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Preamble ……

Anyway - today, I have been asked to speak on the whys and wherefores of groundings from a pilot's perspective. Now that's a strange subject to have to talk on because it's one to which I have to confess that I have no practical experience. Most harbour pilots don't I guess. Most of us have come to learn the sense of sticking to the well-known track rather than venturing off into new areas and then coming to grief. Indeed I think that most pilots would probably agree with the comment of an American harbour pilot who once retorted after being asked "Do you know where all the rocks are around here Pilot" – he said "No – but I sure as hell know where they ain't!"

So firstly I want to redefine the question a little and have a look at the part that harbour pilots play in ensuring that a vessel doesn't go aground, and the reasons why both we, and other mariners, on occasions fail. Then, secondly, I want to look at how these failures can be used by mariners in a more positive manner than they currently are – before moving on to consider a number of administrative changes – in New Zealand at least - that are likely to assist to this end.

For fail we do. We read about it in the papers and magazines. We listen to the scant details of the latest sea disaster on the radio bulletins and see pictures of oil-soaked birds and ravaged oyster beds on the television. We tend to take particular note when harbour pilots are involved, and some find the details useful to bolster whatever viewpoint on harbour pilots best suits their current needs. We oft hear trotted out the statement that "most shipping accidents takes place in pilotage waters" – which is generally accompanied by a plethora of self-serving remarks about the limited or negligible liabilities of pilotage services – or some complaint about monopoly pricing - or that we get paid too much relative to our skills. Personally, I rather wish we did.

The "Amoco Cadiz" scenario used by the NZ Law Society Advanced Litigation Skills course (in which I stand in the witness box to play the role of the Master, or alternatively sometimes as the Master of the tug that "offers" towing assistance) is a good place to start because it helps identify some of the factors that lead ships – with or without pilots – onto the shore. Briefly, the NZ Law Society scenario concerns a super tanker on a voyage from the Persian Gulf, via the Australian Bight to a final discharge port in Stewart Island New Zealand. The weather is awful across the Bight and the vessel incurs some steering gear damage that, according to the Chief Engineer, is being monitored and manually adjusted as necessary. The vessel design provides for no emergency steering arrangement. The Master considers whether to divert – but based on cost and availability of spares arguments he decides to continue the planned passage to the final port.

Nine days later, whilst on the original planned track in a vessel separation zone off the northwest corner of Stewart Island, the steering gear fails and the vessel commences a drift towards the landmass in the SE in the face of a NW gale and high seas. A message is sent advising ships of the

position of the stopped and disabled tanker. After a further 1.5 hrs the Chief Engineer finally pronounces the steering gear to be unfixable and the Master then makes attempts to keep his ship off the rocks. This he does by negotiating for the engagement of a tug and, at a later stage, preparing the vessel's anchors. He fails in his attempts, the tanker breaks apart on the rocks and there is catastrophic oil pollution. Why did this ever occur? Why was it allowed to occur?

Marine groundings are essentially the same sort of failures as aircraft crashes – so let's have a look at a few examples in the aviation world.

In the 1980s an air crash occurred between two 747s in the Canary Islands. A KLM 747 is waiting to take off whilst another 747 is approaching to land. Despite instructions to the contrary the 747 waiting to take off decides to commence its roll in the mistaken belief that clearance by the Tower has been given. It crosses the path of the landing 747 that is unable to take avoiding action and crashes into it. KLM immediately makes a call for its senior pilot / training captain to go to the Canary Islands to undertake an investigation of the accident. They find he cannot attend the investigation because he was the pilot in the KLM 747 taking off and is now dead. Why did the accident take place when the company's most senior pilot was flying the aircraft?

An Air Canada 767 requires fuel. The Captain fills in 30,000 in the appropriate space in the paperwork. The fuel is loaded and the Captain signs for it. Prior to take off, the instruments are checked and a fuel gauge is noted to be reading low. The Captain is aware that the required fuel has been loaded and puts the discrepancy down to a faulty gauge. Sometimes later the engines run out of fuel at altitude and the Captain, fortunately a skilled glider pilot, makes a subsequent un-powered descent and lands without any casualties. But why did the plane run out of fuel?

And finally, in 1978 a United Airlines flight suffers from a undercarriage problem when approaching a US airport to land. The Captain elects to put the aircraft into a holding pattern while he attempts personally to deal with the problem. The Second Officer, noticing that the aircraft is running low on fuel, advises the Captain of this fact. Despite the urgency of the developing fuel shortage, the Captain continues to focus almost exclusively on the undercarriage problem – eventually asking the Second Officer to advise him when there is fuel for another 15 minutes flying. The Second Officer says that there isn't even fuel for that time – at which point the Captain seems to forget the fuel shortage and returns to the undercarriage problem. One hour after the original undercarriage problem occurred the aircraft crashes killing 10 people – including the Second Officer. How could the Captain have arranged his priorities so poorly?

Ships have been grounding as long as there have been people at sea. The concept of a "Master under God" sprung from a need for ships to be totally self-sufficient at a distance, with a Master of all power and knowledge who was to be relied upon by both his employers and his employees for the safe progress and profitable completion of the voyage. The Master may or may not have been competent in his job - but the knowledge expected of him, and the specialised nature of that knowledge, led to the creation of heavy, top-down, shipboard hierarchies. And the problem with strong hierarchies is that generally, we don't feel empowered to buck them by questioning the guy at the top – even if we think that the decision - or the decision-making process - is flawed.

For instance - the Master of the Titanic ordered full speed ahead at night in the full knowledge that icebergs were reported ahead. The film suggested that the decision was without dissent and influenced by commercial pressure. When I was a Second Officer in the Cunard Atlantic Container Line, I noticed one calm dark night in the North Atlantic, a thin line on the radar screen. It looked like a return from a squall - or a current line. But was it? I followed the bridge standing orders and called the Master. He arrived on the bridge in pyjamas and dressing gown, looked at the radar, muttered "ice", turned to starboard and hit the leading edge of the pack ice at right angles at a full 21 knots. I didn't say a word. Not a word.

In the years that followed I relived that moment; admitting to myself that at the time I had had doubts as to the possible presence of unseen growlers, or bergy bits or perhaps just plain icebergs at the ice edge. We had no idea of the thickness of the ice pack and there was, in retrospect, a distinct possibility of damage to the ship. There was no need to go into the ice – we could have gone parallel to it for a while. There was no need to hit it at full speed - there was easily enough time to slow the vessel down for a more cautious approach. My silence reflected an acceptance of a strict hierarchical structure that did not countenance any questioning. I had unknowingly accepted the premise that a Cunard Master who had crossed the Atlantic for years could do no wrong.

The realisation that this hierarchical approach was not the optimal one was reached by United Airlines after its plane had crashed through lack of fuel. United Airlines promoted, trained and subsequently introduced staff to a flattened cockpit management structure that emphasised teamwork, the collaborative full use of all resources, and sound decision-making based on known information. Whilst the Captain remained in charge of the process and maintained responsibility for the ultimate decision, he and the crew adopted a different approach to a crisis situation. The approach was confrontational in style but designed to keep interaction open as long as possible - or as necessary. This new approach was initially termed Command Leadership Resource - but was later modified to Cockpit Resource Management (CRM) once the investigation into the Canary Island disaster had recommended the implementation of a Human Factors Awareness Course.

The realisation that human factors were at the heart of most air accidents offered an opportunity to investigate accidents using new tools. In the United Airlines crash it became clear that the Captain was not in the practise of listening and understanding what his Second Officer said. The Second Officer was a mere functionary there to assist as the Captain saw fit. The culture demanded that the Captain deal with the undercarriage problem on his own without taking the opportunity for the Second Officer's assistance. He failed to take proper note on the impending fuel shortage - and rising stress probably increased his concentration levels and narrowed his field of vision to a level where he may well have become dysfunctional and lost his listening ability.

CRM was revolutionary in the air industry and it resulted in a significant change of culture. Unfortunately for the 582 crew and passengers of two 747s at Tenerife the change did not come early enough. Investigations indicated that the KLM Senior Captain was held in such awe in the cockpit that his decisions had not been contestable. His decision to initiate takeoff in the face of instructions to the contrary could not, and did not, attract dissent.

In the early 1990s there was growing alarm at the number of accidents in pilotage or otherwise confined waters. Informal meetings between airline and marine safety managers had highlighted the

benefits of CRM, and from 1994 onwards, marine accidents started to be analysed in terms that were similar, but more developed, than CRM. This new approach was called Bridge Resource Management (BRM) and was designed to assist with the management of risk in marine operational situations.

BRM recognises that many accidents result from the "one man error type" – the error type that is likely to occur in a hierarchical bridge structure - and puts in place a system of active defences that are designed to protect mariners from these types of accidents. As its premise, it accepts that humans are fallible and that they are, and always will be, subject to limitations in their decision-making processes. BRM identifies the probable results of such human fallibility, and then goes on to offer a number of strategies that are designed to help the mariner overcome, or prevent, their occurrence.

Lets look at the Master's decision-making process in the MZ Law Society Advanced Litigation Skills scenario. Talk about hazardous thoughts – they was there all right weren't they? He knew that there was no auxiliary steering gear so one can presume he understood the probable catastrophic results of a full steering failure. He bowed in his decision-making to the hidden pressures of cost and delay. In the decision to continue to the final port he failed to factor in the possible effects of full steering failure into the appropriateness of maintaining a pre-planned course along a lee-shore, in gale onshore winds and up a separation zone which, in fact, he didn't actually need to use.

His decision to continue with the voyage as planned was premised upon assumptions that were not realistic. "It won't happen to me" and "I can do it" are two really hazardous thoughts that crop up in accidents over and over again. The thoughts "It can happen to me" and "What will happen if it all turns to custard" would have been a far better BRM approach – one that would have encouraged input from his Deck and Engine Room officers at the outset as to the most appropriate action to take. Once failure occurred he failed to recognise and set priorities which gave him the most time to avoid grounding – preferring instead to think more "happy thoughts" – those that the steering gear would be fixed in time for him to avoid the beach. Finally he failed to proactively communicate his problems, intentions and plans to shore authorities – preferring the reactive 'do-nothing" approach.

Inappropriate assumptions are a continual problem for others as well as mariners. The Captain of the 767 that signed for the fuel made the assumption that they were taking on 30,000 gallons. The actual fuel provided was 30,000 litres – substantially less. The fuel gauge was assumed to be reading low because the Captain 'knew' what quantity of fuel had been loaded. Harbour Pilots operate in the same physical surroundings and environments day after day, year in, year out. We perform the same boarding manoeuvres from the pilot launch; we go to the same berths and use the tugs in same manner. Pilots become experts in their port as much as sea-going mariners become expert in their coastal and deep-sea navigation. Inherently, this can be very dangerous indeed. If we leave ourselves open to the opportunities of real boredom and over-familiarity, it then becomes easy (particularly if tired) to fall into the simple trap of thinking "I can do it" or "it won't happen to me" – and then being totally unprepared for it when it does.

Lets look at these hazardous thoughts for a moment. *It won't happen to me*. How many of you drove to this conference? During your drive here, how many of you can recall positively considering whether or not the next approaching vehicle would cross the centre line and hit you head-on? And in

the event that you had considered it, how many of you had a planned evasive action in mind – or indeed had ever practised it? For the year 2001, 10% of all New Zealand road fatalities and nearly 20% of all New Zealand road accidents involved the factor of failing to keep left. *I can do it.* Some 30% of all New Zealand road fatalities involved travelling too fast for the conditions and a further 23% involved losing control of the vehicle. We all fall into the same trap – it's just that it happens in different ways to different people.

Conceptually BRM focuses essentially, but not exclusively, on passage planning and monitoring progress along that planned passage. As the vessel proceeds along the planned track, a closed loop system of communication is used to avoid any errors that may result from misunderstood helm and engine orders. A non-hierarchical bridge culture is encouraged so that staff feel enabled to challenge any deviations from the planned course and speeds. BRM specifically discourages Pilots from making assumptions because these can have severely adverse effects on the safe progress of the vessel. In the grounding of the All Trans at Bluff New Zealand. the poor sight lines from the bridge – due to the configuration of deck cranes - helped the Master and Pilot into confusion as to the correct identification of the next beacon around which the ship was to turn. Each identified a different beacon - but assumed that the other had seen and identified the same beacon as the one they could see. The ship turned early and went aground.

In practice BRM becomes a way of piloting life – in fact many of the lessons one can take from it are equally applicable in our normal day-to-day journeying. Voyage planning is required to be carried out from berth to berth. That's just fine, but of course the bit under pilotage is liable to deviate somewhat from what the vessel has already planned because the ship may be unfamiliar with the port practices. To cover this part of the passage then, the Pilot, once on board the vessel, provides Bridge staff with a planned passage that extends from the pilot boarding area to the berth. The planned route is discussed – together with proposed clearing distances from hazards, traffic movements, berthing procedures and any expected problems likely to be encountered on the way. From this Information Bridge officers are able to monitor the safe progress of the ship to the berth. It is the joint responsibility of the Master and Pilot to create an agreed shared mental concept of the proposed passage plan, and to encourage a Bridge atmosphere state which is both alert and prepared to challenge any deviations from it.

If there is no agreed plan then of course it is impossible to detect any course deviations a Pilot might take. This can lead to disaster - particularly so if the bridge structure is hierarchical and the pilot starts making ad-hoc course changes without involving the bridge staff**.** This was graphically illustrated in 1986 when a New Zealand pilot on the passenger vessel Mikhail Lermontov made a series of sudden course changes which were seemingly premised on assumptions as to the vessel's position, draft and under keel clearances. The course changes were navigationally unnecessary and remained unchallenged by the bridge staff. The vessel subsequently hit submerged rocks and sank.

Language compatibility between the Pilot and the ship can often be a problem – particularly in trying to establish an agreed mental concept of the proposed route. I can assure you that one of the most worrying signs for a Pilot is when the instructions given for boarding a ship are met with a mere "Roger" in reply. We know then that we are likely to have serious problems in establishing a BRM culture on the bridge. In such circumstances a "Yes, Pilot" does not necessarily impart any real understanding of English - and an assumption that it does can be dangerous. On one ship I piloted

recently, the Master was Philippine, the Deck Officers Russian, and Engineers and other crew split between Bulgarian and Rumanian. The ship's common language was officially English - but that seemed only marginally understood on board. The Master hardly understood me and I had no idea of what was going on or being said on the bridge since the Bridge Officers spoke Russian amongst each other. On another vessel the Master was Swedish, the officers Croatian, and the crew Goanese. When we needed to let go an anchor in a hurry, the Master was unable to make himself understood to the crew on the forecastle

I have to say that BRM generally works better with European crews than it does with Asian crews. European crews (which includes Australian and New Zealand crews) are not generally backward in coming forward. Power distances between Masters, Officers and Pilots are generally low – which leads to good communication and a willingness to speak out when there are concerns. In Asian and Pacific crews, however, there is generally a higher power distance between the Officers and the Master and Pilot which can lead to an general unwillingness to challenge and question what goes on. Some combinations of nationalities are worse than others – for instance - quite often there is a distinct lack of trust when European Masters sail with Asian or Pacific Officers, and sometimes one can feel something very wrong on the bridge when two Asian races in particular are sailing together.

BRM is dynamic – not static. Ladies, Gentlemen. You are a pilot on a ship leaving a New Zealand port. You have an Asian Master and crew with you, you have not discussed the planned passage with the Master, and the courses from the Berth to Pilot Boarding Area are not plotted on the chart. The approach to the final reach, which leaves the port, requires a slow turn to the left. You give the necessary rudder order Port (Left) 10 and the vessel starts its turn. Suddenly there is this almighty disastrous crash from somewhere out on the starboard side of the ship. What is your immediate reaction? Think about it.

Well for those that quite understandably rushed out to the bridge wing with the Master and Officer to determine the reason for the noise (which turned out to be a fallen gangway), I am afraid to say that the New Zealand Maritime Safety Authority (MSA) will be calling on you shortly to investigate your role in this grounding. The investigation will show that in the heat of the moment you forgot that you had a Port 10 rudder order on; that you were unaware that the helmsman wasn't going to question the order of the Pilot even if he could see land ahead, and that your vessel has just successfully continued its slow left turn to ground on the entrance breakwater. The outcome will make new recommendations that, as part of the initial Master/Pilot information interchange, a clear understanding is to be reached as to who is responsible for what in the event of an emergency.

Finally a few words about marine safety cultures. I firmly believe that mariners should be reporting all accidents, incidents, mishaps and close calls - for it from these that we are given an opportunity not to fall into the same traps. As Saadi said "Take warnings from the misfortunes of others that others need not have to take warning from your own".

Now, whilst I am not saying that the New Zealand Maritime Safety Authority directly wishes to achieve zero-error reporting as some sort of indication of the current level of maritime safety (like a move to a zero-fatality rate on the roads), I am saying that the current framework under which that organisation operates lends itself, whether it wants to or not, towards this end.

As many of you are no doubt aware, part of the principal objective of the MSA is to promote a safe maritime environment at reasonable cost. Two of its fourteen statutory functions are “To investigate and review maritime transport accidents and incidents” - note, not mishaps; and “To promote compliance with safety and marine pollution prevention standards in the maritime transport system”. The first function is a collegial approach designed to make the workplace safer, whereas the latter is a regulatory approach associated with a prosecution regime.

A mariner who has an accident, incident or mishap is required by statute (under penalty) to advise the MSA. The MSA is empowered to investigate – but only the accidents and incidents. The mariner may then face a safety investigation - which is just fine - but at the outset is given the “Blue Card” that advises him that what he says may be taken down and used in evidence against him. Having read it he is required to sign to that effect. My view at that point is that, if he has any sense, he should walk out of the room without any further comment whatsoever. That is what I would do. Under the current legislative framework I would offer no further assistance to any subsequent safety investigation run by the MSA.

If we accept the prime objective as a baseline, then surely it follows that all functions and policies of the MSA should be directed towards this end. It is, in my view, totally inappropriate for a statutory function to be incompatible with the prime objective. Yet the design of the current legislation sits these functions so uncomfortably together that indeed one might say that - with respect to promoting maritime safety - the MSA has been legislated for failure.

It is well accepted that the most appropriate aim for safety is not error elimination but error management. Mistakes will occur even in the most perfect of marine staff. Errors are not the issue – it is whether they are resolved or not and whether they have no consequences that matter. If errors do occur and a safety investigation takes place, then I can see no good reason at all which compels the MSA to place the names of the parties into the final public document. That, in my view, is a very poor policy direction that runs, once again, contrary to the MSA’s prime directive. The names themselves have no importance to safety purposes – they have relevance only to prosecution purposes and should be divulged only in the case of a prosecution being undertaken. There is a desperate need to increase the amount of no-blame error reporting because errors are fertile – they are the fuel for a safer system. Mariners, like aviators, need error reporting to be encouraged – not discouraged.

This applies at local level too. In 1997, officers on the New Zealand tanker Kotuku made a number of silly navigational errors that could, in other circumstances, have caused it to run ashore. The errors related to the sloppy reading and plotting of GPS positions up the East Coast of the North Island, and a failure to cross check with other navigational systems. The vessel ended up some 75 miles from its true position. The company involved had a safety policy of encouraging the reporting of accidents and incidents so that lessons could be learnt from them.

Following the company’s policy the Master filed an incident report with both the MSA and his Head Office. Both parties then investigated the incident. The MSA outcome was to suspend the certificates of the officers during the investigation and then require them to undertake BRM courses. The company’s outcome was, I understand, to demote the Master and sack the First and Second

Officers. Would staff be subsequently encouraged to report all incidents, mishaps and close calls on that company's ships? Would other mariners be likely to learn from these unreported errors?

One way around this legislative quagmire is to separate the MSA's safety and prosecution roles – leaving the MSA with one or the other of the roles - but not both. It seems to me to be more appropriate to combine all transport safety investigations under one roof with a statutory shield that prohibits the sideways movement of evidential disclosures. This would be similar to the way that the New Zealand Transport Accident Investigation Commission currently operates. Having said that, I am pleased to say that the Ministry of Transport is undertaking a wide spread "green-fields" policy review of the entire transport safety area with a view to gaining the Minister's consent this month to a new approach. The policy will be released sequentially for government agencies input and then for public submissions. This is serious patch territory so watch for the fireworks! With a different legislative base however, I am sincerely hopeful that New Zealand will be able to finally achieve the radical changes needed to significantly encourage no blame error-reporting. *[Note: 16.6.04 A complete reorganisation of the New Zealand Ministry of Transport has been completed – the results of which were made public on 17.6.04]*

To conclude. Grounding is likely to occur when a vessel suffers from Human, Technical or Organisational error. Generally all three will be present in an accident – at least to some degree – so it is necessary for each of the three areas to design defence systems which provide the best protection for each risk. Like the adding of filters on the front of a camera lens, the slotting-in of defence systems from each these three areas form a defence in depth to a system failure. It follows therefore that the more filters there are - the less chance there is of a failure actually occurring. But these filters are actually like Swiss cheese. No defence system is perfect so, unless at least one of the lenses is totally opaque, failure will occur at a moment in time when all the cheese holes line up. In terms of human error then, Pilots using BRM techniques attempt to reduce to a minimum size the cheese holes in their own particular filter. If we can gain total opaqueness then there will be no more groundings.

Whether you see Harbour Pilots as commercial burdens or defenders of the public interest, or any point in between, depends of course on where you stand. The fact is, however, that Harbour Pilots remain an integral part of a defence in depth system that is designed to keep ships from going ashore in areas where the hazards and risks to a ship are at their greatest. The defence in depth system recognises the potential for error in human decision-making and attempts to minimise its effect at the front edge of marine operations by requiring the use of evolving BRM techniques. In turn, for BRM to work properly, there must be a flattened, non-hierarchical bridge culture that encourages input from all the bridge staff.

Harbour Pilots, at least in this part of the world, have come a long way from the hierarchical bridge structures in which many of us were raised. Indeed anecdotal evidence from foreign Masters that I have piloted indicates that Australian and New Zealand Harbour Pilots are the best practitioners of BRM in the world. Whether that is true or not is beside the point. To me the point is that at no time can we afford our defence in depth system to be outflanked by complacency. We need to practically encourage widespread no-blame error-reporting because an 'un-rocked boat" will lead to a decline in the integrity of our existing defences – and eventually to a catastrophic or even a terminal accident. In such cases studies have shown that, like an iceberg, for every dollar recovered from insurers, fifty

times that amount lies below the surface in indirect costs. The real question of course is not what safety costs us – but rather what it saves, and we need perhaps to remember that it may take only one catastrophic failure - or one terminal failure - to put an end to all our worries about the bottom line.

Thank you.
