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The 'ALVA CAPE' and the Automatic Identification System: The Use of VHF in Collision Avoidance at Sea

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One of the most controversial issues relating to marine navigation is the efficacy of ships' crews using VHF radio technology for bridge-to-bridge communications to agree manoeuvres. Through a re-evaluation of historic case studies, this paper provides background on the development of applying VHF technology in collision avoidance and the legislation, national and international, underpinning the practice; a practice that has found little or no support from the legal establishment. Finally the consequential development of a policy to require specific VHF technology to be installed on ships to facilitate agreements in relation to collision avoidance manoeuvres will be reviewed, that is the Automatic Identification System (AIS).

Integrity without knowledge is weak and useless, and knowledge without integrity is dangerous and dreadful. Samuel Johnson

KEY WORDS

1. VHF. 2. Collision Avoidance. 3. IMO. 4. AIS.

1. INTRODUCTION.

The summer of 1966 is more fondly remembered for the World Cup rather than one of the worst disasters in the history of post-war British merchant shipping. Certainly the loss of the ALVA CAPE is seldom, if ever, mentioned in the annals of significance in terms of the development of 'new concepts' in relation to safety at sea. It was hardly a TITANIC or the infamous TORREY CANYON that met its fate a few months later. Nevertheless, the ALVA CAPE was instrumental in the establishment of a policy that continues to generate schisms in the shipping establishment over ships' navigators using VHF radio technology to communicate directly bridge-to-bridge to agree manoeuvres, a policy now extended to require each ship to carry specific technology to broadcast appropriate information to facilitate such agreements, i.e. the Automatic Identification System (AIS).

2. THE EVENTS.

2.1. *ALVA CAPE.* At 1300 Eastern Standard Time (EST) on the 16 June 1966, the London registered tanker ALVA CAPE approached the Bayonne Bridge heading west along Kill Van Kull, a narrow estuary connecting Newark Bay with the Upper Bay of New York Harbour (Figure 1). Under the command of Captain Graham Lewis, she was on the final leg of a voyage from Karachi to the Esso Terminal at Bayway, New Jersey with a cargo of 132 854 barrels of naptha. For the short trip from

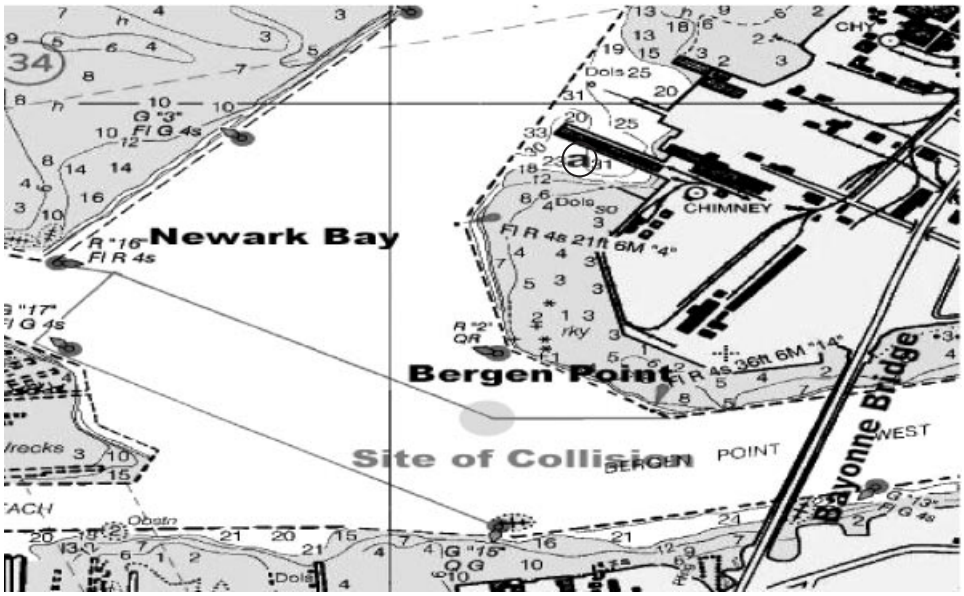

Figure 1. Chart extract showing junction of Kill Van Kull and Newark Bay (not to scale). The Texaco ship left the pier 'a' as the ALVA CAPE approached Bayonne Bridge heading west (source: www.maptech.com).

the anchorage off Staten Island to the berth, the ship's con was in the experienced hands of Donald Baker, the Humble Oil and Refining pilot. Conditions were perfect.

At 1303 EST, after waiting for a southbound cargo vessel to pass clear along Newark Bay, the United States' tanker S.S. TEXACO MASSACHUSETTS backed away from Pier 35, Bayonne Terminal of Texaco Inc., Bayonne, New Jersey; the tug LATIN AMERICAN made up on her port bow to provide assistance. The Texaco pilot, Patrick Kelly, would provide navigation assistance to Captain Richard Pinder for the initial portion of the voyage to Port Arthur, Texas. This included negotiating the left turn around Bergen Point into Kill Van Kull. Five minutes prior to departure, Pilot Kelly had broadcast on VHF to announce that the TEXACO MASSACHUSETTS was leaving the Bayonne Pier proceeding to sea via St. George, Staten Island. A response to this broadcast was not requested and none was received.

At 1307 EST, as she drew level with Bergen Point, the TEXACO MASSACHUSETTS sighted the ALVA CAPE to port passing under the Bayonne Bridge. The ALVA CAPE's speed was estimated at five to six knots with the bow wave clearly visible. In anticipation of the British ship giving way, Pilot Kelly put the rudder to port sounding a single short whistle blast as he did so. The whistle blast was acknowledged in kind by Pilot Baker. The ALVA CAPE did not alter course or speed despite a further whistle blast from Pilot Kelly similarly acknowledged by Pilot Baker.

At 1312 EST, the stem of the TEXACO MASSACHUSETTS penetrated the No. 1 starboard wing tank of the ALVA CAPE at right angles to a depth of approximately twelve feet. With her engines already running full astern, the Texaco ship immediately backed away, naptha spilling from the breach in the ALVA CAPE's hull to surround the unfortunate LATIN AMERICAN.

At 1315 EST, the LATIN AMERICAN blew apart, probably as a result of naptha fumes being drawn into the exhaust, followed seconds later by a series of massive explosions on the ALVA CAPE. Only heroic efforts by the Fire Department of New York (FDNY) prevented a much greater catastrophe. Nevertheless, 34 seafarers burnt to death in the inferno, nineteen on the British ship alone. Amongst those killed were Captain Lewis and Captain Pinder. Pilots Baker and Kelly were subsequently charged with negligence, the latter acquitted on appeal; the fate of the former is not known.

2.2. *AFRICAN STAR.* In the early hours of 16 March 1968, the United States' general cargo ship AFRICAN STAR was heading seawards at about 16 knots in a fairly straight and wide part of the Mississippi River. Approaching upriver making about 6 knots was the tug MIDWEST CITIES pushing the barge INTERCITY NO. 11, and one other, loaded with crude oil. Visibility was good and the pilots on both vessels had been advised on different radio frequencies of the other vessel's movements albeit direct communication between the two ships was not possible due to lack of a common frequency. Both pilots had extensive experience of operations on the Mississippi. Both testified to sighting the navigation lights of the other vessel at a distance of $1\frac{1}{2}$ miles.

The pilot of the MIDWEST CITIES assessed the situation to be a routine 'head-to-head' meeting. He gave a single blast of the whistle to indicate port-to-port passing in accordance with United States' Inland Rules of the Road. The pilot of the AFRICAN STAR was of a different opinion. Taking into account the position of the MIDWEST CITIES and local operating practice, there could be no doubt this was a normal starboard-to-starboard meeting situation. He ordered the AFRICAN STAR's wheel to port to give a 'more perfect green to green light' sounding two short blasts on the whistle to confirm the manoeuvre. Speed was not reduced.

At 0340 Central Standard Time (CST), the AFRICAN STAR struck the barge INTERCITY NO. 11 at an angle of about 45 degrees. Less than a minute later fire and a series of explosions engulfed the AFRICAN STAR. Seventeen died in the resulting fire. While the subsequent testimonies from the pilots involved were widely at variance, each consistently maintained the other vessel made no signal to indicate its manoeuvres, or at least no signal was heard.

2.3. *WHITE ALDER.* At 1820 CST on 7 December 1968, the Taiwanese freighter HELENA was heading upstream approaching Bayou Goula Bend in the Mississippi River at about 14·5 mph under the advisory navigational control of a licensed pilot. The pilot had made a broadcast on VHF Channel 13 (165·65 MHz), the working frequency used by Mississippi Pilots, to advise other river users of the HELENA's identity, location and intentions.

Shortly after the lights of the approaching Coastguard Cutter CGC WHITE ALDER were sighted on the bridge of the HELENA. The pilot of the HELENA assessed this to be a 'port-to-port' situation sounding a single long blast on the whistle. No reply was heard from the approaching ship. Attempts to raise the WHITE ALDER on Channel 13 were similarly unsuccessful. Initially the pilot of the HELENA saw nothing amiss; the red and white lights of the WHITE ALDER could be seen crossing the bow, opening to 10° to 15° albeit the high trim of the bow severely hampered his forward visibility. Speed was maintained.

For reasons unknown, the situation rapidly changed. From the bridge of the HELENA, the green and one white light of the WHITE ALDER now appeared to

be crossing from port to starboard. At 1828 CST, the bow of the HELENA struck the starboard side of the CGC WHITE ALDER about two thirds of the way aft. The WHITE ALDER sank in less than one minute. Of the twenty men onboard, there were only three survivors.

3. INVESTIGATION AND CONCLUSIONS. The United States' Department of Transportation Act, effective 1 April 1967, assigns responsibility to the National Transportation Safety Board (NTSB) for determining the cause of transportation accidents and reporting the facts, conditions and circumstances relating to such accidents. The ALVA CAPE accident was, therefore, one of the first to be determined by the NTSB.

3.1. *ALVA CAPE.* The NTSB found the cause of this collision to be the failure of the persons in charge to exercise due caution. In other words, the deceased Captains Lewis and Pinder. Nevertheless, the NTSB rightfully pointed out that the vessels were under the control of the pilots at the time, and it was their duty to provide expert direction to the safe navigation of the vessels. Ultimately, however, as the burdened vessel, it was the duty of the British ship to keep out of the way of the American ship. The ALVA CAPE was therefore held to be primarily at fault for the collision, notwithstanding the close quarters situation that clearly and directly resulted from the imprudent timing of the departure of the TEXACO MASSACHUSETTS off its berth virtually across the bows of the rapidly approaching British ship. This pointed towards a failure in New York's Vessel Traffic Service (VTS) regime rather than any particular blame on the ships involved. The NTSB concluded the accident would have been prevented if both vessels had strictly adhered to the 'rule of the road', and:

> That any doubt concerning the course of intention of the other vessel could have been readily resolved by the use of bridge-to-bridge radiotelephone, if the vessels had been so equipped (NTSB, 1967).

NTSB recommended:

> That the Commandant (of the United States' Coast Guard (USCG)) continue his efforts to effectuate a requirement for bridge-to-bridge radiotelephone aboard vessels in navigable waters of the United States (NTSB, 1967).

3.2. *AFRICAN STAR.* The NTSB found the cause of this collision to be the failure of the pilots to reach agreement for a safe passing. Contributory was the lack of a common radiotelephonic frequency on the two vessels and their failure to take evasive action when no agreement for passing was reached. The NTSB recommended, amongst other things:

> the need for early enactment of Federal legislation to require commercial vessels operating on the navigable waters of the United States to have the capability of voice bridge-to-bridge radio communications, on a common navigational safety frequency (NTSB, 1969).

The NTSB could offer no explanation for the pilot on the AFRICAN STAR failing to hear the MIDWEST CITIES' whistle signal, albeit the bow lookout on the AFRICAN STAR testified that he heard his vessel sound one blast on the whistle answered immediately by one blast from the MIDWEST CITIES. Nevertheless, the NTSB drew a profound, not to say prophetic conclusion:

> This case illustrates the fact that whistle signals are not of themselves a reliable means of communicating vessels' passing or turning intention. Voice bridge-to-bridge radiotelephonic communications capability on a uniform operational frequency would probably have prevented this tragedy. Radio affords instant information and the opportunity to assent or object to the passing proposed by the vessel initiating the communication. Other advantages are that it is reliable day or night, and even when vessels are not in sight of each other, a safe passage can be arranged by correct interpretation of radar information.
>
> This accident points up again the uncertainties and difficulties which are experienced in applying the Inland Rules of the Road to arrange a safe passing. Arranging for passing requires the effective use of two modes of communication (visual in both directions and audible in both directions) plus the exercise of correct judgement. Failure of one of the two modes of communication, neither of which has an effective backup, can create a situation in which one or more persons must estimate correctly the intentions of the others. In this accident, there was a lack of agreement before the accident, which resulted in the collision. The testimony of the pilots during the investigation regarding the situation prior to the accident implies a failure of both communication modes (NTSB, 1969).

3.3. *WHITE ALDER*. The NTSB found the cause of the loss of the WHITE ALDER to be her abrupt change of course across the bow of the HELENA for reasons unknown. Other causal factors included the failure of the WHITE ALDER to respond to the bridge-to-bridge radiotelephone communications initiated by the pilot of the HELENA. While the NTSB acknowledged the collision would probably have been averted if the HELENA's pilot had slowed once uncertainty had developed, it concluded:

> Establishment of voice communications between the personnel on the bridges of the two vessels would have resulted in agreement for a safe passing (NTSB, 1971).

3.4. *Summary*. Three serious collisions, all with heavy loss of life, all preventable, in the opinion of the accident investigators, if the ships' navigators had used their VHF radio 'bridge-to-bridge' to agree or otherwise confirm their manoeuvres. In other words, the application of VHF radio technology in collision avoidance would offer significantly greater benefits to safety at sea than relying upon (or even using?) existing communications technologies, viz sound and light signals.

4. LEGISLATION.

4.1. *United States*. On 4 August 1971, President Richard Nixon signed the Vessel Bridge-to-Bridge Radiotelephone Act. Amongst other things, the Act states:

(a) Vessels over 20 metres in length must carry a VHF radio; and,
(b) On the navigable waters of the United States, channel 13 (156·65 MHz) is the designated frequency required to be monitored for safety of navigation communications; and,
(c) Each (navigator) shall, when necessary, transmit and confirm, on the designated frequency, the intentions of his vessel and any other information necessary for the safe navigation of vessels.

As of 2001, this Act has been extended to apply to all ships, irrespective of flag, operating in all United States' waters up to and including territorial limits, i.e., within 12 miles of the coast or baselines.

4.2. *Dissension*. While the efficacy, indeed the requirement for all ships to use VHF radio technology to agree collision avoidance manoeuvres is long established in

United States' waters, other maritime regulatory bodies appear less enthused. Notably this includes the United Kingdom. In its Marine Guidance Notice (MGN) published in 1997, the United Kingdom's Marine Safety Agency (now Maritime and Coastguard Agency (MCA)) reminds ships' navigators that:

> There have been a significant number of cases when it has been found that at some stage before the collision VHF radio was being used by one or both parties in an attempt to avoid collision. The use of VHF radio in this role is not always helpful and may even prove dangerous.

The MGN adds, quoting from a case heard by the noted Judge, Mr. Justice Sheen:

> It is very probable that the use of VHF radio for conversation between these ships was a contributory cause of this collision, if only because it distracted the officers on watch from paying careful attention to their radar. I must repeat, in the hope that it will achieve some publicity, what I have said on previous occasions, that any attempt to use VHF to agree the manner of passing is fraught with the danger of misunderstanding. Marine superintendents would be well advised to prohibit such use of VHF radio and to instruct their officers to comply with the Collision Regulations.

In effect, therefore, United Kingdom policy towards using VHF radio in collision avoidance is, to all intents and purposes, diametrically opposed to that of the United States. This leaves the most unsatisfactory situation of one regulator stating ships' navigators must not, or at least *should not*, use VHF radio to agree manoeuvres whereas another requires collision avoidance 'contracts' must always be established between ships using the VHF radio. Who is right? A very important question for the practising navigator, particularly if he or she wishes to avoid prosecution!

4.3. *International Maritime Organization* (*IMO*). The competent body for establishing all 'rules of the road' on the high seas is the IMO. The detail of these rules, including the use of communications between ships to signal or otherwise agree manoeuvres, are adopted through relevant international instruments. Primarily these are the International Collision Regulations (COLREGS) and the International Convention for the Safety of Life at Sea (SOLAS).

In 1988 the IMO convened a Conference to implement the Global Maritime Distress and Safety System (GMDSS). The amendments adopted to (mostly) SOLAS Chapter IV by this Conference had the effect of requiring each ship over 300 gross tonnes to have the means to undertake a range of communications functions all regarded to be essential to safety of life at sea. These regulations took full effect in 1999.

While this may not appear to be the obvious location for rules relating to collision avoidance, one of the essential communication functions prescribed by IMO for operation in the GMDSS is the ability to transmit and receive 'bridge-to-bridge' communications. These are defined as:

> … inter-ship safety communications conducted from the position from which the ship is normally navigated, normally performed by VHF radiotelephony.

To facilitate these communications, SOLAS requires that each ship carry a VHF installation to provide radiotelephone communications on two, and significantly only two, frequencies: Channel 16 (156·8 MHz), the International Distress working frequency, and Channel 13 (156·65 MHz), the frequency internationally designated for ship-to-ship communications relating to the safety of navigation. Furthermore,

through reference to related international instruments applied through SOLAS, i.e., the International Radio Regulations, all ships should, where practicable, maintain a continuous watch on Channel 13 for communications related to the safety of navigation (from other ships).

In terms of the carriage of navigation technology and the operational requirement to be fulfilled by the technology, these regulations are broadly similar, indeed identical in most parts to the United States' Vessel Bridge-to-Bridge Radiotelephone Act. Put another way, to comply with SOLAS, *de facto*, all ships must comply with United States' requirements apropos provision of VHF radio for specific application in collision avoidance. There can be no doubt therefore, by aligning international rules and standards so closely with the regulatory regime of the United States, as a matter of policy, the IMO has determined on the efficacy, i.e., the safety benefits of ships communicating directly using VHF radio to agree manoeuvres. And, in doing so, accepted there are weaknesses in the 'historic' communications systems presently prescribed in the COLREGS (sound and light signals), which can only be addressed through the adoption and use of VHF radio technology.

Nevertheless, it does seem rather odd that the IMO chose to use SOLAS (which only applies to a limited number of ships) rather than the COLREGS (which applies to all ships) to implement such a fundamental change in policy. The concept of some ships, i.e., those subject to SOLAS, using VHF radio to agree manoeuvres – while the majority do not – appears, at best, to be a recipe for confusion.

More importantly, perhaps, the guidance presently being issued by the United Kingdom Government, and therefore adopted by many, if not most navigators at sea is clearly out of line with internationally (IMO) adopted practice, or appears so. There is an alternative interpretation of the United Kingdom's position.

5. THE LAW.

5.1. *The Admiralty Court*. Other than flag states, and then only in relation to individual ships, no legal authority is permitted to exercise jurisdiction over the high seas. High seas' 'law', including all issues related to navigation management, must, and does develop through customary practice. That is, through the resolution of disputes. Where disputes arise between ship-owning interests on the high seas, these are inevitably resolved in the Admiralty Court and, irrespective of the flag state of the ships involved or the actual location of the 'incident', more often than not in the Courts of London. Strictly speaking, disputes on the high seas should always be resolved in the Admiralty Court geographically closest to the incident.

In resolving a dispute, the Admiralty Court will often make more precise those rules about which differences of opinion exist, and even supply new rules because no generally recognized rules cover a new situation. If the relevant group accepts the ruling, as it will where disputes between shipping interests arise, it becomes part of customary law, but not because it is coercively imposed on a group by some authority backing the court. Thus, good rules that facilitate interaction between stakeholders tend to be selected over time, while bad decisions are ignored. Put another way, it is how the court *determines* the rules that establishes law on the high seas not necessarily the detail of the rules themselves. The Judge's word is final.

5.2. MINERAL DAMPIER. At 0330 local time on 22 June 1995, the bulk carrier MINERAL DAMPIER was struck by the bulk carrier HANJIN MADRAS in the East China Sea about 100 miles south of Cheju Island, which is south of Korea.

The impact was in the vicinity of the bulkhead between number 8 and number 9 holds, just forward of the wheelhouse. Laden with 166000 tonnes of Brazilian iron ore, the MINERAL DAMPIER split in two and sank within seconds; variously estimated to be about seven seconds. All twenty-seven crew went to the bottom of the ocean with the ship. The owners of the two ships (strictly speaking the companies providing their insurance) established counter claims in the Admiralty Court of London to recover costs.

5.2.1. *Causal Events*. Two VHF communications took place between the MINERAL DAMPIER and HANJIN MADRAS prior to the collision. With the ships about 4 or 5 miles apart, the former initiated a call to the latter to suggest the vessels should pass 'red to red'. The officer on watch on the HANJIN MADRAS replied: 'OK. Red to red passing; repeat port to port passing' adding he would alter course to starboard advising the MINERAL DAMPIER to keep her present course. The MINERAL DAMPIER acknowledged this information. However, for a number of reasons, the HANJIN MADRAS failed to alter course at this time.

The HANJIN MADRAS, maintaining her previous course and speed, visually sighted the MINERAL DAMPIER at about 3 miles range and called her on VHF to advise: 'keep your present course and speed'. The MINERAL DAMPIER replied: 'understand your message'. Unfortunately the HANJIN MADRAS did little or nothing to avoid the inevitable collision. Nor, fatefully, did the navigator on the MINERAL DAMPIER choosing to believe the information broadcast from the other ship rather than the evidence of his own eyes or his radar.

5.2.2. *Court Ruling*. Mr. Justice Aikens adjudicated the dispute between the two ship owners. He ruled the HANJIN MADRAS must accept 80% of the blame for the collision. He held that no blame attached to either vessel for either the fact or content of the first VHF conversation. However, once in sight of one another, he considered that both were at fault for making what he held to be an agreement using the VHF radio:

> The effect of the agreement was that the MINERAL DAMPIER was to maintain her course and speed, while she expected the HANJIN MADRAS to turn to starboard imminently. This would have meant that the MINERAL DAMPIER was inhibiting herself from acting in accordance with rule 17 (a) (ii) or (b) or good seamanship and so altering course or reducing her speed in circumstances that were fast amounting to a *close quarters situation*. Blame must attach to the MINERAL DAMPIER for letting herself be put in this position (Royal Courts of Justice, 2001).

In other words, by agreeing a collision avoidance 'contract' with the HANJIN MADRAS using VHF radio that was, in effect, *ultra vires* (could not be complied with without breaching the COLREGS), the MINERAL DAMPIER had to accept some penalty for the collision albeit significantly less than that imposed on the HANJIN MADRAS.

Nevertheless, that the MINERAL DAMPIER did not alter course, in Justice Aikens' opinion, was because the HANJIN MADRAS had said to her in the second VHF conversation: 'keep your course and speed'. In other words, the HANJIN MADRAS 'lied'; the information broadcast from its bridge had no integrity. It was a fatal mistake. The owners of the HANJIN MADRAS viewed this ruling to be disproportionate. They appealed on grounds that, amongst other reasons, Mr. Justice Aikens was wrong in principle to hold that their ship was more to blame for the agreement in the second VHF conversation than the MINERAL DAMPIER.

NB: The Admiralty Court is only interested in financial issues, i.e., which insurance company picks up the bill for the damage caused to the ships and the loss of the cargo. As noted above, only the flag state is permitted to apply criminal sanctions against stakeholder interests involved in a collision between ships on the high seas. Research has not located any evidence of this accident being investigated by the flag state(s) concerned never mind any criminal charges being laid against the wretched HANJIN MADRAS (which continues to trade under this name) her owners or, in particular, her crew.

5.2.3. *The Appeal*. In July 2001, the Supreme Court of Judicature at the Admiralty Court met to consider the appeal from the owners of the HANJIN MADRAS. It was dismissed. Nevertheless, while not questioning the fundamental judgement of Mr. Justice Aikens, the Appeal Court did not concur fully with his analysis notably the role played by the VHF communications in the collision. In the opinion of the court, the direct cause of a collision will always be the navigational action, or inaction, which conflicts with the requirements of the collision regulations or of good seamanship. Thus the appeal court were not persuaded that the second VHF conversation amounted to an *agreement*, or that the MINERAL DAMPIER could be criticised for her VHF response to the HANJIN MADRAS's communication; what else could have been said bearing in mind there was no doubt the HANJIN MADRAS was the give-way vessel? The fault of the MINERAL DAMPIER's crew only arose after the serious failure of the give-way vessel and was mitigated by the fact that she was no doubt expecting the HANJIN MADRAS to do what she said she would. The court did not view there to be an embargo on all VHF communications about navigation between two vessels which are passing or *approaching* a close quarters situation subject to there being no doubt as to which vessel is sending that information. The court accepted that those occasions where the technique has been effectively used to *avoid* collision never come to its notice adding:

> … in the course of the appeal we were shown Marine Guidance Note MGN 27 (M + F) published by the Marine Safety Agency in August 1997, which seems to be consistent with the views we have just expressed (Royal Courts of Justice, 2001).

5.2.4. *Summary and Discussion*. In terms of the application of VHF technology in collision avoidance, there can be little doubt both ships involved in this tragedy fully complied with the operational requirements prescribed by the United States, as latterly endorsed, if not required to be used by the IMO. That is, they used their VHF radios to communicate directly bridge-to-bridge to afford instant information and *provide the opportunity to assent with the passing proposed by the vessel initiating the communication*. And, as the MINERAL DAMPIER initiated these communications, i.e., sought to establish the collision avoidance 'contract', this would appear to add weight to original judgement of Mr Justice Aikens, and the point of appeal.

As it so happens, none of those providing advice to the court, including the Elder Brethren of Trinity House, appear to have made any reference to the direction issued by the IMO regarding the use of VHF radio in collision avoidance. It is a matter of conjecture whether the court would have reached a different opinion if so advised; probably not in terms of the respective awards/penalties made.

Whatever, pending further clarification from the court, there is no doubt the United Kingdom's advice remains apposite, it reflects the present status of 'law'. Furthermore, taking into account the detail of Appeal Court's ruling, if ships do

choose to use VHF radio to agree their manoeuvres, and subsequently problems arise, the misuse of VHF may well be relevant in determining the extent to which the improper action or inaction of a vessel was blameworthy. In other words, the 'broadcaster' of information does so at the risk of bearing the greater burden of liability for consequential damage if that information should, in any way, be false or misleading, i.e., lack integrity. For the 'receiver', if navigators choose to believe information broadcast by another ship in relation to its manoeuvres, more fool them; it can be added to their epitaph. Neither can expect much sympathy from the court.

6. CONCLUSIONS AND THE AIS. VHF technology has been developed and applied to address the manifest weakness in the 'traditional' communications systems used in collision avoidance, light and sound signals. This weakness, and the value of ships' navigators using VHF radio to agree or otherwise confirm their manoeuvres were demonstrable in the loss of the ALVA CAPE and others. Consequential legislation adopted in the United States requires that all ships use VHF technology, as a matter of course, to institute collision avoidance 'contracts', a *modus operandi* subsequently endorsed by the IMO and, thus, arguably applicable to all ships on all voyages.

However, operational experience suggests that the confidence of regulators as to the efficacy of using VHF radio in collision avoidance is misplaced notably as highlighted in the loss of the MINERAL DAMPIER. In determining on this and similar cases, the Courts have chosen not to endorse the IMO direction or view the relevant rules and standards to be inapt; there is no purpose in ships using VHF to 'agree' manoeuvres because there is nothing to agree!

Nevertheless, notwithstanding the Court's opinion and reservations expressed by other competent authorities, including the United Kingdom, the IMO remains fully committed to the further development and application of VHF technology in collision avoidance. This is manifested through the recent adoption of legislation requiring that each ship be provided with, and use, an Automatic Identification System (AIS). From the proposed United States' regulations implementing the IMO mandate:

> AIS technology relies upon global navigational positioning systems, navigation sensors, and digital communication equipment operating according to standardized protocols (i.e., AIS transponders) that permit the voiceless exchange of navigation information between vessels and shoreside vessel traffic centers. AIS transponders on vessels can broadcast information about the vessel, such as its name or call sign, dimensions, type, position (derived from a global navigation system), course, speed, and navigation status. This information is continually updated and received by all AIS-equipped vessels in its vicinity (US Federal Register, 2000).

AIS is, therefore, an automatic dependent surveillance technology applying broadcast techniques (ADS-B).

Functionally, the AIS is identical to light signals albeit applying VHF technology rather than 'colour and aspect' to transmit information from one ship to another. As this information must be 'seen' by all others at all times to be of value in collision avoidance, the IMO requires all AIS broadcasts be continuous, unencrypted and on 'open' VHF radio channels.

As for the initial mandate relating to the use of VHF technology in collision avoidance, the IMO has chosen to impose its AIS policy through SOLAS rather than

the COLREGS. This means, of course, unlike light signals for example, most ships will never be fitted with AIS or at least not *required* to use AIS in collision avoidance suggesting, at least, that a degree of confusion may arise.

On the positive side, amongst other things, the AIS will remove any potential ambiguity in the identification of ships where installed. This will facilitate or otherwise assist ships' navigators in developing and agreeing collision avoidance 'contracts' in accordance with legislation applied. Indeed, bearing in mind the additional information provided in the AIS transmission, there can be increased confidence that a ship is actually doing what it is supposed to be doing in relation to its manoeuvres. Providing, of course, there are strict standards controlling the integrity of the information transmitted by the AIS.

This information, particularly in the context of VTS, might have saved those on the ALVA CAPE and, of course, the MINERAL DAMPIER. As explained in Lützhöft and Dekker (2002), and as tragically proved in the loss of the MINERAL DAMPIER, it is nebulous and fallacious to assume the receiving ship will undertake its own correlation or validation (cross-check) of any information it receives from the broadcasting ship.

Taking into account the Court's judgement in the MINERAL DAMPIER case, the burden of responsibility to ensure all AIS transmissions are truthful and honest clearly rests with the broadcasting ship. In practice, however, this duty of care is likely to be borne by the equipment manufacturer who can, and must expect to be held accountable for any consequential damage resulting from an AIS transmitting false or misleading information. It will be in manufacturers' interests to ensure suitable action is taken to control this risk on each ship supplied with AIS. Which means rather more, of course, than 'contractual small print' or using 'bad data' flags in transmissions that rely upon the receiver to decode. This will fool no one looking for recompense, least of all the judges of the Admiralty Court.

EPILOGUE. At approximately 1543 EST on 28 June 1966, during salvage, the ALVA CAPE suffered a further explosion. Four of those on board at the time were killed and seven others seriously injured including several members of the FDNY. The ALVA CAPE was eventually removed from New York Harbour on 2 July 1966 by the tug TERRY MORAN. At the request of its owners, the ship was sunk on 3 July 1966 in 1,200 fathoms of water, position 38° 55 N, 72° 20·1 W, by gunfire from CGC SPENCER.

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