GUIDANCE ON THE USE OF TUGS FOR SHIP ASSIST IN THE PORT OF SOUTHAMPTON

Document Control Information

Policy Information

Document Number	
Business Area	
Document Title	Guidance on the Use of Tugs for Ship Assist in the Port of Southampton
Version	1
Author(s)	Jamie Nicholson, Richard Erskine
Approver(s)	Simon Lockwood

Effective Date	1st February 2021
Review Date	

Review/Approval History

Version	Date	Reason for Update	Updated by	Signed Off by
1.2	14/02/2024	As per industry guidance being updated post incident of tug girting on River Clyde	C. Kempton	J.Goodfellow

Accountable Owner

The Accountable Owner for this Policy.

Accountable Owner	Title	Geographical Location
Simon Lockwood	Deputy Harbour Master (Pilotage)	Southampton

Contents

Section 1 - Introduction

1.1 - This document has been put together to share some of the most common practices when utilizing tugs in the port of Southampton with a view to align how we all operate. It focuses of elements of tug capability, expectation, anticipation and communication.

1.2 – Throughout this document common phrases which are currently familiar to all parties are "in speech marks". There are undoubtedly effective variations of phraseology that are equally unambiguous, all of which contribute to efficient and safe towage. By operating with similar styles and techniques, it will allow for more consistency between pilots, towage providers and tug masters, resulting in a safer operation throughout.

Section 2 - Tugs available in the Port of Southampton

2.1 - Conventional Twin Screw Tugs

2.1.1 - Conventional twin screw tugs make up all of our smaller tugs within the port (<30t bollard pull). They are ideally suited for 'second class' ships up to 20,000t dwt and in certain circumstances can be used for assisting larger ships when space to manoeuvre is limited. The windage area of some 'second class' ro-ros may in certain weather conditions require consideration of larger tractor towage with additional bollard pull.

Propulsion

2.1.2 – Propulsion on these tugs consists of two independent shaft propellers, steering with one or two rudders. It is not common for tugs in this sector to be fitted with any form of bow thruster. Whilst being adequately powered for their size, and sufficiently manoeuvrable for their work, these tugs do lack the ability to quickly move sideways and/or reposition. If a reposition is requested without weight on the tow line, sufficient time should be allowed for the tug to do this safely.

All applied tow line weight is simply executed by setting throttle RPM with no tow line load readout.

Towing Gear

2.1.3 – These tugs predominately tow with a single line over the stern. Usually the line is made up of a fixed length wire or rope attached to a towing hook on an open stern deck. To push the tug uses its bow. Essentially the fixed length of line cannot be shortened or lengthened during the job, but some tugs will have different lengths of line for different jobs.

An adjustable gog rope, on a dedicated gog winch, fitted to the tow line allows for a moveable 'fairlead' from which the tow line leaves the tug. The purpose of the gog rope is to optimise the tow line angle relative to the tug and enhance tug safety.

Working Push/Pull

2.1.4 - Once an over the stern tow line is attached, the tug will be very wary or wholly reluctant to offer up any form of push due to the possibility of fouling the tugs propellers with the tow line. Should a push be required, the tug may request to let go first.

Alternatively, a twin screw tug can operate with a short (soft) line over the bow, usually turned up on bow bits to perform push/pull. Whilst the push can be 100% of the tugs rating, the pull or lift will be reduced due to the tug now operating astern to generate the pulling force. The tug may also be limited to the SWL of the tugs own deck bits. This is amplified further if the short tow line has a steep ascendancy to the main deck of the ship.

2.1.5 - Making fast centre lead aft over the tugs bow on a very short line can be used to offer some braking and athwartships assistance, for example when following a vessel through a narrow entrance such as the Empress Dock. This also allows for subsequent push/pull on the quarter if required. If operating in this fashion, the tug master must be comfortable that he can slip the line quickly in event of a developing situation affecting the safety of the tug.

Working Centre Lead Aft

2.1.6 - Twin screw tugs making fast centre lead aft will like to know whether their purpose is primarily for a lift, a brake, or both. They will in all cases make fast running with the vessel on the quarter to one side of the ships wash. If required as a brake, they will only drop astern to straighten the tow line when the ships speed has reduced sufficiently. At this point the tug is effectively being towed backwards and can offer up an opposing braking force against the ships direction of travel.

2.1.7 - If these tugs are pulled through the water stern first too quickly, or the tug ends up beam on to the towline, there is a risk of girting and in the worst case they can capsize. The tug crew will manage the tugs heading, tow line weight and gog line accordingly to help prevent this scenario to the best of the tug's limited ability when working in this position. An emergency release is fitted in case they need to let go of the tow line in a hurry. Although the risk of girting is more prominent for tugs on the stern this risk also applies to tugs secure at the bow. Every effort should be made to manage your speed (ahead or astern) whilst these tugs are secure. Less than 4kts is often manageable for the tugs but it can vary depending on their size and their available power, it's important to discuss speeds with the tug master early to determine the limitations of that specific tug.

When conventional tugs towing over the stern or bow are connected to and assisting a vessel manoeuvring with a 'swing', the bridge team should be conscious of the ROT and athwartships speed generated through that manoeuvre. There is a possibility that the tug can be 'overtaken' on her towline. This can potentially result in the tugs gog line taking the weight 'protecting' the tug from girting but then resulting in it losing its position and its ability to assist. The bridge team should keep the tug briefed of the intended manoeuvre and ensure they are suitably positioned prior to turning the vessel.

2.1.8 - Ship propeller wash is also a concern for these smaller tugs. When they are working in the vicinity of the stern, the forces and pressures of water can easily change the tugs position or heading to one where the risk of girting is increased. Kicks on the engine even at a low speed creates large movements of water, be aware that this movement of water is relative to the engine order speed not to the actual ships speed in that moment. Early communication, control of ships speed, and minimising engine or rudder movements where possible can give the tug time to pre-empt these effects.

Benefits	Limitations
• Ideal on smaller ships. Capable of manoeuvring within smaller areas of the docks such as up the Itchen River, in the Empress Dock and in the KGV Dry Dock. • Can be used safely in most positions around the ship with or without a line providing	• Not as effective at transitioning between positions when compared to more modern tractor tugs. • They often use the tow line to help control the tug when moving between positions resulting in some weight on the line. If this

speed in well controlled with early communication.	is unfavourable, give plenty of time for the tug to move and specify "no weight". • The tow line length is not adjustable during the operations due to it not being on a winch. Line length to be set accordingly at the start of the job. • Danger of girting if the tow line comes on to the tugs beam whilst under load.

2.2 - Tractor Tugs

2.2.1 – The tractor tugs in the port are made up of both Voith drive tugs and Azimuth Tractor Drive tugs (ATDs), with bollard pulls of more than 60t.

Propulsion

2.2.2 – Propulsion on these tugs consists of either two athwartships Voith units, or two athwartships azimuth thrusters. The propulsion is positioned forward of midships effectively pulling the tug through the water. Tractor tugs are very directionally stable when operating either ahead or astern at all speeds. They are capable of a quicker reposition than conventional twin screw tugs, and can move effectively in any direction when at slow speeds.

Tow line weight may be displayed to the tug master if a calibrated load cell is fitted to the winch, but on many tugs this is not the case and it is judged by propulsion RPM.

Towing Gear

2.2.3 - These tugs tow with a single line over the stern and also push with the stern. This makes them ideal for efficient push/pull operations. The tow line is on a stern winch before it passes through a fixed staple aft of midships, which reduces the risk of girting. During towage operations, either, the winch brake is applied or tension control is utilised before the line is loaded. Line length can be adjusted during an operation but minimum or no weight on the line may be required to do so depending on the winch configuration. Sufficient time should be allowed for the tug to do this safely.

Escort Towage

2.2.4 - Certain certified Voith tugs within the port are designed and stationed for escort towage. Due to shape of the hull and an oversized skeg they can be very effective at creating high steering forces when in an indirect towing position. For instance, a 70t bollard pull escort tug can generate steering forces of 150t.

Benefits	Limitations

• Manoeuvrable in all directions. Capable of working all positions around the ship, and well suited to changing position. • Tow line length can be adjusted during the job. • When making fast centre lead forward, the tug itself is operating forwards offering good directional stability and control at approach speeds.	• Not as effective at slowing a large ship at speed from the stern when compared to an ASD. • Voith tugs tend to have a deeper draft than an equivalent ASD. In Southampton Voith escort tugs have a draft of 6.7m.

2.3 - ASD (Azimuth Stern Drive) Tugs

2.3.1 – ASD tugs are also known as a reverse tractor tugs due to the direction of pull. These powerful tugs are highly manoeuvrable and efficient, with bollard pulls exceeding 60t.

Propulsion

2.3.2 – These tugs are propelled with two powerful azimuth thrusters positioned athwartships right at the stern, allowing the tug to be manoeuvred in any direction without delay. On occasion, the tow line may be used on minimal weight to assist with holding the bow of the tug in position, during periods of readiness or during a reposition. If "no weight" is required that should be made clear by the pilot.

Towline weight may be displayed to the tug master if a calibrated load cell is fitted to the winch, but on many tugs this is not the case and it is judged by propulsion RPM.

Towing Gear

2.3.3 - These tugs tow with a single line over the bow and also push with the bow. They work effectively in push/pull just like the tractor tugs. The tow line is on a bow winch before it passes through a fixed staple on the bow which again reduces the risk of girting. During towage operations, either, the winch brake is applied or the winch tension control is utilised before the line is loaded. Line length can be adjusted during an operation but minimum weight on the line may be required depending on the winch configuration. Sufficient time should be allowed for the tug to do this safely.

Working Centre Lead Forward

2.3.4 - Safely working an ASD tug bow to bow is a highly skilled manoeuvre for the tug. Some ASD tugs, generally those with a less favourable underwater profile, can be less directionally stable when operating stern first. This instability is easily amplified when dealing with higher approach speeds when the tug is working within the pressure zones of the ships bow. As a result, careful consideration of the ships approach speed is critical.

An alternative option, where possible, may be to connect an ASD tug in the push/pull position on the shoulder. The tug can either run bow to bow with the vessel but offset to one side ahead of the fairlead, or they can run with the vessel aft of the connection fairlead where they may even be able to lie alongside. The tug doesn't necessarily have to be able to push directly below the fairlead in which it is secured through. They can be secured on the shoulder above the flare of the bow and when required be asked to drop back to a flat part of the ships side and push there. This is only achievable providing the distance from the fairlead isn't too excessive and the tow line can be deployed and recovered safely.

Escort Towage

2.3.5 - Like the Voith tractor tugs, certain certified ASD tugs can be used for escort towage. When used indirectly at optimized speeds they initially generate steering forces using a combination of bow skeg and power, ultimately resorting to their raw power as the speed falls away and water pressure on the skeg reduces.

Working Centre Lead Aft

2.3.6 – ASD tugs excel on the stern of a ship where the technique of transverse arrest quickly generates large braking forces. This can also be followed up by applying increasingly direct power to maintain these forces as the speed reduces. This technique creates a huge amount of drag whilst allowing the tug to remain directionally stable and controlled at higher speeds.

Benefits	Limitations
• High powered, agile tugs which can deliver responsive power in all directions. • Very effective when used as a brake on the stern of a ship, particularly at higher speeds.	• Can be used as a bow to bow tug but lower ship speeds are essential to reduce the water forces and pressures around the ships bow. This gives the tug more directional stability whilst operating stern first.

2.4 - Type of Tugs – Summary

2.4.1 - Whilst tugs are more often than not pre allocated, the pilot can still place the best matched tug type and size with the function that the tug will be expected to perform. Optimising the position of a particular tug type gives each tug the best opportunity to perform that function efficiently and safely.

2.4.2 - The full capabilities of a tug often far exceed those which they display during their day to day towage operations. However, taking a tug to near or beyond those capabilities could eventually become increasingly uncomfortable or potentially dangerous. There will be a point where the tug may need to reduce the assistance offered or even back out altogether for their own safety.

The Right Balance

2.4.3 - Although larger tugs have an abundance of power, they may not have the delicacy for smaller increments of applied force when used on smaller ships. They will often become quickly confined in smaller spaces due to their draft and size. The weight of the tow line alone may exert an undesirable force that cannot be eliminated and the tow line itself may also be unsuitable for the physical size and SWL of the ships securing arrangements.

2.4.4 - Small tugs on large ships may offer a 'something is better than nothing' approach but may be more affected by the water forces and pressures generated by a larger vessel. They may also be working nearer the capability limits of the tugs propulsion, and the tow gear may present a steeper tow line to deck which is less effective. They could also become hampered by a fixed length tow line and ultimately may become more vulnerable.

2.4.5 - To summarise:

- Voith and ATD tugs are well suited for working centre lead forward.
- All tractor tugs can perform efficient push/pull and are well capable of responding to multiple position changes.
- ASD tugs can deliver particularly effective and large braking forces whilst working on the stern.
- Small Conventional Twin Screw Tugs work well within the tighter and shallower spots around the port.

That being said, speed and time management can act as a suitable control to mitigate some of the limitations presented. Additionally, facilitation of appropriately timed tug training will always add benefit to the available towage resource.

2.4.6 - A full list of tugs available in the port can be found in the Local Notices to Mariners on the Southampton VTS website.

Section 3 - Communication

Channels and Procedures

3.1 - Communication is by VHF and should be carried out on these designated channels:

- Ch 87 – Container Terminal
- Ch 71 – Fawley Marine Terminal and BPJ
- Ch 74 – Docks (Primary)
- Ch 10 – Docks (Secondary)
- Ch 08 – Docks (Last resort – Not recorded)

3.2 - Communications are to be established as early as possible and confirmed by all parties. A clear, concise and closed loop format confirming all instructions can catch any miscommunication before incorrect application.

Callsigns

3.4 - Whilst some ports use numbers or positions to identify their tugs, in Southampton we generally call with the individual tugs name. Prefixing the message with "on the (tugs name)" often ensures that transmission commences and the tugs name gets heard. This allows the tug master to pick out their orders amongst multiple tugs.

Good Planning

3.5 - Majority of the communication about the planned operation should be carried out early and during a safe period before the operation. The outlined plan will include the intended manoeuvre, specific tug placement, the function of each tug, any vessel limitations or relevant defects, any particular aspects which may be non-routine, and the SWL of ships bollards. At this point the tug can highlight any limitations that may be encountered for the pilot to consider and balance.

Once the operation is underway communication should be kept clear, concise and to essential content only.

Roles and Responsibilities

3.6 - The role of the pilot is to co-ordinate all available assets to safely conduct the intended manoeuvre. These assets include the towage, the ships main propulsion, thrusters and rudder, the ships bridge and deck teams, the use of the mooring lines and boats to best suit the specific vessel, the berth and approaches and the environmental factors. The desired action of one tug may simultaneously create an unavoidable or undesirable consequence which the pilot will look to counter by introducing or removing a separate force elsewhere.

3.7 - The role of tug master is to carry out the commands of the pilot providing it is safe to do so. They are responsible for the safety of their tug and their crew. If a tug is requested to carry out an action, they should do this as efficiently and as accurately as possible. Tugs frequently operate out of sight of the pilot and bridge team, as a result there is an assumption made by the pilot that the tug is operating as and where requested. Any restrictions to carrying out the action required need to be relayed to the pilot as early as possible so that they can be taken into account. Equally any safety concerns, clearing proximity to hazards, or observations by the tug master are of timely interest to the conducting pilot.

Most operational concerns should have been addressed prior and anything not safety critical can always be discussed after the job and be utilised in future operations.

Section 4 - Tow Line Connection

Speed and Heading Control

4.1 - The process of tow line connection can be a particularly vulnerable period for the tug as it operates in the different pressure zones around the ship. The faster the ship is moving, the more the interaction forces will affect the directional stability and relative positioning of the tug. Slower speeds offer more reaction time for the tug master to respond, particularly for any tug on the bow.

4.2 - With the ships speed reduced appropriately and the ship's crew confirmed as standing by ready, the pilot can request the tug to "come in to make fast when you are ready/when it is safe to do so". It is the judgement of the tug master to assess when they can safely approach. If any adjustment of speed is required then the pilot should be informed as soon as possible.

4.3 – Large alterations of ships heading during connection could significantly change the relative position of the tug to the ship, particularly for a centre lead forward tug. Sudden changes will leave the tug with less time to react, and more work to do to restore the relative running position. Small alterations of course and advanced warning can alleviate this.

Using A Tug Centre Lead Aft

4.4 - In cases of a high dead slow speed or conditions of considerable leeway, the pilot may need the aft tug secured and "leaning back" or "giving weight right astern" sooner rather than later. This slows the ship down but also allows the ship to keep propulsion running and maintain directional steerage. This is referred to as "working against" the tug.

4.5 - If this is a known case then the pilot should establish communication with the tugs as early as possible and make sure the aft tug is present early enough to get the speed under control for the manoeuvre or for making the forward tug fast safely.

Tug Lines

4.6 - In Southampton all of the tugs use their own tow lines, most are synthetic fibre rope, but some smaller tugs use wires. They are to be passed to the ship by firstly receiving a suitable (legal) heaving line which will be connected to the tugs messenger line. The messenger line can then be mechanically hauled onboard the ship and used to heave the tow line onboard. Manual handling of messengers and tow lines is best avoided whenever possible, particularly when connecting in open water where there is movement in a seaway.

The towline should pass through a panama lead and be secured onto a tug strong point or suitable set of bollards. Roller leads and leads which are scarred by wires are to be avoided.

The pilot should be informed of the SWL of the bollards/fairleads and this should be relayed to the tug master. The best combination of fairlead and bollard is preferable, close to the vessel's side and in the most direct line between them.

A banksman must be in place at the vessel's rail with a clear view of the towline as it comes on board, as well as the crew on the deck of the tug.

4.7 - The tug should avoid putting any weight on the line until they have been signalled by the deck crew that they are all fast - this is commonly signalled with crossed forearms. If they do not receive a visual indication from the deck then they are to contact the pilot immediately to obtain confirmation.

Emergencies

4.8 - If a tug has any control issues either during the connection process or whilst connected they can emergency release the tow line. For the larger tugs this results in the winch freewheeling until the towline runs out completely, for the smaller tugs they simply drop the line. This will mean the tow line is left in the water and may still be connected to the ship. Is it important that if control of the situation cannot be regained by the tug concerned then they should inform "all stations" of the hazard now in the water. If the line is still connected to the ship, they should recover it onboard and if possible not release it to the water. Some tugs have a secondary tow line and providing their operational integrity is not compromised they can attempt to use this and regain operational control.

Car Carriers

4.9 - Some car carriers have a pipe fairlead system on the transom where the towline is pulled onboard through a piped fairlead and secured safely up on the mooring deck. Whilst this fairlead system is effective at keeping the tugs tow line clear of the stern ramp and allowing for a greater lift angle, the reality is these pipes are heavily corroded internally, easily damaging synthetic tow lines. Understandably the tugs can be wholly reluctant to use them.

4.10 - Other car carriers have external platforms with fairleads and bollards protruding out below the stern ramp, again designed to offer a lower securing point and circumvent the stern ramp limiting the lift angle. Unfortunately, these platforms and their bollards often lie below the freeboard of modern harbour tugs which means the tugs tow line runs downward over the tug bulwark. This is far from ideal for two reasons. Firstly, the tow line can be damaged from rubbing against the bulwark, and secondly the tow line can be lifted from the bollards during the operation. To make fast to these bollards they have to be at least level with the tugs staple.

4.11 - If it is not feasible to use these platform bollards and there is no other suitable fairlead on the transom then the tug may be able to make fast on the port quarter. From there, at low speeds, they could still be able to "lean back astern", although the weight applied will still be slightly to port of centre. Push/pull on the port quarter could be offered, but in both scenarios the tug will not be able to move around the stern to starboard due to the sharp transom corner edge. Alternatively a smaller (lesser freeboard) tug should be considered.

Safe Working Loads

4.12 - If the SWL of the bollards is less than the maximum bollard pull of the tug then best practice is for the pilot to ensure he does not ask the tug for more that this SWL. For example, if the SWL of the ships bollards is 30t and the tug can pull up to 65t, the pilot would not request more than "half" power. In any case the tug master can limit the applied power to that of the securing SWL and advise the pilot accordingly.

Section 5 - Tow Line Length

5.1 – Tow line length is an important part of the tug set up, not least when it is fixed. The tug master will normally use their judgment and decide the length of line they wish to use based on the scope of the operation, the freeboard of the ship and the length of line available. Any requests or alterations to their choice should be made during the briefing before the operation begins.

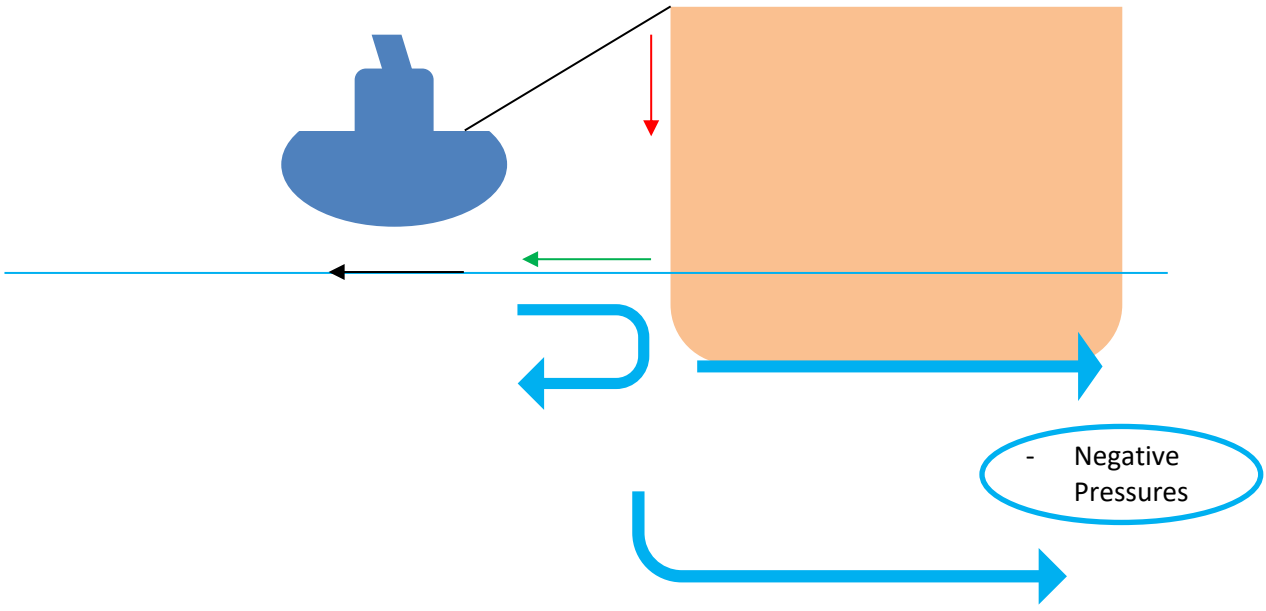
Long or Short

5.2 - A longer tow line can be more effective when delivering lift, and may give the tug more freedom of movement. Ultimately, tow line length may be limited by the operational space in which the tug has to manoeuvre and the overall length of line on the winch drum.

5.3 - A shorter tow line makes for shorter transitions during a reposition, and may offer quicker response times. It will however place the tug closer to the ships propeller wash, flat hull surfaces and pressure zones. A tug working with a high freeboard ship will result in a steep tow line angle.

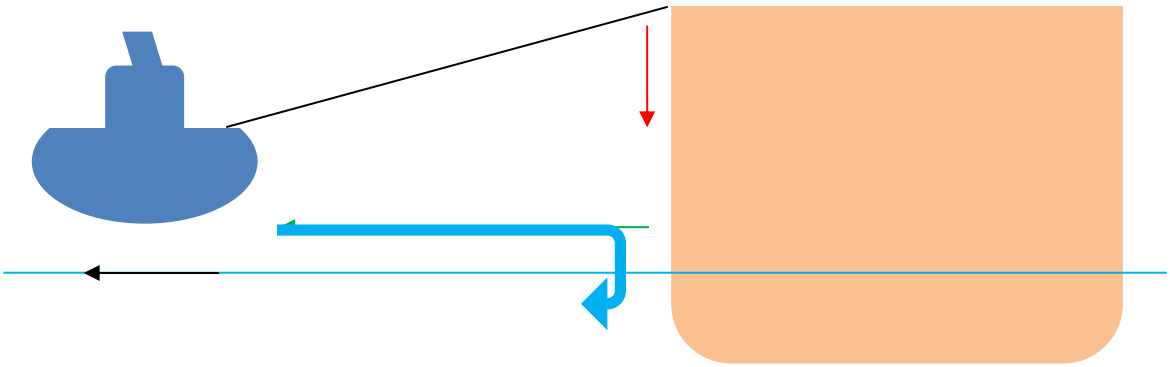
Tow Line Angle, Cavitation and Coanda Effect

5.4 - With a longer tow line, there is more space for the tug wash to disperse, before it pushes adversely onto the ship's hull in a direction opposite to that of the lift force. Returning tug wash will disturb the water in which the tug is attempting to grip, resulting in cavitation and reduced efficiency.



5.5 - In the first image the tow line angle is steep and 50% of the tugs force is lifting horizontally and 50% is a vertical component.

In the second image by lengthening the tow line 75% of the tugs force in now lifting and only 25% is that vertical component.



5.6 - If the ship has a small UKC, and/or the tug is near the bow or the stern, some of the water can be forced below the vessel or around its extremities. This coanda effect creates negative pressures below and on the far side of the ship. These pressure drops will oppose the tugs pulling force and in some cases they will even balance out. Often the result is for the pilot to request more power which only increases the flow of water and in turn increases the negative pressures and the adverse effects on the tugs pulling ability.

The combination of these effects can result in a substantial reduction of effective bollard pull. This can be well highlighted by an aft push/pull tug requiring a much greater power setting than a shoulder push/pull tug to achieve a parallel bodily lift of a deep draught vessel with minimal UKC (notwithstanding the effect of trim, any headway/sternway, tide and/or windage).

Working A Tug Right Astern

5.7 - A longer line on a tug secured centre lead aft and working right astern can be beneficial. With a longer line the tug can remain clear of the wash and therefore maintain control more effectively. If they do sway and move either side of "right astern" the longer line length reduces the angle at the ship and therefore reduces the undesired impact of the tug being out of position. This can prove particularly useful during the dry dock job where the ship is working against the tug and a sway from the stern tug can easily pull the stern of the ship towards either side of the dock.

Changing Line Length Mid Operation

5.7 - During some ship manoeuvres the tug will routinely adjust the line length to suit each stage of the operation. For example, a centre lead aft tug may initially offer braking forces on a longer line when there is active propeller wash from the ship and subsequently shorten when coming around to offer a lift. Breaking the inertia of a stationary vessel may require a longer line length before shortening to a length ready for transitioning in a reposition. A deep draught ship with minimum UKC may require a longer length to allow room to disperse tug wash.

5.8 - "Shortening up" and "stretching out" will inevitably take a few moments and good planning by the pilot and tug master ensures that this time allowance is not critical or unduly rushed. Once in position, "standing by ready" from the tug master indicates the tug has completed that move and is ready to apply the next force.

Section 6 - Tug Power

6.1 - In Southampton power increments are generally requested in fractions of the tugs maximum bollard pull. The levels of power commonly used are:

"Full"	100% Power
"Three Quarters"	75% Power
"Two Thirds"	66% Power
"Half"	50% Power
"One Third"	33% Power
"One Quarter"	25% Power
"Minimum" or "Easy" or "Tight Line"	Line is just tight visibly or gear is simply just engaged when leaning on for a push.
"No Weight" or "All Stop" or "All Easy"	Line is visibly slack (not in the water) or tug is holding position/barely touching the ship side ready for a push.

6.2 - Depending on the role of the tug the power request is prefixed with either "lift" for pulling or "push" for pushing. For example:

"On the (tugs name) lift full" or "On the (tugs name) push half"

Reduction in Remaining Power

6.3 - As well as using propulsion power to deliver the requested tow line load, a further degree of power may be required just to hold the tug at the same relative position and angle to the ship. The more headway, or the more tide and/or wind, the more power needed to achieve that hold.

Small Adjustments

6.4 - At certain stages of the operation, mainly as the ship closes the berth the pilot may wish to adjust the power of the tug in smaller increments. The pilot may ask the tug master for either "a little more" or "a little less" power, at this stage they are looking for finesse and it's important that the tug master makes the changes carefully and smoothly. The pilot will be watching for the reaction in the ships movement and if required they will request further adjustments until the desired outcome is achieved.

Section 7 - Tug Positions

The Arc of Free Movement

7.1 - Once a tug is secured to a ship it is limited in its moveable range. Normally a line from any fairlead will theoretically allow up to 170 degrees of arc movement for a stationary vessel, reducing significantly as the speed of the vessel increases. The tug master will monitor the fairlead angle and seek to keep the tow line protected whilst effectively and safely carrying out the pilots request.

Pulling Towards the Berth

7.2 – As the ship approaches a berth the range of movement of a tug secured centre lead forward or aft is increasingly restricted on the berth side of the ship. The tug can lift towards the berth, particularly early on in the approach when room is more abundant. However, as the ship closes the berth the tug will have to reduce their angle moving away from the beam and this will increase the head or sternway of ship.

7.3 – A tug working on the berth side of the vessel has less options of escape, be that for example in the event of a tow line parting where the tug has energy towards the quay, or a tug mechanical failure where the vessel is closing the quay. An alternative option is to make the tug fast on the opposite shoulder (push/pull).

Tow Line Hazards

7.4 - The aim for the tug master is to keep the tow line clear of snags, clear of the water and clear of sharp edges. At the bow the tug master will be watching for the anchors and their housing. At the stern they will be cautious of sharper edges on the extremities of the transom. One main concern that limits the range of tug movement is the stern/quarter ramp on car carriers. Often these ramps protrude from the stern and present sharp edges that could easily cause damage to the tow line. This limits the tugs to approximately 45 degrees of movement on the stbd quarter. Lifting at 45 degrees will result in not insignificant sternway on the ship. Sometimes, if available fairleads and bollards are present the tug master may request to make fast over towards the port side of the transom. This will allow a slightly increased angle of free movement out onto the "stbd quarter".

Pushing Limitations

7.5 - Pushing tugs are limited by the amount of suitably safe flat side on the ship. Most ships are marked with suitable tug pushing points avoiding shell doors and other weak spots that should be clearly marked 'No Tugs'.

Push/Pull

7.6 - If the tug is in a push/pull situation they will be limited by the length of line and any required adjustments to said length. The pilot must allow enough time not only to move the tug along the ships side but also for the tug to transition to and from a push or pull position.

The tug can be requested to be "out ready for a lift" or to "come back alongside ready for a push". At the final stages of a manoeuvre if the required force is small and the tug tow line angle to the ship is shallow, the pilot may request the push/pull tug to "lift from alongside" or "short lift". It is best to confirm this is ok with the tug master early on and if it's not then the pilot will have to allow time for the tug to lengthen out before load weight can be applied.

Sometimes when a tug is operating pull/push aft, due to the shape of a ship's counter particularly in ballast or part loaded, operating alongside push/pull may only be possible if the tug re-orientates itself and runs ahead of the fairlead instead of astern of the fairlead. This is to ensure the tugs structure remains clear of the counter, and has flat side of the ship available to lie alongside and later push square. The tug Master should advise the pilot of this. Push/pull will still be achieved, but the aft tug will not be able to "lay back". If the pilot requires a lay back for the maneuver, this should be communicated in the pilot/master briefing. Instead the forward tug could be used to lay back, or a centre lead aft stern tug position should be considered.

Laying Back

7.7 – A shoulder tug which is made fast push/pull and lying alongside the ship's hull will often be able to 'lay back alongside' and in doing so exercise a braking force. This will not generate the same braking force as a stern tug but could be sufficiently useful in the absence of a stern tug, or even in addition to a stern tug braking.

An aft main deck push/pull tug may also be able to lay back alongside in the same fashion, assuming the tug is orientated appropriately i.e astern of the fairlead, and there is enough flat hull to lie alongside i.e. working with a stern hull form which is not excessively countered.

A push/pull tug laying back alongside will not necessarily create a turning moment on the ship, but any such moment could be countered with the ships engine and rudder or used to advantage.

Tug Vectoring

7.8 - Pushing tugs can also be used to alter the ships position in a longitudinal manner whilst close to or alongside the berth. The tug can be requested to "vector" ahead or astern. The tug will be angled in way that it applies the

pushing force in the desired longitudinal direction as well as pushing the ship alongside. This is very effective and can negate the need for kicks on the ships engine. However, it is not recommended with movable fenders such as tyre fenders, yokohama fenders, pole fenders or poor condition fixed fenders.

Good Practices

7.8 - It is good practice for the pilot to prepare the tug for its next command particularly if it means changing position or tow line length. This can be achieved by asking the tug master to "stand by". For example:

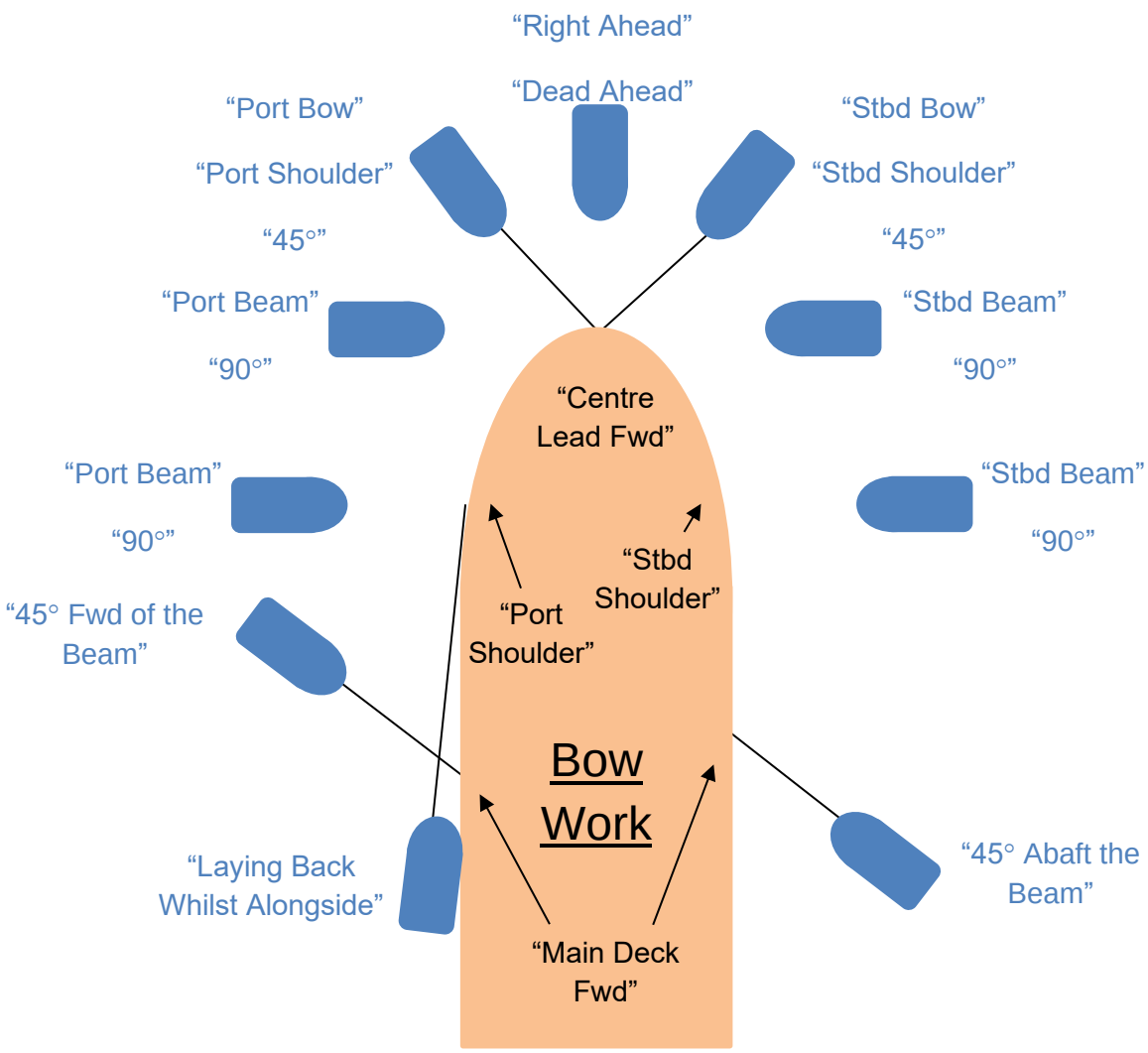
"On the (tugs name), stand by for a lift" Or "On the (tugs name), stand by to let go"

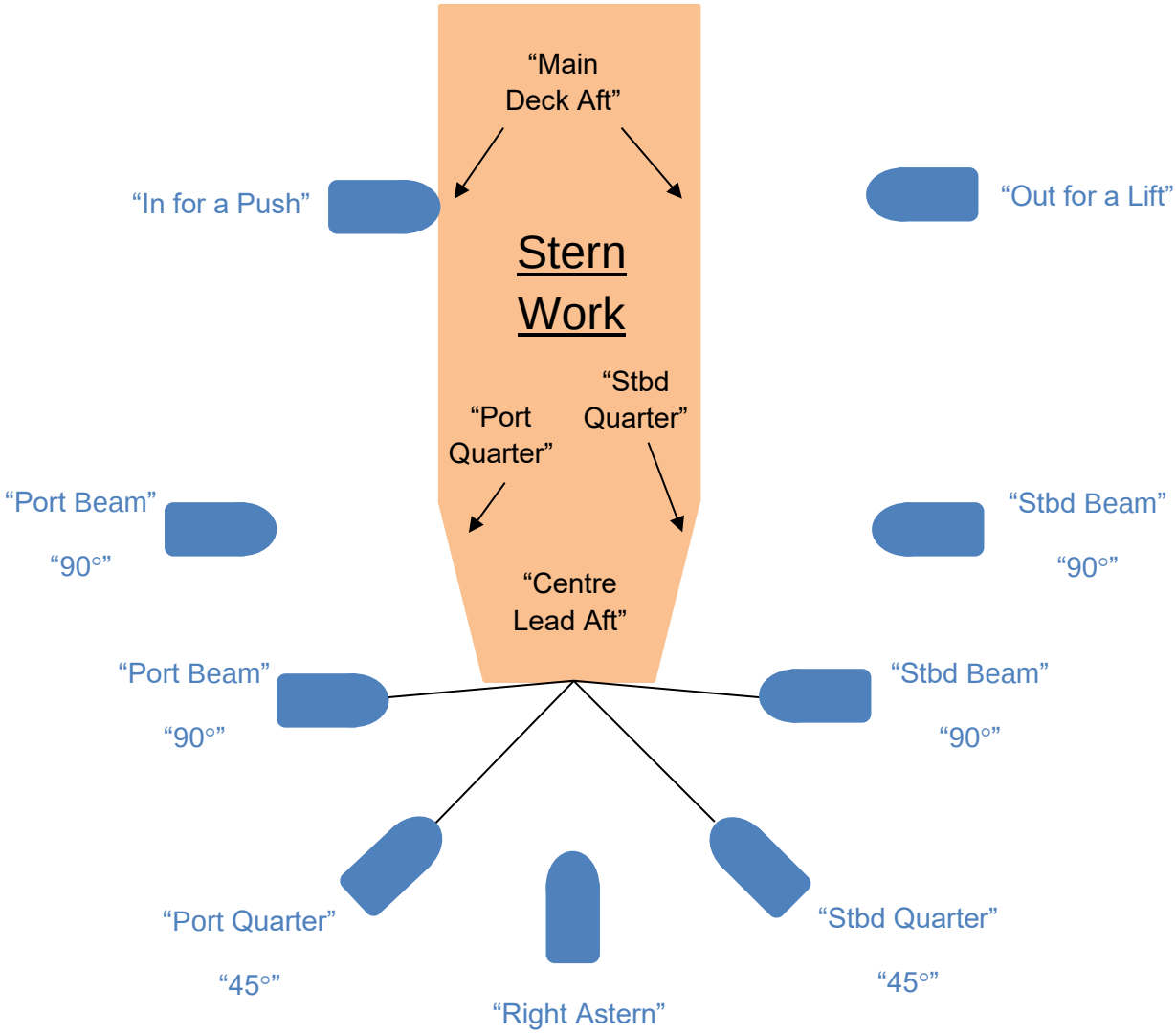
Tug Positions

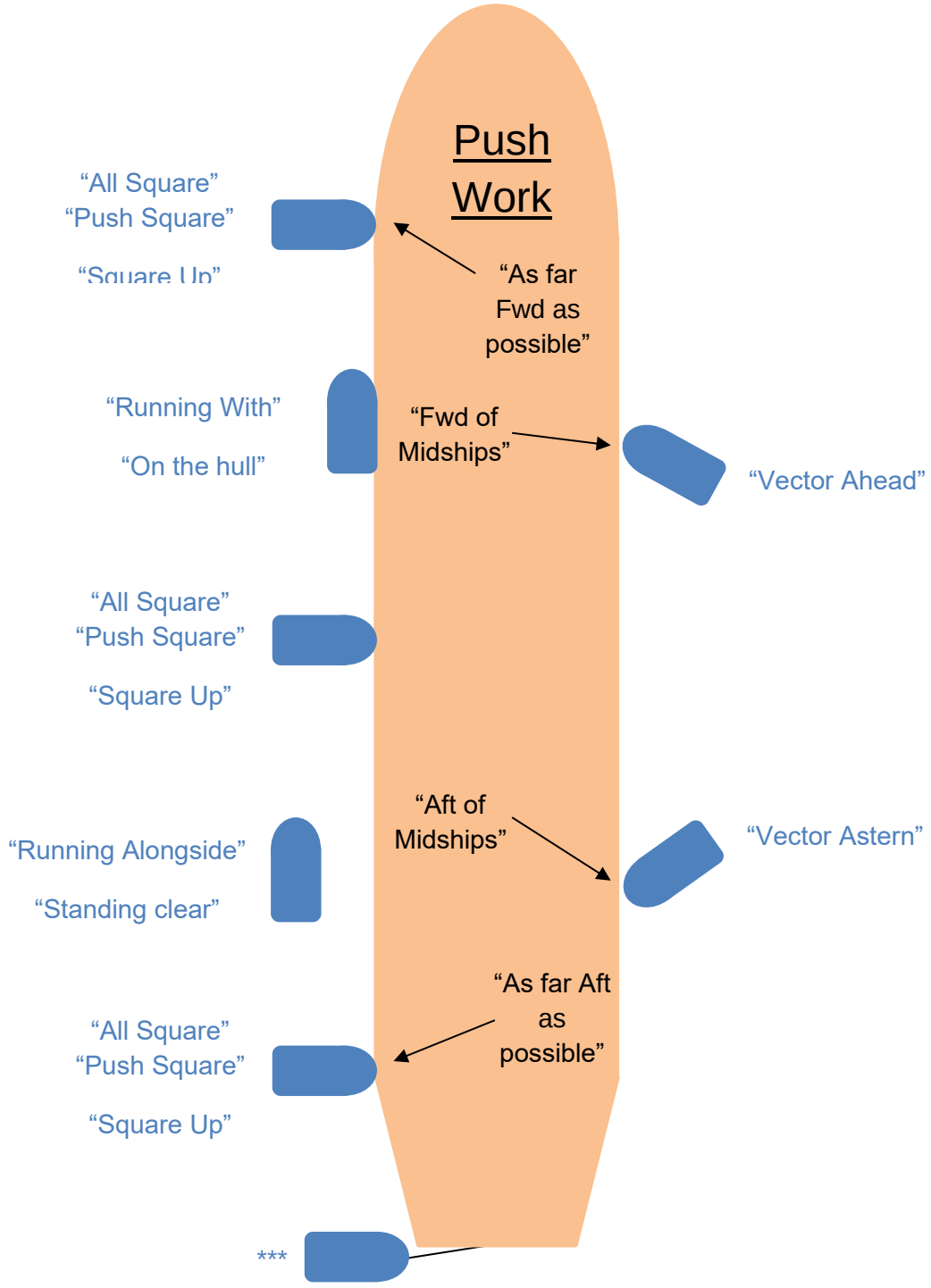
7.9 - Below is a series of diagrams showing various tug positions and phrases used for communication:

Black text within the ships outline indicates where the tug is made fast.

Blue text next to the tug indicates its position.







*** A tug that is made fast centre lead aft may be able to shorten their line and push on the very corner of the transom if there is sufficient clear flat hull to take the tugs fender. Any counter shaped stern though will rule this out. From there the tug is also ready for a lift once the line is re-lengthened. This could be considered where space is constrained at the vicinity of the quayside.

Fine Tuning

7.10 - Tugs on a tow line can be asked to adjust position beyond what's shown above by requesting the following:

"Favour the bow" – The tug should move towards the bow incrementally.

"Favour the beam" – The tug should move towards the beam incrementally.

"Favour the stern" – The tug should move towards the stern incrementally.

A suitable increment would be considered an adjustment of approximately 20 degrees of angle. After each movement the pilot will watch for the effect on the manoeuvre and if required request further changes.

A pilot could also request the tug to pull in the direction of a landmark or "up the middle" of a channel. This is perhaps more useful with smaller tugs who are looking out forwards from their wheelhouse, rather than with larger tractor tugs where the tug master is facing the tow line/ship and the landmark is physically behind them.

7.11 - Pushing tugs can be asked to adjust position beyond what's shown above by requesting them to "Move towards the Bow" or "Move towards the Stern". It often works well to give visual targets for the tugs. For example:

"Just forward of the accommodation"

"In line with the aft deck crane"

"Below the funnel"

Pushing tugs will of course still be limited by the flare of the stern, the flare of the bow and "No Tug" marked weak spots.

Minor Compromises

7.12 - When a tug is asked to "run with the ship, on the hull", such that a contact push is more immediately delivered if required, the presence of the tug resting alongside may unintentionally influence the assisted vessel. The degree of this influence will depend on the tugs position relative to the ships length i.e. pivot point, the speed and size of the ship, and the degree of leaning on contact made by the tug. A tug could be asked to "run (close) alongside but clear" to remove this influence altogether.

Requesting tugs to "square up and be ready to push" with a higher water speed is often not achievable. As the tugs turns in towards the ship a pushing force will be created due to the deflection of water flow around the tugs hull. It may be beneficial to not instruct the tugs to square up until the speed has reduced or until the pilot is at least ready for that pushing force.

If a push is required at speed the tug will utilize much of its power to hold position when square. A better practice is to first request the tug to "lean on" the hull and later square up as the speed reduces. When a tug is leaning on the ship, despite not being able to apply full propulsion force square the differential pressures created by the tugs hull (much like a large rudder) will make the push effective. The tug master will know their own tug and be aware of what speed they can safely transition from leaning on to pushing up square and will most likely carry this out gradually as the speed reduces.

Section 8 – Tow Line Disconnection

8.1 - Disconnection of the tow line can leave both the tugs and the ships deck crew vulnerably placed if weight inadvertently comes on a tow line or messenger at the point at which it is being handled.

8.2 - Asking the tug to confirm readiness for disconnection ensures that the tug is appropriately positioned and ready on deck for recovery of the line. Asking the ship's crew to gently lower the tow line under control will ensure that the tug has time to retrieve the line before it lands in a pile on the tug deck or with great length in the water.

A banksman is to be stationed at the rail with a clear view of the whole situation.

8.3 - Finally, the tug master will state when the tug is clear and no longer operating in the immediate vicinity of the ship. That may conclude the towage requirements, or the tug may be requested to accompany the ship for a further period. The pilot will make it clear when the tug is no longer required.

Section 9 – Useful Hyperlinks and Further Resources

Southampton VTS Notices to Mariners

Southampton Port Users Information and Navigation Guidelines (PUNG)

European Tugowners Association

British Tugowners Association

The Workboat Association

Marine Accident Investigation Branch - GOV.UK