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What's to Know About Life Rafts



Life rafts come in many shapes and sizes with virtually no standardisation between manufacturers. Square, oval, rectangular, hexagonal, octagonal, single buoyancy tube, two stacked buoyancy tubes are just some of the choices. Cost, weight, intended purpose and people-carrying capacity are usually the determining factors. All life raft manufacturers try to satisfy the mutually exclusive aims of making their rafts and equipment the simplest and most foolproof possible while providing the most features.



No-one ever expects to have to use their raft but it remains a salutary thought: your life and that of your

crew may one day depend on it, so choose your life-raft carefully.

Construction/build quality: Most life raft air tubes are made from either PVC, nylon reinforced butyl rubber or polyurethane. Some also have an outer cover of welded PVC that protects a PVC bladder. Quality rafts, including those to SOLAS (international shipping) standard, tend to be made from polyurethane, while cheaper versions are usually constructed of welded PVC. Whichever fabric the raft is made of, initially it needs to withstand being squashed into a tight container for an extended time period. On launching, it must withstand rapid inflation from a gas that enters it at freezing temperatures. The

International Organisation for Standardisation (ISO) has established a range of criteria detailing all the materials used in the construction of life rafts and their performance requirements including; inflation, launching, material resistance, buoyancy and interior space. All SOLAS rafts must be certified and stamped to show that they meet these demanding construction standards and for rafts found on coastal shipping and recreational vessels, the recently introduced ISO 9650 certified standard is highly recommended.



Buoyancy Tubes: Where single tubed rafts were once found on coastal and blue water vessels, they are no longer used except for aircraft and some search-and-rescue applications. Two stacked tube rafts are now mandatory because they provide a redundancy safety margin. Either of the two tubes is designed to support the raft's maximum load on its own. Unlike a car tyre or even an inflatable boat, the tubes of a fullyinflated raft are maintained at a relatively low pressure of only about 2 psi. It's the volume of air, not its pressure that supports the weight - so any leaks that may develop are reasonably easy to deal with, by either applying repair patches or inserting leak stoppers into any holes.



Shape: With a space allowance of only about 1.2 square metres per person, no-one can expect a life-raft to be luxurious, but its shape can affect comfort and morale. The choice however, finally depends on certain trade-offs. For example, a rectangular or square floor may mean that several adults can stretch out and lie down. The raft's centre of gravity is lowered which increases stability. But a round shape provides greater strength uniformly around its perimeter compared to a rectangular floor, but may only allow one or two persons to stretch out flat in the centre. Survivors sitting in a round raft will automatically tend to position themselves around the sides, with their backs against the tubes and feet inwards. Their weight will be distributed evenly.

<graphic of different raft shapes (lose text)>



Floor & Canopy: As well as protection from wind and sun, a raft's other role is to keep you warm and dry. A single membrane floor and roof could allow rapid heat loss. This may become life-threatening very quickly, particularly in colder temperatures and higher latitudes. Many life raft models now come standard with insulated floors and this feature significantly guards against hypothermia and improves comfort for all onboard. SOLAS life raft standards require an insulated floor choices available are: a sandwich of layers with a core of cellular foam, a fabric base with an aluminium film on top to reflect body heat, or an inflatable floor that needs to be independently pumped up after the raft is boarded. Insulated canopies on SOLAS life rafts usually have a double-layered membrane that is coloured safety orange on the outside and blue on the underside. In addition to improving insulation properties, the canopy's interior blue layer aids visual comfort by lessening the harsh orange glow usually associated with single skinned canopies.



<pic Insulated floor>



<caption> Composite foam insulated floor

Weight and Manageability: Even a basic four-man raft is guite heavy while a so-called light-weight raft, primarily designed for weight conscience racing sailboats, could be half the weight of a standard version. Light-weights are often made by what is called bent tube construction, where a single continuous top and bottom tube is simply bent at each corner and welded. The floor is highly critical to the design to maintain overall shape and integrity. Lightweight rafts are a popular choice with coastal sailors, in that they are light and easy to manhandle and relatively inexpensive, but unfortunately it was such a raft that failed in the 1998 Sydney to Hobart disaster when its floor was cut. Regulations and demand for more features has seen significant changes to life raft design since then. Nevertheless, in an extreme emergency and particularly when conditions are rough, getting a raft over the side can be a difficult task. Having a prearranged method in place where even the smallest crew member can remove a standard raft from its locker or storage place and prepare it for deployment is certainly good practice.



Access: Nearly all rafts larger than eight person have openings on opposite sides. Gaining access in extreme conditions, when stepping down from a boat while trying to rotate a single opening raft could be extremely difficult. A double entry system is mandatory for larger commercial life rafts and standard on larger recreational versions, but the down-side is that it may lessen security and allow more water ingress. Very often, rafts need to be accessed from the water and this can be difficult. Assistance is normally provided by a weighted multi-rung ladder and/or a semi rigid boarding ramp plus a webbing handhold to haul yourself over the



buoyancy tubes. The coroner's finding into the 1998 Sydney Hobart disaster stated that victims who were cold, fatigued and weighted down with foul weather clothing and inflated lifejackets found it extremely difficult to board a life-raft using a simple webbing ladder. To aid entering a raft, it is now accepted that single entry rafts and the second entry point on larger rafts should be fitted with a hard or semi-rigid boarding ramp. The Coroner was also highly critical of the methods of securing the opening of some raft

types. Access flaps secured using fabric ties were impossible to undo and retie and are now discouraged in raft manufacture.

Stability: Life-raft stability is influenced by a number of factors: raft shape, wind getting under the floor, canopy shape, loading of occupants, sea anchors and water ballast. But it is the combined force of wind and waves that cause rafts to capsize and water ballasted stability bags, firmly attached to the raft's underside, help to resist this occurrence. They should be triangular in section and fill with water within seconds of inflation to increase stability and reduce the risk of capsize. SOLAS and ISO 9650 standards require that stability bags be weighted and each capable of containing at least 22 litres of water.

The important role of the sea anchor or drogue should also not be overlooked. Numerous authoritative tests have shown that they deliver a powerful stabilising force that help prevent capsize. To be effective, they should be a tapered sleeve of heavy duty fabric, about twice as long as the mouth is wide.

<Insert gr a, b.>



<text for gr.1. drogue>

The drogue should be streamed as soon as possible after the life raft has been boarded. Throw the drogue overboard in the direction of movement. Its line is 30 metres long and it will into sink into the water about two to three wave lengths ahead. It will provide a powerful stabilising force onto the life raft. The line should be checked regularly by survivors.

<text for gr.2. overturning raft>

In calm conditions, wind presses down on the canopy and helps to keep the raft level. In rough weather, rotational forces come into play whereby a breaking wave in combination with the wind on the canopy can cause the raft to lift, allowing more wind under the floor. If the occupants are thrown to the low side, the raft is likely to capsize.

Observation/ventilation port: Most people will be seasick if they are in a raft for any length of time. Raising the canopy in rough conditions for this or other reasons could allow much water ingress without this important feature. They also allow a watch for possible rescue activity.



Lights: Most rafts have two lights fitted, one white or orangecoloured light outside on the roof centreline and one whitecoloured light inside. The outside light is not primarily designed for search and rescue purposes; its purpose is to aid spotting the raft from the disabled boat at night. Lights can be powered by either a special water-activated battery that can't be turned off, or a lithium type that can be de-energised by a switch or by removing the batteries. In both cases the power cell will power the globe(s) for up to 22 hours. (SOLAS requires a minimum of eight hours).

Rainwater catchment system: This is usually a fabric vee gutter stitched into the canopy that leads to a closable delivery pipe within the raft. It's a simple system that allows replenishing of the most precious commodity on board, water for drinking and for washing injuries and salt-water induced sores.





Rescue support: Simple components such as a radar reflector and retro-reflective tape segments aid rescuers locating life rafts. Radar reflectors can be incorporated into the raft canopy as a metallised reflector panel or as a separate passive component that is unfolded and deployed on a pole above the raft canopy. SOLAS requirements and rafts built to ISO 9650 standards require both a radar reflector device and retro-reflective tape segments. The highly reflective tape-segments (a propriety hexagonal-pattern that bounces light back toward a light source) aid visual sighting by maximising a ship or aircraft's spotlight. They must conform to strict manufacturing standards and occupy a minimum surface area of the raft's top and underside. In his findings into the 1998 Sydney to Hobart Race disaster, the Coroner suggested stability bags and raft bottoms be made in a highly-visible colour. Perhaps surprisingly, up to that time, many life-raft bottoms and stability bags were black coloured and the Coroner found that the sighting of dark coloured upturned rafts by searching air and water craft to be extremely difficult. Quality life rafts now incorporate highly visible stability bags and floor bottoms into their raft design.



Stowage:



Canister Stowage

Neat and low profile hard fibreglass case for cradle or deck mount stowage.



Valise Stowage

Compact, strong and highly visible polyester case for locker or cabin stowage.

Life rafts can either be stowed in a non-waterproof soft valise for underdeck or locker storage or on deck in a hard fibreglass or plastic canister. The valise option still requires that the raft be protected from chafing and sharp objects and a dedicated locker devoted to abandon ship equipment is highly desirable. Otherwise the raft will get buried beneath sails or other regularly used gear. The valise pack also means that there is usually no way to fasten the painter/activation lanyard to the boat while the raft is stowed. But hauling a raft topside, or retrieving it from a poorly accessed locker, under the most difficult of conditions is certainly a reason why a deck mounted canister stowed raft maybe a good choice. Australian Sailing now requires that yachts competing in its races have all rafts stowed on deck, preferably accessed from specially-assigned deck lockers.

Whatever the final choice, there are common-sense installation 'rules' that should be adhered to:

Canister stowage:

- 1. Always store the life raft in an easily accessible location. Ensure that it is not stowed close to any source of heat (e.g. engine or generator) or in proximity to oil products such as diesel, petrol/gasoline
- 2. Stow flat on deck with top uppermost or if stowed in a cradle, ensure that the instructions are clearly visible.
- 3. Ensure that the canister is securely lashed down to prevent accidental movement and damage. Check lashings periodically for tightness and any signs of ultra-violet damage.
- 4. Regularly inspect canister drain holes to ensure that they have not become blocked.

IMPORTANT: Before deployment ensure that the painter line is attached to a strong point on the vessel.

Valise stowage:

- 1. Always store the life raft in a dry and easily accessible location. Ensure that it is not stowed close to any source of heat (e.g. engine or generator) or in proximity to oil products such as diesel, petrol/gasoline.
- 2. Valise packed life rafts are made from a heavy polyurethane fabric and to avoid excessive wear, store securely so that it does not move around in its stowage compartment. Also ensure that nothing heavy or sharp shares the same compartment as this could cause damage. Improper stowage may cause damage to the life raft or its contents.
- 3. Ensure that your raft is readily accessible and that handles are free and uppermost before any passage. When transporting, always carry the life raft by its handles.

IMPORTANT: Before deployment ensure that the painter line is attached to a strong point on the vessel.

Abandoning Ship is a Harrowing Experience

There is no doubt that a vessel emergency that sees survivors' take to a life raft is an extremely stressful undertaking for all on board. Some survivors may also suffer shock reactions where they impulsively abandon all hope rather than strive for survival. Those survivors should be vigorously supported and offered encouragement. In reality the situation is far from hopeless as modern life rafts are designed and equipped to save all those on board. Thankfully, modern life rafts have proved their worth on countless numbers of occasions.

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