



Improving Marine Workplace Safety and Chances of Survival in MOB Incidents

Lindsay Lyon, Mobilarm, Australia

SYNOPSIS

The commercial marine workplace has a number of identified risks to employee safety that do not occur in traditional places of employment. The working environment often comprises harsh environmental factors with an unsteady working platform, particularly during foul weather. Fatalities and injuries in the commercial marine workplace result from a number of causes relating to fatigue, equipment usage or failure, vessel hazards and collisions, and man overboard events. Man Overboard Events (MOB) are the single largest cause of marine fatalities, with the chances of death through falling off a vessel being 2.8 per cent, or 2,800 fatalities for every 100,000 persons, over a 45-year working career.

With odds this high, it is vital that operators, owners and workers alike do everything in their power to remove this risk from the marine workplace. This means the development and adherence to strict safety routines, systems and, of course, the use of common sense and an instinct for survival. Technology is playing a vital role in ensuring that casualties from MOB incidents are kept to a minimum through either structured shipboard solutions installed by the owner/operator or personal systems chosen by the crew member. This paper describes how to improve marine workplace safety, with a focus on MOB, and explores the differences and new developments in such systems to remove or significantly mitigate the MOB risk from the marine workplace.

COMMERCIAL MARINE WORKPLACE RISKS

Marine workplace accidents, both fatal and non-fatal, are made up of vessel accidents and personal accidents. Personal accidents are generally categorised into slips and falls, manual handling, and machine operations. Research shows that personal accidents form approximately 33 per cent of all mortality cases, ie three times the number of mortality cases caused by vessel casualties, demonstrating that prevention of personal accidents on board vessels should be given a high priority.

The US tugboat, towboat and barge industry body AWO, representing nearly 5,000 modern tugboats and towboats, and more than 27,000 barges, has indicated a fatality/overboard statistic of several dozen deaths a year, and as many as 100 falls overboard.

MOB PREVENTION AND DETECTION

Most MOB incidents come about as a result of slips and falls; therefore this area of vessel safety provides employers a focus on which to seek immediate improvements to reduce MOB risks. The moving workplace presents a major challenge and is the most difficult to address in a real working environment; however, non-slip deck coatings have been proven to dramatically reduce incidents.

Australian-based research of commercial seafarers has shown that, in general, commercial marine workers display greater levels of health-compromising behaviours than

the community at large. Employee health is also a major determining factor in ensuring a safe working environment, with the effects of smoking, alcohol consumption and the lack of sleep and exercise when at sea adversely affecting an employee's ability to perform work tasks safely.

Because of the varying conditions of the marine working environment, it is difficult for employers to completely remove the risk of a MOB event occurring, so the focus must be moved to using technology to automatically detect the event. Over the years there have been a number of attempts to solve the automatic detection challenge, with varying results. Automatic detection is critical in an MOB event as the chances of survival in such a situation is directly related to the time the distressed mariner is in the water – time to recovery is critical in removing the risk of a fatality. To date, the most popular method has been the use of Personal Locator Beacons (PLB) using 121.5MHz radio frequency for both MOB event detection and subsequent location of the distressed mariner. The 121.5MHz technology was also detected until recently by the Search and Rescue (SAR) satellite network. This satellite detection has now been phased out, although 121.5MHz direction finding is still supported on most SAR retrieval assets. This technology requires the vessel operator to install a receiver for detecting the event; the PLB would attempt to communicate a signal back to the vessel to raise the alarm, and then using specific radio directional finding (DF) equipment to locate the distressed mariner. The directional finding technology has over the years

produced mixed results, with hand-held DF systems faring the worst, being exceptionally difficult to use in any sea state more than a fresh breeze. Fixed DF systems fare better, although they also have their limitations.

One of the bigger limitations in the 121.5MHz MOB system is its ability to distinguish between multiple signals in the case of multiple MOB's in the water. It has been this specific failure within the system that has been a major contributing factor to loss of life where, because of the "noise" generated by multiple PLBs/victims in the water, SAR authorities are unable to use DF to locate and retrieve anyone. More recently, manufacturers of vessel 406MHz Emergency Position Indicator Radio Beacons (EPIRBs) have adapted these products for personal use in the marine and land-based environment. The Personal EPIRBs, or 406MHz PLBs as they are known, are an excellent solution for single-handed operations when there is no one to return to pick up the MOB mariner. However, in a commercial working environment they are not as suitable, as the people in the best position to rescue an MOB are the crew on board the vessel from which the MOB came, not someone back on a land-based facility which is where these PLBs report the alert to. Once again, time in water is the largest determining factor in an MOB survival.

The latest standalone product on the MOB market is the VHF Position Indicator Radio Beacon (VPIRB). The VPIRB solution has some significant advantages over the old 121.5MHz PBL from a perspective of functionality, cost and adoption. The VPIRB can be automatic (water) and manually activated, and on activation will send a VHF voice and DSC message to the distressed mariner's vessel with the exact GPS coordinates and a unique MMSI number. As the MOB alert and tracking information is transmitted on standard VHF, any vessel within VHF range can be alerted and participate in the rescue, with each MOB being identified by an individual and unique MMSI number. As standard VHF and GPS technology is used, there is no need to fit the vessel with specific receiving and directional finding technology, as is the case with older 121.5MHz technology. It should be noted that the VPIRB falls more under the Marine Survivor Locator System (MSLS) category than the PBL category as it has been specifically designed to address the MOB detection and tracking challenge.

While the systems described above address the core problem, all of the PBL and MSLS systems have a common single failure: they require the signal or alert to be successful transmitted back to the vessel, or vessels in the case of the VPIRB. If, in an MOB event, the device is worn where it is underwater, it cannot transmit the alert back the vessel because the transmission will not travel through the water. If the device is not manually activated, the battery is flat, or the unit is broken, no alert will be raised; or, in harsher terms, when these systems fail, they 'fail dead'.

Wireless sensor networking technology has now been successfully adapted to address the automatic

detection challenge. These systems work by creating a fully meshed wireless network on the vessel where, in the event of an MOB, the distressed mariner, wearing a small wireless tag, is 'disconnected' from the network, thus virtually guaranteeing an alarm. The system will log a provisional waypoint within approximately four seconds and sound an alarm within approximately eight seconds, so the distressed mariner will not be missed and, in most cases, will still be very close to the vessel. Even if the tag (mariner) is discounted from the network by water blocking the signal back to the vessel, distance from the vessel, battery failure or unit failure, an alert will be raised. So, in contrast to other solutions, any failure in the tag will result in an alert, or the system will "fail safe".

The other advantage of these new wireless MOB systems is that they provide much more than just MOB alerting. Additional features on the tags include strobe light for visual identification at night, vibration motors for alerting in noisy work environments, manual duress alarms, individual or group paging, and the ability to use the system to generate a vessel general alarm or muster.

OPERATOR/EMPLOYEE OBLIGATIONS

Taking into account the financial and economic aspects of marine workplace safety, commercial vessel operators will normally only carry the bare essentials in respect of safety equipment to stay within the law. From a legal perspective, this is not considered wise. There are a number of precedents that determine company directors' and a skipper's legal obligations towards an employee's safety.

A previous US maritime case of the early 1900s involved a tugboat that ran down another vessel in the fog, causing a number of deaths. In court, the owners of the vessel claimed that they had maintained and used all of the required safety equipment on board (loud-hailer, bell and foghorn) and that, therefore, they were not at fault. The US court, however, found them guilty because there was technology (wireless radio) available that could have been used to avoid the collision, and that the vessel did not have one on board. The case set forth the principle (which still stands today) that if technology is available (and in use) that could have helped to avoid a disaster or save lives – even if it is not required by law – a vessel operator is considered to be negligent if he doesn't use it and becomes involved in such a situation. This principle still impacts on US maritime insurers when they are introduced to new marine technology – such as MOB safety systems.

SUMMARY

Manufacturers working to address the MOB detection and tracking challenges have over recent years made significant progress. The products, technologies and solutions described here are without doubt addressing the challenge of automatically detecting MOB events, tracking and locating distressed mariners. They provide considerable improvements to safety in the commercial work place. Vessel operators and owners should be encouraged to continue to regularly review their safety standards and procedures in the light of newer technologies that remove risk from the marine work place.