Don't get Lost at sea

Diving brings many joys but it also comes with a few risk factors, which we can mitigate by adopting safety protocols and mind-sets. In this extended feature, we take a closer look at measures that can be taken to avoid being lost at sea.

Getting lost at sea is a basic fear most divers can relate to. There is a whole genre of movies about being lost at sea in some shape or form, including the really bad film, *Open Water*—the 2003 drama loosely based on the much-publicised case of the American couple, Tom and Eileen Lonergan, whom most divers active around the turn of the century have heard of. The couple disappeared off the Great Barrier Reef after their dive boat accidentally left them behind in open water, because the crew failed to take an accurate headcount. It was not until two days later that the pair was discovered to be missing, after a bag containing their belongings was found on board the dive boat. The skipper of the dive boat was charged with unlawful killing but later found not guilty. However, the operator was fined after pleading guilty to negligence and went out of business.

There can be no doubt that the operator neglected its duty of care, with tragic consequences.

While the Lonergan case prompted authorities, in Australia and elsewhere, to introduce much tighter regulations, including the requirement that both the captain and another crew member must independently confirm each headcount. But no system is infallible, and even the most diligent human is prone to making a mistake. The responsibility for our own safety always rests with ourselves, and we should never assume that others will step to cover our shortcomings in that regard. We should always be safety-conscientious and take reasonable measures to prevent ending up in a precarious situation.

Being at the mercy of a strong current, which may pick up with little or no prior notice under water or on the surface, can be a quite discomforting, if not an outright terrifying experience. Even on a shore dive, you can get swept up by a current, which is too strong to fight, and end up being swept along, unable to make it back on your own. So, now what do you do? Has somebody been keeping an eye on you from the beach (or boat) who can provide some assistance, or raise the alarm? Did you bring a SMB (a.k.a. safety sausage), which you can deploy?

And in particular, if you are diving at night in hazy or foggy weather where there are currents or tides, or in remote areas, what means of communicating with your dive boat and relaying your position are you equipped with in case you get lost or cannot make it back on your own?

Thanks to the ingenuity of various entrepreneurs, a range of affordable and small personal electronic devices have been on the market for some years, and still more refined models are being developed. Some are simply VHF radios or satellite phones in a waterproof housing depth-rated for diving. More dedicated devices comprise AIS or DCS transmitters, which send a message or distress alert to vessels within range. But these units have no voice transmission or personal locator beacon (PLB) that alerts search and rescue services by transmitting a coded message via the COSPAS-SARSAT global satellite system to the nearest rescue coordination centre.

The use of some systems require a radio license, some do not. Some systems are free, while others require an annual subscription to private companies. Some systems are only legal in some parts of the world, or have varying local restrictions imposed, limiting their functionality.

Confused? You are not alone.

Emergency Transmitters for Divers

— What You Know Could Save Your Life

CHRISTIANE LINKENBACH

Text by Christiane Linkenbach
Translated by Peter Symes

As a diver, how does one rescue oneself when in distress? Call rescue services? How do the different emergency frequencies work? Which one is the most efficient for divers?

Diver in distress?

Yes, divers get into sticky situations too, and more frequently than one might think or read in the media. In particular, it happens whenever divers surface too far away from the dive boat, because they got caught in a current. Adrift alone, or with a buddy, divers find themselves in the same life-threatening predicament as sailors falling overboard from a boat that just keeps sailing away.

It has been the sailing industry that has long since looked into safety measures and devices and come up with what is known as "MOB transmitters" (MOB: man-over-board), some of which are also now being made as depth-rated models for divers.

DISCLOSURE: Christiane Linkenbach is the deputy director of Seareq, who manufactures the Enos personal safety devices. This background article endorses no specific brand of equipment or product. There exists no financial arrangements between the magazine and Seareq.

Old wine in new bottles?

These transmitters provide divers with some degree of peace of mind, because what is good for sailors must also be useful for divers, and one need not be concerned with obtaining a licence and undergo a lot of training to operate them. After all, these devices have been in use for years. It is just that divers are not usually given any training or much insight into sea rescue procedures and the use of marine radios. A maritime radio licence is not required to go diving. But ignorance can kill here too.

Imagine an average diver, Joe, who visits some dive expo looking for inspiration for his next dive trip. He sees all these seductive presentations of paradisiacal resorts and alluring waters when he suddenly finds himself in front of a poster depicting a diver lost at sea. The advert cleverly targets a latent fear, and Joe is drawn to take a closer look at the advertised rescue system.

The gadget is labelled with various known certification markings such as CE, FCC and EMV, along with some other more or less familiar symbols, which is comforting. It looks trustworthy. It is handy, small, well-built and capable. The sales representative comes up to Joe, all smiles, and relates how he once resurfaced far from the boat himself and understood the fear. But because he had this gadget, he was soon safely back on the boat—and Joe should always wear one too. Joe is not quite sure what to make of the technical specifications but feels reassured that it would be good insurance against being lost at sea, and his worries are put to rest.

This is, of course, a made-up

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stereotypical scenario but one that often plays out in some shape or form—depending on the product, its operating principle and distress frequencies used, and of course, the competence of the seller as well as the previous knowledge of the diver. Being unfamiliar with some topic is something we can all relate to, so what do most of us do? We seek advice, which is all good, provided the guidance is trustworthy, accurate and relevant—and when it helps us to make the right decision and purchases that suit our needs. But how do we make heads or tails out of sometimes conflicting information and recommendations? And how do we see though the sales and marketing babble?

"They have to save you!"

So, the smooth-talking sales rep has managed to build a rapport with Joe by relating to him that he too has experienced surfacing far from the boat. "Been there, done that!" he says and proceeds to describe his product in more technical terms. Some of the lingo Joe has heard before, but he does not quite understand how this gadget is the solution to the problem. Joe does not want to come across as ignorant, so he does not raise many questions. In between being lost in the technical jargon and mentions of AIS, DSC 70, EPIRB, Channel 16, PLB and 406 MHz, he also hears two reassuring sentences: "Everybody welcomes you here" and "They must save you."

Cost

Next up is the question of price. What does such a device cost? Typically, prices are in the 150 to 400 USD/EUR/GBP range, which stings a little, but not a big price for a potential life-saver. And since sailors also use this device, as the sales rep keeps emphasising, it is fair to presume Joe would be oblivious that his intended use of the device may not always be legal. That is too absurd to contemplate. Who cares about formalities when lives can be saved? Who would not rather commit an offence than die?

Saving lives and responding to distress always takes precedence over adherence to formalities and procedures, the sales rep reassures Joe, who ends up making a purchase. He leaves the booth feeling good and resumes looking at travel destinations, convinced that he now has a transmitter that will alert every vessel within X nautical miles about his predicament, in case he ever ends up in distress and needs to be rescued.

Are commercial shipping vessels obliged to respond to any MOB alarm raised by leisure crafts, sailors, wind or kite-surfers and divers?

Dangerous presumption

Every vessel? Not quite. Let us have a closer look at what really happens when a personal device is activated and how a captain of a commercial vessel, which may be transiting beyond the horizon, in all likelihood, would react. Is it safe to assume that such a vessel would receive the distress call and turn around? Are they obliged to respond to any MOB alarm raised by leisure crafts, sailors, wind- or kite-surfers and divers? The notion that "they are obliged to come to your rescue" may suggest this is the case, underpinned by the fact that coming to the rescue at sea is mandatory. Under international maritime law, a skipper is obliged to provide immediate assistance within his or her means when he or she becomes aware of an emergency. This obligation is also stipulated in the International Convention on Maritime Search and Rescue.

But what does "within his or her means" imply?

While sales reps and customers may have their discussions of what triggers an emergency response, they rarely consider the position of the rescuer who may have to provide assistance. First of all, the captain of a large ship—perhaps up to several hundred metres long—is primarily responsible for the safety of his or her crew and any passengers aboard, the vessel and its cargo, as well as his or her own life. Is it reasonable to assume that such a captain can just stop, turn around and provide assistance?

No, it is not. Considering the momentum of a heavy ship travelling at speed, it is quite unlikely the captain is able to assist most leisure water-sportsmen in distress. With a stopping distance of several nautical miles, it takes a good long while before a big vessel—say, a passenger liner, cargo ship or tanker—comes to a halt. Around busy or constricted shipping lanes, it may also be impossible for a big vessel to alter course due to risk of collision with other traffic. That is also why most other ships cannot easily stop either.

If the emergency takes place in less-frequented waters—say, south of Brothers Islands in the Red Sea—a change in course may represent a rather low risk for the ship. However, it still takes considerable time before a freighter can turn about and make it to the drifting diver, because it must be slowed down early in order not to overshoot the diver. You never hear of such spectacular manoeuvres because they do not occur in reality.

Fuel versus rescue

Often, the captain is unable to turn around even if he or she wanted to. In many cases, ships are only carrying a precisely calculated amount of fuel, which does not allow for such a turning manoeuvre. Without required reserves, it could leave the ship short of fuel to reach the next port. Shipping has become highly competitive, and time constraints are tight. In order to carry as many containers as possible, the amount of fuel carried is precisely calculated and will only include a small "storm reserve." These calculations are so finely tuned that they even consider the different water densities of the various seas. The Mediterranean and

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the Red Sea are particularly popular with shipping companies, because the higher salt content provides more buoyancy, allowing for more cargo.

If a cargo ship south of Brothers Islands receives the distress call from a drifting diver, the captain may well be left with no choice but to carry on, as any action could deplete designated fuel reserves. Accordingly, it would thus not be "within the means" of the captain to provide direct assistance.

Rather, the captain would notify the nearest Maritime Rescue Coordination Centre (MRCC) of the emergency—in this case, the MRCC in Jeddah. The centre in Jeddah would most likely forward the alert to the Egyptian MRCC in Alexandria, which will coordinate the mission. Next, Alexandria would alert the Egyptian SAR (Search and Rescue) in Marsa Alam or El Quseir from where a boat would be dispatched. It sounds complicated, but it is the quickest way, because Jeddah is a lot farther from the scene of the accident than the two Egyptian cities (whose ports are too small for the largest vessels to approach). In any case, it goes to show how many unknown factors and how many elements are involved in a rescue operation.

In 2003, a Danish diver who aborted a dive on the *Thistlegorm* wreck was accidentally spotted some 20 nautical miles away by the crew of a freighter, after being adrift for 20 hours. Instead of stopping and turning, the captain radioed the SAR in Sharm el-Sheikh, which immediately went to the designated location and rescued the diver. Thanks to the SAR station being relatively nearby, the rescue could be carried out in a targeted manner. The diver was in many ways unbelievably lucky: Not only was he spotted by chance but survived the ordeal unscathed, after drifting across the busy shipping route between Sinai and Shadwan Island at night without being hit by any of the many passing vessels.

Channel 16 and proper protocol

Often, captains are merely unable to assist in a rescue. But at other times, they are not obliged to—for example, when an emergency call is not placed according to protocol. It may sound unbelievable, but it is so and for a good reason: More than 90 percent of distress calls on various maritime radio frequencies are false alarms. It puts captains and rescue services in a dilemma when leisure craft skippers are simply testing emergency calls to see if they work. Others are simply misusing Channel 16, which is the marine VHF channel designated as an international distress frequency (156.8 MHz). Primarily intended for distress, urgency and safety priority calls, this frequency may also carry routine calls to establish communication before switching to another working channel, blocking the channel and preventing real emergency calls in the process.

The consequences of not following protocol can be dire, because emergency calls on Channel 16 only have to be reacted to if the caller is unequivocally recognised as an "authorised user." This happens automatically when the emergency call is issued in accordance with the prescribed protocol form—in other words, when the emergency caller knows and uses proper "radio language."

Emergency calls over Channel 16 only have to be responded to when the emergency call is issued in accordance with the prescribed protocol form—in other words, when the emergency caller knows and uses proper "radio language."

Although communication is conducted in English, command of the language is not enough. In order to effectively broadcast on Channel 16, one is required to have at least an SRC (Short Range Certificate)—a licence for leisure crafts and water sports. Professionals must have an LRC (Long Range Certificate). During the course, the correct procedures and emergency call protocol regarding Channel 16 are taught.

If average diver Joe ever finds himself adrift at sea and calls a passing ship on Channel 16, without following protocol, he may find that the ship just continues on its course.

Transmitters

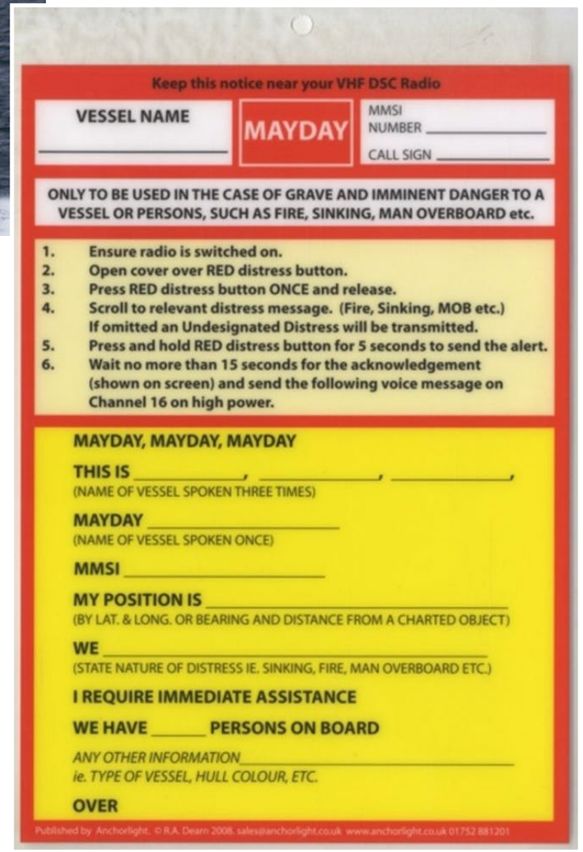
Depending on the incident, a distinction is made between an emergency report, an emergency message or a safety message. Even calling off a (false) alarm must be made following a specific protocol.

Just calling "Mayday, Mayday, Mayday" is not enough

Protocols dictate how an emergency is declared, how the caller presents him or herself and how the emergency is described. The call must include the name of the ship and its radio call sign—ideally, also the MMSI (Maritime Mobile Safety Identity), which is an individual ship identification number comparable to the chassis number of a motor vehicle. As complicated as such strict protocols may appear at first, they are actually very effective, as they ensure life-saving information such as the type of vessel, number of souls aboard, GPS (global positioning system) position and nature of the emergency is expediently and clearly relayed to the parties in charge of rescue.

To ensure that emergency calls are correctly placed even under panic or shock, stickers and cards listing these procedures for correctly placing maritime radio emergency calls can be kept on or beside the radio. These aids also allow crew members without SRC to call for help. Having a radio licence does not matter. Placing the call correctly does, and just yelling "Mayday, Mayday, Mayday" into the ether will not help.

So, if Joe ever finds himself adrift at sea and calls a passing ship on Channel 16, without following protocol, he may find that the ship just continues on its course. The captain will likely consider him yet another prankster who clogs Channel 16 worldwide, and as a result, the nearest MRCC will not be notified. That a diver could be lost at sea for real is probably the last thing on the captain's mind, and


Keep this notice near your VHF DSC Radio

VESSEL NAME _____

MAYDAY

MMSI NUMBER _____

CALL SIGN _____

ONLY TO BE USED IN THE CASE OF GRAVE AND IMMINENT DANGER TO A VESSEL OR PERSONS, SUCH AS FIRE, SINKING, MAN OVERBOARD etc.

1. Ensure radio is switched on.
2. Open cover over RED distress button.
3. Press RED distress button ONCE and release.
4. Scroll to relevant distress message. (Fire, Sinking, MOB etc.) If omitted an Undesignated Distress will be transmitted.
5. Press and hold RED distress button for 5 seconds to send the alert.
6. Wait no more than 15 seconds for the acknowledgement (shown on screen) and send the following voice message on Channel 16 on high power.

MAYDAY, MAYDAY, MAYDAY

THIS IS _____, _____, _____,
(NAME OF VESSEL SPOKEN THREE TIMES)

MAYDAY _____
(NAME OF VESSEL SPOKEN ONCE)

MMSI _____

MY POSITION IS _____
(BY LAT. & LONG. OR BEARING AND DISTANCE FROM A CHARTED OBJECT)

WE _____
(STATE NATURE OF DISTRESS IE. SINKING, FIRE, MAN OVERBOARD ETC.)

I REQUIRE IMMEDIATE ASSISTANCE

WE HAVE _____ PERSONS ON BOARD

ANY OTHER INFORMATION _____
ie. TYPE OF VESSEL, HULL COLOUR, ETC.

OVER

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Stickers and cards listing the procedures for correctly placing maritime radio emergency calls can be purchased for a few bucks, euros or quid.

The technological options, pros and cons can be confusing. Be prepared and get the right equipment from the outset—get to know its uses and limitations. Once you find yourself in a precarious situation, it is too late to read the manial and figure out how it all works.

Transmitters

Joe would only have himself to blame for being left at sea.

DSC 70

Some distress rescue stations for divers are also equipped with digital selective calling or DSC, which was developed to replace a voice call in older procedures. DSC senders are programmed with the ship's MMSI and may be connected to the ship's GPS, which allows the apparatus to know what ship it is, what time it is and where it is. This allows a distress signal to be sent very quickly. Until a few years ago, this channel was only installed in radios that were permanently installed in the wheelhouse. Personal MOB transmitters equipped with channel DSC 70 have only been on the market for a few years.

It is important to note that if MMSI is not entered into the transmitter, the capability to place DSC 70 emergency calls is deactivated and cannot be used. This feature is there to prevent the widespread abuse associated with Channel 16. Since an emergency call transmitted on DSC 70 has a range of up to 60 nautical miles, any misuse or false alarms would be heard by quite a few.

The international treaty

Responding to emergency calls over DSC 70 is obligatory, as per the international treaty governing the use of the radio-frequency spectrum. The first ship to receive a distress call on its DSC 70 receiver must acknowledge the alarm and is required to coordinate the rescue. Once the alarm is acknowledged, it will be deactivated to clear the DSC 70 channel for any other emergency calls.

Despite DSC 70 being strictly regulated as well as the requirement of an SRC being in place, problems with false alarms are also on the rise in this area. When purchasing a personal transmitter, it is therefore important to ascertain that the built-in DSC 70 button can only be used once an MMSI has been associated with the transmitter and that distress calls made over DSC 70 can be deactivated by other vessels. This feature indicates whether the personal rescue system is legal or not. Also, some transmitters are unable to receive confirmations, or be shut off remotely, once alarms have been received.

Devices that do not meet the requirements may put the whole system at risk and jeopardise everybody's safety at sea. Already in 2013, FSR—a German trade association for rescue equipment—warned that "the effectiveness of the entire system of mutual assistance at sea is in danger" due to improper use of handheld radio devices with a distress button.

While some argue paragraphs and applicable laws are required to restrict access to maritime rescue frequencies in order to prevent abuse, others argue that modern hi-tech needs to be made readily available to the increasing number of people on the water in order to comply with SOLAS, the International Convention for the Safety of Life at Sea—an international maritime treaty which sets minimum safety standards.

This makes for a delicate balancing act for decision-makers. On one hand, every human should be rescued as soon as possible! On the other hand, the use of emergency frequencies must be internationally regulated so rescue can be carried out promptly. In any case, it is of paramount importance that misuse and incompetence is reduced, as each emergency call blocks the rescuers from other operations.

Closed loop or open loop

Among the latest technology now available are MOB transmitters using a so-called "closed loop mode," which makes it possible to call for assistance without raising the alarm with every vessel within range. In this mode, the emergency call is only received by DSC 70 receivers on vessels whose MMSI numbers have been previously stored in the transmitter. This does away with the principle of a big alarm being broadcast to everybody within range, because past experience has shown that it is not necessarily safer when all surrounding vessels hear of the emergency.

Moreover, DSC 70 transmitters may also be used in closed loop mode by users who do not hold a marine radio license. This could, however, change on short notice, as such devices will automatically switch to the open loop mode after seven to ten minutes if the alarm is not confirmed by one of the programmed receivers, after which the call goes out to all vessels within range as before.

For this arrangement to work, it is assumed the dive vessel is equipped with a corresponding DSC receiver. However, as it is not mandatory for all vessels to carry receivers with channel DSC 70, it should

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Uh-oh... where is the boat?

Transmitters

never be presumed they have one installed. For example, many dive centres work with different day boats, which are hired locally, such as dhonis, Philippine outriggers, or inflatable boats—none of which have an MMSI.

In order to fully appreciate the advantages and limitations of using DSC 70, it is therefore necessary for our average diver Joe to gain a deeper understanding of how the technology works and its limitations. Only, few divers do.

Our friend Joe has done his homework, and on his next dive trip, he arrives on location with his newly purchased transmitter with a DSC 70 button for closed loop function. Once aboard the dive boat, he asks the crew about their MMSI, and to his chagrin, finds that nobody has any idea about it—or worse, that there is no DSC 70 receiver on board.

AIS

Such scenarios apply equally to Automatic Identification System (AIS) frequency emergency transmitters, which require special onboard receivers to receive the AIS signals. Originally, the AIS was developed as an "anti-collision system" for commercial shipping. Using the AIS frequency, vessels exchange information on their position, ship's name, weight, load, speed and so on. Since 2000, the system has been mandatory for commercial shipping worldwide.

In order to receive information from other vessels, an AIS receiver is required. This is connected to a plotter (screen) on which a digital nautical chart is displayed. On this chart, every vessel is displayed in relation to other ships and constantly updated. Thanks to stationary terrestrial antennas, it is even possible to detect ships when they are still behind headlands or cliffs and not yet visible. Since the implementation of this system, the number of collisions at sea has fallen sharply worldwide.

The AIS industry is happy to suggest that AIS receivers are now installed on every ship. In doing so, it relies on the International Maritime Organization's (IMO's) regulation that every commercial vessel must have AIS on board. In reality, that is not the case in every region of the world, because the IMO allows its member states so-called "national exemptions," of which some popular dive destinations such as Egypt and the Maldives make use.

In the Maldives, cargo ships approach the port of Malé in a large arc and not through the atolls, and there are no terrestrial AIS antennas there. As a result, the Maldives government does not require AIS equipment aboard dive boats and dhonis. In Egypt, the government is protecting the fishermen, who operate as micro-entrepreneurs but cannot afford AIS. Therefore, in Egyptian territorial waters, AIS is allowed but not compulsory. Consequently, many dive vessels there are not equipped with an AIS system either.

AIS as an MOB alarm

Since AIS became compulsory for commercial shipping, the AIS industry requested the IMO to also authorise the frequency for personal maritime rescuers, so the improved safety in seafaring could find its way into personal rescue. AIS MOB transmitters hit the market in 2010 and caused some hype among sailors. The royalty-free AIS frequency does not require an SRC, so sailors were able to equip their life jackets with an AIS transmitter. As the stations sold very well, the AIS industry was obviously quite pleased.

Much less happy were search-and-rescue teams, coast guards and commercial shipping, which soon experienced a firework of alarms on their plotters. Although each AIS-MOB transmitter has a "test button" to simulate and train emergencies, most of the MOB training was unfortunately done with the "sharp" alarm button. In areas with heavy traffic such as the bay of Kiel in the southwestern Baltic Sea—which is rife with ports, marinas, wharfs, a naval base, busy ferry crossings and lots of leisure boats—the plotters became swamped.

Transmitter Classes A and B

To differentiate between commercial shipping and leisure craft, two classes of transmitters were defined: "SART Class A" and "SART Class B" (SART: Search And Rescue Transponder).

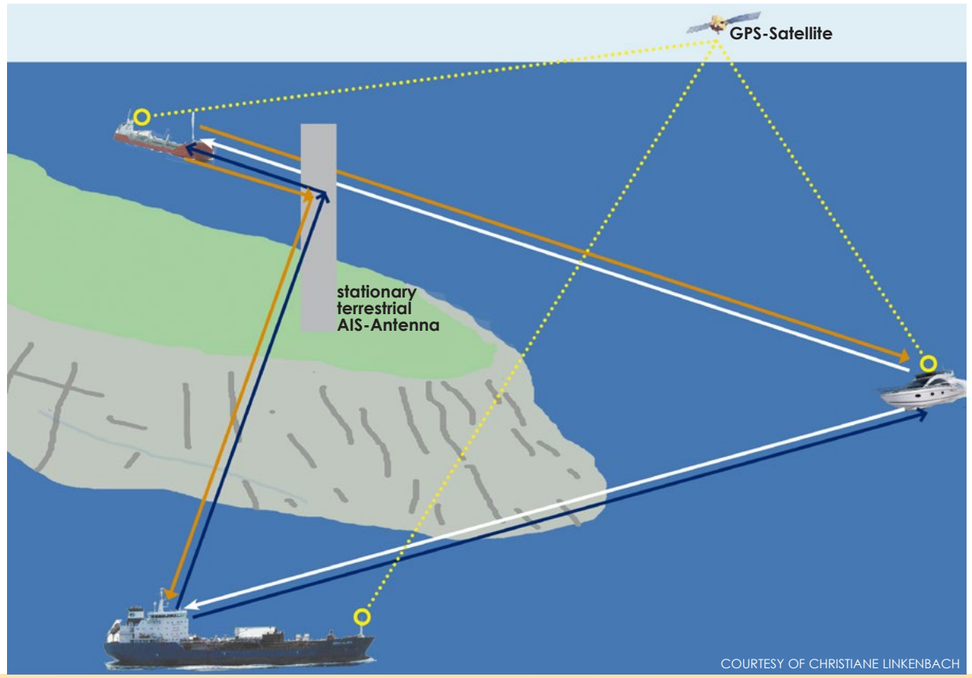
SART A transmitters for commercial shipping send data in intervals between 30 seconds and six minutes. In order for each signal to be seen by the other subscribers in the AIS system, the devices reserve time slots in the system. Meanwhile, SART B transmitters used by recreational sailing must wait until a free time slot is available for the transmission of the radio signal, which works reliably if enough time slots are available. But in regions with heavy traffic such as the English Channel, the SART B signals of recreational boating may not get through and will not appear on the plotters of the surrounding ships. This has prompted some entrepreneurs to develop some special class A transponders for pleasure craft, which cost over 2,000 Euros, in order to increase their chances of being spotted.

AIS MOB Transmitter Class A

Personal AIS channels are categorised under class A, so they are given high priority since they are (in theory) only activated in the case of an emergency. However, since they are just battery-powered, they have the weakest power of all AIS broadcasters—just one watt. Thus, the signal would stand little chance of getting through in regions where all time slots are occupied.

Another restriction is that plotters built before 2010 do not recognise the MOB icon in the AIS system (an X in a circle). On these older screens, the received signal would display as a triangular icon, which is the symbol for a ship, which may obfuscate the true nature of the emergency.

The AIS was originally developed as an "anti-collision system" for commercial shipping but was later adopted for personal transmitters too. Use of AIS transmitters does not require a radio licence.



COURTESY OF CHRISTIANE LINKENBACH

Dive instructors should possess knowledge of how present-day sea rescue works, how it is structured, and which safeguards have been implemented to keep thoughtless individuals from messing about with this crucial system.

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Waves absorb radio signals

Many AIS handheld units also require an antenna to be unfolded, or unrolled, prior to use. As a result, they may not be deployed vertically but in some other position, which is not optimal for transmission. It is already a significant challenge that water absorbs radio signals, and sea waves block the transmission. One must therefore also understand the physical circumstances at play and how they may affect the transmission of an emergency signal.

Such complications do not exactly make it any easier for our average diver Joe to make heads or tails of the technical information. One brochure may, for example, state that the transmitter has a range of 55km—which, in a strict sense, may be true. However, this may only apply when the transmitter is mounted high up on top of a wheelhouse of a big ship and connected to a tall antenna. It should therefore never be presumed that the stated range and other performance data also apply to personal units handheld by a drifting sailor or diver—except where explicitly specified.

Factors influencing transmission quality and range

Water absorbs all radio frequencies used for emergency signals, so waves of any significant height will block most of the transmission. On top of this, AIS alarms will be further attenuated if the antenna is not held vertically but at a slant. The biggest limitation, however, is the low transmission power of only up to one watt maximum for battery-powered handhelds.

Even in areas with low traffic, AIS-MOB transmitters cannot be expected to reach their stated maximum transmission range of up to eight nautical miles (15km). In reality, most will only cover 1.2 to 3 nautical miles (2 to 5.5km), which various reviews have demonstrated.

It is quite important how high up the receiving antenna is mounted—the higher it is, the better the range! Dive boats rigged with sails are able to mount their receivers high up on the mast where it can pick up alarms from longer distances. But when it is mounted on the roof of a small cutter, the diver better not have been drifting far, the sea better be smooth and there should only be a few ships around, for the AIS distress signal to go through. On a side note, it should be added that the density of the atmosphere, the curvature of the earth and even solar storms also affect the range of a radio transmission wave. In any case, there are so many factors, which come together in a complex manner, that it is impossible to put it in a simple formula. Any statements to the contrary are either unscrupulous or incompetent (or both), and can have dire consequences for users who do not know otherwise.

It would thus be a welcome change if dive training organisations would provide some basic knowledge of how sea rescue works, given the fact that distress rescue stations are increasingly pushing into the diving market. It does not mean that divers or even instructors should necessarily have an SRC. But they should at least possess knowledge of how present-day sea rescue works, how it is structured, and which safeguards have been implemented to keep thoughtless individuals from messing about with this crucial system.


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EPIRB

It was during the 1970s when the United States, Canada, France and the Soviet Union came together and jointly developed a global rescue system for commercial shipping, despite all the political tensions following the Cold War. At the time, nobody envisaged how many different functions it would eventually comprise. The effort going into technological development today is small in comparison to what it took to set up the first international emergency call frequency 406 MHz.

This frequency was initially available only to ships, because the emergency transmitters were large beacons mounted on the ship's deck. These beacons are called EPIRBs (Emergency Position Indicating Radio Beacons) and are triggered by water contact such as when a ship is listing or sinking. Initially, these beacons were connected to GPS (which was permitted for civilian use in the 1980s), but sent their emergency calls with MMSI to dedicated satellites, which were launched into space for this very purpose. From these satellites, the distress calls were forwarded to one of the more than 40 receiving stations, called LUTs (Local User Terminals), which are spread out over the globe. The LUT then forwards the emergency call to the

nearest MRCC, of which more than 40 stations also exist worldwide. From here, whatever RCC (Rescue Coordination Station) was closest to the scene of the accident and where the SAR initiated the rescue was alerted.

This is a rather complex chain, but even for ships that find themselves in distress alone on the high seas, this is the only system, even today. As horizontal radio transmission is limited by the many aforementioned factors, emergency calls must be routed via satellites in order to reach over the horizon. In the open ocean, the signal may have to travel several thousand kilometres.

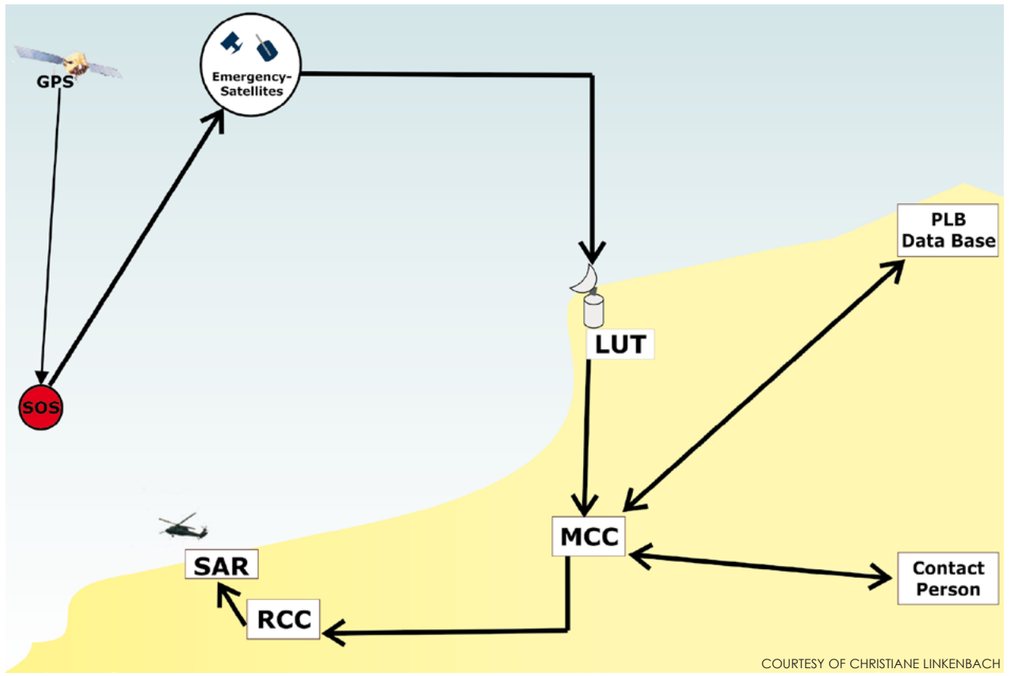
PLB

Over the years, the EPIRB has become smaller. Today, such transmitters can be mounted on the wall and are no longer installed on the deck. Personal emergency transmitters, which were attached to life jackets and clothing, were introduced. They are called PLBs (Personal Locator Beacons) and also work on the 406 MHz frequency, on the same principle as the EPIRB. For divers, there are depth-rated models in underwater housings, which first have to be opened at the water's surface in order to raise the alarm in the case of an emergency.

For decades, 406 MHz was the only rescue frequency for ships, and MOB, the only chance of rescue. Right from the onset, this system was also plagued by false alarms, both due to technical problems and to improper handling.

In order not to block rescuers and to quickly establish whether the alarm is real or false, two additional steps have been built into the rescue chain. First, each PLB is kept in a database, with the name of the owner and the contact details of another person who knows the owner (emergency contact). Second, in case of an emergency, this designated person will be contacted by the MCC to confirm that the sender is actually at sea.

This protocol should ensure that genuine emergencies are verified as such and passed immediately on to the RCC and SAR. It may appear a bit complicated, but it only adds a few minutes to the response time, which is worth the while in order to prevent initiating unnecessary rescue operations in the case of false alarms.



Rescue Operation, International Emergency Frequency / 406 Mhz

A blessing and a curse

It is a blessing we now have technology that makes it possible to respond to and rescue people in distress even over long distances. Large thanks are owed in particular to the sea rescue services and their members, many of which are volunteers, who often risk their own lives to help others. Their heroic attitudes cannot be commended often enough.

A salient point must therefore be made that personal safety at sea cannot be viewed as just yet another product category of equipment, which can be purchased and some of which are produced primarily for the sake of making a profit.

There are some real issues and limitations to consider as well as the occasional misleading information or overreaching marketing pitches to weed out, which is not easy considering the complexity of the matter.

As divers, we just seek to safeguard ourselves from being lost at sea. Fair enough. But in doing so, we still have the primary responsibility for our own safety. First of all, that means taking every reasonable precaution to ensure we do not end up in such a predicament in the first place, and not relying on having a personal safety device to call in a ride home to safety.

It is basic, sound principle that we should never rely on delegating any degree of responsibility for our own safety to other people—it is plainly wrong, and dangerous. And this goes for the purchase and use of safety devices too. Any distress calls made will, to various degrees, either inconvenience other people or put them at risk. We owe it them—and to our loved ones—to make sure we understand the design, technical features and proper use of these devices, as well as the implications if we do not. Should we one day have to raise the alarm for real because we, despite our best efforts, end up in a perilous situation, we should be able to correctly use and rely on a system that has been created to save our lives. ■

TESTING FOR LED INTERFERENCE

LED lights may interfere with VHF radiotelephone, AIS and DSC devices. The US Coast Guard has issued a "Marine Safety Alert" regarding the potential interference of VHF-FM radio and AIS reception from LED lighting. It has quite recently been found that LED bulbs may emit interference in the same frequency of the aforementioned radios. Although the jury is still out and there is no solid scientific results yet, skippers are urged to conduct a test to find out if their on-board radios are also compromised.

Nonetheless, it may be possible to test for the presence of LED interference by using the following procedures:

1. Turn off LED light(s).

2. Tune the VHF radio to a quiet channel (e.g. Ch. 13).

3. Adjust the VHF radio's squelch control until the radio outputs audio noise.

4. Re-adjust the VHF radio's squelch control until the audio noise is quiet, only slightly above the noise threshold.

5. Turn on the LED light(s). If the radio now outputs audio noise, then the LED lights have raised the noise floor. (The noise floor is generally the amount of interfering signals or static received beyond the specific signal or channel being monitored.)

6. If the radio does not output audio noise, then the LED lights have not raised the noise floor.

If the noise floor is found to have been raised, then it is likely that both shipboard VHF marine radio and AIS reception are being degraded by LED lighting. ■