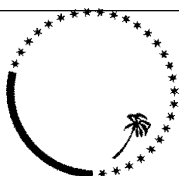


Module 2

SAFETY AT SEA AND SMALL BOAT FAD FISHING



1 INTRODUCTION

A general discussion is suggested as a good way to commence the module. Depending on the time available, two topics for discussion are suggested.

Topic 1: Tell a story

TEACHING HINT!

Emphasis Introductory discussion

To commence the module it may be useful to ask each of the participants to relate a sea story, either from personal experience, or that of friends, family, or associates, which has involved a close call or even loss of life. Take notes, then get the group to review each story discussing what could have been done to solve the problems presented in the story.

Topic 2: Is small-boat safety a problem?

TEACHING HINT!

Emphasis Is small-boat safety a problem?

Having heard the stories from the group, ask them to consider whether or not they consider small-boat safety a problem or an issue for the community. Ask questions about accidents at sea which have resulted in death or disappearance. How many people known to participants have died or disappeared in the past five years? How often does a 'close call' situation such as a search for a missing boat or local fishers running out of fuel occur? Is this a problem?

Allow about an hour for these two discussions then review the main points that have been made.

If it has not already come out in the introductory discussion, try and get the group to consider what is meant by the term **small-boat safety**. If you ask this question at the end of your summary, it should provide you with a good background of general discussion prior to examining the causes of distress situations in some detail.

TEACHING HINT!

Emphasis : Definition

Ask the group to discuss what is meant by the term '**small-boat safety**'. Use a white board to write down the main points made in the discussion.

Here are two possible definitions you might like to consider suggesting to the group:

1. Safety at sea means that fishers will take all possible precautions to ensure that they, and their vessels, are adequately equipped to handle any problems which might occur whilst at sea.
2. Safety at sea means 'always getting home'.

Write these definitions on the whiteboard and underline the words **all possible precautions**. Rather than having the group list precautions at this stage of the workshop, tell the participants that these precautions will be discussed in detail at a latter stage of the module.

If your discussions have gone well, the group should now have a reasonable background for the introduction of the first main section of the workshop.

2 CAUSES OF DISTRESS INCIDENTS AT SEA

2.1 What is an emergency situation for a small boat at sea?

POINT TO NOTE!

An emergency situation for a small boat at sea can be defined as:

‘A situation which, if not controlled or managed, will place human life at risk.’

Emergency situations usually occur when a problem situation is experienced and the fisher is either not equipped or not capable of solving the problem. Generally, a compound problem makes the initial problem situation turn into an emergency. This scenario is illustrated with the following examples:

- | | |
|-----------------------|--|
| 1. Problem situation: | run out of fuel 2 km offshore. |
| Compound problem: | no auxiliary means of propulsion. |
| Emergency situation: | boat is drifting away. |
| | |
| 2. Problem situation: | boat is filled with water by large wave. |
| Compound problem: | no pumps working / no flotation devices. |
| Emergency situation: | life at risk through possible drowning. |

TEACHING HINT!

Split the class into groups of four or five persons and ask each group to prepare a list of **emergency situations** which can occur at sea in a small boat. Suggest to the group that they should:

1. Distinguish between a problem situation and an emergency situation.
2. Think about compound problems, i.e. how problem situations become emergency situations.
3. For each emergency situation, list the sequence:
initial problem —> compound problem —> emergency situation.

Ask one trainee of each group to read his list to the rest of the class. Attach lists to the wall of the classroom.

Examine the lists presented by the groups and write a re-organised list on

the whiteboard which summarises the findings of the class.

The following table summarises the seven main emergency scenarios which might occur at sea on a small boat.

How does this table compare with the list produced by the trainees?

Initial Problem	Solution	Compound problem	Emergency
• engine failure	repair engine	no tools or no repair skills/ no auxiliary power	drifting away
• out of fuel	spare fuel	no auxiliary power	drifting away
• lost sight of land	compass and basic navigation skills	no compass or no navigation skills	drifting away
• vessel leaking or swamped	pump or drain water	no pump/ drainage capability	vessel in danger of sinking
• sudden change of weather	seaworthy vessel, good seamanship	vessel un-seaworthy or poor seamanship	possible loss of life
• accident or injury	apply first aid	no first-aid kit or no first-aid skill	possible loss of life
• fire	fire extinguisher	no fire extinguisher	vessel in danger of burning

The next step is to consider the real ‘cause’ of most emergency situations, **human error**.

2.2 What causes emergency situations for small boats at sea?

TEACHING HINT!

Emphasis The role of human error in emergency situations

Ask the trainees to consider the role of **human error** in emergency situations. Check through the list of scenarios already recorded by the group and focus discussion on **why** the problems and emergencies have occurred.

WHY did the boat not carry tools, spare fuel, auxiliary power, flotation devices, fire extinguisher, compass, first-aid kit etc?

WHY did the engine break down?

WHY were the navigation skills missing?

BECAUSE NOBODY HAD PUT THE TOOLS, SPARE FUEL ETC. ON BOARD, NOBODY HAD CHECKED THE ENGINE PRIOR TO DEPARTURE. AND NOBODY HAD BOTHERED TO STUDY BASIC NAVIGATION.

POINT TO NOTE!

In most cases, if fishers take **all possible precautions** in planning their trip, ~~any problem situation would be more easily resolved and emergency situations would not occur.~~

The group discussions undertaken so far have answered the first major question of the module ('What is an emergency situation for a small boat at sea?'). The next step is to examine the precautions that fishers should take to minimise the risk of emergency situations.

3 PREPARATION FOR PROBLEM SITUATIONS AT SEA

3.1 Equipment to take to sea – Life-saving aids

There is never a great deal of spare room on a small fishing boat heading off-shore, so the task of selecting exactly what should be taken to sea in the way of both general and safety equipment is an important one. The equipment needed will of course depend on the type and size of the vessel, the duration and destination of the trip, the number of people going, and the type of fishing to be undertaken.

TEACHING HINT!

Emphasis Life-saving aids

Split the class into groups of four or five persons and ask each group to list safety items that should be taken on a small offshore fishing boat (stress that the list is for a small boat and should not include safety equipment normally associated with larger vessels such as liferafts or SSB radios).

Ask one trainee of each group to read his list to the rest of the class. Attach lists to the wall of the classroom.

Examine the lists presented by the groups and write a single list on the whiteboard combining the suggestions made by each group.

Ask the class to then consider each item listed and decide whether the item is **'essential'** (i.e. you SHOULD NOT go to sea without it) or **'desirable'** (i.e. item you would like to have on board but it is either too expensive or not essential).

AV 2-3.1

How does the list prepared by the class compare with the following safety equipment list?

ITEM	ESSENTIAL	DESIRABLE
* Spare fuel	Yes	
* Engine tools	Yes	
* Basic spare parts	Yes	
* Anchor/chain/rope	Yes	
* Equipment to rig a sea anchor	Yes	
* Alternative means of propulsion	Yes	
* Compass	Yes	
* Signalling device	Yes	
* Flotation devices	Yes	
* Water in container	Yes	
* Food	Yes	
* Basic first-aid medical kit	Yes	
* Knives	Yes	
* Pumping or bailing equipment	Yes	
* Equipment to rig shelter	Yes	
* Radio AM/FM		Yes
* Radio VHF/SSB		Yes
* Chart		Yes
* Fire extinguisher		Yes
* EPIRB		Yes

One main difference between the list prepared by the group and the above list will probably be with the use of the terms **signalling device**, **flotation devices**, and **alternative means of propulsion**. Chances are that the group will list specific items such as flares, lifejackets, or auxiliary engine. All are costly items and it is very likely that the group will raise the issue of cost in relation to safety equipment.

At this stage, it is worthwhile stressing that, while these expensive safety items are certainly effective to solve problem situations at sea, there are **cheaper alternatives** which, although not as effective, are considerably **better than nothing at all**.

3.2 Affordable safety equipment

Many fishers in the Pacific perceive safety equipment to be so expensive that it is beyond their purchasing power. Consequently, many choose to ignore any safety mechanisms, even those which are relatively inexpensive.

If fishers can see that basic safety equipment can be fitted to their vessel at minimal cost, and other important safety measures can be taken for little or no cost, then perhaps they will take safety more seriously. This is one of the key point of emphasis in the workshop, so time should be taken to promote the perspective that safety equipment need not be expensive.

TEACHING HINT!

Emphasis Equipment alternatives

Ask the group to look at the equipment list (section 3.1) and to consider **alternative means of propulsion, and signalling and flotation devices**. (Note that these constitute three very important aspects of basic safety). Ask the group to list all possible safety items for each of the above equipment categories.

Trainees should make up their list as follows:

- Equipment category: ALTERNATIVE MEANS OF PROPULSION
Possible safety items: **oars, sail rig, auxiliary engine.**
- Equipment category: SIGNALLING DEVICE
Possible safety items: **mirror, torch, code flags, air horn, flares, VHF radio, EPIRB.**
- Equipment category: FLOTATION DEVICE
Possible safety items: **longline floats, plastic container, life-jackets.**

Now that trainees have listed the different items for each of the three categories of safety equipment, it is time to stress the following points:

- For fishers whose boat is swamped and sinks, clinging to a **fishing float or a 20 litre plastic container** may mean the difference between life and death.

- For fishers who find themselves out of fuel or unable to repair an engine which has broken down, an **emergency sail rig** can mean the difference between arriving home several hours late and never arriving home. The simple sail rig designed and advertised in the region by the FAO is cheap to purchase or build and can be easily fitted to most dory type small vessels.
- Although flares, VHF radios, and EPIRBS are certainly desirable for signalling the position of a boat in distress, these items can be beyond the purchasing power of small boat fishers. Mirrors, torches, flags, and V signals are all useful means of close-range signalling, but by far the most effective means of sending the signal that you are in distress is failure to return home at a scheduled rendez-vous. In simple terms **‘tell somebody where you are going, who is going, and what time you plan to return.’** If you do not return on time, the signal is received, and (hopefully) search and rescue will be mobilised.
- Another very effective safety ‘signal’ can be found in the application of the buddy system used in scuba-diving, **‘always fish with a friend’**. Working in close cooperation with another vessel or a group of vessels is one of the simplest and most effective safety measure for small-boat operators offshore. Keeping a casual eye on other vessels fishing a FAD and accounting for the return of each vessel on a daily basis, whether it be in pairs or groups, is a sure way to provide a signal should one of the vessels get into danger.

Try and get the group to agree that these simple concessions to safety are both easy to organise and inexpensive.

POINT TO NOTE!

Basic safety at sea for small boats does not necessarily mean spending big money.

TEACHING HINT!

Emphasis The cost of a 'safe' boat

Ask the fishers or boat owners in the group to list the safety equipment they currently carry aboard their vessels. Have the group compare the lists with the essential safety item list (section 3.1) and summarise the safety deficiencies of each vessel.

Using estimated prices for each item, ask the group to try and cost the probable expenditure required for each vessel to come up to an essential equipment standard (Stress that while looking at the safety requirements of each vessel, trainees should consider the cheap alternatives discussed previously).

When the group has placed dollar values on the purchases required for each vessel, promote a discussion on whether the expenditure is 'affordable' or not.

If the general consensus is that the expenditure is not affordable, suggest to the group possible mechanisms for purchase such as extended credit, revolving funds, grants, bank loans etc.

The point of this exercise was to show trainees that basic safety at sea on small boats is affordable. If participants are serious about playing it safe at sea, not being able to afford the equipment should not be an excuse anymore.

POINT TO NOTE!

It may happen at the end of this exercise that some trainees still consider that the recommended safety equipment is beyond their purchasing power.

In that case, your final words should be the question: **'How much is your life worth?'**

3.3 Departure checklist

We have so far examined the recommended safety equipment which should be carried on small vessels. What other matters should be considered before heading out to sea?

TEACHING HINT!

Emphasis Things to do before going out to sea

Split the class into groups of four or five persons and ask each group to list the various steps that should be taken prior to heading offshore on a small boat.

Ask one trainee of each group to read his list to the rest of the class. Attach lists to the wall of the classroom.

Examine the lists presented by the groups and write a single list on the whiteboard combining the suggestions made by each group. Discuss each item as it is listed.

AV 2-3.3

How does the list compare with the one set out below?

• Weather report	check the weather forecast
• Shore-based contact	tell someone who cares where you are going and when you plans to return
• Safety equipment	is all necessary safety equipment on board?
• Gear and equipment storage	are gear and equipment well stowed?
• Engine	check that your engine is in good running condition
• Bilge and hull	inspect the hull for cracks or leaks and check bilges

Discussion:

- **Weather:** most island countries now have regular radio weather bulletins to advise of expected weather conditions and wind. The reliability of weather forecasts is a favourite subject for commercial fishers and many tend to rely primarily on local knowledge. Experienced fishers use things such as cloud movement and formation, sea conditions, and seasonal weather variations to assess likely conditions offshore. Perhaps the best approach to weather is to **combine all available information** when making weather-related decisions.
- **Shore based contact:** the most appropriate shore based contact is **a person who cares about you** – usually a family member or friend. If you go fishing regularly, it should be easy to develop the habit of leaving a message each day with your general fishing plan and the time you intend to return.
- **Safety equipment and gear storage:** having a range of safety equipment aboard your vessel is a good thing but it is also important to ensure that your equipment is well stowed and accessible when you need it. Ensure items such as spare parts and first-aid kit are stowed in **waterproof containers** and make sure you know where everything is. **Plastic containers** such as fish boxes can be very useful for general storage in small boats. Be sure that everything is tied or lashed so that there will not be any loose pieces of equipment flying around the boat if the weather is rough.
- **Engine, bilges and hull:** a quick pre-departure check of your engine should be carried out each time you go out fishing, although the check-list will vary according to the engine type and configuration. For outboards, check for gearcase oil leaks, check bracket mounting bolts, propeller split pin and fuel filter, and ensure the water pump is operational. When using non-oil injection outboards, you should be 100 per cent sure that **fuel tanks contain pre-mix and not pure petrol**. For inboards, check the sea-water intake and associated hoses and clamps, check engine oil level and check V-belt tension. A quick general hull inspection should be carried out to look for new cracks or leaks and bilge should always be checked prior to departure.

POINT TO NOTE!

Using a **departure checklist** is a good way for fishers to make sure that none of the safety items or precautions is forgotten prior to departing to sea.

Ideally, the departure checklist is a **recto-verso laminated sheet** which will be left aboard the boat. One side of the sheet will include the essential Life-saving aids to have on board (section 3.1) whilst the other side will recall the things to do before heading off to sea.

**Show SPC
checklist card
& distribute
same**

3.4 Engine maintenance

While Life-saving aids might help a fisher after he is in trouble at sea, keeping him out of trouble in the first place is obviously a major consideration.

Since engine failure is listed in almost all Pacific Island countries as being the major cause of emergency situations, the purpose of this section is to promote **proper and regular maintenance of motors**, and thus to prevent fishers from mechanical problems.

POINT TO NOTE!

Mechanical problems associated with engines are the major cause of distress for small boats at sea.

The time allocation for this module on safety at sea does not allow a comprehensive coverage of engine maintenance with 'hands-on' practicals. However, rather than ignoring this important safety issue, some guidelines can be given to the trainees through discussions and the distribution of hand-outs.

TEACHING HINT!

Emphasis The importance of regular engine maintenance

1. Ask the trainees who have a motorised vessel whether they regularly maintain their engine or not. For those who do not maintain their engine, try to find out why. Typically, two types of answers can be expected : lack of adequate supply of spare parts and lack of engineering skills.
2. Discuss the trainees how the problem of **spare parts availability** could be solved. Suggest options, like fishers jointly expressing their concerns to the local engine dealer, directly or through the Fisheries Department.
3. Explain that for small engines (outboards up to 75 HP, diesels up to 30 HP), regular maintenance does not require a large amount of skills. These can be easily transferred from one fisher to others.
4. Display AV 2-3.4a (for outboards) or AV 2-3.4b (for diesels) and distribute corresponding hand-outs. Briefly go through the maintenance lists explaining each item and its importance.

AV 2-3.4a

AV 2-3.4b

& distribute
handouts of
same

POINT TO NOTE!

The life expectancy of **non-maintained engines** varies from 2 to 4 years whereas regularly maintained ones can last indefinitely.

VIDEO: 'Better Safe Than Sorry' – SPC (30 mins)

1. Introduce the video

This video relates the story of two fishermen who are close friends. These fishers have completely opposed approaches to safety at sea – one, Jone, always plays it safe when at sea; the other, Rambo, is careless. The story is pure fiction, but many Pacific Islands artisanal fishers might recognize themselves in one of the two main characters – and possibly more in Rambo than in Jone.

2. Participants to identify major points

- The video first highlights two different approaches to safety:
 - Jone, the safety conscious fisherman, always carries the essential Life-saving aids on board his boat.
 - Rambo, on the other hand, does not believe that small-boat safety is an important issue. He carries no safety equipment on board his boat, and, although he once had a serious alert at the FAD, he still does not listen to Jone's advice concerning the need to carry the essential Life-saving aids on board his boat.
- The video then shows the Search and Rescue process with impressive means put in place (aircraft, SAR vessel, small village boats). It also highlights the cost of SAR operations.
- The conclusion of the video is fairly pessimistic: although all possible means for search have been explored, Rambo remains lost at sea after three days drifting.
- The main message of this video is that distress incidents like Rambo's can be avoided if fishers carry decent safety equipment on their boat. Another important message is that equipment for small boat safety is not necessarily expensive.

3. *Discussion*

- Do you think a similar story could happen amongst the fisher community in your village? Why?
- Now that you have watched the video and discussed small-boat safety issues in the classroom, do you think your attitude concerning safety at sea will change? What new safety measures will you take prior to the next fishing trip?
- What would you do if a fisher from your village gets lost at sea? What are the means for Search and Rescue available locally?
- What should be done to improve the success rate of Search and Rescue operations in your country?

Difficult situations at sea can occur anytime, even if the fisher has taken all necessary precautions to ensure that he and his vessel are safely equipped. Having the right equipment on board is a good first step to handle the problem or emergency situation, however, the fisher and his crew need to know exactly how to respond to danger by **doing the right thing at the right time**.

POINT TO NOTE!

In most cases of emergency, **time is the most important factor**, i.e. the fisher will need to **take decisions quickly and action efficiently**.

The purpose of this section is to advise trainees on how to handle certain types of problem/emergency situations at sea.

4.1 Engine breakdown

As explained in section 2.1, an engine breakdown on a small boat offshore is a problem situation which may, under certain circumstances, evolve into an emergency situation. If the boat is safely equipped, i.e. has a tool kit, some engine spare parts, an anchor or a grapnel with rope, a sea anchor and an auxiliary means of propulsion, the fisher should always be able to handle the problem situation and return home safely.

The way fishers should respond to an engine breakdown is as follows (if time permits, this can be done as an exercise by splitting the class in groups of 4 to 5 trainees and asking them to list the various steps to follow when facing an engine breakdown):

Step 1 Stop the boat from drifting/put the boat head to wind

Why?: To avoid drifting away/capsizing (if weather is rough)

How?: **Anchor the boat** (if close to the reef) or **deploy sea anchor**

Step 2 Try and repair the engine

How?: Use your **tool kit** and/or **spare engine parts** (see section 4.1.1)

Step 3 (If engine can not be fixed): Install auxiliary means of propulsion

How? Set up your **sail rig** or your **spare engine** and ensure it is working well

Step 4 Haul the anchor/sea anchor, stop fishing and head back home

POINT TO NOTE!

An **auxiliary engine** will only save your life if it works when you need it. To avoid the tragic scenario of the spare engine not starting when you are in distress, **maintain it properly** and **make it run regularly**.

AV 2-4.1a

POINT TO NOTE!

In the event of a complete breakdown compounded by the absence or failure of the auxiliary propulsion, it is essential to stop the boat from drifting unless it moves towards the shore. A **stationary boat** is indeed easier for searchers to locate after flares or other signalling devices have been used.

If the breakdown happens in deep offshore waters, the drift can still be slowed down a lot by using a **sea anchor**. Efficient sea anchors can be purchased or made up with **rice bags or tarpaulin**. An improvised sea anchor can also be made by tying **buckets** onto the ends of ropes. If buckets or tarpaulins are not available, a surprising amount of resistance against wind drift can still be created simply by trailing **long ropes** in the water.

4.1.1 Engine troubleshooting

Engine troubleshooting could be the subject of a two-day workshop on its own. Because of time limitation, only brief advice on outboard motor troubleshooting will be given in this section.

Most frequently, engine breakdowns on small boats are caused by **fuel-supply problems** which, very often, are fairly easy to solve. The following 'step-by-step' list should help fishers to find out whether an engine breakdown is or is not caused by a fuel-supply problem:

AV 2-4.1b

& distribute
hand-out of
same

- Step 1** check fuel tank to ensure that it is not empty
- Step 2** check fuel tank to ensure that air screw is opened
- Step 3** check fuel tank filter (if one) to ensure that it is not blocked
- Step 4** check arrow on primer pump to ensure that fuel line is connected the right way
- Step 5** check fuel line for leaks and to ensure that it is well connected on both ends (fuel tank and engine)
- Step 6** check fuel filter to ensure that filter casing is tightly screwed and that filter is not blocked

Step 7 check fuel pump to ensure that membrane is not torn out

Step 8 check carburettor to ensure that draining screw is not opened

Other simple problems can cause an engine breakdown. Depending on the engine symptoms, carry out the following checkups:

AV 2-4.1c

**& distribute
hand-out of
same**

- ENGINE DOES NOT START:
 - safety cut-out switch unplugged? (manual start)
 - contact switch 'off' ? (electric start)
 - spark plugs need to be cleaned or changed?
 - fuel supply problem? (see above)
- ENGINE STARTS THEN STOPS ALMOST IMMEDIATELY
 - choke is 'on' ?
 - fuel-supply problem? (see above)
- ENGINE STARTS BUT STOPS WHEN GEAR IS ENGAGED
 - propeller is blocked?
 - transmission is blocked?
 - spark plugs need to be cleaned or changed?
 - idle needs adjustment?
- ENGINE RUNS BUT GEAR CANNOT BE ENGAGED
 - remote control unplugged?
 - gear inversion shaft unplugged?
- ENGINE IS REVVING UP BUT BOAT'S SPEED IS NOT INCREASING
 - propeller split pin broken or silent block spins freely?
 - an object is stuck in the propeller?
- ENGINE IS GETTING HOT
 - water intake is blocked (usually by plastic bag)?
 - water cooling system is blocked or impeller is broken? (check pump system 'tell tale')

POINT TO NOTE!

The **main point** in troubleshooting is to envisage the **simple problems first** and work back through the engine system.

4.1.2 Handy spare parts and tools

The spare parts and tools a fisher will take aboard depend on the type of engine he has.

For **small outboard motor** operators, the recommended repair kit is as follows:

AV 2-4.1d

**& distribute
hand-out of
same**

- screwdriver
- pliers
- wrenches
- spark plug spanner
- spark plugs
- split pins
- spare propeller
- spare starting rope
- spray of water-repellent oil (CRC or similar)

For **diesel engines**, add the following:

- sockets and drivers
- hammer
- adjustable wrenches
- clamps
- torch
- oil and fuel filters
- V-belts

POINT TO NOTE!

When preparing your repair kit, get ready for problems you have had in the past by taking the tools or parts you missed on these occasions.

4.2 Vessel sinking

With this type of emergency situation, **time is the most critical factor**, and the outcome of the accident will mainly depend on the circumstances in which the sinking took place.

If the sinking occurs in a flash, for instance after the boat was capsized by a large wave or after a reef was hit at high speed, then the fisher will not have time to get prepared for the emergency and his life will be at risk through possible drowning. In that scenario, the most sensible thing the fisher can do is to grab a floating object which will help to keep him afloat. Drifting offshore without any food, fresh water and signalling device, the fisher will have almost no chance to survive longer than a couple of days. **Hypothermia** (excessive body heat loss which can lead to death), **thirst**, **sunburns**, and **sharks** will be the fisher's worst enemies.

In other circumstances, the sinking of the vessel will be more predictable, leaving the fisher more time to prepare for the emergency situation. This can be the case in a vessel being progressively filled with water by big waves or by a major hull leak. In such conditions, the fisher should **try not to panic** and make the best possible use of the short period of time leading up to the sinking. The following list suggests a sequence of measures which could be taken on a small offshore boat prior to sinking:

N°1 Each fisher on board ensures that a **flotation device** (lifejacket/fishing float/container) is at hand

Why? To avoid drowning when the vessel has sunk

N°2 Each fisher puts any possible **clothing** on

Why? To delay hypothermia

N°3 **Half-full fresh water container** is placed at hand

Why? If full, the water container would sink

N°4 **Signalling devices** (EPIRB and flares being the best) are placed at hand. If flares are on board, they should be put in a water-tight plastic bag

Why? To increase your chances of being located by a passing ship/plane or the Search and Rescue team. If flares are being taken, the water-tight plastic bag will protect them from humidity

After the vessel has been abandoned, the fishers should try to stay **in sight of each other** when drifting.

POINT TO NOTE!

Drifting fishers, after a sinking, are almost impossible to detect from a plane or a boat. If flares are to be used, they should not be wasted but fired when there is most likely to be someone on land, on a boat or in a plane to see them

4.3 Fire

There is a **fire risk** on all small motorised fishing boats due to the inflammable nature of engine fuels.

Fire extinguishers are highly desirable (and in some countries mandatory) on **diesel-driven vessels** due to the inflammable nature of gas-oil. These fire extinguishers need not be expensive: small, cheap extinguishers sold for car, pleasure boat and camping use will usually be suitable.

If a fire starts on a diesel engine, try to stop it by using the fire extinguisher or by covering it with some cloth or a blanket. **Never pour water on burning gas-oil as this will only make the fire build up.**

Petrol is a much more flammable fuel than diesel (gas-oil), and petrol fumes present the greatest fire risk of all.

POINT TO NOTE!

WHEN PETROL IGNITES, YOU DO NOT GET A FIRE, YOU GET AN EXPLOSION OF WHICH THERE ARE NO WARNINGS AND OFTEN NO SURVIVORS.

To reduce the risk of explosions on **petrol-driven boats**, several precautions should be taken:

- **ban smoking** completely on board, or at least ensure that the lighting of cigarettes is done well away from fuel tanks and from the engine itself.
- stow petrol tanks in a ventilated part of the boat, and never in the cabin where people may be smoking.
- be careful with **naked flames** (matches, Colman lamps, etc.).
- before starting **inboard petrol engines**, remove the engine cover for a few minutes to allow fumes to disperse. This will reduce the risk of an explosion caused by sparks from the starter motor's electrical system.

4.4 Crew injuries

Fishing boats are places where sharp and dangerous objects are used to catch and kill often powerful fish. Minor injuries such as cuts and bruises are almost a certainty, and there is great potential for more serious accidents.

AV 2-4.4a

The boat's skipper should ensure that his crew adopt safe working practices and avoid injury to themselves and other crewmen. In particular:

- **gloves should always be worn** to protect hands from lines, knives and fish teeth,
- **fishing gear and knives should be kept in a safe place** when not in use,
- **fish with sharp teeth should be gaffed and handled carefully** to avoid dangerous bites,
- when using wooden hand reels for trolling, **keep out of the way of the reels** so as to avoid severe injury from the spinning reel when a large fish makes its initial run.

Nevertheless, any fisher should be ready to cope with accidents when they do occur. To do so, first-aid supplies should always be on board.

POINT TO NOTE!

The first-aid kit is a piece of essential safety equipment that should be on board every small boat.

A basic first-aid kit will include the following items:

- aspirin or Panadol (or any other pain killer),
- liquid antiseptic (iodine, 60° alcohol, etc.),
- antiseptic cream,
- band-aids,
- bandage,
- sterile gauze,
- adhesive tape,
- scissors,
- tweezers.

AV 2-4.4b

**& distribute
hand-out of
same**

4.4.1 Minor cuts and burns

Fish slime is full of bacteria which can cause painful infections in even small knife cuts, hook scratches and line burns. These should always be washed in fresh water and then treated with antiseptic cream and covered using a band-aid or small bandage. Gloves should then be worn to prevent any dressings on the hands being pulled off.

4.4.2 Taking out a hook

If a barbed hook gets impaled in a finger, or anywhere else, it is usually extremely painful to pull it back out again. A less painful way to get it out is to push the hook right through the flesh until the point and barb stick out clearly. Then, using pliers or wire cutters, snip either the eye or the barbed point off the hook. This will allow it to be pulled out more easily. If the hook is too thick to be easily cut, gently file down the barb, or squeeze it shut using pliers, so that it offers less resistance to being pulled back out.

AV 2-4.4c

4.4.3 Broken bones

This is a case where the best remedy is to get the injured person ashore as soon as possible. If the sea is rough and he is unable to lie in relative comfort, it may be necessary to try to relieve his pain by immobilising the broken bone. For a broken arm or leg, a splint made from a paddle or gaff handle should be tied along the broken limb, using cloth strips. This will keep the limb straight and prevent it from moving. For a broken collarbone, a cloth sling should be made to support the affected arm in a comfortable position across the chest.

AV 2-4.4d

4.5 **Bad weather**

In the Pacific region, it is not uncommon to get caught in a squall while fishing offshore. Squalls are often accompanied by large waves which may place a small fishing vessel in threat of capsizing. Under such circumstances, the following measures should be taken by small vessel operators to reduce the risks of capsizing:

- N° 1 reduce speed** of the boat and **steer into the wind**;
- N° 2 distribute load** on board in order to obtain the safest possible balance;
- N° 3 ask one crew-member to **secure heavy or bulky equipment**** on board (e.g. ice-box, water and fuel containers, deep-bottom grapnel and rope);
- N° 4 if waves get bigger and boat starts to get swamped, crew should get ready for vessel sinking** (see 4.2).

POINT TO NOTE!

Before heading out to sea, if the fisher realises the weather is too rough for his vessel, he should always play it safe by postponing his fishing trip.

Breakdowns at sea, small boats going missing and fishers drifting ashore in other countries after spending weeks or months at sea, are much too common events in the Pacific Islands region. Sometimes the boat crew survive, but in many instances, there is considerable unnecessary suffering and loss of life. Although most of these mishaps are caused by carelessness or inadequate preparation before fishing trips, some accidents at sea can also occur to 'safe' fishers.

If misfortune befalls a fisher and he finds himself drifting lost at sea, there are a few important tips he should know to increase his chances of survival until help or land arrives.

TEACHING HINT!

Emphasis The 'enemies' of drifting fishers lost at sea

Ask the group to list the 'enemies' that drifting fishers lost at sea have to face.

Compare the findings of the class with the following list:

- thirst (or lack of fresh water),
- sun (or lack of shade),
- hypothermia (or lack of clothing and shelter),
- hunger (or lack of food),
- bad weather,
- being missed by the Search and Rescue team,
- discouragement.

5.1 Collection of fresh water

An offshore fisher should never go out to sea without **plenty of surplus water**. Big fresh-water containers should be kept on board the boat at all times.

POINT TO NOTE!

Thirst is a much greater threat than hunger.

If he has to, a man can survive several weeks without food, but only a few days without water.

AV 2-5.1

Even before the water supplies start to run low, the lost fisher should make every effort to **use as little as he can**, and to **collect extra water** at every opportunity.

- when it rains, use buckets to collect drips from the deck or cabin top, or arrange a tarpaulin, cloth or canvas as a collector.
- during the night, fresh water will condense on cold objects such as metal items, glass windows and the deck. Use a cloth to collect it, and improvise additional condensation collectors, such as plastic bags or buckets filled with seawater. These will cool down during the night, so that condensation forms on the outside and this can be shaken or scraped off into a cup or bowl.
- other sources of water include the juice of drifting coconuts, and the fluid from the belly cavity of sharks. This fluid has a low salt content and can be tolerated by the human body. A number of drifting micronesians are known to have survived by drinking shark 'belly-water' (not blood).

POINT TO NOTE!

If things are really desperate, small volumes of sea-water can be drunk each day with only a few little sips taken at a time.

5.2 **Protection against the sun**

As far as possible, stay out of the sun during daytime. If you have no shelter on your boat, try to rig up some sort of shade from clothing, a tarpaulin, or canvas. This will reduce the risk of sunstroke or severe sunburn and cut down on water loss from the body. The result is that less drinking water will be used and water supplies will last longer.

5.3 Protection against the cold

Hypothermia (excessive body heat loss) can lead to death, and is a threat, even in the tropics. This is particularly true in small open boats, where there is no shelter from the elements. A long period of exposure to wind and rain, especially at night, can cause rapid chilling. If no protective clothing or shelter is available, it may be warmer to hang over the side of the boat in the water for short periods of time.

5.4 Collection of food

Try to catch fish or sea-birds to eat rather than consuming any preserved or canned food you may have on board – save this for as long as possible. Improve harpoons with straightened hooks to catch basking fish, mai-mai, sharks or turtles which may approach the boat. If you have lamps, use them at night to attract fish close to the boat where they can be speared, hooked or scoop-netted.

5.5 Bad weather

On a drifting boat caught in bad weather, the only way to minimise the risk of sinking/capsizing is to deploy a sea-anchor. If no proper sea-anchor is available, you can improvise one using buckets or a tarpaulin (see section 4.1).

5.6 Search and Rescue

Knowing certain distress signals, and being able to make them, may attract attention to the fact that a vessel is in trouble, or help searchers to locate it more easily.

- **Radio signals:** the most effective way to attract attention in areas close to urban centres is to carry a **VHF radio**. Although expensive, this is the best way to call for help, provided that you know the frequencies to use to contact the local marine radio station, coastguard, or other vessels. However, the range of VHF radios is limited (within a few nautical miles). VHF radios are not very useful in most rural or outer-island areas in Pacific Island countries.

Show
VHF radio

Another radio device is the **EPIRB** (Emergency Position Indicating Radio Beacon). These units are now commonly available and when activated emit signals on international distress frequencies which can be picked up by passing planes or boats, or nearby shore stations. EPIRB signals can be detected by radio receivers hundreds of miles away.

Show
EPIRB

- **Flares:** One of the best way to attract attention and to signal distress is to use flares, of which there are two main types. **Smoke flares**, are for daytime use only and are practically invisible at night. They are very valuable for assisting actively searching planes and boats to locate the vessel in distress. 'Starburst' or '**parachute**' flares which shoot a burning red or white firework into the air, are clearly visible in daylight but are even more noticeable at night. For practical purposes, parachute flares are the best for alerting distant observers that a boat is in trouble. They should be fired straight up for maximum visibility.

Show
set of flares
(two types)

POINT TO NOTE!

If you do have to use flares, try to do so when there are most likely to be people to see them. Spread them out allowing a reasonable time (2–3 hours) between flares, rather than firing them all at once.

DON'T WASTE YOUR FLARES UNLESS YOU THINK THERE IS LIKELY TO BE SOMEONE AROUND TO SEE THEM!

Show
'SOS' signal
using torch

- **'SOS' signal:** This is the best known of all international distress signals, and consists of three short pulses, followed by three long ones, then three short ones again, the whole group being repeated regularly. The 'SOS' signal can be made using lights – for example, switching a **torch** on and off, using a bucket to cover and uncover a **Colman lantern**, or in the daytime, using a **mirror** or other flat, shiny object to flash sunlight towards an observer. The signal can also be made using sound if a **whistle, airhorn**, or other sounding device is at hand.
- **'V' signal:** The letter 'V' displayed on a boat deck or cabin top is another international distress signal, particularly useful if you are trying to attract the attention of aeroplanes. The 'V' can be painted on the back of a **tarpaulin** ready for emergency use (make sure the 'V' is never displayed during normal use). Alternatively, if there is a **pot of paint** on board, it can be painted directly onto the deck or cabin top.

POINT TO NOTE!

Distress signals should never be made except in case of real emergency. As well as being foolish and dangerous, deliberately making false distress signals is punishable by law in most countries.

5.7 Discouragement

It is a well-known fact that distressed fishers keeping their morale high will survive longer at sea than discouraged ones.

It is almost impossible to give advice or tips on this matter although the key word is probably **faith**.

POINT TO NOTE!

Even safety-conscious fishers can find themselves drifting lost at sea. Because their boat is well-equipped, those fishers can survive at sea longer than careless ones. And because they have signalling devices on board, their chances of being located by the Search and Rescue team are higher.

VIDEO: ‘Survival at Sea – A Kiribati Tale’ - SPC(30 mins)

1. Introduce the video

This video relates the story of three i-Kiribati fishermen who drifted 7 months on a small fishing boat between Kiribati and Western Samoa. One fisher died at sea but two survived.

2. Participants to identify the major points

- During an ordinary fishing trip, the boat ran out of petrol and started to drift offshore.
- The fishers prayed a lot, and always believed that they would survive.
- For the first three months, the fishers ate raw fish (mainly tunas) caught on their lines.
- They exercised their muscles in the water to remain as fit as possible.
- Their main problem was the lack of shelter during sunny days.
- After three months, the boat capsized in a storm, and the fishers lost most of their gear except a stick, a chinese hard hat and a piece of rope.
- After capsizing, their only source of food was the sharks they could lasso.
- One of the fishers died of starvation.
- For the last two months, they had no food and only survived on rain water.
- One day they saw land, and, although very weak, they paddled with the stick and the hard hat towards it.
- After 36 hours, a big wave washed the boat into a lagoon. After seven months of drifting on the Pacific and a 2,500 km journey, the two surviving fishers had reached Western Samoa.
- The world press saluted the courage, endurance and skills of these modern heroes who created a new record of survival at sea.
- In Kiribati also, the two men were welcomed as heroes.

3. Discussion

- Have the group consider the disproportion between the cause of this drama (running out of fuel) and the result (7 months drifting at sea and the death of one fisherman).
- Would this drama have occurred if those fishers were safety conscious?
- Analyse the survival skills shown by the fishers
- What do you think of the reaction of the press? Should the fishers be considered as heroes or fools?

This section is not intended to teach formal navigation to workshop participants. Its purpose is to help small vessel operators to navigate more safely to and from a FAD.

The navigation techniques and equipment required by FAD users will vary considerably depending on the type of island and the distance of the FAD from shore (FADs are deployed at distances varying from a couple of miles to 10 miles and even more). For an **atoll** fisher, finding an offshore FAD will obviously be a difficult, if not dangerous, task, whereas any small boat operator from a **high island** will have less problems doing so. In both cases, the fisher will need to show some sort of navigation skills, but the techniques used to reach the FAD will be different.

After a few important definitions, we shall describe those navigation techniques for finding a FAD from a given land position, then some advice will be given on how to safely chase fish schools located several miles from the FAD, and finally we shall present one navigation technique for returning home from the FAD.

6.1 Definitions

Whatever the navigation technique used, it is important to be familiar with the following definitions:

Compass: a compass can be simply defined as a magnetic needle free to pivot until aligned with the earth's magnetic field. The fixed direction shown by the compass' needle is called the earth's magnetic North.

Show
compass

Course: on a moving boat, the direction pointed to by the boat's bow is its course. The course is measured by the angle created by the direction of the ship's bow from magnetic North. It is always referred to in degrees (from 0° to 360°), a measure which can, at any time, be read directly on the compass.

Explain with
compass

Reciprocal course: steering a reciprocal course means steering the boat in the opposite direction to the initial course. For example, if the initial course was 27° , its reciprocal course is $27^{\circ} + 180^{\circ} = 207^{\circ}$.

Bearing: a direction to something from your vessel (for example the direction to a lighthouse from your vessel). The bearing has no direct relationship to the course. It is measured by the angle between the direction to a fixed point (such as a lighthouse) from magnetic North.

Transit: the position line generated by two marks (usually landmarks) kept in transit.

AV 2-6.1

Way point: a fixed point used as a reference position for navigational purposes (example: a FAD, a beacon, a pass entrance, etc.).

Mile or nautical mile: unit of length used by mariners. One nautical mile (nm) equals 1,852 metres.

Knot: unit of speed used by mariners. One knot (kn) equals one nautical mile per hour (= 1.8 km per hour).

Marine chart: the marine chart is simply a map which has been produced for seafarers. Its main purpose is to help navigate charted waters without running into danger.

Show
marine chart

6.2 Finding a FAD. . .

FADs are not dropped just anywhere in the ocean. Prior to a FAD deployment, an accurate site survey is made using high-technology navigation aids like GPS, and deep-water echo-sounders. The FAD is then dropped to a specific position previously selected for its characteristics (depth, bottom contour, distance from shore, etc.). The FAD position is thus accurately known by the local Fisheries Department and that information (the exact FAD position) should be passed on to all interested fishers.

6.2.1 . . . from a high island

Looking for a FAD moored offshore a high island does not necessarily require the use of a compass as explained in the next section (6.2.2). Other simple navigation aids can be used instead.

POINT TO NOTE!

Although the compass is part of the essential safety equipment that any FAD fisher should have on his boat, other navigation techniques can, under certain circumstances, be used for finding FADs from high islands.

Technique N°1: cross transits

AV 2-6.2a

This technique relies on looking back to the land when at the FAD site and taking note of, at least, two landmark alignments (or transits) on the island. The fisher should then be able to return back to the FAD **by following the direction of one landmark alignment (first transit) until the other pair of landmarks get aligned (second transit).**

What is a good landmark? A good landmark is something fixed and conspicuous on the island, either a big and bright enough thing to be seen from a considerable distance or a very distinct shape on the island contour. For example, a big white building, a sand pit, a transmitting aerial, a mountain peak or a valley.

What is a good transit? To have a good transit, the landmarks need to be as far from each other as possible (example: a white building on shore and a peak in the background). If the two marks are too close to each other, their alignment is not accurate.

How to select two transits: The two sets of landmarks should preferably be chosen so that the transits cross at a large angle, the ideal being 90°. If the two sets of landmarks are so close together that the transits cross at a small angle (less than 20°), then the intersection point will not be accurate. If possible, do not use angles of less than 40°.

Of course, this navigation technique relies on the fisher having visited the FAD and taken note of landmarks and transits from the FAD. Fishers who do not know how to find a FAD can accompany others, or perhaps their fisheries departments can assist.

Technique n°2: transit and time

In some cases, it may happen that only one alignment of landmarks can be observed from the FAD. Following this transit from the island will give the fisher an idea of the direction to travel to reach the FAD. However, in order to maximise his chances of finding the FAD, the fisher will want to know what distance he has to cover in that direction **from a starting way point**. That distance, which can be read on a marine chart, will be converted into a cruising time at a known speed (the boat's cruising speed). This requires the fisher being able to measure the boat's cruising speed with some accuracy (see section 6.2.2).

AV 2-6.2b

For going to the FAD the fisher will proceed as follows (see AV 2-6.2b):

Step n°1 Reach the starting way point on the landmark alignment and take note of the time.

Step n°2 Follow the landmark alignment at cruising speed checking time every now and then. 10 or 15 minutes before reaching the FAD, start to carefully inspect the horizon to locate the FAD.

POINT TO NOTE!

It is easier to locate a FAD on a free horizon than when land is behind it. Therefore, it is better finding the FAD on the first try rather than missing it and having to turn back, as then the FAD will be placed between land (the island) and the fisher.

POINT TO NOTE!

If suitable landmarks are not available from the FAD site, the fisher can note the **shape of the island**. Most islands look different when viewed from different directions. Although this method is not likely to be as accurate as using transits, remembering how an island looks from the FAD can be a great help in locating a FAD.

POINT TO NOTE!

Because the above two navigation techniques are based on the sighting of land marks, they can only be used when visibility is excellent both at sea (absence of rain) and on land (absence of clouds). This is why **all FAD fishers should have a compass on board and know how to use it.**

6.2.2 ... from an atoll.

Atolls are very low on the sea surface and, because of the curvature of the earth's surface, can hardly be seen from more than a few miles offshore.

AV 2-6.2c

POINT TO NOTE!

On a clear calm day, a fisher standing in his boat would completely lose sight of a 10 metre high atoll after **9 miles**, whereas, under the same weather conditions, he would still be able to see a 200 metre high island **30 miles offshore.**

Within its sighting range, an atoll will look like a thick line on the horizon. For atoll fishers it is thus difficult to align land marks for finding a FAD. The navigation technique described in section 2.6.2.1 cannot generally be used by atoll fishers.

POINT TO NOTE!

Because atolls are so low on the sea surface, landmarks cannot be used to find an offshore FAD. The **compass is the only cheap and safe navigation aid** a FAD fisher can use.

The **GPS** (Global Positioning System) is the most recent and accurate navigation tool, but its price is still beyond the purchasing power of most artisanal FAD fishers in the region.

Coastal navigation with compass is a fairly comprehensive discipline which involves some mathematics and physical principles that can not be covered in this module. However, the most important thing a FAD fisher equipped with a compass needs to know is how to read and steer compass courses.

TEACHING HINT!

Emphasis Teaching basic navigation in a FAD fishing workshop

Because some of the workshop participants may have difficulty with the mathematical and conceptual principles of compass navigation, it is important not to try and present too much information. Therefore, some important aspects like principles of **variation** and **deviation** are not covered in this module. Only the basic use of the compass is described thereafter.

For a FAD fisher having a compass on his boat, it is necessary to calculate the compass course to steer and distance to the FAD from a given land or sea position. To do so, the fisher (or someone else who knows how to use marine charts) will go through the following steps:

- Step 1** He will plot the FAD position on the local marine chart.
- Step 2** He will calculate the bearing of the FAD from the fisher's starting way point (the beach where he lives, the nearest reef passage, the island's northern point etc.).
- Step 3** He will measure the distance (in nautical miles) from the starting way point to the FAD.

From the above information, the fisher knows the direction to follow (i.e. the course to steer) to find the FAD from a certain way point, however to use the distance factor as a navigation aid it has to be transposed into a **cruising time at a known speed**.

Example:

The information obtained from the marine chart is as follows:

The FAD bearing from Walu Passage is 332° , distance 12 nm. For the fisher to find the FAD, this information means that after having reached Walu Passage, he will have to steer 332° for 12 nm.

AV 2-6.2d

Although this information might be sufficient to find the FAD on a bright calm day (especially if the FAD is marked with a good flag pole), the fisher may possibly have problems to locate it, and may even miss it, on a rough rainy day. Knowing his boat's cruising speed will considerably assist the fisher as he will be able to estimate the time to cover the distance between Walu Passage and the FAD.

POINT TO NOTE!

An easy way to estimate a boat's cruising speed is to measure the time it takes to cover a known distance (the longer the better) on a straight line at constant cruising speed and then apply the simple formula:

$$\text{Cruising speed (in nm per hour)} = \frac{60}{T} \times D$$

D: distance covered (in nautical miles)

T: time to cover the distance (in minutes)

Example:

AV 2-6.2e

At cruising speed, it takes 53 minutes for the fisher to reach Walu Passage from his village. The distance between the village and Walu Passage shown on the marine chart is 8 nm. The boat's cruising speed is given by the above formula: $(60/53) \times 8 = (480/53) = 9$ nm per hour.

AV 2-6.2f

Therefore, to cover the distance between Walu Passage and the FAD (12 miles on the 332° course), it will take the fisher an hour and twenty minutes at the cruising speed of 9 nm per hour.

POINT TO NOTE!

The cruising speed of a small boat can substantially vary depending on various factors including the weather, currents, and load. Therefore, the above calculation will only give the fisher an estimate of his boat's cruising speed which will have to be adjusted according to the variation of these factors.

POINT TO NOTE!

Remember too that diverting to fish schools sighted en route to the FAD will make 'distance travelled' calculations very difficult unless the fisher can return to his initial track (which is seldom the case!).

Using that navigation technique adds an **important safety aspect** to the fisher's FAD fishing trips: the fisher follows a track (the course), knowing fairly precisely when the FAD will appear on the horizon. If the FAD is still not in sight after 15 or 20 minutes of cruising **on the same course**, then it means that something went wrong (the fisher missed the FAD because of slight course error or bad visibility) and the fisher needs to turn back, follow the reciprocal course (i.e. the opposite direction) and start looking again for the FAD. Doing so, the fisher will increase his chance to find the FAD, save some fuel, and minimise chances of getting lost at sea.

POINT TO NOTE!

Using a compass when going to a FAD brings an important safety aspect to the fishing operations, saves on fuel expenses, increases chances of finding the FAD quickly and thus adds to your fishing efficiency.

POINT TO NOTE!

Because of its magnetic nature, the compass needle will deviate if any piece of metal is placed in its vicinity. This phenomenon is called **compass deviation**.

It is essential to **avoid placing metallic items** near the compass as this can substantially affect the navigation accuracy.

Remember that a small transistor radio placed in the vicinity of a compass can induce a deviation of up to 50°!

6.3 Fishing schools at a distance from the FAD

Because FAD fishers usually track schools of fast moving skipjacks quite a distance away from the FAD, they very often go beyond its sighting range. This being the case, experienced fishers will use the sun position or the wind direction to estimate the position of the FAD or that of their island, however playing that game is a gamble, as wind direction and weather may suddenly change.

Chasing fish schools long distances away from a FAD requires the fisher to use a compass:

In the first instance, when at the FAD, the fisher should note the bearing of the school he is going to track (i.e. the course to steer to reach the feeding birds or course n° 1) and the time (T1) to reach them. Once on the school, he should record from his compass the direction the school is moving to (course n° 2), and estimate the time spent on following it (T2).

Collecting these figures will greatly assist the fisher in getting back to the FAD. To do so, he will steer **reciprocal courses**.

Therefore, to come back to the FAD, the fisher should be steering the reciprocal course to course n° 2 for time T2, then the reciprocal course to course n° 1 for time T1.

AV 2-6.3

POINT TO NOTE!

When fishing schools far off the FAD, it is again a safe practice to use the compass to avoid getting lost. This will be mainly true for atoll fishers who can easily lose sight of their island.

6.4 Returning home from the FAD

In section 6.2, we have explained that for atoll fishers going to fish around an offshore FAD, the compass is the only safe and cheap navigation tool.

Unless the FAD was deployed inside the island's sighting range, the fisher will again need to use his compass when returning home. Doing so, he will steer the reciprocal course to the one steered on his way to the FAD.

How to determine the reciprocal course :

- If initial course is between **0° and 180°**, the reciprocal course is determined by **adding 180°**.

Example : Initial course 27°
Reciprocal course is $27^\circ + 180^\circ = 207^\circ$

- If the initial course is between **180° and 360°**, the reciprocal course is determined by **subtracting 180°**.

Example : Initial course 332°
Reciprocal course is $332^\circ - 180^\circ = 152^\circ$

POINT TO NOTE!

Because of the extra length of rope built into the FAD mooring, **the FAD raft rarely stays exactly on top of the anchor**. Under the combined action of wind and current, the FAD raft will move inside a 'watch circle' whose size is directly proportional to the depth. For FADs deployed in 1,500 metres of water, the diameter of the watch circle is more than a kilometre long. This explains why FADs are sometimes so difficult to locate.

Without attempting to gauge the emotional cost experienced by families and friends as a result of distress incidents on small boats, it is possible to examine in general terms some of the economic perspectives relating to the cost of safety, and in particular, the cost of Search and Rescue.

Obviously, this is not an easy task, especially if considered on a regional basis, as the variables for consideration are numerous. With 22 island states and territories covering more than 25 million square kilometres of ocean and more than 42,000 small fishing vessels working the near-shore waters of these islands, the exact number of distress incidents occurring each year is difficult to calculate.

During the 1991 UNDP–FAO survey of artisanal fishing-vessel safety, it was estimated that an average of one incident of distress per day comes to the attention of officials, with around 60 fatalities per year known to occur. This does not account for incidents which occur in more isolated areas, and the actual number of incidents and fatalities is probably far higher. Similarly, there is little documentation of specific responses to distress incidents in terms of resources deployed to undertake Search and Rescue and the associated cost in dollar terms.

The 1991 survey conservatively estimated a cost of around US\$1,000,000 per annum for the region as a whole, but once again, this figure is probably very unrealistic. In the absence of substantive data, it is interesting (although possibly not particularly accurate) to project potential figures, and for the purpose of this exercise, precise figures for Search and Rescue operations carried out in New Caledonia during 1994 have been obtained.

The New Caledonia figures can be summarised as follows:

Number of Incidents (1994)

51 Search and Rescue operations requiring 72 trips by either patrol boats, helicopters or planes totalling 180 hours of sea search and 72 hours of plane search;

Causes of distress

mechanical problems	18
navigational problems	10
fuel shortage	3
injuries	4
diving accidents	3
false alert	5
misplaced concern	10

Cost of Search and Rescue (US\$)

Large search plane	(8 trips, 26 hours @ \$6,540 per hour)	\$170,040
large helicopter	(4 trips, 7.2 hours @ \$4,632 per hour)	\$ 33,350
small helicopter	(17 trips, 39.5 hours @ \$2,500 per hour)	\$ 98,750
large patrol boat	(3 trips, 34 hours @ \$1,000 per hour)	\$ 34,000
small patrol boat	(85 hours @ \$272 per hour)	\$ 23,120
Total machinery and equipment cost		\$359,960

In addition to these direct costs, it is also necessary to consider shore-based support infrastructure costs incurred by organisations and institutions involved in Search and Rescue such as Police and Civil Defense. Given that SAR is just one of a number of functions carried out by these organisations, only a portion of infrastructure costs can be attributed to SAR.

In this instance, it is perhaps appropriate to add around \$50,000 per annum to the machinery and equipment costs as a reasonable contribution to infrastructure support. Thus we arrive at a figure for New Caledonia of \$409,960 for SAR operations in New Caledonia on an annual basis.

If this figure can be taken as indicative of per country costs, it can then be suggested that the cost of SAR to the region will be in the vicinity of \$8,000,000 per annum. However, this is not realistic as many countries do not have the support infrastructure utilised for SAR in New Caledonia, and would more likely undertake a SAR operation with small boats rather than a patrol boat or a helicopter. However, smaller countries may call for SAR assistance from navy or airforce support from NZ, Australia, France or the US, and with a large surveillance aircraft likely to cost around \$10,000 an hour to operate, the cost will very quickly mount.

In the absence of detailed figures from each country it is difficult to come up with more accurate figures, but it would seem safe to promote a ballpark figure for the cost of regional SAR at between 5 and 8 million dollars per annum.

Whatever the exact amount, one thing is for sure, it is a cost we could well do without!