The pilotage paradox

Cosco Busan

Captain Paul Drouin MNI

On 7 November 2007, the *Cosco Busan* made headlines around the world for clipping the San Francisco-Oakland Bay Bridge on the outbound voyage and in the process spilling just over 200 tonnes of oil. In absolute terms, this was a small accident. The bridge structure was undamaged; the ship was gashed but quickly repaired; and the oil pollution was cleaned up with environmental and ecological damage minimised.

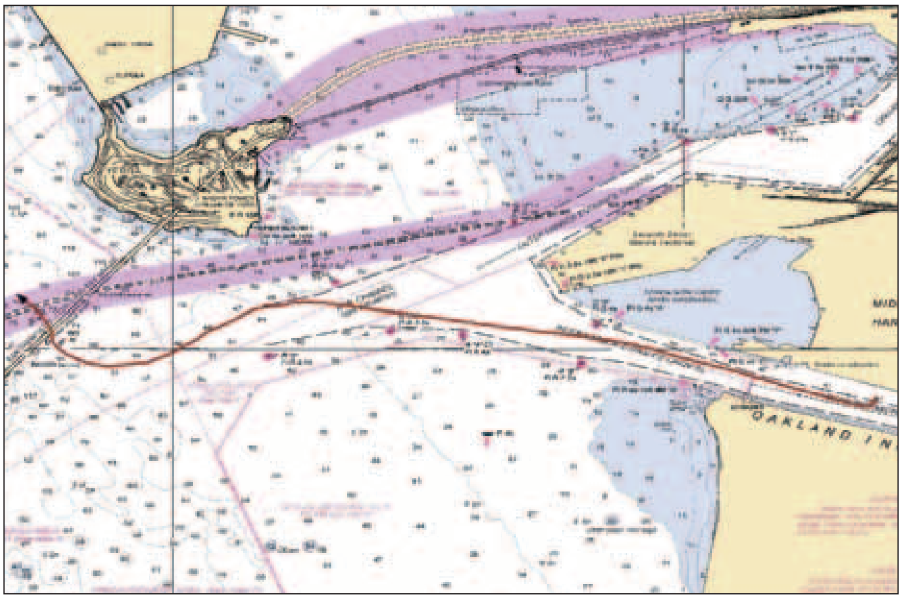
This article looks at underlying issues of the interaction between the bridge team and the pilot which may have contributed to the outcome.

An unremarkable accident in objective terms – but it has resulted in the pilot facing felony charges and some crew members still held in custody as witnesses; yet another example of the trend towards criminalising mariners.
See Edgar Gold's article, p 13.

In the seven-minute interval between leaving the inner harbour entrance channel and striking the Delta bridge pylon, the pilot gave 13 helm orders – yet the vessel managed to stray considerably from the intended course as indicated on the chart. While relatively close to the bridge and in fog, the ship's head was allowed to come to port to a heading as low as 241° (T), almost parallel with the bridge, which makes about 220° (T). Consequently, at a critical time the vessel's course made good decreased to as low as 235° (T). The course to be made good at that time should have been about 310° (T). All of these manoeuvres were executed without the slightest indication on the bridge of the *Cosco Busan* that anything was amiss. We know this because the National Transportation Safety Board (NTSB), the American agency charged with the investigation of the accident, has left an amazing amount of information on their public docket website, including transcripts of the bridge voice recordings.

Leaving berth 56 (Port of Oakland) and passing under the San Francisco-Oakland Bay Bridge is a relatively simple matter, even under blind pilotage conditions. This manoeuvre should not give an experienced third mate cause to sweat, much less an experienced pilot. The Delta-Echo span of the bridge, through which they intended to pass, has a horizontal clearance of 673 metres and is equipped with a radio transporter, which was functional, dead centre of the span. Winds were light and the vessel would be stemming the flood current as it passed under the bridge.

Leaving the berth, two course changes bring you through the span. Under-keel clearance was not great for the *Cosco Busan*, however, and as a consequence hydrodynamic forces on the hull caused by the flood tide would have been strong as the vessel's sidebody came to obstruct the flow, which was setting at approximately 130° (T) near the bridge and anywhere up



▲ *Cosco Busan* track, NTSB - Group Chairman's Factual Report Of Investigation, DCA08MM004

▲ *Cosco Busan* chart of San Francisco-Oakland Bay with courses indicated to 168° (T) elsewhere in the bay.

While some controversy remains as to whether or not a passage plan existed for the outbound voyage, for what it is worth and thanks to the NTSB's public docket, it can be seen that courses seem to have been left on the ship's chart after the inbound voyage, and reciprocal courses would indicate an intended outbound route. The red arrows were added by the NTSB to point out the bridge pylons Delta and Echo.

It is not the purpose here to criticise the appropriateness of the courses on the chart or those of some other voyage plan, or even the decision to leave port given the prevailing visibility at the time – although these points do seem to leave themselves open to criticism. Nor is it intended to preempt the NTSB investigation that, if past reports are any indication, will be exhaustive and complete. What I would like to focus on here is the interaction between the bridge team and the pilot once underway and how this interaction – or lack of it – contributed to the outcome.

After examining the data available to the public, it does not take a doctorate in human performance to realise that the pilot, and quite possibly the crew, had lost situational awareness in the minutes that preceded the accident. This accident, as with many others that have the same root cause, can be categorised into what I call the pilotage paradox. For on the one hand, we wish to confide the safety and con of the vessel to the pilot, yet on the other insist it is the crew and captain that are ultimately responsible and accountable for the safe conduct of the vessel.

What is remarkable about this accident is, ironically, how unremarkable it really is. Year in and year out, albeit with less press coverage, accidents similar to this one happen with a regularity that should redden cheeks. By many accounts, pilotage is still a 'one-man-show' in most parts of the world. The intended route is almost inevitably in the pilot's head and a team approach is in theory only. Under this paradigm, if the pilot, for any reason, loses situational awareness or makes the wrong decision, the team cannot correct, object or challenge. I have found, in my 10 years as an accident investigator, that while crews and pilots are generally well informed of bridge resource management (BRM) techniques, they do not apply them when a pilot has the con.

Breaking the mould

I am aware of only one pilotage jurisdiction that has radically changed the way they do business. For ships arriving off Brisbane, bridge teams, and in particular the OOW, can expect to be treated differently by the pilot – they can expect to be treated as an effective member of the navigation team. Brisbane pilots have, for some years, introduced the following procedures. (Thanks to Steve Pelecanos FNI, chairman, Brisbane Marine Pilots Pty Ltd, for supplying the following information):

- On boarding, the pilot asks to see the ship's passage plan and the pilot takes the bridge team through his own passage plan during which time any variances in the two plans are discussed and resolved.
- The pilot will not take over the con of the vessel until the courses on the ship's charts and the pilot's passage plan are the same. Any variances are amended on the ship's charts (paper), electronic (ENC) and radar.
- The OOW is asked to confirm with the pilot each alter course position as they approach to within seven cables of the position as well as the mark used to alter course and the next course.
- The bridge team is encouraged to use the pilot's portable pilot unit (PPU) for comparison purposes – but not as a prime means of monitoring the ship's position. The PPU is used as an aid to navigation, independent of the ship's equipment.

This last point is reassuring as we now see a proliferation of pilotage authorities adopting the use of PPUs by their pilots. While this is not in itself a bad thing, if the bridge team is excluded from this equipment we would only be entrenching and validating the 'one-man-show' paradigm.

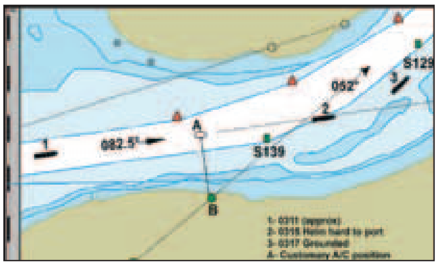
Brisbane pilots must be congratulated for breaking the mould and showing the way forward to a better way of pilotage. Yet, their innovation was not without some resistance. When first developed, a number of their pilots were convinced they could never get foreign crews to competently participate in such an exercise. These preconceptions have proven quite wrong. Today, some six years along, Brisbane pilots have been pleasantly surprised by the competency and cooperation of ships' crews. And the corresponding response from crews has been one of enthusiasm and a sense of genuine participation in the pilotage operation.

Some jurisdictions, such as those with short pilotage runs (but not exclusively so), may try and rationalise away these procedures as not practicable for their area. But in today's world of electronic charts, digital global positioning system (DGPS), centralised vessel traffic control, and easy electronic communication, these are only feeble excuses. For a majority of pilotage areas today, there is no reason why standardised pilotage passage plans cannot be transmitted to the vessel beforehand so as to be noted on the charts, electronic or otherwise. When the pilot boards the vessel, any last-minute corrections or changes can be agreed, thus proceeding without delay – and everyone is singing from the same song sheet.

Canadian experience

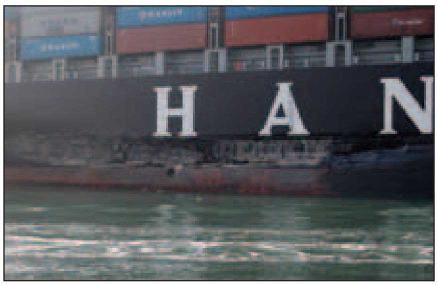
In a published report by the Transportation Safety Board of Canada (TSB M04L0092: Grounding of the container vessel *Horizon*, 2004) one can review circumstances similar to that of the *Cosco Busan*. While downbound in the river at night and while under pilotage, the *Horizon* was allowed to continue past the pilot's customary course alteration point (see 'A' in diagram below) by approximately three cables (50 seconds at a speed of 15 knots).

No correction or challenge by the OOW was forthcoming as the vessel passed the pilot's customary course alteration point and ploughed into the mud bank on the south side of the river. In this case, the



▲ Vessel *Horizon* positions before and after grounding (from TSB report M04L0092)

▲ *Horizon* being lightered (from TSB report



▲ Damage to the *Cosco Busan*, USCG visual information gallery.

pilot's performance was probably affected by fatigue but the OOW could not correct the situation in time because he did not have the tools or the information to do so. Although damage to the vessel was minimal and no pollution ensued, a costly salvage operation was necessary, with 109 containers having to be offloaded before refloating could be successful.

There are plenty of other examples of course. Although each has its own particularities and contributing factors, many accidents, like the two mentioned above, could have been avoided if the pilot and the bridge team, especially the OOW, had shared the same mental model of the voyage. Because of the extent of many pilotage areas, the St Lawrence River for example, it is unrealistic to think the OOW can navigate in real-time using parallel index techniques on the radar. There are just too many course alterations. And in such restricted waters, often only 15 to 20 seconds of inattention are enough to cause trouble. Without question, the continuous, real-time monitoring of the vessel's position in relation to the intended track by the OOW is necessary. But how?

Electronic charts

One instrument with the potential to further the safety of navigation in pilotage waters are the various manifestations of electronic chart systems up to and including electronic chart display and information systems (ECDIS). These allow complete, dock-to-dock routes to be stored in memory and they can be quickly changed to conform to the pilot's plan. Continuous, real-time positioning is accurate, and the navigator can see the vessel to scale on the (chart) screen.

Of course, the *Cosco Busan* had an electronic chart but, as the photo above shows, they still managed to take out a fair sized chunk of the Delta pylon's fendering system. For that matter, given the short distance and so few course alterations, even parallel index navigation could have been effectively accomplished by the OOW in this instance. It is one thing to have all of the right equipment and quite another to use it adequately.

And there is another event in this accident sequence that deserves contemplation. How is it that the collision with the Delta pylon seemed almost inevitable to the VTS officer on duty before it did to anyone on the bridge of the *Cosco Busan*? This question is raised not to insinuate any additional responsibility on the VTS side of the equation. It is meant to highlight how unperceptive a navigation

▲ From USCG 11th District Public Affairs, bridge damage survey video, Delta pylon fendering.

team can become when operating in isolation one from the other, under pressure, and without a pre-established plan with parameters known by all, such as maximum speed, intended course and parallel index reference points.

Suffice it to say that bridge ergonomics, BRM, as well as pilotage practices and procedures, have a long way to go before the precise navigation of a large vessel by a pilot and crew of two or more can be accomplished in a seamless, complementary and consistent manner. If massive airplanes can be operated as such, so too, I believe, can a seagoing vessel in pilotage waters. With the proper planning, intended courses can be adhered to and mistakes, if made, corrected in time to avoid nasty consequences.

Additionally, maybe vessel bridges will have to change – possibly reduced in size and with a more ergonomic and compact layout to bring the team together. Better all-round visibility would be a great advantage as well. Since BRM was inspired by the air industry's 'cockpit resource management', maybe, too the designers of ships' bridges should be inspired by the airplane cockpit.

■ To view the NTSB records, go to www.ntsb.gov/surface/marine/marine.htm and click on 'Public hearings: allision of the container ship M/V *Cosco Busan*' then on 'details', right-hand column.