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Changing the Fleet – New Vessels, Same People

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SYNOPSIS

In 2007, Serco Ltd won a long contract from the UK Ministry of Defence (MoD) which built on the previous years of marine services work. The expanded contract scope requires delivery of multi-activity marine support to the Royal Navy with some services required worldwide.

Delivery of this contract is in a non-competitive environment, but has required the purchase of the MoD-owned legacy fleet and delivery of a new build programme of more than 30 new vessels (valued at approximately £168m at award of contract). This ambitious build programme includes a suite of 10 new Azimuth Stern Drive (ASD) and Azimuth Tractor Drive (ATD) tugs. This requires tug crews to cross deck from both Voith and conventional tugs to azimuth propulsion, embracing new methods of working along the way. The tugs are being introduced into service within the tightly regulated environment of the three UK naval bases, and Serco has worked hard to provide assurance to the Royal Navy that these tugs are fit for purpose.

Fundamental to this process is the effective training of tug masters and crews to be competent in the safe operation of this new generation of tugs.

This paper aims to describe the events that have initiated and influenced this programme of change. It seeks to focus on the human issues relating to the training of tug masters and concludes by highlighting the lessons learnt so far. *ITS* colleagues within the wider towage industry will hopefully gain benefit from our experiences. The views expressed are my own and are not necessarily those of my company.

INTRODUCTION

Tug training, and especially tug conversion training, from conventional through to omni-directional propulsion systems (Voith and azimuth) has been a universal challenge for the towage industry for the past 30 years. In the 1970s, the UK Ministry of Defence introduced the first generation of omni-directional tugs into the Naval Dockyard Ports through an evolutionary process. Single Voith were followed by twin unit propulsion configurations, with a gradual replacement of conventional screw tugs of various sizes. This change process is now being repeated with a programme of replacement with azimuth propulsion in three new classes of ASD/ATD tugs.

In the towage industry, each generation of tug type has seen an incremental increase in power with respect to displacement ratios, with a similar decrease in the average physical size of harbour tugs (now generally built to 30m or less). In parallel, the handling skills required of the operator have had to improve as these changes in both the size and power of tugs has markedly decreased reaction times for tug handlers. These same factors have directly influenced changes in tow line equipment and handling practices. There has been a shift away from towing using ships' ropes secured to tug bollards or on to tripping type tow hooks, to tugs equipped with robust towing winches, initially fitted with wire tows and, in recent years, with synthetic (plasma) high-breaking strain HMPE ropes. Crew complements have been reduced as a direct consequence of these evolutionary factors in tug design. Other advancements have been made in marine engineering plant and control systems with a progressive shift from medium to high speed diesel plant.

The Australian *McCoy Report* was commissioned in 2001 by towage companys' to determine the lowest safe manning achievable on ASD harbour tugs. It broadly concluded that de-manning from four to three man crews was achievable on the specific criteria that it was limited to tugs fitted with modern towing winches and equipped with rope towlines[1].

BACKGROUND TO HARBOUR TOWAGE FOR THE ROYAL NAVY

As a dedicated towage service to the RN, the evolution of the tug fleet now operated by Serco has been driven throughout its history by changes in warship design and fleet composition. By the early 1980s, the heavy cruisers of the 1940s and '50s had given way to more lightly constructed and faster frigates and destroyers (typically 4,000 to 6,000 tonnes displacement) and to much smaller aircraft carriers. Naval propulsion systems changed from heavy oil steam plant over to gas turbine technology with nuclear propulsion displacing electric in

the submarine fleet. This has produced modern warships that are more manoeuvrable in constricted waters than their predecessors, which had reduced reliance on multi-tug assistance for hot (with ships' power) berthing and sailing evolutions. In contrast, the manoeuvrability and size of submarines has moved in the other evolutionary direction, with nuclear-powered boats replacing those propelled by conventional twin screw. The modern submarine has its propeller behind the rudder which makes handling in confined waters somewhat difficult and is mitigated by the use of tugs ideally equipped with underwater fenders whenever available.

Photo: Arie Nygh

Submarine movement in Scotland.

OUR TOWAGE SUPPORT BUSINESS

In general, the conduct of safe ship assist port operations requires relevant experience, teamwork, good communications and knowledge on the limitations of both the ship being attended and the tugs supplying assistance. Movements of warships and auxiliaries additionally needs an awareness of the peculiarities of these long, thin-skinned, light displacement vessels which are highly likely to have other 'constructional' hazards such as protruding stabiliser systems. The safe movement of naval vessels by tugs always demands a careful assessment to be made in both naval bases and commercial ports alike.

In our sector of the towage industry, a strong professional relationship has always existed between tugmasters and pilots. Admiralty pilots hold a licence issued by the Queen's Harbour Master (QHM), and they undertake pilotage acts on his authority. Up until 1996, the MoD tug masters also provided the certificated admiralty pilots as a secondary role for senior tugmasters and those involved had to follow a competency-based training route lasting two years, in order to gain their full licences. Initially, they were required to be in full charge of a tug for a minimum of 120 major ship movements before sitting the first national examination. Unfortunately, this excellent and professional relationship was split apart when the service was privatised in 1996. The ramifications of this decision have resonated to the present day as it 'broke the mould' on what was a fairly unique, complementary vocation as a tugmaster/pilot.

Photo: Arie Nygh

Single Voith tugs cold moving an MCMV (Mine Countermeasures Vessel).

In our somewhat fussy naval port business, ship movements have designated as either 'hot' or 'cold'. In a 'hot' movement, the ship will have its own engines, rudders and thrusters available. The tugs assist with the move with a pilot embarked to advise the commanding officer. Arrival and departure movements are normally 'hot', as are certain other movements, such as to and from mooring buoys. In a 'cold' movement, the ship will have no motive power, and at least one tug will be secured in such a manner to be considered a composite unit under the terms of the International Collision Regulations. In such circumstances, the ship will be moved entirely under the tugs' power and a pilot will carry this out on behalf of the QHM.

This has required a positive system of control orders to be developed especially for the tug secured alongside the warship as the 'prime mover'. The pilot is stationed remotely on the warship and has to drive the ship with tugs by passing commands to the tug master who is effectively controlling the attached engine room. The tug is normally secured tightly to the stern of the ship with three towlines and with omni-directional units positioned in clear water. The tug controlling the bow has to be agile enough to move its directional pull to and from each side as a common manoeuvre in Naval Dockyards (built in Victorian days) are movements to and from restrictive docks and basins.

A specific requirement on the legacy fleet of tugs that Serco now operates, is the need to meet the exacting operating requirements of the Naval Dockyard Ports Safety Management Systems which include strict compliance with nuclear site licenses and regulations. Thus, the number of tugs assisting RN and auxiliary ships is normally greater than found in commercial ports. Naval support tugs adopt commercial designs, but require a sensible balance between bollard pull and agility in manoeuvring so as to provide directional power during restricted movements around the

waterfront berths and inside basin areas. For such complex operations, the manning requirements require crews that are suitably qualified and experienced personnel (SQEP). Towage tasks are always conducted under the safety management of the Queen's Harbour Master when inside the statutory governed Dockyard Port areas. Generally the manning scenario reflects this heightened safety case regime, by raising the level of crew above the industry norm.

The marine organisation that Serco fully inherited in 2007 (formerly the Royal Maritime Auxiliary Service) has a long history of harbour towage in naval ports in the UK and countries around the world such as Singapore, Bermuda, Hong Kong and Malta etc. In the UK, the Ministry of Defence towage fleet was gradually modernised and increased in size between 1960 and the early 1980s. This build programme phased out large steam-powered paddle and conventional diesel CPP tugs, and provided a renewed mixed fleet consisting of modern twin screw harbour tugs and single Voith water tractors. This programme culminated with the introduction of a fleet of modern Voith twin unit tractor tugs as the prime ship assist towage assets. These remain in service today in all the remaining Naval Bases in the UK and at Gibraltar.

Until the early 1990s, the fleet also included large sea-going tugs (R Class) which were in service primarily for sea towage duties and salvage, but were also used for some harbour movements when 'weight' on the bow was required.

Photo: Arie Nygh

Voith twin unit canal transit of aircraft carrier.

The last new tugs to be built within the legacy tug fleet were as a direct consequence of the TRIDENT submarines entering service in the Royal Navy in the early 1990s. It was pre-determined that these very large nuclear submarines would need specialist submarine berthing tugs to manoeuvre them around their new handling facilities being constructed at the submarine base in the Clyde. After design consultation, two 40-tonne bollard pull IMP Class ASD tugs (34m), to a naval specification incorporating a unique underwater bow fender arrangement for submarine berthing operations, were ordered from Richard Dunston in Hull at a cost of approximately £5m per tug.

IMP Class ASD built in 1991.

MODERNISING THE NATIONAL TOWAGE FLEET – OUR ORIGINAL APPROACH

The original proposal for new tugs was first formulated in 2004 and formed part of the overall technical solution for the Serco bid for the *Future Provision of Marine Services* contract. This covers a wide range of marine support activities, of which towage in the naval ports is one of the services required. As part of Serco Denholm Ltd, the company were the despondent owners and operators of the legacy fleet and had access to good technical knowledge. However, it was considered important to provide the customer with a coherent, logical and technically robust case for the replacement of existing assets across the fleet, as the overall procurement of new vessels was funded under the contract terms and conditions indirectly with public money.

In order to achieve this, we devised a technical model by which, through common factors, the remaining life and costs of operating each vessel could be determined, capturing both vessel maintenance and crew costs. Our criteria were designed to be as non subjective as possible and were broadly based upon classification society rules, IMO and EU regulations and condition reports. It will come as no surprise that the operational considerations of the replacement of tugs related closely to potential reduction in crew numbers. The reduction of one crewman gave an average saving of nearly £1m over the 15-year life of the contract, making the multiplication effect of reducing crew numbers within a crew shift pattern very attractive indeed. Overall, the model did its job, and its output was carefully balanced against other operational issues, resulting in a taught technical solution to this multi-activity marine business.

Our original proposal concerning towage was to:

- Rationalise, modernise and improve the existing tug suites in each naval base to achieve a balanced tug fleet capable of attending both submarine and the full range of surface ships up to and including the new aircraft carrier (CVF) at 45,000 tonnes displacement.
- Meet concurrent tasking through agreement and

de-confliction on a prioritised basis. Towage services includ other tasks eg the movement of lighters, compass swinging of ships, target towing and laser ranges, positioning berthing aids, attending sea ranges and ship movements at remote locations.

- Progressively move from the current suite of Voith Schneider tugs to azimuth propulsion systems in each naval port as a national standard, in order to provide a controlled evolution from one omni-propulsion system to another.
- Introduce new tugs with an increased bollard pull to ensure adequate collective power for the new larger RN/RFA amphibious units, but to reduce the number of tugs required as a quid pro quo equation.

We created a new build procurement plan for tugs that was structured to be a progressive change at each location in order to enable tug masters, pilots and crews to become familiar with azimuth propulsion systems over a phased programme of replacement in the first six years of the contract.

In order to inform and educate our pilot colleagues with further information on ASD tugs, we actively engaged in debate and arranged a fact finding-trip to Canada (Halifax) for the chief pilots to observe these types of tugs in ship assist operations. Our competitors offered a similar opportunity with a visit to Rotterdam hosted by Smit.

WHY DID WE CHOOSE AZIMUTH PROPULSION FOR A RENEWED TUG FLEET?

At the start of the project, we had to become educated on what was current best practice in the towage industry. Our proposals were based upon advice and consultation taken from within the UK and international industry. We visited and appraised tug operations in Vancouver, Canada, Turkey, Australia (Defence Marine Services Pty), the USA and the Netherlands. We consulted with designers and builders such as Robert Allan Ltd, Sanmar and Damen. This process enabled us to investigate new concepts in tug design such as Z-Tech tractor tugs that were just being introduced into service in Singapore for container ship operations. This concept of tug design was greatly favoured by our 'practioners' as it could provide a common towage asset for concurrent tasking. Within the UK, we consulted with colleagues in the British Tug Owners Association (BTA) such as Svitzer Marine Ltd who ran continuous procurement across its worldwide fleet of tugs.

We found that the main design factors that point the tug buyer towards the new generation of ASD tugs included consideration of the following:

- Modern hydraulics and control technology found operating together in azimuth control systems;
- The improved reliability and lower through-life maintenance costs of high speed marine plant that has created a move away from medium to high speed engines in tugs over recent years;
- The smaller capital construction costs of these smaller tugs.

These issues have no doubt been considered inside many towage company board rooms concerning new construction options. Serco did the same sums as others, and the choice of the ASD/ATD over a possible renewal of the aging Voith fleet was an early decision. Our proposed tug-building programme comprised of 18 azimuth drive tugs with a supporting cast of conventional powered tugs, multicats and workboats. This provided a common national tug configuration at each port comprising of:

Designation	Type of propulsion	Bollard pull in tonnes	Number required per port
Large berthing tugs	Azimuth Stern Drive	40 tonne	4
Small berthing tugs	Azimuth Stern Drive	20 tonne	2
		TOTAL x 3 ports	***18***

Figure 1: Original tug suite proposals in 2004

THE AFFORDABLE SOLUTION

The three years it took from submitting our proposals to the MoD (late 2004) to the contract start (2007) involved modifications to the technical solution due to affordability issues. One of the major outcomes of this poverty was a significant reduction in the overall new build programme from 58 to 30 new vessels.

These changes reduced the number of new tugs being built to:

- Three conventional twin screw (Damen 2608);
- Two ASD (Damen 2509);
- Four smaller ASD (Damen 2009);
- Four ATD (Damen 2909).

This had other repercussions in that it fundamentally altered the original policy of a complete type change from Voith to azimuth propulsion and forced a continuation of mixed fleets in most ports.

The accepted view of training on tugs is that you do not try and add handling skills, but move people on to the new propulsion system for a set period (eg six months) in order to programme the subconscious on instinctive reactions when operating in close quarters (the authors of references [2] and [3] outline this aspect in greater detail). We were then faced with a task we had sought to leave behind us, and needed to plan quickly to train existing crews onto the new tugs as an additional training package.

The revised towage mix was now going to be:

	Conventional	ASD	ATD	VOITH
Devonport	1 large 1 large workboat/tug	2 small	Nil	1 SUTT 4 TUTT
Portsmouth	1	2 large 2 small	2	2 SUTT
Clyde	2	2 IMP Class	2	Nil

Figure 2: Disposition of tug types in UK post new build programme (2011)

It was also decided that there was going to be an increased rate of building and delivery within a condensed new build programme covering just four years, with the majority of the new tugs arriving within half this time. This change was driven by the rising risks in procurement costs related to price volatility in world markets, such as steel. It also emerged that a contractual clause had been agreed by the company for all new construction to be accepted into service within a specified period (60 days) of delivery to the UK. This was to set a fast pace for the operational business to meet and relinquish the legacy vessels for re-sale once replaced by the new construction. All the new tugs would have to be trialled with crews fully trained to allow the tug to enter service within this two month period, which was perhaps a high risk decision made in isolation to our collective abilities to deliver. This is a lesson on the need for an inclusive and informed assessment to be made prior to agreeing to commercially binding arrangements totally reliant upon human factors.

The RN at an operational level, the three port QHMs and their pilots views on these changes also had to be managed. Winning of the pilot's confidence in the general operability of our proposed new ASD/ATD tugs had yet to be achieved and these latest changes did little to reduce their overall concerns. In fact, it emerged that the accelerated programme had just raised the risks tangibly for one of these stakeholders where three tugs were to be delivered in a three-month period. At the time of writing this paper, the gaining of their confidence remains very much work in progress, but has encouragement from recent joint training opportunities.

THE TUG TRAINING STRATEGY

Our original tug master training strategy was formulated to follow the established mentoring approach previously used on legacy tugs. This basically used a tutoring approach, with an experienced senior tug master in each port able to progressively train others after some personal external training. The structure of the programme was originally adequately spaced to allow for this progressive training to be conducted at low risk. We also identified the potential utility of simulator-based training as part of the original training strategy in 2004.

During the period when the changes outlined above were being decided, a somewhat ill-informed view took root within the joint senior management teams - that tug master training on azimuth propulsion could be delivered entirely b*ased* upon the use of a simulator. This was derived from a report on European based simulators produced by a joint Serco and MoD team the year before. It concluded that the FORCE Technology tug simulator in Copenhagen was the best in Europe and could deliver the necessary training of tug masters and pilots. From my own appreciation, I consider that FORCE has a good, if not one of the very best, technical tug simulators in the world. Its Tug Operations course was specifically developed over several years and forms part of a bigger tug master training programme in use by other towage companies. This course however, is aimed to round off the practical training of tug masters by bringing them together with port pilots in joint exercises, and it is aimed at experienced students. It does not, therefore, purport or seek to teach basic tug handling techniques to complete novice tug masters. It is an excellent course for the right level of competent students.

I became responsible for this project in late February 2008, when I was chairman of the Technical Committee of the British Tug Owners Association (BTA). We had just completed work on the development of a set of voluntary towage endorsements within a working group consisting of members of the towage and workboat industry and the Maritime Coastguard Agency (MCA). The MCA wanted to address training in the towage industry, as it had come to recognise that several serious recent incidents in UK waters had involved harbour tugs, some unfortunately with loss of life, and a review of standards was necessary. I had a good appreciation that a week in a simulator was highly unlikely to produce a competent or *confident* ASD tug master. Given the increased risks which emerged in the revised building programme, I re-drafted a training strategy for tugs, and this process showed me that we needed a combination of hands-on training, supported by appropriate simulator training followed by several months of consolidation training aboard an ASD/ ATD tug. Time was wasted and concerns heightened within the whole towage community due to the delays experienced. We needed to get some momentum on this revised programme with considrable urgency.

Very fortuitously, at *ITS 2008* in May*, Seaways Consultancy* and *Serco Marine* were introduced in the guises of Arie Nygh and myself. Arie explained his competency-based tug master training system and I returned to the UK totally convinced that this was exactly what we now needed to train our 40 tug masters and mates properly on ASD/ATD tugs to meet the new deadlines.

After drafting a revised strategy around the Seaways *Tug Master Training Programme*, I was fortunate to gain swift internal approval. It was agreed that the Force

simulator training should remain a component of our revised training strategy. In December 2008 we sent a joint group of tug masters and pilots to Copenhagen to evaluate this course. Suffice to say, this training now continues in synergy with the 'core' SeaWays training modules. Before attending, tug masters have to complete their initial training module and the pilots undertake a three day ASD/ATD familiarisation course which Serco runs on their behalf. This strategy is endorsed by the Royal Navy's *Dockyard Ports Advisory Board* on which sat the Queen's harbour masters and chief pilots. An agreed training strategy was now in place, but with barely 12 months left before the first ASD arrived in Portsmouth at the end of Oct 2009.

An early constraint was a classic *'Catch 22'* situation – new tugs on the way from builders, but the need to conduct training prior to their arrival – so how to train without tugs? In the autumn period prior to the start of the practical SeaWays training, we had to somehow gain some traction in our understanding of basic ASD handling dynamics, either on the Scottish based 17 year old IMP Class or on a simulator.

We decided to revisit the 2007 simulator study and paid a visit to Transas Marine UK Ltd, located conveniently up the road in Portsmouth. This turned out be the start of what has become a close relationship with Transas who rose swiftly to the challenge we had set and fabricated an ASD tug module that they plugged into their bridge simulator. The ergonomics of this bridge were somewhat oversized for a tug, but were offset by the fact that Transas had an existing contract with the RN and already had all the UK Naval ports and ships on their large database. We were therefore able to set down a virtual ASD tug in a familiar port environment and began to develop some good basic understanding of azimuth controls. This period was very much a case of the blind leading the blind, with myself and the un-trained training masters alike, only a step ahead of colleagues, but it served its purpose and started the overall learning process. This initial simulator training has continued to be highly beneficial in providing all trainees with a basic understanding of ASD controls and propulsion systems, and has been a well-used element of the overall training regime ever since, as it has been used to teach selected exercises from the wider competency-based programme.

I would suggest that these sorts of resource issues are not unique in our industry, where availability of tugs on which to train will always be constrained by operational and commercial pressures. They pushed us in particular, into using simulator-based training at an early point in the programme, and in my view, there is a growing need for simulation training to move to a new level in terms of ergonomics, technical accuracy of interaction forces and visual realism. Most importantly, the improved simulator can be made to provide a consistent instructional approach with a seamless move from simulator exercises to a tug and back again. Simulator-based 'type rating' training, as found universally in the aviation industry, can provide a verifiable training standard to meet the statutory requirements on training that ISO, ISM, STCW 95 and the new Maritime Labour Convention demand. In aviation, they initially train pilots on new aircraft types on the ground in a flight simulator and not in the air on the actual aircraft. I believe our industry needs to emulate this approach when training people to safely operate tugs.

COMPANY TRAINING MASTERS

As mentioned earlier, the use of a mentor approach with the trainee following a task-based structure over a period of six months was our initial tug training methodology. This arrangement worked well when bringing individual trainees into a stable tug fleet. It served to develop the tug handling skills concurrently with gaining the detailed local knowledge of each port and provide an understanding of local towage methods. With the sheer volume of training (50 tug masters), we were faced with over the next two-three year period, this approach was never going to deliver the required standards in time.

In the period prior to SeaWays coming into the UK to commence our training programme, Arie Nygh and I had many email conversations on how we were going to try and achieve the impossible. It became obvious to us both that the role of the company training masters was going to be critical to success. The SeaWays standard for azimuth tug operations is probably the highest in the world, and by this time had been achieved by more than 120 tug masters. With our high volume of trainees requiring the full package from SeaWays, it was agreed in principle that we would have to train the training masters so that they could themselves prepare trainees for external competency assessments between a programme of four-six monthly visits by Seaways. At that time, we had a single training master in the whole company based at Faslane (Dave Ferrier) and we had two volunteer tug masters at Portsmouth – Steve Sandy and Bob Wilkinson. Dave already had ASD time gained over several years on the IMP Class ASD and had developed a good driving style. He was actively engaged in trying to help colleagues to improve their own handling skills over the preceding two years with some notable success. Faslane operated a mixed fleet of Voith, ASD and conventional tugs with crews required to man all types of tug. They were suffering already from the demands of this polyvalence in handling skills across the range of tug types being operated on a daily basis.

SeaWays arrived in January 2009, by which time I had three out of a possible four trainee Training Masters (TM) identified. I decided to undertake the initial training master instruction myself in place of the missing fourth tug master. This turned out to be a good decision as it has equipped me with a clear appreciation of the standards we seek from our

people. It also demonstrated why skills have to be practised on a regular basis as later, my time away from the controls on management duties, highlighted to me the natural degradation in skills such an absence naturally creates.

The subsequent month spent undertaking the SeaWays training on our two 'aged' ASDs in the Clyde was very demanding and hard work, but an incredibly inspirational time for all of us. These old tugs had developed some interesting handling challenges of their own with significant wear in the analogue control systems creating engine revs/min stability issues for the trainee and trainer alike.

SeaWays departed in February having delivered all the necessary skills to allow the TM team to take this momentum into a continual training programme based initially around the IMP Class in the Clyde and in the tug simulator at Portsmouth concurrently.

Serco Tug Master Training team, February 2009.

MODULE 1
ASD/ATD handling

We commenced internally training in earnest in March last year. The SeaWays training system is based upon a structured approach, which culminates in trainees being examined against clearly defined non subjective competency standard – the *Competency Check.* This simple test objectively measures by ability, the handling of the tug on a timed circuit of manoeuvres within 30 per cent of the TM's time on four consecutive circuits. It is a great leveller for an existing towage company staffed with experienced tug captains and is a simple antidote to those people who talk the talk but can't walk the walk. There are those tug masters that have natural abilities, and then those that have to build their skill set progressively and take longer to achieve the same standards. This really does not matter in this competency-based training programme as it is designed to cater for all abilities. Importantly for both a towage company and a Port Authority, such an unambiguous training system provides their safety management systems with a fully verifiable standard of competence.

Serco Tug Master Training Programme

As we gained experience last year, we began to flesh out complimentary and core elements to our *Serco Tug Master Training Programme* into the following training pathway, shown on page 11.

Training in the Clyde – summer 2009

SeaWays returned in May to a make an assessment on the in-house training undertaken by the Serco TMs. By then we had issued SeaWays training manuals for this module to all our tug masters across the UK, and the initial tranche of trainees progressed at various rates. We offered up five tug masters for external assessment of which four were approved to the SeaWays standard with very little further polishing required. This gave a great boost to the confidence of the TMs and to the wider audience of senior management on both sides.

Operationally, we did not gain any particular relief from tasking when embarked on the Clyde training tugs and there were many periods of frustration when programmed training was precluded for various reasons. As the TMs began to experience this friction, we adjusted expectations and where possible switched training effort on to the Portsmouth simulator. It was a great credit to all those involved in making the roster changes required to allow the release of tug masters into the training programme, and without this buy-in from all involved, the training programme would not have progressed. The use of the simulator to maintain skills on those that had been signed off earlier in the year also became a crucial element over this extended summer period.

Unfortunately, we had a major setback when we lost one TM to another employer which serves to illustrate the fragility and risks in what we were attempting on such a large scale, where individuals are key to success. We are still managing this situation, but were able by November last year, to achieve the certification of 12 tug masters when SeaWays returned to commence the second phase of training. This put Portsmouth into the right training posture to receive its first ASD (***SD Independent***) and first ATD (***SD Reliable***) in November and December 2009.

Photo: Arie Nygh

***SD Reliable**, ATD Damen 2909, arriving in Portsmouth from build.*

Engineering training

In order to mitigate the risks of our marine engineers being able to step aboard the new Damen tugs and run them up competently, we had to indentify similar

issues of competence that the tug master training was addressing. A training engineer was appointed to co-ordinate this specialist training. We identified and purchased a portable ASD engine simulator software package from Transas which had a series of exercises loaded onto a laptop computer. This was circulated afloat for computer-based training of engineers.

This training system essentially provided a series of exercises relating to the modern plant layout found on a typical ASD tug. It is easy to forget that engineering colleagues were being asked to make a large transition from old plant to modern, computerised systems.

This initial familiarisation training on systems lead on to the booking of OEM delivered engineering training courses from both Caterpillar (engines) and Rolls-Royce (azimuth propellers) that was coordinated with the arrival of the first new Damen tugs in November 2009.

Crew training

An established company procedure (no doubt common in many other towage companies) is crew orientation and familiarisation training on joining a 'new vessel' – that is, new to the joiner. This procedure follows a standard syllabus of on-board safety related training (eg fire-fighting, life-saving and man overboard). However, the new tugs were fitted with entirely modern equipment in all departments from the galley to the deck with rendering towing winches, trainable fire monitors, hydraulic lowering masts etc. Time had to be factored into other programmes to enable the whole crew the time and space to cross deck from their legacy tugs on to the new vessels. Specialist training on winches and hydraulic cranes was also required and had to be arranged. This was all necessary training but it ate into the available time to train tug masters.

Crew training had been made harder by another hidden cost saving related to the new build programme. Each new vessel was delivered with full drawings and OEM manuals. However, the company had decided not to have specific operating manuals written by the shipbuilder. These would have provided new crews with the *quick guide* to each vessel and would have greatly helped structure and accelerate on-board training. This oversight (again driven by financial constraints), introduced a lot of friction and slowed down the crews' ability to learn how to operate their new vessel. It was yet another factor delaying tugs getting underway for training and into service.

MODULE 2

Undertaking harbour towage

During recent weeks, we have moved the Portsmouth tug masters on to the second module of training on their new tugs. Before this however, SeaWays had to again train the trainers and our two TMs were back as students learning to handle these brand new tugs. This was coincidental with crews learning their way around these new 'ships'. The delivery of the new tugs into the port raised external pressures with the pilots, in particular wanting (quite rightly) to see these tugs being trialled within their ship movement tasking. They were also keen (as were we) to begin practising commands that had been developed for ASD/ATD tugs for the control of azimuth units during cold movements. This was still a high risk area for them – and us.

We were fortunate to be able to demonstrate to a wider audience the abilities and utility of the ASD and the ATD tugs when asked to assist in the berthing of ***HMS Ark Royal*** as she arrived back in Portsmouth for Christmas leave. A great public relations exercise and somewhat emotional for some of us.

Conflicting demands had to be constantly managed to minimise the operational frictions that conspired to draw off resources from the training programme. Observing third parties had to be made to understand that project plans on paper were constantly vulnerable to a wider range of factors with a modicum of technical understanding and flexibility required from all involved.

By last December, both the TMs and four other Portsmouth colleagues had successfully completed this second demanding training module conducted by Seaways. Training activity on this module continues throughout this year.

Vessel trials and assessment

Since the start of the contract in 2007, Serco has (to date) taken delivery of a total of 15 new build vessels and introduced one existing vessel into service under its integrated management system procedure for new build vessels – OPS 408 process. This new process has been introduced to facilitate the acceptance of vessels new to a port to enable sign-off of the platform operational safety case. It consists of the following elements:

New build supervision

A key element in the successful delivery of any new build project includes:

- The finalising of the contract specification;
- Plan approval;
- Supervision during hull build;
- Attendance during vessel commissioning and harbour trials;
- Witnessing sea trials, technical acceptance and post delivery inspection.

Platform Issues Logs

These are live documents that are populated by the assigned project engineer with outputs from meetings, changes to design and issues arising during the build process. The Platform Issues Logs are updated on a regular basis. All issues raised during the design review processes that could not be 'designed out' have been transferred to the Operational HAZIDS logs.

A vessel HAZID

A key milestone in the acceptance process is the vessel Hazard Identification (HAZID) which is completed by a team of Suitably Qualified Experienced Personnel (SQEP) made up of a minimum of a master, engineer, crew members led by a safety manager.

For the first of class vessels the HAZID was conducted during the latter stages of vessel outfitting, whilst for the remaining vessels of that class the HAZID was undertaken on arrival at the vessel's home port. This philosophy is at present under review as it is acknowledged that work procedures for the new harbour tugs could well differ from port to port.

OPS408

In outline, the Serco OPS 408 procedure has an emphasis on the two key elements:

- To use existing vessel tasking to identify the trials new build trials programme;
- To prove issues carried over from the platform issues logs at the design stage.

As the programme expands with the delivery of vessels of the same class, the OPS 408 assessment forms derived at other ports are made available to prevent unnecessary duplication of form filling and trials.

Vessel user groups

It became evident, as the arrival date of the new tugs approached, that the crews were frustrated that information was not being passed on, and that they felt that there had been little involvement in the new build delivery process once the design reviews had been completed. Concerns over the resources required to bring the vessels into effective service, highlighted that all of the rostered crews would need to be trained.

This forum now aims to make sure that operational staff and management are engaged in the process. Their terms of reference and the principle tasks are to: *"Formulate and agree the operational trials programme prior to the programmed delivery date of each new vessel intended for tasking in the provision of Marine Services. This programme is to be aligned upon the functional roles of each new vessel as determined by the Design Review process….."*.

SUMMARY OF LESSONS LEARNT

Due to the necessity of a narrative style for this paper, it has been difficult to provide the reader with anything other than a commentary highlighting the problems encountered. Here is a brief summary of the main lessons I consider have been learnt to date:

- It is important to identify and understand both the human fears and likely resistance to change that resides within a group of people used to operating within a comfortable environment. We failed to address this until late in the process. This raised the stress levels in key individuals (tug masters, engineers and pilots) and it created high risk factors as staff felt that matters were out of their control;

- To engage the practitioners (the doers) within the selection and design process of a new vessel at an early stage, and to maintain this involvement through to the vessels successful delivery into service. The current training programme has belatedly given some of this vital ownership back to crews and has begun to win hearts and minds as a direct consequence;

- The delivery of new vessels requires the appointing of a local project manager who has strong organisational and leadership skills. The hazard identification on new vessels needs to become extended from the initial shipyard phase to include first-of-class vessels with the early nomination of a vessel lead master and engineer in each port. These weaknesses remain;

- Well-developed technical solutions should not be modified independently by third parties as this will not produce technically achievable outcomes. We have been managing unrealistic commercial targets that are heavily reliant on key people attaining new skill sets. This is a very high risk strategy in any industry;

- Introducing new vessels must not assume that crews can self-learn their departmental areas without a structured programme of on-board training. In our case, financial constraints prevented the purchase of ship operating manuals from the builder and this delayed the introduction of the tugs into the training and trials programmes;

- Training programmes must be aimed to deliver competence and confidence in equal measure within structured programmes that are effectively and adequately resourced. We have been fortunate in identifying a world class external training company and in equal measure, extremely lucky in selecting the right personalities to provide the in-house training elements;

- Simulation training should be considered part of a training programme when preparing crews to operate new vessels and systems. Tug simulators can be developed further to provide initial and continuation training at low cost and risk. Without supporting simulation facilities, the Serco tug master training programme would not have progressed as far as it has over the past 12 months;

Photo: Transas Marine UK Ltd

Simulator view of No 2 Basin in Portsmouth with a virtual ASD Damen 2509.

- Lastly, there is perhaps no better teacher than experience. "The way to get started is to quit talking and begin doing" – *sic Walt Disney.*

CONCLUSIONS

Training is a very human activity and cannot be project managed to deliver successful outcomes by set deadlines that are totally reliant upon the individual's ability to learn new skills at their own pace with confidence.

The role of good trainers is fundamental to the successful delivery of any complex training programme that requires practical skills to be transferred by one human being to another.

The towage industry uses high-powered modern tugs, and the industry needs to have improved structured training processes that set definable standards of competence with annual assessed refreshment of these core skill levels. Without such processes in place and a strong commitment from towage companies, expensive towage accidents and more importantly, unnecessary loss of life will continue in our industry.

Photo: Becky Nixon

The growing cadre of SeaWays tugmasters receiving their certificates from the naval base commander, Portsmouth.

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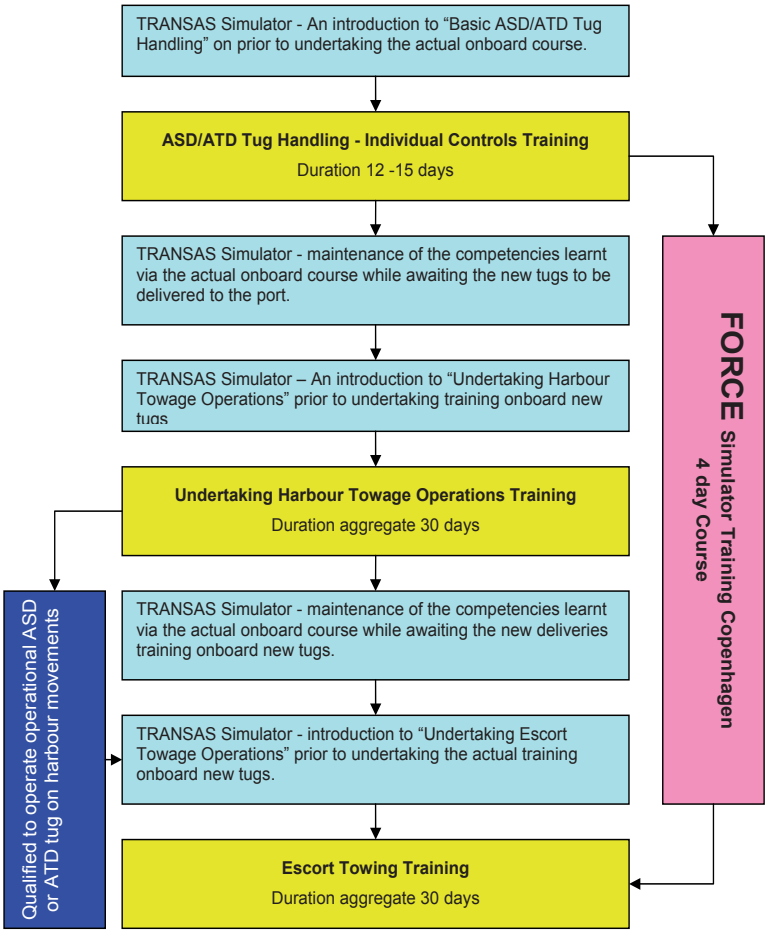

Figure 3: Summary of Serco Tug Training Programme.