SEVENTY or more kilometres from land, your boat strikes an unseen object and sinks quickly. You have no time to send a radio message. You jump into your life raft. You have flares in your life raft, but they are only visible from a distance of about 5 km. How do you send an emergency signal to the nearest rescue centre?

This happened to two sailors on 18 July this year. They were sailing in the Indian Ocean when their boat, the *Tiger*, struck a sharp object. The boat quickly sank 77 kilometres from the nearest land. They got into their life raft, but their radio was lost when the boat went down. At 09.30 the coastguard received a signal from the boat’s emergency beacon. The coastguard forwarded it to the rescue centre and by 11.00 (only 90 minutes later) the crew of the helicopter found the two sailors and winched them into the helicopter from the life raft. How was the emergency signal transmitted?

Fortunately, the *Tiger* was fitted with a 406 MHz free-floating beacon, which was linked to the Cospas-Sarsat satellite system. When the boat sank, the beacon automatically detached itself from the yacht and floated to the surface. There it switched on automatically and transmitted an emergency signal on the 406 MHz wavelength to the satellite. The satellite then forwarded the signal to the coastguard. The free-floating beacon and the Cospas-Sarsat satellite system can increase the chances of saving lives in any air-sea rescue, in which the most important thing is to locate the survivors quickly.

Which ones:
1. stop you from sinking?
2. tell the rescuers where you are?
3. rescue you from the water?

Listening

1. Listen to this news report and put the six safety devices from 1 in the order the reporter mentions them.

A. **winch**
B. **life jacket**
C. **life raft**
D. **beacon**
E. **radio**
F. **flares**

2. Put these statements in the order the events actually happened. Then listen again to check your answers.

A. The helicopter winched the sailors out of the life raft.
B. The sailors inflated the life raft and jumped in.
C. The boat struck an object in the sea.
D. The sailors fired two flares into the air.
E. The boat sank.
F. The beacon sent a signal to the satellite.
G. The beacon detached itself from the boat.
H. The rescue team saw the flares.

Speaking

Work in pairs. Take turns to be the rescue pilot and a safety officer. The safety officer interviews the pilot and asks questions based on the form.

Examples: What’s your name? When did the rescue take place?
2 Transmission

Start here 1 Complete this description of how a satellite communication system works, using the correct form of the verbs in the box:

receive convert detach activate carry out transmit locate

If a plane crashes, or a ship sinks, the survivors try to (1) _______ their personal emergency beacons manually. In addition, an automatic beacon (2) _______ itself from the plane or ship and switches on automatically. The beacon then (3) _______ a signal to one or more satellites. The satellites (4) _______ the beacon’s transmission and then send the beacon’s signal to their ground station. The ground station then processes the satellite signals (that is, it (5) _______ the signals into useful data), and then passes on the data about the beacon to a national centre. The national centre forwards this data to the rescue centre nearest to the crashed plane or sinking ship. The rescue centre then (6) _______ the beacon and sends out a rescue team, which then (7) _______ the rescue.

Listening 2 Listen to this discussion and check your answers to 1.

Reading 3 Part of this text is missing. Write the letters of phrases A-G below in the correct form of the verbs in the box. Use the illustration in 1 to help you.

The Cospas-Sarsat system is an international search and rescue system which consists of a network of satellites in space, and control centres on Earth.

The components of the system are:
- radio beacons, which (1) _______ their personal emergency beacons manually.
- satellites, which (2) _______ a signal to one or more satellites.
- ground stations, where (3) _______ the satellite’s transmission and then send the satellite’s signal to their ground station.
- national centres, from where (4) _______ this data to the rescue centre nearest to the crashed plane or sinking ship.
- rescue teams, who (5) _______ a rescue team when a signal is received.

The system uses two types of satellite:
- satellites in geostationary Earth orbit (GEO), which (6) _______ the satellite’s transmission and then send the satellite’s signal to their ground station.
- satellites in low-altitude Earth orbit (LEO), which (7) _______ the satellite’s transmission and then send the satellite’s signal to their ground station.

A are closer to the earth and cover polar regions.
B information about the emergency is sent to the rescue teams.
C are at a high altitude and cover a wide area.
D transmit 406 MHz signals in an emergency.
E signals from the satellites are processed.
F pick up the signals from the beacons.
G receive the information and carry out the search and rescue.

Language The relative pronoun (for example, which, who, where) is a useful way to join two sentences together.

| Signals are transmitted to | the satellite. The satellite then sends the signals to Earth. |
| The goods are taken to | the warehouse. Here they are stored safely. |
| This is | the city centre. From here roads lead in all directions. |
| Ricardo reports to | Waleed. Waleed is the operations manager. |

4 Join these pairs of sentences into single sentences. Use which, who, from where and who to replace the words in italics.

Example: I . . . to the satellite, from where . . .

1 The beacon sends a signal to the satellite. From here the signal is transmitted to the ground station.
2 The rescue centre contacts the helicopter pilot. He or she then carries out the rescue.
3 The sailor activated his beacon. This sent a 406 MHz signal to the satellite.
4 The sailors were winched into the helicopter. Here they were given blankets and hot drinks.
5 The sailors were taken by helicopter to the rescue centre. From here, they were driven by ambulance to the nearest hospital.
6 Hundreds of survivors are saved every year by the Cospas-Sarsat system. This was first launched in 1982.

Speaking 5 Look at the table. Read out items a-h in full.

Example: (a) (from) two to five kilograms

<table>
<thead>
<tr>
<th>Some facts and figures about the emergency beacon and the satellite system</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Radio frequency of beacon</td>
</tr>
<tr>
<td>2 Power (wattage) of beacon signal</td>
</tr>
<tr>
<td>3 Length and frequency of beacon signal</td>
</tr>
<tr>
<td>4 Dimensions</td>
</tr>
<tr>
<td>5 Weight</td>
</tr>
<tr>
<td>6 Operating range (temperature)</td>
</tr>
<tr>
<td>7 Model number</td>
</tr>
<tr>
<td>8 Altitude of GEOSAR satellite</td>
</tr>
</tbody>
</table>

Task 6 Match items 1–8 with the correct items a–h in the table in 5.

Scanning 7 Practise your speed reading. Look for the information you need on the SPEED SEARCH pages (116–117). Try to be first to answer these questions.

1 When was the first Cospas-Sarsat satellite launched?
2 Which four countries started the Cospas-Sarsat system?
3 How many countries now operate the Cospas-Sarsat system?
3 Operation

Start here 1 Work in small groups. Study the diagram and discuss these questions.

1 Why is it important for the beacon to detach itself and activate itself automatically?
2 How do you think it works?

Vocabulary 2

With your group, match synonyms a–e with the words in italics in 1–5.

1 the beacon is submerged
2 the rod breaks and this releases the cover
3 the cover is ejected from the base
4 the beacon moves out of range of the magnet
5 the beacon activates itself

Task 3

With your group, match questions 1–5 with answers a–e.

1 What does the rod do?
2 What makes the knife cut the rod?
3 After the knife has cut the rod, what pushes the cover away from the base?
4 What does the magnet do?
5 When the beacon floats away from the base, why does it switch on automatically?

Vocabulary 5

Study the illustrations and supply the missing verbs in the instructions below.

ensure tear off touch remove slide place pull push

How to activate the emergency beacon manually

ONLY IN EMERGENCY

1. Tear tab
2. Push and slide left

Writing 6

Produce an operating manual with your group for a device you know about.

1 Agree on the device you want to write about.
2 Divide up the work. Each group member produces a different section of the operating manual: (1) how it works, (2) operating instructions, and (3) labelled diagrams.
3 Check each other’s work, and then produce a single manual from the group.