Preface.

In this chapter we will study the emergency maneuvering of three ports in Taiwan which are my simulation exercises in ship handling. These 3 exercises are used to enhance the theory of shiphandling with hand-on experiences. More theorical study we have seen before had not really give us a clear picture of what has going on when we are at scene. All vessels we used for illustration is small vessel with LOA 200 meters long. The main reason for this is small vessel are more prominent in their response to force majeure, i.e. wind or current. These force majeure although sometimes is not significant but it sure is something we have to deal with or to use it as our aid, like old sailor said “poor man’s tug” if we are competent to the use of it.

本章我們將研究台灣三個港口的緊急操縱，這是我在船舶操縱方面的模擬練習。這 3 個練習用於透過實務經驗來增強船舶操縱理論。我們之前看到的更多理論研究並沒有真正讓我們清楚地了解我們在現場時發生的情況。我們用於插圖的所有船隻都是 LOA 200 公尺長的小型船隻。主要原因是小型船舶對風、水流等不可抗力的反應較為突出。這些不可抗力雖然有時並不重要，但如果我們有能力使用它，它肯定是我們必須處理或使用它作為我們的幫助，就像老水手所說的「窮人的拖船」。

Key Words: On Shore Hard ; Kick Ahead ; Parallel Un/berthing

Terms used:

1. On Shore Hard : Put hard over rudder to the side of wharf, i.e. portside alongside vessel put rudder to Hard Port.
2. Kick Ahead **:** set hard over rudder first then use short burst engine order to expel current on rudder, the purpose is to use stern side thrust received from the rudder.
3. Parallel Un/berthing : Lever up ship fore and aft line to parallel with berth line to avoid collision ship’s bow and stern with dock or its machinery.
4. Consistent Common Reference Point (CCRP) (e.g. conning position) : Facilities should be provided to compensate for the offset between antenna position and the consistent common reference point on installation. Where multiple antennas are installed, there

should be provision for applying different position offsets for each antenna in the radar system.

5. Ship bow reference point : reference point to simulate the position of ship bow.
6. Wheel Effect : The effect when main Engine propeller turning which will work as a wheel in a car and create side way movement.
7. leeway : This drift angle in ship's heading we applied to compensate for ship's position drifting to downwind side is called the leeway
8. Wind sail effect : vessel position push to upwind side when windage astern of pivot point larger than windage ahead.

CHAPTER 8 Departure with no Tug

8.1 Why no tug assistance available?

In an island constantly visited by typhoon in summer time, container vessel working around the clock usually have their berth window to obey. In their window time, they can load and discharge cargo as required for quick turnaround. If the typhoon is approaching Kaohsiung port, thee cargo operation just continue. When the wind strength reached force 7, suddenly all vessel have to evacuate from their berth. The tug boat assistance is going to help the big vessels with trouble in their windage and draft issues. As a prudent navigation we need to leave our berth with our knowledge and skill to save the time to evade the typhoon.
Currently, ownship is berthed at TWKHH as figure 8 -00. The departure plan consisted of 3 parts as figure 8 -00,
First is to leave the berth which it is parallel departure or with an angle to berth line.
Second part is to go stern way to turning basin.
Third part is to turn with Poor man's tug and set the course outbound.
Preparation for departure :

1. First thing in shiphandling or whenever captain come to bridge is to check where the wind is coming. When ownship is at berth, the wind may come onto the wharf or blow off the wharf.

2. Set the rudder full to “On Shore Hard”. When ownship is portside alongside the rudder should turn to “Hard Port” before maneuvering. The purpose for this precaution is to push stern away for the wharf by “Kick Ahead” engine.
3. When vessel had single-up, captain order to let go stern line first. Keep one forward spring for later use.

When the departure arrangement had finished as figure 8 – 01, this small vessel has no bow thruster which is common in early 2000.

- The wind is in this case is blowing off the dock, however the wind force is not enough.
- Captain decide to give her a kick ahead to swing out ownship’s stern.
- After chief confirmed forward spring is ready and clear of any personnel near it, Captain ordered “Dead Slow Ahead” .
- When the engine’s ahead revolution had started (with starting air surging ahead, RPM burst forward very quickly) and RPM steady on dead slow ahead (rpm is established after fall back from starting air). The RPM indictor needle reaction on bridge control console may only be observable in real ship’s bridge, no simulation of this detail in ship handling simulator.
- When ownship has only one forward spring connected with wharf, ownship’s pivot point will be at the choke of ship’s deck where the forward spring had turned to astern as red point in figure 8 – 01. Ownship will turn around of this point
- Ownship will turn around of this point because this mooring line restrict ownship’s movement forward.
- Ownship’s stern will swing off the berth.
- This forward spring mooring line will sustain the surge ahead power from main engine.
    1. It is likely this mooring line may break after kick ahead.
    2. It is prudent for captain to ask “does this forward spring had picked up the slack ?” to avoid sudden jerk force.
    3. Forward station OOW should ensure no personnel in bounce back area of this line.
- If forward spring had not let go, ownship’s stern swing out slowly and ownship’s bow will turn into the wharf.
- Container vessel usually have their bow flare reach out. If vessel turn 5 degrees to the wharf vessel’s bow may contact with machinery at dock.
- Forward station OOW should check any machinery or crane are nearing the bow and inform Captain of its present at scene if any.
- In these days, small vessel also has bow thruster although its power is less.

The art of shiphandling is to predict vessel’s future movement then wait and see if

things are developing we expected.

- If vessel movement is exactly what we had expected, this will built our confidence and skill in this maneuvering.
- If mariner can know exactly what will happen from now on, there will have the room for him to prepare for it beforehand.
- To take steps to set the stage for vessel to move is our skill.
- To finish the setting for vessel to move and have the time to wait and see is our art of shiphandling.

Figure 8 – 00 Departure KSG with no Tug

- The maneuvering is no guaranteed its success and efficiency. This is also the part of mariner's life. Nothing is for sure. The wind like the current change the force and direction all the time.

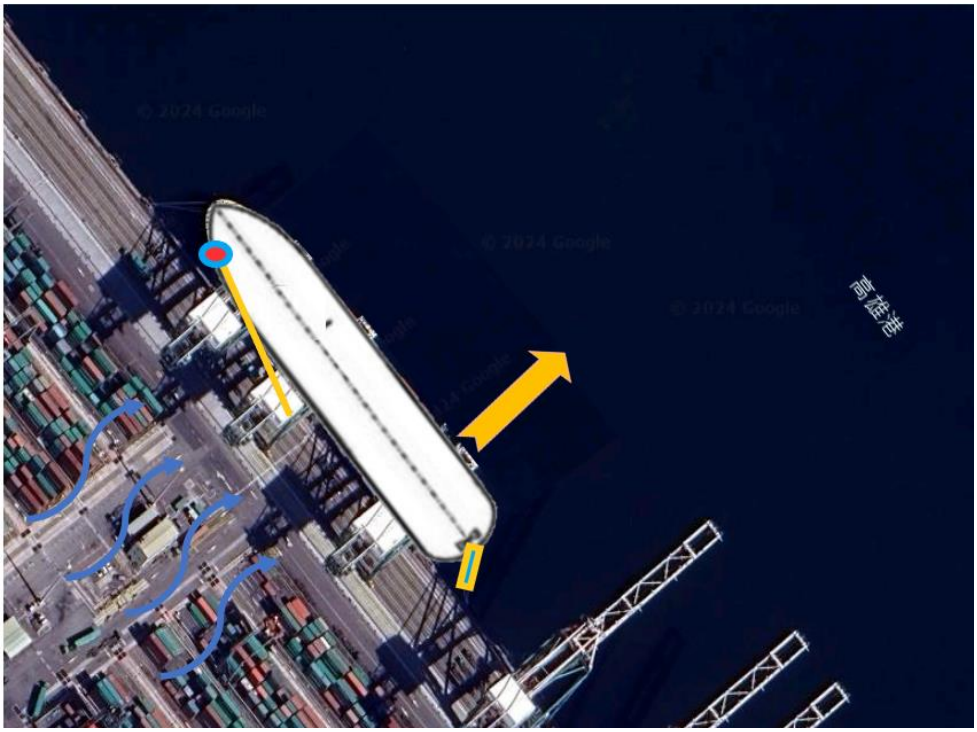

Figure 8 – 01 preparation for departure with no tug. Weak wind

In figure 8 -02, if the off shore wind is strong captain don't need to keep forward spring to turn the stern.

- The wind force working on ship's side is even. The pivot point may located near ship's center position.
- We can use "On Shore Hard" rudder to port side and kick-ahead of engine to crate the stern side thrust.
- The bow thruster are used to lever up ownship fore and aft to parallel to the berth line which are more preferable to some company as "Parallel Unberthing".
- If no bow thruster available, Captain can use "Off Shore Rudder" to hard starboard and kick-ahead engine to slow down stern swing out too fast.
- Usually, when container ship stopped in the water the wind will blow the vessel to her stern direction.

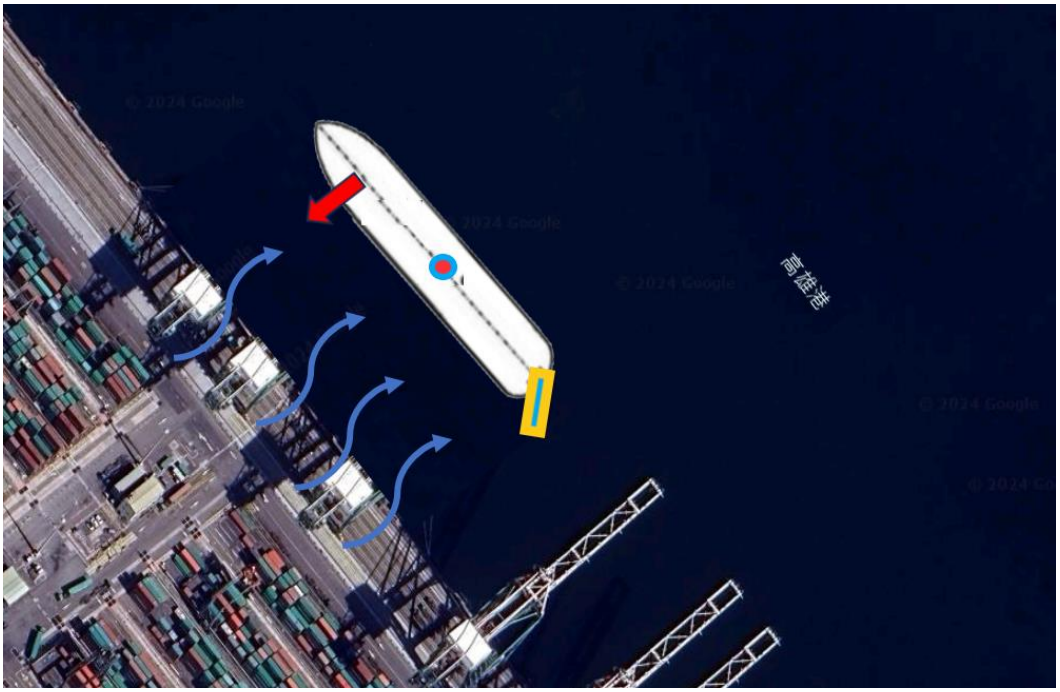

Figure 8 -02 Poor man's Tug

Drifting with no speed available

- As figure 8 – 03 drifting with no speed available, when vessel has no speed through the water, the wind blows on her superstructure has a center where fore and aft wind force are equal.
    1. This is the blue dot on her portside which located a little aft of its mid-section because the bridge or accommodation house is at her aft part.
    2. This wind force will push vessel to downwind direction where the ship hull underwater surface will stop by the water resistance.
    3. The water resistance center point under water line (yellow dot on starboard side) may not at same distance to vessel's mid-ship section.
    4. The distance between the wind force center and water resistance center will create a leverage to turn the vessel's heading as figure 8 – 03 right drawing had turn to port side a little.
    5. When vessel's heading had changed, the superstructure windage area and water resistance under water line will also change according to ship hull structure above and under water.
    6. The drifting speed and direction is varied as different vessel's ship hull and wind/current direction/force are changing all the time.

7. The general rule is “If the wind come from windward, vessel will drift to her **lee’s quarter** direction.” In another words, if wind comes from portside vessel will drift to her starboard quarter direction.
8. Mariner should use each opportunity to observe this phenomenon or vessel’s drifting in other way when vessel drift in open sea.
9. When vessel lost her main engine around some reef, shoal, shallow water or small island area, the correct drifting direction can take vessel away from those grounding danger area.
10. However the chance to get away has no waiting time, vessel will lost her steering after the initial speed had dropped drastically.
11. Captain have to decide which direction (port quarter or starboard quarter) is preferable for ownship to drift when lost main engine’s RPM in the first instance otherwise they will be too late when vessel is setting to wrong direction.

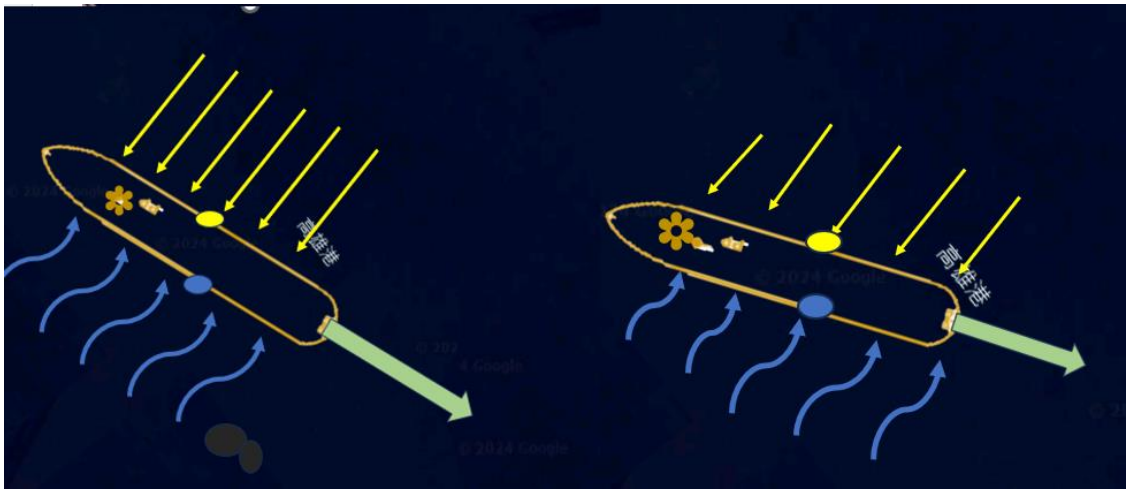

Figure 8 -03 drifting with no speed available

Monitor bow movement

In weak off shore wind situation, when vessel’s stern is swinging out our attention will concentrate on ship’s bow. Now captain have many tools to monitor ship’s bow movement :

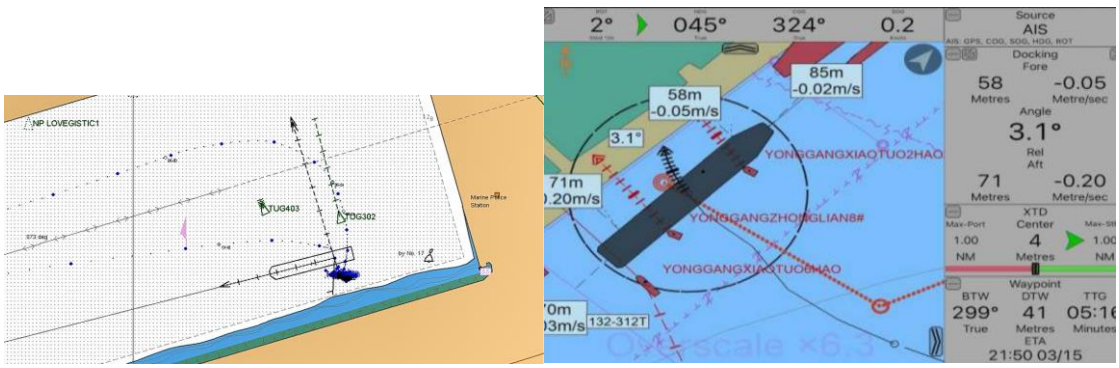

Figure 8 – 04 ECDIS and PPA picture when departure dock

1. Most primitive one is the doppler log 30 years ago, it has indication of the forward station's speed over ground is toward or away the dock. With the bow thruster's help or waiting for the wind to blow, mariner can keep ship's bow away from dock.
2. Now vessel have ECDIS to help the monitor of ship bow movement. However, ECDIS is not designed for this berthing/unberthing purpose. So the indication may very much confused to Captain as there are two speed vectors. One is speed vector over ground SOG and the other is speed vector through water STW. And these two speed vector direction can divide by 90 degrees to their action forces. Speed vector over ground is a compound forces consist of every and each force worked on ship's hull like : wind, current, resistance, rudder, main engine, bank cushion, bank suction, shallow water, tug boat, mooring line…. The problem of speed vector over ground is "no clear indication where ship bow is moving"
3. Another tool to help berthing/unberthing operation is PPA personal piloting aid which have the presentation of ship bow and stern movement speed/direction as the doppler log did. Also the PPA provide a graphical picture to provide instant intuition of vessel's heading, dock direction, distance, speed, bow and stern movement….. The PPA's data source comes from AIS. When the source of AIS which is GPS signal are not stable, the AIS data is also jumping or lagging.
4. The most reliable way is by visual which connecting with 80% of our brain ability.

- We cannot see directly where is our bow's position at bridge. We have to estimate it from our experience.
- For bulk carrier and VLCC with no deck cargo, the reference point from ownship's side is very easy to estimate.
- In figure 8 – 05, the best opportunity to find our reference point of bow and stern position is when vessel prepare to leave the berth.
- In our example, vessel is portside alongside. Captain should go to port shipside and look overboard to check where is the Ballard position of head line and forward spring line ?

- Use these two lines' bollard center position as reference point to simulate the position of ship bow.
- From this reference point look back to find the intersection point with ownship's deck cargo or containers or deck edge.
- This intersection point is located on ownship. So, it is moving as ownship's movement.
- We need to use this intersection point as our reference point as figure 8 – 05 F point in right drawing. The F point is the position of ship's bow and A point is the position of ship's stern.
- If ownship is approaching pilot station or coastal water, ship bow position need to estimate by the bow wave we sought over shipside as the left drawing.
- If the reference point is close to dock line, it means vessel is approaching the berth.
- If the reference point distance to dock line remained steady, it means ship's bow distance to the berth is ste4ady too.

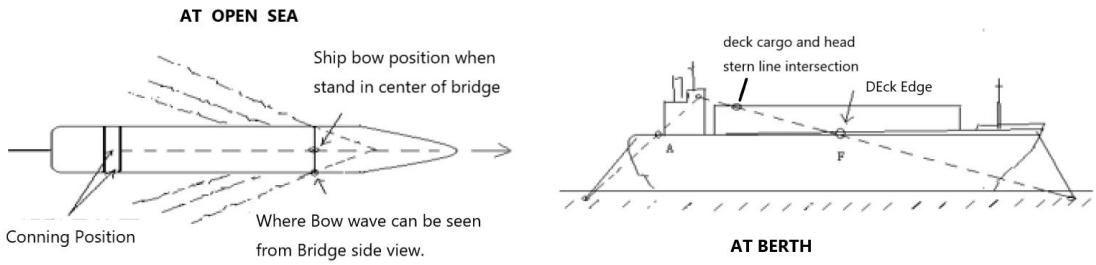

Figure 8 – 05 Bow and Stern position at sea and berth

Steady ship heading when go astern

Ship bow reference point is also be used to monitor vessel's heading is steady or not. In figure 8 – 06, ownship need to go sternway to leave the berth due to no strong wind's help to parallel with the dock.

- The angle we need is 15 degrees off the dock line as the drawing shown.
- When we use forward spring line to stop the ahead movement in Kick ahead, vessel may turn up to 5 degrees by the stern kick out from port side without problem.
- If the heading changed more than 5 degrees to portside, ship 's bow may cut into the berth or squeezed with the dock.
- Any dock machinery or crane stationed at ship's bow position may be damaged by ownship's turning.

- The forward stationed OOW should observe this possibility and report to bridge in time to avoid this incident. Captain can always ask the pilot to coordinate with local authority to clear these obstructions before vessel departure.
- As to the squeeze of ship bow which might damage the wharf at the same time, captain may need to release forward spring first after vessel had the turning rate (tendency) to port side.
- After forward spring had release and recover from water, captain may use bow thruster to control the abeam distance of ship bow to the wharf.
- If vessel has no bow thruster available, the squeeze of ship's bow may not be avoidable.
- Make arrangement to use fender whether it's from ship or shore to avoid the scratch.
- The 15 degrees turn should turn step by step, use kick ahead 3 times with patience.
- If the dock line direction is 316 degrees after vessel turned to portside 15 degrees, the heading should be 301 degrees.
- Looking back to ownship's stern, our port quarter should clear of vessel berthed astern.
- Looking to ownship's ahead direction, use the bow position reference point to a shore base point (yellow circle) to form a visual leading line to go back after the required angle is reached.
- This visual reference line is used when ownship is try to go back to center of the fairway.
- Captain has to look to ship's ahead direction to check does bow position reference point still in line with the reference point on shore or not ?
- By the knowledge of Positioning EBL, we know this visual reference line can also be replaced by an EBL set along ownship portside same direction of our heading.
- This is the way to replace the visual reference points when raining or visibility no good.

Why we need to steady the direction of sternway ? This is just a precaution of shiphandling to unify each and every maneuvering when ownship have to go astern. Because the wind/current may vary in every and each instance, if we can steady the vessel direction all the time there will be no extra turning momentum build up to a lever which mariner may have trouble to deal with.

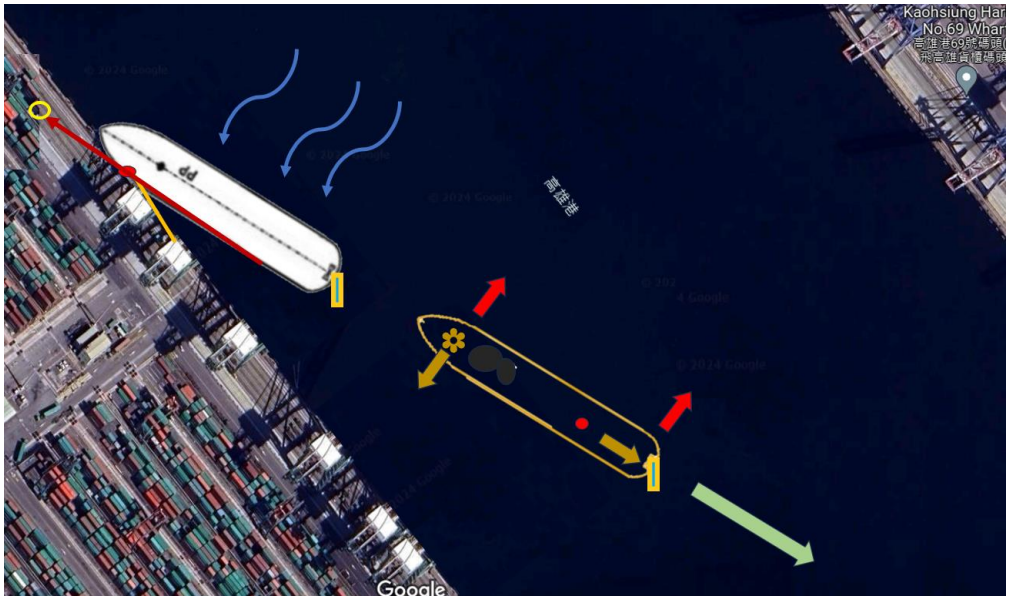

Figure 8 -06 off shore with correct heading

When ownship heading had turned 15 degrees to portside captain can order "Dead Slow Astern" to go backward.

- The rudder should keep to "Hard Port" , full on shore rudder" to push stern out to the fairway by engine if necessary. Due to the slow speed astern, hard port rudder has little effect to move ownship stern to port.
- Ownship can kick main engine ahead even when vessel has aster speed as the compress air in main engine system is power enough to turn the propeller.
- Usually, Captain can kick ahead the engine to adjust ship heading when ship astern speed is below "Dead Slow Astern" RPM.
- However, kick-ahead the stern is not effective when vessel is going astern.
- With the engine RPM goes anti-clockwise (astern direction) , the wheel effect of propeller may take vessel's stern to portside.
- The pivot point when vessel go astern is located near ship's stern (as the red dot) which make bow thruster's force leverage longer than ship goes ahead.
- This long leverage of bow thruster only useful when vessel speed is slower than 5 or 4 knots.
- The astern speed should never be more than enough as the bow thruster has its limitation to control the heading.
- The gyro compass reading should be monitored while vessel go astern.
- To check visual reference points on board and shore are in line or not which will help captain to monitor vessel's turning tendency.
- Vessel's stern have the tendency to go upwind (or ship bow go downwind) when she has astern speed. If the wind comes from portside, her stern goes to portside too.

- Vessel's turning tendency, no matter how small it is in the beginning, should be captured immediately before any momentum built up. This is our due diligence in ship handling which should not wait pilot to handle it for us.
- Usually mariner use Kick-ahead to adjust position of stern and bow thruster to adjust ship's bow position as figure 8 -06.
- These side thrust forces of bow thruster and Kick-ahead of main engine may offer more forces to compensate the wind pressure.

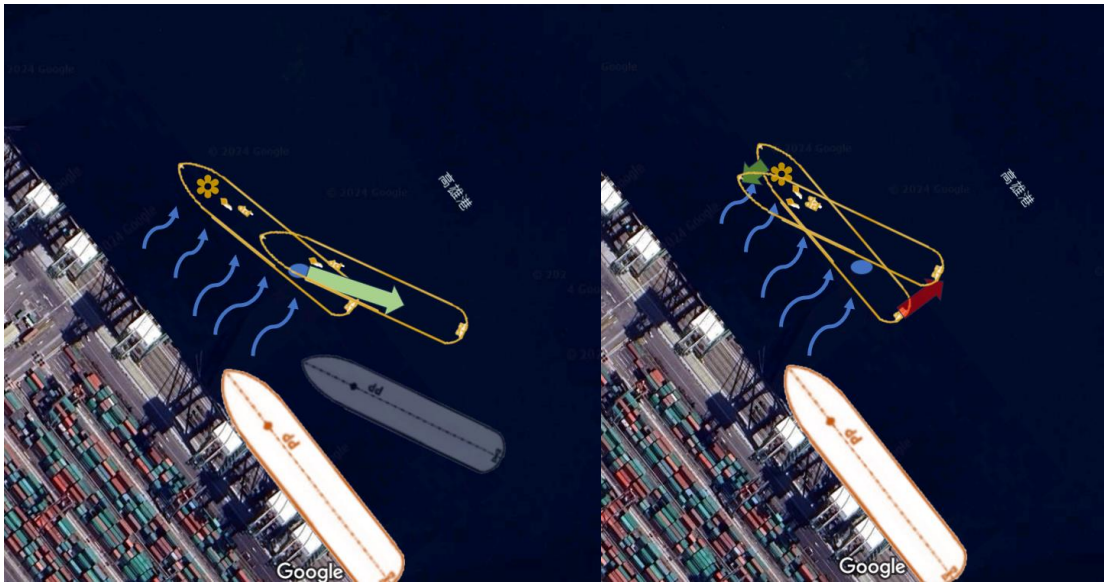

Figure 8 -07 going back to correct astern direction

Correct astern direction with no tugs

In figure 8 -07 when ownship's heading is not correct as 15 degrees to dock line or 301 degrees. Vessel is not at right shape to go astern. The heading may change from 316 degrees to 306 degrees as figure 8 -07. The SOG in ECDIS may still go to 316 degrees as we required but vessel's heading is not correct. We may expect ownship will back off like the drawing in the left. This is the direct impression we had with the use of ECDIS. But, the thing may go wrong from here.

- First thing is what had caused the heading changed from 316 degrees to 306 degrees now? Well, we don't know now.
- When pilot is conning ownship, he has extra help from port service tugs to give extra abeam thrust force to adjust our heading from 306 digress to 316 degrees again. Most probably action he take is to pull ownship stern out of dock as vessel is going back now.

- Because ownship is moving back continuously while pilot use stern tug to pull it out, the end result may be as the shadow vessel moved close to berthed vessel where the vessel had turned but abeam distance to berthed vessel had not increased.
- In this shadowed vessel's position, vessel is too close to berthed vessel. This position will restricted our choice in maneuvering and movement.
- For a captain who has no tug assistance, he should not try to do the same (go astern and adjust the heading at the same time) as local pilot.
- The correct way is to stop the engine as right drawing in figure 8 - 07.
- Stop ownship at current position then adjust the astern direction (the heading 316 degrees) at correct angle.
- Use kick ahead engine to swing out our stern and bow thruster to assist the turn as right drawing in figure 8 - 07.
- When ownship stopped the kick-ahead will more effective to move ownship's stern out.
- After ownship heading is adjust to 301 degrees, captain can use astern engine to go back to her original course line.
- Because the pivot point (red point in figure 8 -07) is located astern when vessel has astern speed.
- Pivot point position is moving to aft of midship section due to water resistance is at ship's stern when vessel is moving astern.

The direction of sternway will more easy to control by bow thruster due to longer leverage (distance from bow thruster to pivot point) until vessel almost reached the center line of fairway (red line in figure 8 – 08)

Compensate for wind pressure

In figure 8 -07, when vessel left the berth as we required, it's time to check how is the effect of wind dong to our back track. We can use bow thruster and kick-ahead to adjust the heading / bow / stern of ownship in astern movement. In shiphandling there is a very important concept is to **divide ownship's response into three different parts : the bow, stern and ship's body.** This is the same concept as we divide the turning in collision avoidance into 4 stages. Each stage's skill is closely related to OOW seniority. Usually Mr. pilot will depend on tugboat to assist each part of vessel to maneuver. Take tugs on ship's bow, stern and midship part if necessary. For a captain with no tug assistance available:

1. We will use bow thruster to move ship's bow in slow speed.

2. Use kick-ahead to move ship's astern if ownship is in slow speed.
3. Use rudder angle to move ship's stern if ownship is in higher speed.
4. Use anchor to fix ship's bow position in emergency occasion.

When ownship's track deviated from intended route, we should check which part is the problem first.

- The direction to turning basin is the direction of fairway which is 316 degrees.
- Ship's bow will pay off the wind as always in her astern movement.
- When the wind comes from starboard side, we may want to adjust our stern to point to the wind (starboard side). So, ownship can move to more upwind area to keep more sea room when we need to turn in turning basin.
- Captain may need to use bow thruster to align with fairway direction when ownship 's stern have arrive centerline of fairway (red line in figure 8 – 08, this is the course over ground we need).
- The wind force worked on ship hull when ownship have stern way should be compensated by drift angle (the angle between green heading line and red line) to steady vessels' track on fairway's center.
- This drift angle in ship's heading we applied to compensate for ship's position drifting to downwind side is called **leeway**.
- Even vessel with leeway astern speed over ground already parallelled with fairway, we may need to apply bow thruster output to compensate for continue wind blowing.
- This (continuous use bow thruster) is in theorical, in shipboard operation sometimes the bow thruster operational time is limited due to it small output and bad colling system arrangement which cause bow thruster overheating then tripped off automatically.
- For the effective of bow thruster's force, ownship have go astern slower than "Dead Slow Astern" speed, under 5 knots ahead or astern speed as general rule.
- The astern speed to maintain 3 or 4 knots may be needed if we want to keep the option of bow thruster to help ownship's bow movement.

In figure 8 -08 position 1, when ownship's bow had cleared of the berth we may apply more leeway to upwind direction.

- However, the astern heading should not allow to change too quickly, just little by little. This is the precaution to avoid too many deviation to our intended route.
- We can monitor ownship bow's movement and control it by bow thruster to maintain steady heading.

In position 2, ownship have to arrange to parallel with the fairway direction.

- Basically, we will arrange to keep pivot point on the center line of fairway to facilitate following maneuvering.

- Set the center EBL first for easy reference.
- When ownship stern touched Center EBL, we will use bow thruster to help the turning.
- If the wind is strong, the turning may wait a few moment more when ownship's center had reached this center EBL line and keep some leeway to upwind direction in the expectation of "ownship will set to downwind side with this strong wind"
- However, this may not be the truth when "ownship's movement is upwind when the wind force is strong".
  - This may against our common sense that everything blew by the wind will drift to downwind side especially vessel is floating on water surface.
  - If vessel has no speed on water, the strong wind will work at center of our windage area about our midship position.
  - When ownship had speed, our pivot point moving ahead due to water resistance and engine force worked together.
  - When windage astern of pivot point larger than windage ahead which may push vessel position to upwind side, we may call this wind sail effect.
  - If ownship do have windsail effect, we may need to turn to fairway direction earlier with the reference of center EBL.
- 15 degrees turn to fairway course (upwind direction) may not be easy due to the wind pressure.
- It is better to try to turn earlier than later when ownship already deviated from the center.
- Use full bow thruster power as early as possible.
- We can reduce the power of bow thruster later when the turning to upwind is easy.
- If the turning to upwind direction has difficulty, we will understand the trouble earlier if full power bow thruster is no working (may be vessel has too many astern speed).
- We may use the kick ahead to correct this situation if the bow thruster is no working.
  - In position 2, the rudder is put to "Hard Starboard" to move ownship's stern to portside to help the heading to starboard side.
  - This kick ahead can also help to reduce the astern speed and give ownship more time to handle the situation before it is out of control.
  - In worst condition, we will need to stop the vessel first then correct the heading with "Hard Over Rudder".
  - Stop the vessel first is always the safest way in ship habdling.

In position 3 of figure 8 – 08, ownship maintained very good control of our Course over Ground COG and positioned ownship in the center of fairway with some degrees of leeway to compensate for the wind pressure.

- Ownship's bow may blow downwind by the wind and we correct the heading by using bow thruster as necessary.
- When ownship's pivot point or ship's body had deviated from center EBL, we may use the kick ahead to correct the situation.
- In position 3' in figure 8 – 08, we see the pivot point is at starboard side of center EBL.
  - If we use bow thruster to correct this situation, there will be no coming back to center EBL course.
  - As we said, if the bow deviated can use bow thruster to move it. Now, the stern or pivot point is away from center, it is better to use kick ahead to correct it.
  - Ownship use hard Starboard rudder to kick our stern to portside.

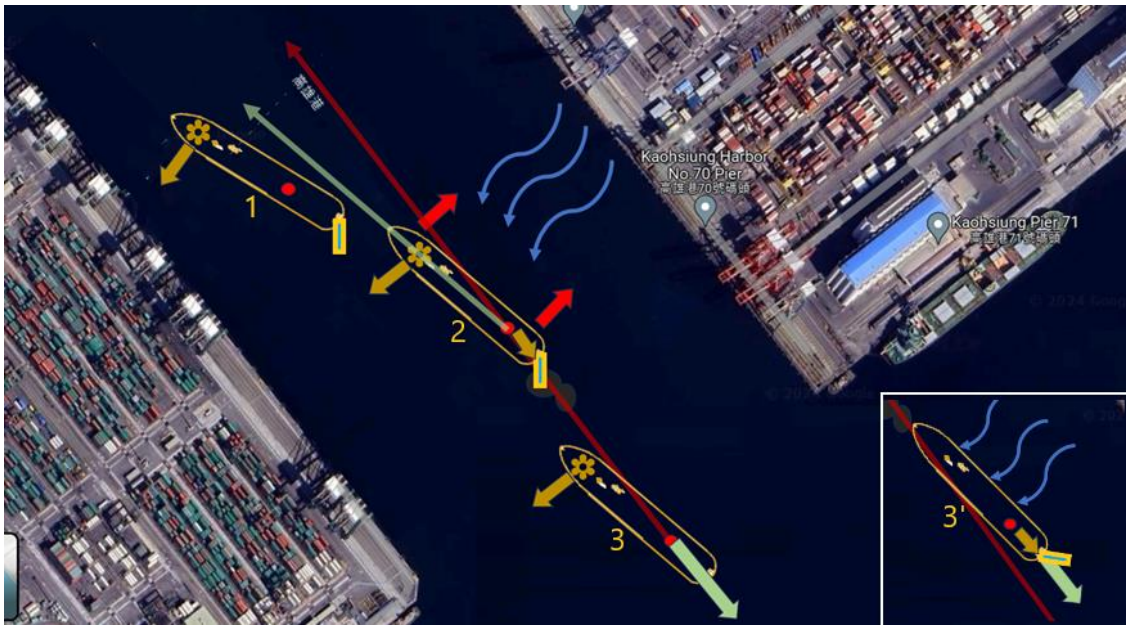

Figure 8 – 08 astern sailing in the center of fairway

In figure 8 – 09, the maneuvering is almost the same as figure 8 - 08.

In position 1, ownship have to deal with the wind blow off our bow.

- We need to use bow thruster to against the wind pressure to keep 15 degrees angle to the berth line.
- If the bow thruster is not power enough to keep this 15 degrees, we may use kick ahead to maintain this 15 degrees angle.
- In this stage is the same as ownship departed the berth, keep the rudder toward the shore side (port side in this case) then kick the main engine as necessary to keep this 15 degrees.

In position 2 of figure 8 – 09, ownship bow need to turn more degrees than 15 degrees.

- This will not be a problem when ownship has astern speed.
- The rudder may shift to downwind side to prepare for kick ahead if necessary.

In position 3 of figure 8 – 09, we need to consider the next run is to upwind side (portside in this case).

- Turning upwind is more easy when ownship has ahead speed.
- After ownship cleared starboard side berth, we may let vessel to set to downwind side to allow fore more space when ownship is turning upwind.
- So, when ownship is at 3' position (more to upwind side), it is not in favor of next turn. We should correct this situation as soon as possible.

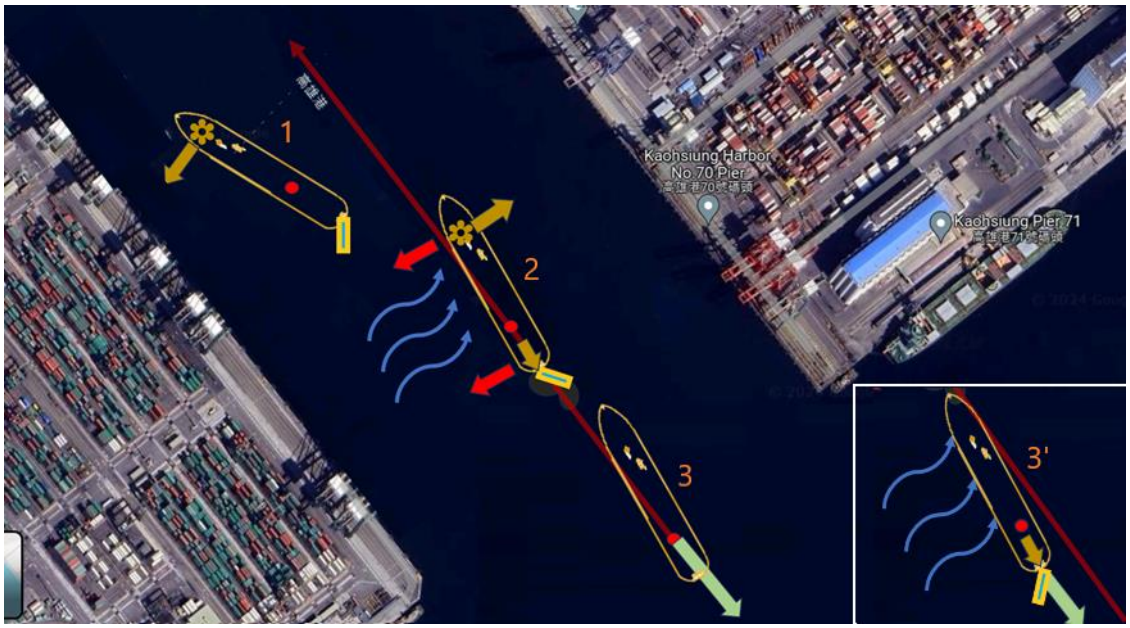

Figure 8 – 09 SW wind back off route

Turn around at same spot

We will use turn around at same spot skill to finish the turn. This is because of the merit of this maneuvering is multiple.

1. No excess speed is no excess collision risk. As the first rule of collision avoidance is reduce speed.
2. The turning need minimum space to accomplish.
3. Best usage of the wind or current effect to assist the turn,
4. Make most effect usage of kick-ahead, bow thruster to help the turning due to pivot point distance is largest.
5. This maneuvering meet all safety requirements.

The only problem is the time needed for this maneuvering is more longer.
First check where the wind come from and make necessary arrangement. The best policy is always keep vessel in upwind area to save any unexpected trouble.
In figure 8 – 10, the wind is coming from starboard side and the outbound route is at portside.

- Vessel need to turn to downwind side when she arrive turning basin.
- Turning to downwind direction comprise of unexpecting risk because we don't know how strong the wind will be when we try to make the turn by rudder effect.
- Well, this is right if we only use ahead speed to conduct this turn like we doing it in river sailing.
- However, we are not turning in a river bend but a turning basin. We have the option to go astern in turning basin.
- When vessel has astern speed, the pivot point will move to aft of the ship.
- Vessel will have its stern moving upwind and her bow moving downwind when she goes astern. This is what we want in this maneuvering.
- As always we need to mark the outbound route with positioning EBL first which should be in the center of the fairway (light blue direction).

In figure 8 -10, we may let ship's astern moving upwind as we had astern speed from fairway center line.

- In orange color position, ownship's bow is keeping to downwind side about 5 degrees which is pointing to 311 degrees. This 5 degrees less than the 316 degrees of fairway direction is the "leeway" we applied in keeping vessel COG course over ground at center of fairway.
- When ownship stern entered turning basin in green vessel's position, we may start the bow turning to portside (downwind side) with the astern speed's help.
- Keep the turning tendency with the help of astern speed.
- However, when ownship's stern reached outbound positioning EBL in yellow colored vessel position, we can reduce or stop the astern RPM of main engine.
- Then, we should wait the astern speed reduced while ship bow still pay off the wind and swing to outbound direction.
- The port swing of ship's bow can be assisted by bow thruster if it is operatable.
- When ownship's heading is almost the same as outbound direction at white colored vessel's position, start main engine ahead RPM to establish ahead speed.
- Go upwind direction when ownship has ahead speed. Ownship position may set to portside direction when the wind is blowing in starboard side.

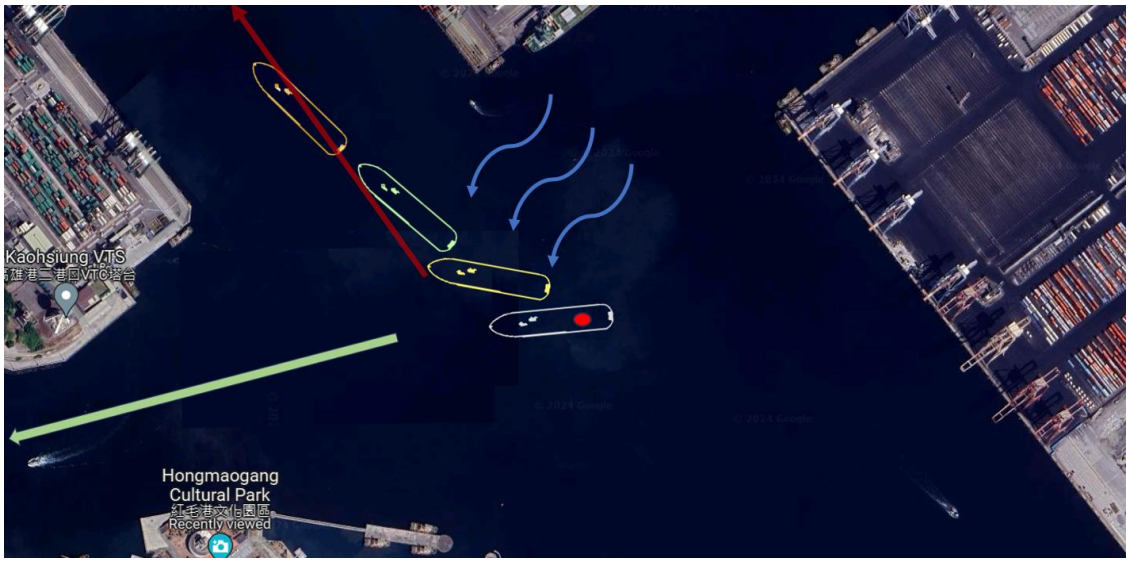

Figure 8 – 10 turning basin NE wind

In figure 8 – 11, when the wind is coming from outbound direction ownship will have to turn to upwind direction in turning basin.

- Turning upwind is better when ownship has ahead speed as pivot point positioned more forward to help.
- Ownship (color orange) keep to center of fairway with the help of positioning EBL (red line).
- Ownship position (color green) is setting to downwind direction but still with astern speed.
- The turning is no hurry, ownship will wait until ship's bow almost reached outbound positioning EBL (color yellow).
- This is because ship's bow will be the pivot point when ownship go ahead.
- We should always keep vessel's pivot point at center of outbound fairway.
- In figure 8 -10, when wind comes from starboard side, we start the turning and keep our stern to the center of outbound positioning EBL.
- As ahead speed moves pivot point forward, the rudder effect can be used to help ownship turning.
- As the wind direction is more portside than outbound direction, ownship can turn more easy to portside than we need.
-

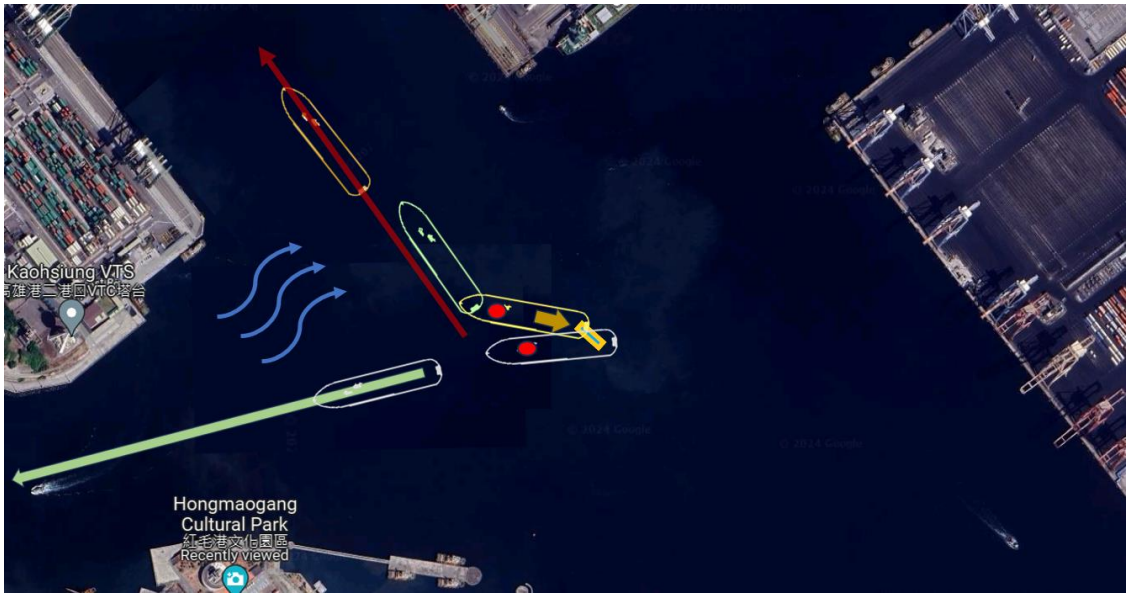

Figure 8 – 11 turning basin SW wind