zone in voyage planning as figure 7-14 and 15: Safe Side of precautionary area for Eastbound and Westbound Vessel.
- When transiting "crossing traffic area" we should avoid using inside route to leave more room for crossing vessels.
- In figure 7-29, Crossing vessels as brown vessel should arrange their course line as close to separation line or zone as close as possible to avoid block the way of overtaking vessel.
- Beware of vessel navigate closely to separation line or zone as they are about to cross the traffic lanes for many reasons (give-way to small vessels) we may not know.
- Any course change will change our collision risk and position with other vessel.
- Set ownship's course carefully as collision is always ahead of ownship.



圖形 7-29 完整的航線安排在分道航行制之內。

7-60 利用碰撞點概念解決碰撞危機

本船應該使用碰撞點的概念，來安排我們在分道航行制內的航線。圖形 7-14 可能的碰撞點在分道航行制內：

⇒ 任何碰撞危機一定是在本船船首向上面，

⇒ 兩個平行的航線，不會互相交叉，所以就不會有碰撞點。
⇒ 如果本船與向南航行的船隻的碰撞點，是在南航船只的航行巷道之內。也就是，如果本船沒有使用分道航行制，而與航行巷道裡面的船隻有碰撞危機，碰撞點就是在分道航行制裡面。
⇒ 如果本船避免橫越航行巷道，或是隔離線，碰撞危機就會減少，這就是防衛性的航行。
⇒ 當本船轉向，我們的速度向量線會掃過其他船隻的速度向量線，造成新的碰撞區域大小，就是跟本船船首向所改變的角度是一樣的。
⇒ 如果本船右轉 90 度，船頭到右舷 90 度之間的船隻，與本船都可能產生新的碰撞危機，如果他們跟本船的距離很近。
⇒ 當本船改變航向，在我們轉向點附近的區域，都是最危險的碰撞面，碰撞區域。
⇒ 當本船正在轉向，碰撞危機是無法確定的，這是因為
    - 本船的船首向不確定，由於在回轉以及可能的回轉過度，阿帕攫取的計算，回轉的船首向變得不正確。
    - 本船的速度正在減少，然而碰撞危機是與本船的船速成正比。
    - 跟其他船隻接近的距離，變得很難估計，沒人知道何時本船可以及時穩定在新的航向上。
    - 碰撞危機的評估是困難的，即時使用阿帕擷取的目標，在轉向點上，本船的航向航速，都是隨時在變。

碰撞點的位置，經常會有更多的碰撞危機，換句話說本船的回轉，是在航行中最脆弱的時刻。在老式的船藝裡，在接近轉向點的時候，應該要呼叫船長，通知船長到駕駛台，這是指在三副期間。

⇒ 本船應該要小心評估碰撞的情勢，當其他船隻接近本船的轉向點，或是新的航線。
⇒ 我們轉向的時候，不但要估計到轉向點附近船隻的碰撞危機，還要估計在新航線上，是否有來船。
⇒ 適當地安排我們的轉向點，來避免與其他船隻的轉向點重合，這是熟練的航海家，本船要轉向，就已經是什麼都無法確定？當其他船隻的轉向點，跟我們重合的時候，這個兩條船誰也不知道？誰要去哪裡？更危險。所以轉向點要與其他船隻的轉向點分開，在哪裡我們只有把我們自己的轉向點，儘量安排遠離其他船隻可能的航線。
⇒ 如果我們沒有這樣的概念，我們的航行，就會是一種冒險，純粹靠運氣，看看會不會遇到其他船隻？如果轉向點在對我們不利的位置，那就是經常要去試試看運氣？再叫船長上來，看看船長運氣好不好？
⇒ 不要把轉向點安排在航行巷道的終點，如果我們不知道其他船隻的新航向是多少？
⇒ 應該安排我們的航線，儘量地遠離分道線，避免創造新的碰撞點，如果它是根本船同向。
⇒ 本船的航線跟分道線，隔離區間的海域，就是我們遇到對向來船時候的緩衝區域。

在遠離橫越航行區的航線，會給本船更多的空間，去避免碰撞。更多的空間，是指本船在航行巷道的外側航線，跟橫越船會有多一點的緩衝時間。要記得，您的位置是比安全的速度重要，這就像是長慧輪的碰撞案件，如果你的船位不對，速度再慢，也是要發生碰撞。

⇒ 船隻使用慢速前進，並不是安全速度，只要本船擋到了其他船隻的航線，就像長慧輪碰撞的位置，永遠都是在那邊，不會改變。除非我們改變本船的航線，只有改變航速，不會改變碰撞點點跟碰撞的位置。

圖形 7-29，我們重新安排這四條船的可能碰撞航線的可能性：

1. 對於綠色船隻航向 257 度，我們延後他的轉向點，直到終點區域更遠的位置。
2. 藍色的遠洋船隻航線 074 度，在很遠的位置，我們就先轉好向來接近航行巷道的終點。
3. 對於紅色的近洋船，必須中間進入航行巷道，我們要安排他的航線來進入航行巷道，
    a. 以最小的交角，與一般流通方向的角度來加入，盡可能實際，就像規則要求的一樣。

b. O　　紅色船隻必須加入行航行巷道的一般流通方向，他應該安排她的航線，避免其他船隻的轉向點，就是要遠離其他船隻可能的轉向點，所以就是安排在航行巷道的中間加入，如果航行巷道外面的水深不夠，就無法如此進入。就像圖形 7-26。

4. 對於粽色船隻在航向 257 度，需要橫越分道航行制，在通過淺水區域之後，
   a. 他應該安排他的航線接近隔離區，儘早可能的去避免擋到同向船隻的航路
   b. 安排他的橫越位置，遠離其他船隻的轉向點區域。就像圖形 7-26

Figure 7-29: Throughout course arrangement inside Traffic Separation Scheme

7-60 Deconflict collision inside TSS by collision point concepts

Ownship should arrange our course line inside a TSS with **the concepts of collision point**. As we summarized in figure 7-14 Possible collision point inside Traffic Separation Scheme,

- Any collision risk must have a collision point at ownship's heading.
- Two parallel courses won't cross each other and will not have collision point.
- Ownship collision point with south bound vessel should be inside south bound lane.
- If ownship avoid crossing traffic lanes or separation line collision risk will decrease.

These are concepts of defense navigation.

When ownship alter course, our speed vector will sweep cross other vessels' speed vector in an area as large as ownship's heading had changed. **When ownship changing course at turning point the area around our turning point is most dangerous area of collision.** When ownship is changing course, the collision risk cannot be sure because:

- Ownship heading is uncertain due to the swing and overshooting. Any ARPA acquired calculation based on this swing course line is not correct.
- Ownship speed is dropping. Collision risk is proportional to ownship's speed.
- Closing distance to another vessel is hard to estimated. Nobody knows when ownship can steady in time.
- Collision risk evaluation is difficult even by ARPA acquired target.

The turning point position usually have more collision risk.

⇒ In another words, when ownship is turning it is the most vulnerable time in navigation.
⇒ In old seamanship, Captain should be called when approaching turning point.
⇒ Ownship should cautiously evaluate collision situation when other vessels are nearing ownship's turning point or new course line.
⇒ Properly arrange our turning point to avoid overlap with other vessels' turning point is a prudent seamanship.
⇒ If we did not have this concept our voyage will be an adventure by chance to meet other vessel in unfavorable position from time to time.
⇒ Don't arrange turning point at termination of traffic lane for we don't know other vessel's new course will be.
⇒ Ownship should arrange our course line as far away separation line as practical to avoid collision point created with other vessels crossing our traffic lane in their turning maneuvering.
⇒ The space between ownship's course line and separation line or zone is our buffer zone to crossing vessels.
⇒ Proceed in outer limit of *crossing traffic zone* will give ownship more space to avoid possible collision point.

- Do remember one thing:

safe position is more important than safe speed

- Vessel proceed with slow speed is not safe speed as long as ownship block other vessel's course line as Ever Smart case.
- If Collision risk is positive, waiting cannot change anything.

In figure 7-29, we can see 4 vessels' collision possibilities:

- As green vessel in course 257^0 (T) postpone her turning point further outside termination area. If other vessel is sailing close to separation line, green vessel alter course too early will create collision position around the terminal of TTS. Also, green vessel can arrange her collision position with blue vessel away from terminal of TTS.
- As blue ocean-going vessel set course line in course 074^0 (T) very far away to terminal of Traffic separation scheme and close to outer limits of traffic lane.
- As red coastal vessel has to join North bound traffic, arrange her course line to join the traffic lane at as small an angle to the general direction of traffic flow as practicable. As COLREG rule 10: *when joining or leaving from either side shall do so at as small an angle to the general direction of traffic flow as practicable.*
- If red ship had to join general direction of traffic lane, she should arrange her course line to avoid turning point of other vessels. The route she choose is in the middle section of traffic lane when further north route water depth is not enough as figure 7-26.
- If south bound brown vessel need to cross TSS after the shallow water area, she should
    - arrange her course line close to separation zone as early as possible to avoid blocking the way of other vessels proceeded in same direction and
    - arrange her crossing position away from other vessels turning points area. as Figure 7-29.

分道航行制外的碰撞位置是誘餌

7-61 解決分道航行制外的碰撞問題

作為一個船長，我們應該知道避碰時，是避免碰撞點，而不是碰撞的船隻。**如果任何的碰撞點，位於我們航行巷道之外，那一定是有什麼不對勁**，那什麼樣的事情，可能會出差錯？

- 就像在航行巷道之外的碰撞位置，我們不一定需要讓路。
- 這可能不是一個碰撞的問題，而是我們航向和船首向的問題。這可能是錯誤的，就像圖形 6-06，擱淺前 6 分鐘的位置，本船應該盡可能快速回到原始的航線。
- 在原來的航線上，檢查碰撞危機，不要直接讓路給在分道航行制之外的碰撞位置。
- 我們瞭解這些碰撞位置是簡單，但是阿帕避碰雷達並沒有這種概念，只要 CPA 是零，就會給你碰撞警告，不論是哪裡的碰撞位置。
- 這些警告使得當值船副緊張焦慮，不是把警報關掉，就是完全忽略這些碰撞警報，也不管是不是合理？
- 聽到阿帕避碰雷達的碰撞警告，先檢查是哪裡的碰撞位置，再決定如何行動。
- 安全的位置是在航行巷道之內，具有足夠的安全水深，**我們應該儘快，儘快回到本船的航行巷道之內航行。**
- 瞭解安全的相對方位，與如何通過目標船的船頭？會給我們相當的信心，回到原航向。
- 如果我們航向修正，回到原始航線，會發現跟其他船隻的碰撞危機，跟本就不是真正的問題。本船加上航向修正之後，與目標船的碰撞危機，可能就消失了。
- 如果本船不能及時通過這些船隻的船頭，航向修正後，目標船的相對方位不夠大，解決方案就是減速，讓這些船隻先通過本船的船頭。

Collision Location outside Traffic Separation Scheme: a decoy

7-61 Deconflict collision outside TSS

As a master, we should know collision avoidance is to avoid the collision point, not collision vessel. If any collision point locates outside our traffic lane it must have something wrong. Something must have go wrong as:

- Don't give way to collision location outside TTS. It is not a collision problem.
- It is problem of our course or heading which is wrong as Figure 6- 06: 6 min. before grounding. If ownship position locate outside TTS, we should go back to original traffic lane as soon as possible.
- Check collision risk in our original course line, do not give way to collision position outside the traffic lane.
- This is easy to understand but ARPA did not have this concept. ARPA gives collision alarm whenever CPA is zero no matter where is the collision position. Usually, too much alarm makes OOW nerves who will either turn off the alarm or ignore all alarms whether it is reasonable or not.
- Safe location is inside the traffic lane with enough safety depth.

Always navigate inside the traffic lane as soon as possible.

- By understanding the RSB will help ownship to pass target vessel's bow with confidence.

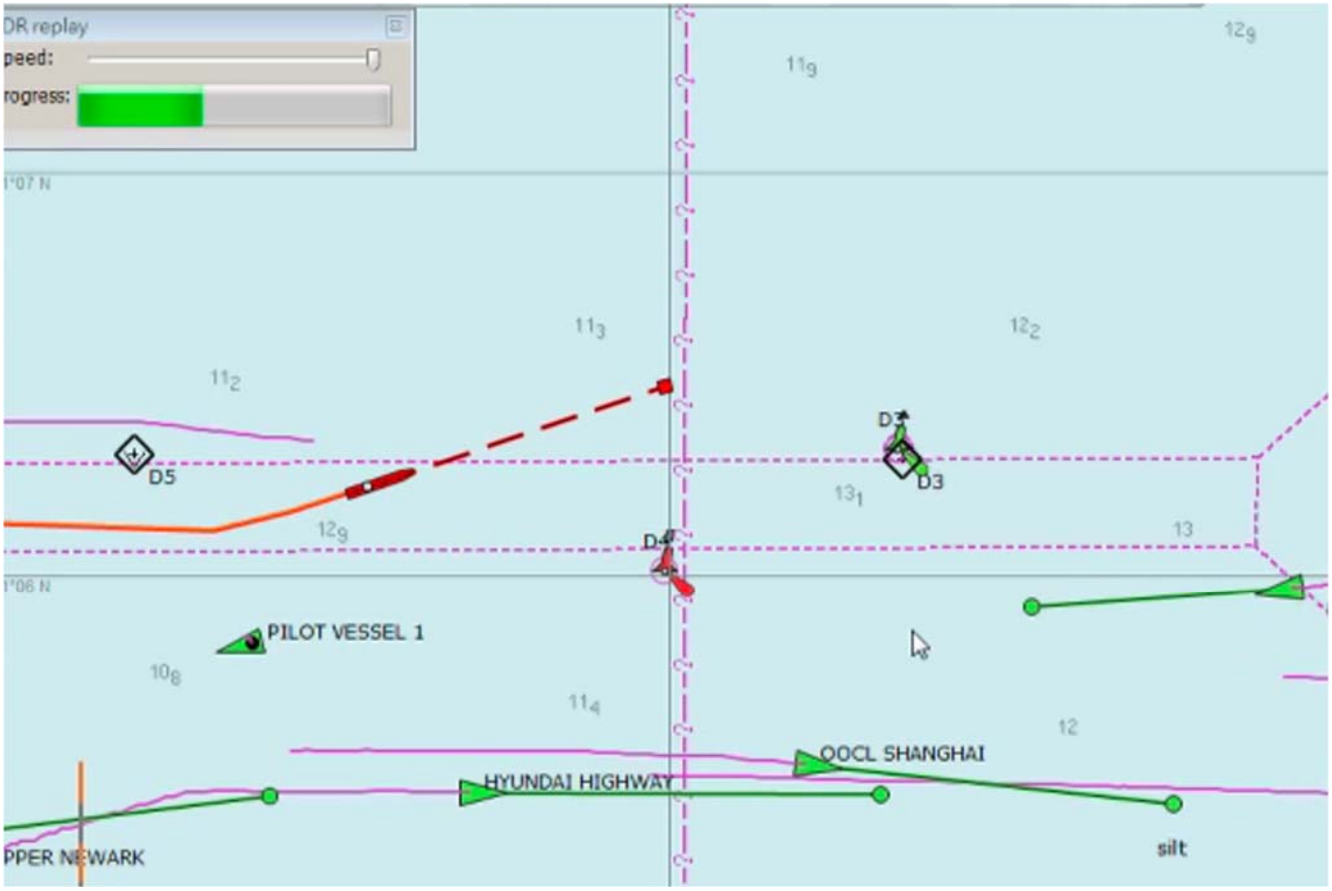
If we alter course to go back to original traffic lane, the collision risk with another vessel is dismissed immediately. If Ownship cannot find the way to avoid those vessels ahead,

The ultimate solution is to reduce speed to let all these vessels to pass ahead of ownship.

在領港站附近的碰撞位置

7-62 在領港站附近做下風

領港站是海上航行的最後階段，雖然有當地領港跟船隻通航服務的協助，在領港站附近，仍然是在我們整個航程計畫裡面，最危險的一段。就像圖形 6-05，這個案件，本船接近領港站，同時有 4 條船出港，最後造成本船擱淺。就像圖形 7-06 本船從浮標航道開出來，與一條在浮標航道前面等待的油輪，發生碰撞。如果本船必須上領港和下領港，在領港站附近，特別是在天氣不好的時候，本船必須做一個下風給領港登輪，這個是非常技巧的操作，或是非常難以預測的操作。



圖形 7-30 在分道航行制內為領港做下風，

⇒ 在分道航行制內，要在哪裡坐下風，很少在我們的課程裡面討論，即使船長已經有了很多年的海上經驗，誰能知道什麼是對的？或是錯的？如果沒有意外發生。

⇒ 圖形 7-30 本船必須坐下風給領港，在三四節的向南流的潮流之中。本船轉向 20 度向左，船長看到領港船已經在接近的時候，這個就是我們的第一個錯誤，因為我們的速度向量橫越過進港船的航路，過了一會，本船勢必需要再度橫越進港船隻的航路，才能夠回到航道的右邊，也就是我們本來的這一邊，這樣一個左轉操作，就產生了兩個新的碰撞位置。

⇒ 要為領港做下風的還有兩條船，OOCL 上海跟現代高速一樣需要下領港，他們在航道的外側前進，就算他們向左轉向 20 度到 070 度，也不會製造出這樣的碰撞位置，也就是不會橫越進港船隻的航路。

⇒ 現代高速已經轉向到 090 度，在領港離之後，仍然是在行道的右側，而且與進港船的迎艏正遇的航路，還是非常遠。

⇒ 轉向為領港做下風，要在正確的位置上，否則領港船就不會在那邊等待，我們知道船隻轉向，需要至少 4 到 6 倍船隻的長度，才能夠完成。

⇒ 在一般的狀況，在做下風之前，船長應該決定本船應該在什麼位置，去接領港？船長必須保留足夠的前進跟正橫距離，距離的估計要正確，以本船的長度做估計。

⇒ 本船在領港站的速度，領港船靠上本船的速度，都要確認，可以要求領港船或是領港站給予它速度的資訊，如果這個天氣的狀況並不好。天氣好的時候，可以慢速靠上。天氣不好的時候，就具要需要相當的速度，才能夠製造足夠的下風區域，讓領港船靠上，這需要他的小船能夠跟得上。

⇒ 向左舷轉向做下風，本船應該避免橫越進港船的航行巷道，所以我們要先向右邊開點，如果水深足夠的話，要不然就是儘量慢車，免得直接橫過對向航道。

⇒ 向右舷轉向做下風，應該將本船置於航行巷道的外側，來避免跟出港船隻造成碰撞。我們向左轉向怕跟進港船發生碰撞，向右轉怕跟其他出港的船隻發生碰撞，因為我們下領港時候，會減速，也會轉向，也許後面其他同向的船隻，又追上來了，所以最好的方法，還是什麼？開到航道的外側。

⇒ 不管向左向右轉向，都必須注意水深不足而擱淺。

⇒ 突然的航向改變做下風，會使得的附近船隻感到混淆迷惑。

⇒ 應該小心瞭望，觀測他船在領港站附近的動向，也許他們也在下領港，或是要接領港，因為領港船接近，他們也可能忽然的轉向。

⇒ 在領港船靠上之前，海浪的形式與週期，應該要小心確認，這是說在天氣惡劣的時候，要先觀察一下波浪的週期，是幾個大浪？幾個小浪？從哪邊來的浪比較大？要觀測清楚，才不會費時，造成小船靠不上，領港船無法登輪。

⇒ 如果船長可以掌握好時機，領港只需要一個完美的回轉，來擋住波浪跟風力的影響，讓他能夠及時抓上領港梯，所以領港船如果沒有辦法靠上大船，那就不要浪費我們的時間精力去做回轉，應該先把車停下來，等他能夠跟得上的時候，再做一次完美的回轉。

⇒ 如果船隻太早轉向，領港船追不上領港梯的位置，就需要繼續維持做下風的航向，比我們應該要轉的還多還久，也就是本船有可能越來越偏離原來的航線。

⇒ 領港登輪是在第二階段的回轉，也就是本船應該是轉了 20 到 40 度之後，直接來擋住船頭來的波浪，使用船體來擋著湧浪，有時候風浪跟湧浪的來向不一樣，船長要先決定一下，哪一個對小船的影響比較大？以經驗的判斷在做取捨，是要擋浪？還是要擋湧？

⇒ 船長如果看不出波浪形式，沒把握，就問領港船“接領港有沒有建議的航向航速是多少？”

⇒ 如果本船的回轉速率太快，那本船擋住風壓跟波浪的功效，就會少了很多，所以船隻也不能轉得太快。

⇒ 即使本船是在接領港，我們也必須遵守避碰規則。

⇒ 在錨地外等待是正常的操作，在現在這些日子，當貨櫃船越變越大，錨地就變得越來越小，同樣可以拋錨的船隻，那數量也會減少，因為大船需要放的錨鏈更多更長，會占到錨地的位置更大。

⇒ 在等待領港的區域，流水可能強到三到四節，這就是上海港外面的情況，如果是這樣，如何決定本船的船首向跟速度來避免漂流太多，在等待領港的時候，讓領港船能順利靠上，登輪方便，這還需要很多的研究。

Collision Location around pilot station

7-62 Make lee around pilot station

Pilot station is at last stage of ocean passage. Although with local pilot and Vessel Traffic Service (VTS) assistant pilot station is still the most collision location in our voyage planning. As figure 6-05 we have this case ownship approach pilot station with four vessels outbound which cause ownship go aground. As figure 7-06 ownship sailed out from buoyed channel and had a collision with a tanker waiting in front of buoyed channel. If ownship have to embark or disembark a pilot in pilot station especially in bad weather ownship also have to make a lee by sharp turn for pilot.

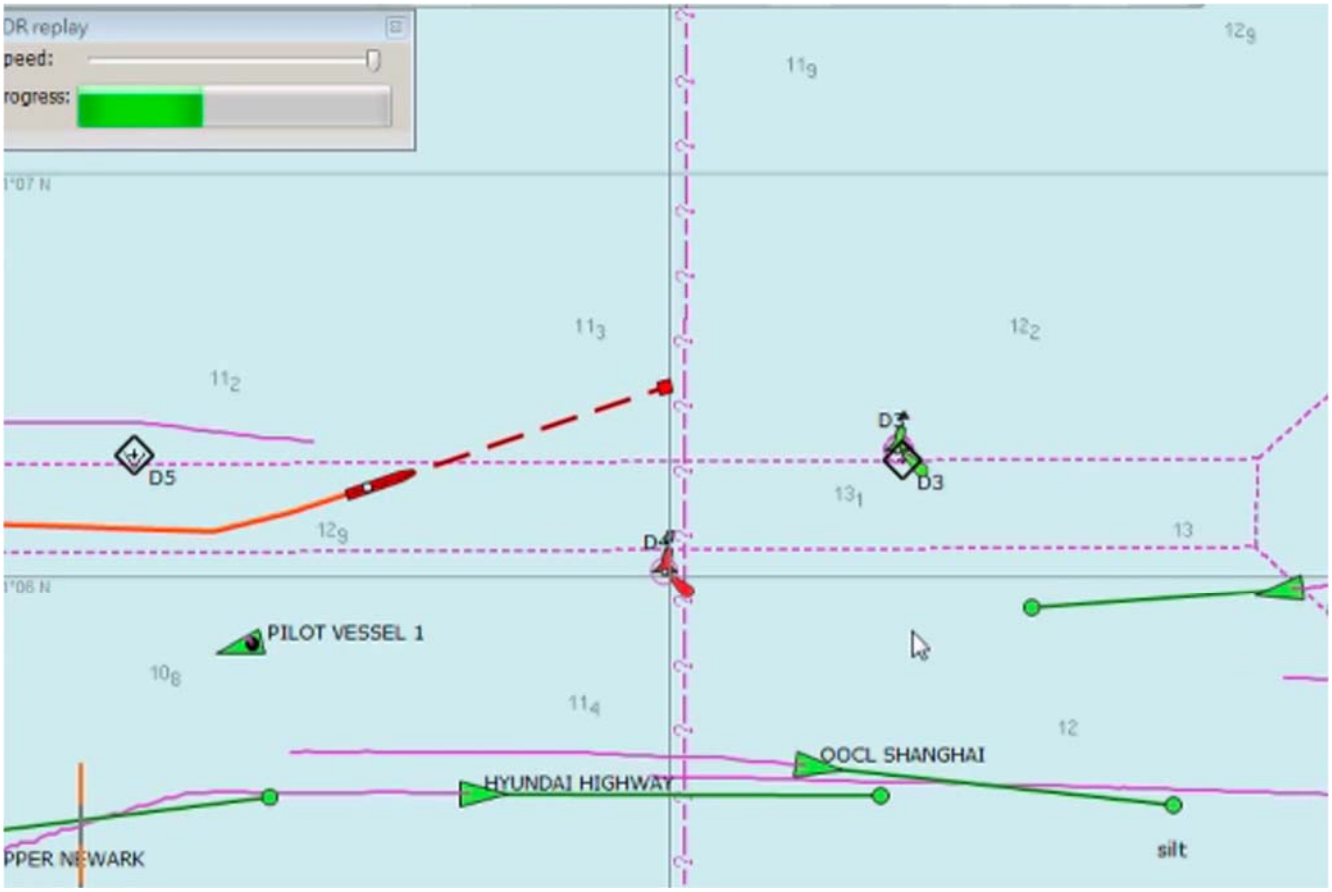


Figure 7-30: Make Lee for pilot inside Traffic Separation Scheme

Where to make lee seldom discussed on our courses even Master had many sea experiences because it's case by case, each port has its consideration. Who can tell what is right or wrong if no accident happened? In figure 7-30 ownship have to make lee for pilot disembark in 3-4 knots southernly current.

⇒ Ownship alter course 20 degrees to 070^0 (T) when captain saw pilot boat approached.

- This is first mistake for our speed vector crossed inbound vessel's course line.
- Later, ownship will need to cross again to go back starboard side of the channel.

⇒ Two new collision location created by making lee for pilot.

⇒ Two vessels OOCL Shanghai and Hyundai Highway need to disembark pilot too. They proceed outside the channel so as if they alter course 20 degrees to 070^0 (T) will not create these two collision positions.

⇒ Refer to HYUNDAI HIGHWAY's purple track, minutes before her track is on the heading of 070^0 (T) same as ownship now. After pilot disembarked, she had course again to 090^0 (T). She is still in the starboard side of the channel and very far away to inbound traffic, if any.

⇒ Make a lee for Pilot. Ownship have to consider the location alter course changed will not too far away pilot boat.

Judging by the drawing, we can see outbound vessels had kept one NM abeam distance to their route.

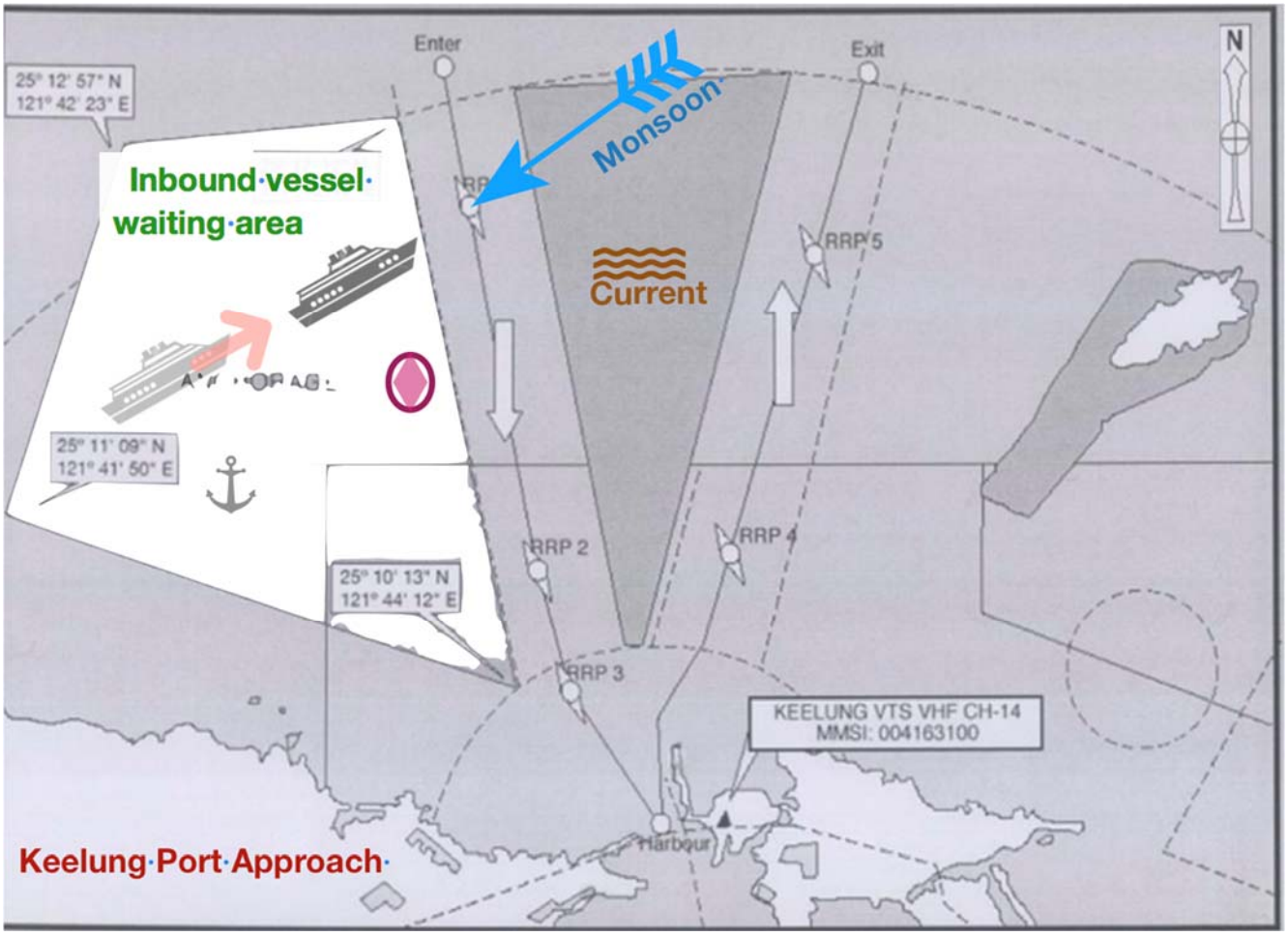
- Before make lee captain should decide which position ownship can pick up or drop pilot.
- Captain has to estimate advance and abeam distance needed in current speed when make the lee.
- Ownship course and speed at pilot station and pilot boat speed alongside should ask pilot boat or pilot station to make sure if weather no good.
- If it is necessary to alter course to port side to make lee for pilot boat, ownship should avoid crossing traffic lane or inbound vessels by keeping enough abeam distance to it.
- Alter course to starboard side to make lee should locate ownship to outer limits of traffic lane to avoid collision with outbound overtaking vessels.
- Either alter course to port side or starboard side ownship have to beware of grounding in shallow water.
- Sudden course change to make lee will confuse target vessel around. Ownship should lookout by visual and radio carefully for other vessel's activities around pilot station. They may change course without notice from pilot station.
- The wave pattern and formation should check carefully before pilot boat alongside in rough sea.
- If captain can get correct timing, pilot need only one perfect turn which can block the wave and wind for him to grab pilot ladder in time.
- Don't waste it when pilot boat cannot come alongside. By the study of vessel's turning stages, we understand that the momentum created in second stage will push away ownship's stern to against wave and current in weather side.
- If vessel turning too early pilot boat cannot catch pilot ladder in time, ownship will have to keep the course longer than usual.
- If ownship steady on a heading where we have perfect condition for pilot boarding, the situation will soon be deteriorated when the turning momentum gradually lost after turning.
- Pilot boarding is in second stage of turning while
    - ownship have 20-40 degrees turn to block the wave
    - ownship use ship's hull to block the swell
    - if ownship rate of turn is too much the block effect will not be ideal.
- Vessel turns to leeside is slower than to weather side. This property could be used when we make the lee to prolong the boarding time.
- Even ownship is picking pilot we still need to comply with COLREG.

Drifting for pilot outside the anchorage is common operation on bridge in these days when container vessel getting bigger and anchorage getting smaller. In some pilot waiting area the tidal current can reach 3 or 4 knots as outside Shanghai, South China Sea. How to set vessel heading and speed to avoid drifting too much while waiting and facilitate the pilot boarding need our study.

等待領港時漂航

7-63 在等待區等領港

基隆是我的母港，現在他已經是世界主要港口的排名之外，由臺北港取代其地位。在冬季盛行東北風，9 月到 5 月，夏天西南風是從 6 月到 8 月，東北季風在冬天，跟夏天的東南季風，還有偶而的颱風 7 月到 10 月，降雨都是在冬天，下霧大部分都是在春夏之交。平均的潮差只有 0.92 米，在下面圖上線條圍起來的水域，是外港的西錨地，暫時保留為進港船的等待錨地，請看圖形 7-31。進港船在這邊等碼頭，只要港裡面的船，還沒有完工的時候。基隆港的貨櫃作業，因為沒有貨櫃場，所以是船邊作業，櫃子要拉到幾公里外的內陸櫃場。由十幾輛車的車隊的運輸，在配合貨櫃船的作業，只能做到小型船隻。



圖形 7-31 分道航行制等待領港區域

⇒ *所有船隻接近或離開港區，必須要遵守該航行巷道內，進港跟出港的航向。*”
⇒ *進出港的水路是單行道*”
⇒ *船隻在這些航行巷道內航行，跟前面的船隻，應該保持安全距離，依照本船的操縱特性*”
⇒ *禁止拋錨或臨時停留在進出港的航行巷道之內*”
⇒ *防波堤的入口是只能一次一條船隻進出*”
⇒ *船隻進港應該遵守 1972 年的國際避碰規則*”
⇒ *接近或離開航行巷道，一般的是在其終點*”
⇒ *但是接近或離開航行巷道的邊線時，應該與航行巷道一般流動方向最小的角度為之*”
⇒ *船隻應該盡可能避免橫越航行巷道*”

這些就是當地的規則，幾乎是跟其他的通航服務區的規則是一樣。要使用這個為小型船隻所設的進港等待錨區，要有勇氣接受流錨，或是纏錨的困難和痛苦，強勁的東北季風，流水湧浪增加要起錨時候的困難。這個港口的錨地下面，不知道有多少船隻廢棄的錨與錨煉。所以不能相信棄錨的注記，自己要檢查海圖，在你下錨之前，記得底質是由許多的石頭，跟失去的一些錨組成。有些船隻可能失錨，棄錨，可是沒有向港務台報告，這個就沒確認。錨地的水深是 40 到 50 米，加上強勁的湧浪，使得船隻很難去起錨，或是在錨煉纏繞其他障礙之後，就是直接切斷棄錨，錨地裡又加上了一名犧牲者在裡面，所以這個對大船來講，要拋錨已經是困難重重，進港等待錨地變成進港的等待區域，或是在附近漂流取代下錨的決定。熟練的船長會在港區進口 10 到 15 海浬更遠的地方漂航，因為有足夠的水域在那裡進退。如果在冬季，天氣非常不好，如果船隻沒有足夠的陸地，可以屏障他的風浪，這會使得每個人都焦慮，特別是輪機員，必須隨時備便主機，長時間的等待領港，所謂的長時間，也不過是三四個鐘頭。

⇒ 第一件事情就是要畫出來不可接近的區域，安全的範圍，設定擱淺的警報在紙海圖和電子海圖上來做設定與劃分。
⇒ 準備本船的航程計畫，先使用紙海圖估計所需要前進跟正橫距離，當領港船出防波堤的時候，我們可以及時調頭去接領港。
⇒ 確保本船有足夠的海域，在這個等待區域，可以向後漂流，當那風力水流非常強勁的時候，所以除了要保持前面與正橫的距離，準備掉頭接領港，還要保留向下風漂流的距離。
⇒ 船隻一旦進入這個等待區，立刻回轉本船，船頭上風，減少受風面積，抵抗風壓，也就是船頭頂著東北風，來抗風壓。
⇒ 必要時，進車前進避免繼續後退擱淺。
⇒ 使用船首推進器去幫助本船上風，一旦本船向西南漂流的太多，使用主機前進到原來我們東北上風的位置。
⇒ 繼續正常的航行班，在駕駛台監測船隻漂流的位置，使用目視和電子海圖監控。
⇒ 看到領港船接近，轉向到 170 度進港船的方向，用這個回轉，這個從東北轉到 170 度將近正南的方位，這 120 度的回轉，會提供一個良好的下風來抵抗東北風，提供領港登船。

Drifting for pilot boarding

7-63 Waiting pilot longer inside waiting area

Keelung is my home port. Right now, it already lost major port position in worldwide service. Prevailing NE and NNE monsoon comes most of time in winter and from SW and S during summer day. Every year from July to October is typhoon season; fog occurs mostly in spring or summer (March to July); average range of the tide is about 0.92 meter.

The waters bounded by a line connecting referential points in West anchorage which is notorious for anchor fouling. These area outside of the port are temporary reserved as “inbound waiting anchorage” for merchant vessels (see Figure 7-31) so that they can enter and berth as soon as the berth is available

Figure 7-31: Waiting for pilot outside Traffic Separation Scheme

⇒ All vessels approaching or departing port are required to follow the inbound/outbound directions of traffic channels.
⇒ Inbound/outbound waterways are one-way traffic lane.
⇒ All vessels operating in these traffic lanes should maintain a safety distance with vessel ahead according to maneuverability of own vessel.
⇒ Any anchoring or temporary stay is prohibited at inbound/outbound traffic lanes.
⇒ Only one vessel at a time is allowed to sail and pass break water entrance. By its narrow entrance property, ownship should arrange the perfect timing to approach it.
⇒ Vessels allowed to enter the port should follow the rules of COLREG to avoid collision risk.
⇒ Normally join or leave a traffic lane at the termination of the lane,
⇒ But when joining or leaving from the side shall do so at as small an angel to the general direction of traffic flow as practicable.
⇒ A vessel shall so far as practicable avoid crossing traffic lanes.

Well, this is local rule which is almost identical to other VTS regulation. The “inbound waiting anchorage” is for small vessel with enough courage to drag or foul her anchor and fight with strong NE monsoon/

current/swell when weighing her anchor. Check the chart before you drop the anchor. The anchorage bottom had marked many rocks and anchor lost; some are unreported. Who know? The water depth are 40 or 50 meters together with strong swell and current make vessel very hard to recover their anchor after anchor fouled. It is not safe to anchor any more. Just change “inbound waiting anchorage” into “inbound waiting area” and drifting instead of anchoring if you could. Prudent Master will drift vessel 10 or 15 miles from harbour entrance for more sea room is available there. However, in winter time the sea is rougher if vessel has no land to shelter the drifting will be unbearable by stern pounding. This will make everybody anxious especially engineer who have to stand by the machinery all the time.

How to wait pilot longer inside the waiting area?

- First thing is marking no go area, safety contour, grounding alarm etc., by paper chart and ECDIS.
- Prepare ownship’s maneuvering plan with estimated advance and transverse distance needed when pilot boat come out.
- Make sure ownship have enough sea room inside the waiting area to drift backward while wind and current is strong.
- Once inside the waiting area turn ownship upwind (NE monsoon) to minimize our windage.
- Stand by bow thruster to help vessel head into the wind.
- Once ownship drift to SW leeward use main engine to go back to original upwind NE position.
- Continue normal navigational watch on bridge and monitor the drifting position by visual and ECDIS.
- When ownship see pilot boat approached, make the turn to 170^0 (T) inbound vessel’s direction.
- This 120 degree turn will serve as a good lee to calm the strong NE monsoon for pilot boarding.
- Pilot ladder is at starboard side for sure.

7-07 防衛性航行的結論

避開所有的碰撞位置，對航程計畫的重要

在航程計畫之前，要先做海圖作業，仔細的研究海圖所有的標記，在大比例尺的海圖上，用眼睛確認所有的淺水，暗礁與禁航區域等等，用紅色蠟筆標記，這簡單的工作，在紙海圖的年代，用放大鏡就可以完成。現在幾乎是不可能的，這是因為電子海圖有太多圖層顯示，惡魔總是藏在細節之後，這是在工作程式上的一個諺語，但是對電子海圖來講，圖層惡魔卻是殘酷的事實。

電子海圖的危險，就是太過信任電子海圖，任何他看不見的顯示圖層，就不能知道哪一層的海圖，所包含的危險，對本船來說，就算檢查這個電子海圖的監視器，用眼睛來看，也不一定看得到，**因為以前用放大鏡可以看到的東西，你用放大鏡在監視器上也看不到，這必須依賴電子海圖的計算與你的使用能力來探測危險的所在**，也許是危險的位置，也許是因為它距離本船的距離，電子海圖是沒有頭腦的，寫電子海圖，設計電子海圖的人，也不是航海者，最終的產品就是任何新的航線，就會跟著數百個警報產生，沒有適當的分類，可以簡單的參考 。大部分的警報都是假警報，多餘的警報，使得航海者浪費了很多時間跟精力去確認。電子海圖的時代，能夠使用紙海圖，還算是幸運的。

習慣使用紙海圖的航海者，在電子海圖剛開始的年代，並沒有引起多大的困擾，因為紙海圖的記憶猶在，知道那裡有淺灘暗礁。最近 2020 年的擱淺事件發生，船公司突然發現電子海圖上，竟然有一處暗礁沒有標示，為什麼過了 20 年才出事，不像新加坡海峽的 One Fathom Bank ，十年前就有船擱淺。要解決這個問題，就只有允許更多的水深要求設定，對本船的航路，對比紙海圖的年代，在電子海圖上要有更多的安全係數。要將以前世代的智慧，繼續留在電子海圖時代，需要承先啟後的義氣，也就是自動的安全文化。

不熟悉的水域，不要輕易嘗試，任何的捷徑，即使是在時間緊急的時候，也不可涉險走捷徑。

7 – 07 Conclusion of Defensive Navigation

Avoid all collision locations is essence of voyage planning.

Before any voyage begins, there are chart works to prepare. To study the chart carefully is first priority. To identify all risk by eyes in large scale sea chart, mark the shallow waters and no go area… etc. This simple work in paper chart era with magnify glass is almost impossible now. Simply because ECDIS is not big enough to show all details in its monitor. This truth can be verified by comparing how many characters could be printed in one page of book with how many characters can be displayed on one monitor. Although ECDIS can storage lots more data than any one sea chart, when we check on its monitor, we can only read even less portion than paper chart. The solution ECDIS provided is chart layers in its display. The devil is always hidden in it details. This is a proverb in other working procedure. But it is a crucial fact in ECDIS. The danger of over trust ECDIS is the details invisible by its displayed layers. Although computer won't lie, ECDIS will always give out alarm when the danger is detected. Mariner cannot know which layer contain the danger to ownship by examine the monitor of ECDIS by eyes. Mariner has to check very carefully on each layer to find out where is the alarm come out. Rely on ECDIS computer abilities to detect the danger either by its location or by its distance to ownship. Sometimes the alarms are just too much, OOW have no time to verify each passage plan's feasibility due to quick turnaround in coastal sailing. ECDIS has no brain and the programmer is not mariner. The end product is any new course line have hundreds of alarms without proper categorized for easy reference, most of it could be ignored. These extra alarms make Mariner exhausted to identify them. It is lucky that paper chart has overlapping period with ECDIS. Mariner who had carried on their old memory of sailing information had not cause too many accidents in ECDIS age. To save the problem it is prudent to allow for more water depth or beam distance to ownship's route than the paper chart era. This will create extra cost for shipping company. One other solution is to provide each passage plan by the company officials as I see in Taiwan's shipping company.

Don't try to make any short cut of the route in ECDIS age even in a hurry.

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