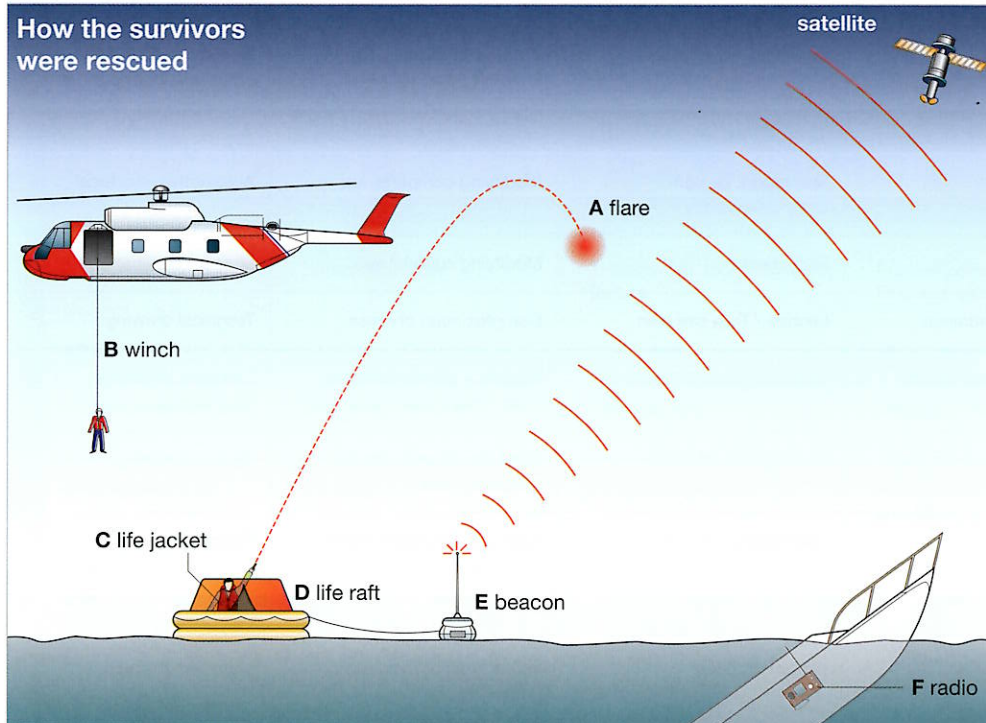


## 1 Rescue

**Start here** 1 Work in pairs. Answer the questions about the safety devices in this illustration of an air-sea rescue.



Which ones:

- 1 stop you from sinking?
- 2 tell the rescuers where you are?
- 3 rescue you from the water?

**Listening** 2 02 Listen to this news report and put the six safety devices from 1 in the order the reporter mentions them.

1 \_\_\_\_ 2 \_\_\_\_ 3 \_\_\_\_ 4 \_\_\_\_ 5 \_\_\_\_ 6 \_\_\_\_

3 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 1 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.





**Reading 4** Read this news article and explain what the words below refer to.

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.

- 1 They (line 14) the two sailors
- 2 it (line 25) \_\_\_\_\_
- 3 which (line 35) \_\_\_\_\_
- 4 itself (line 39) \_\_\_\_\_
- 5 There (line 41) \_\_\_\_\_
- 6 in which (line 52) \_\_\_\_\_

kilometres flares visible emergency signal coastguard beacon  
free-floating satellite automatically megahertz wavelength



**5** Complete this incident report form.

INCIDENT REPORT FORM	
Name of rescue helicopter pilot:	<u>Ricardo Moussa</u> Date of rescue: _____
Name of boat:	_____
Distance of boat from land:	_____
Number of people rescued:	_____
Time of first emergency signal:	_____
Type of emergency beacon:	_____
Time of rescue:	_____
Method of rescue:	_____

**Speaking 6** 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.

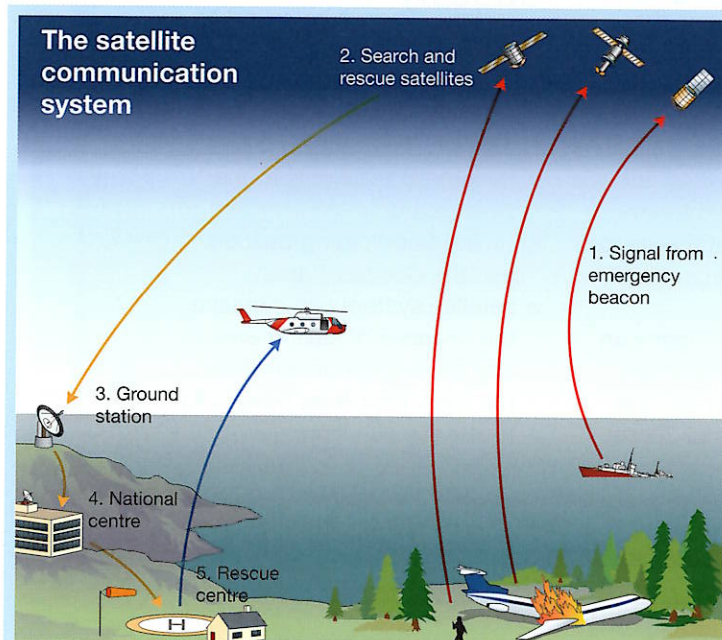
Examples: *What's your name? When did the rescue take place?*



## 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 04 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 spaces. Use the illustration in 1 to help you.

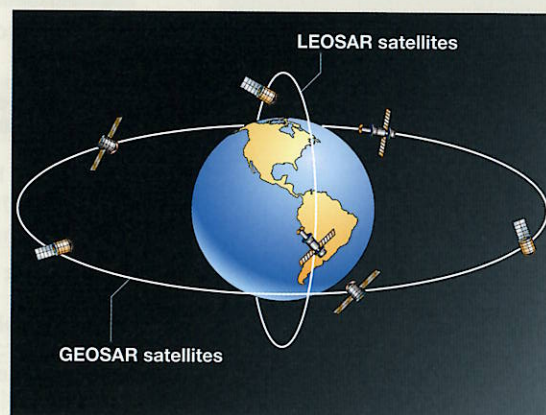
**The Cospas-Sarsat system is an international search and rescue system which consists of a network of satellites in space, and control centres on Earth.**

The components of the system are:

- radio beacons, which (1) \_\_\_\_\_
- satellites, which (2) \_\_\_\_\_
- ground stations, where (3) \_\_\_\_\_
- national centres, from where (4) \_\_\_\_\_
- rescue teams, who (5) \_\_\_\_\_

The system uses two types of satellite:

- satellites in geostationary Earth orbit (GEO), which (6) \_\_\_\_\_
- satellites in low-altitude Earth orbit (LEO), which (7) \_\_\_\_\_



**geo-** = Earth  
Geostationary satellites move at the same speed and in the same direction as the Earth. When we observe them, they seem to be *stationary* or not moving.

- 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 satellite, which	
The goods are taken to	the warehouse. Here	they are stored safely.
	the warehouse, where	
This is	the city centre. From here	roads lead in all directions.
	the city centre, from where	
Ricardo reports to	Waleed. Waleed	is the operations manager.
	Waleed, who	

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

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

- The beacon sends a signal to the satellite. *From here* the signal is transmitted to the ground station.
- The rescue centre contacts the helicopter pilot. *He or she* then carries out the rescue.
- The sailor activated his beacon. *This* sent a 406 MHz signal to the satellite.
- The sailors were winched into the helicopter. *Here* they were given blankets and hot drinks.
- The sailors were taken by helicopter to the rescue centre. *From here*, they were driven by ambulance to the nearest hospital.
- 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*

**Some facts and figures about the emergency beacon and the satellite system**

<b>1</b>	Radio frequency of beacon	<b>a)</b>	2–5 kg
<b>2</b>	Power (wattage) of beacon signal	<b>b)</b>	260 mm (h) x 102 mm (w) x 83 mm (d)
<b>3</b>	Length and frequency of beacon signal	<b>c)</b>	GME 203FF 18756
<b>4</b>	Dimensions	<b>d)</b>	35,000 km
<b>5</b>	Weight	<b>e)</b>	406 MHz
<b>6</b>	Operating range (temperature)	<b>f)</b>	–40°C–40°C
<b>7</b>	Model number	<b>g)</b>	5 W
<b>8</b>	Altitude of GEOSAR satellite	<b>h)</b>	0.5 sec every 50 sec

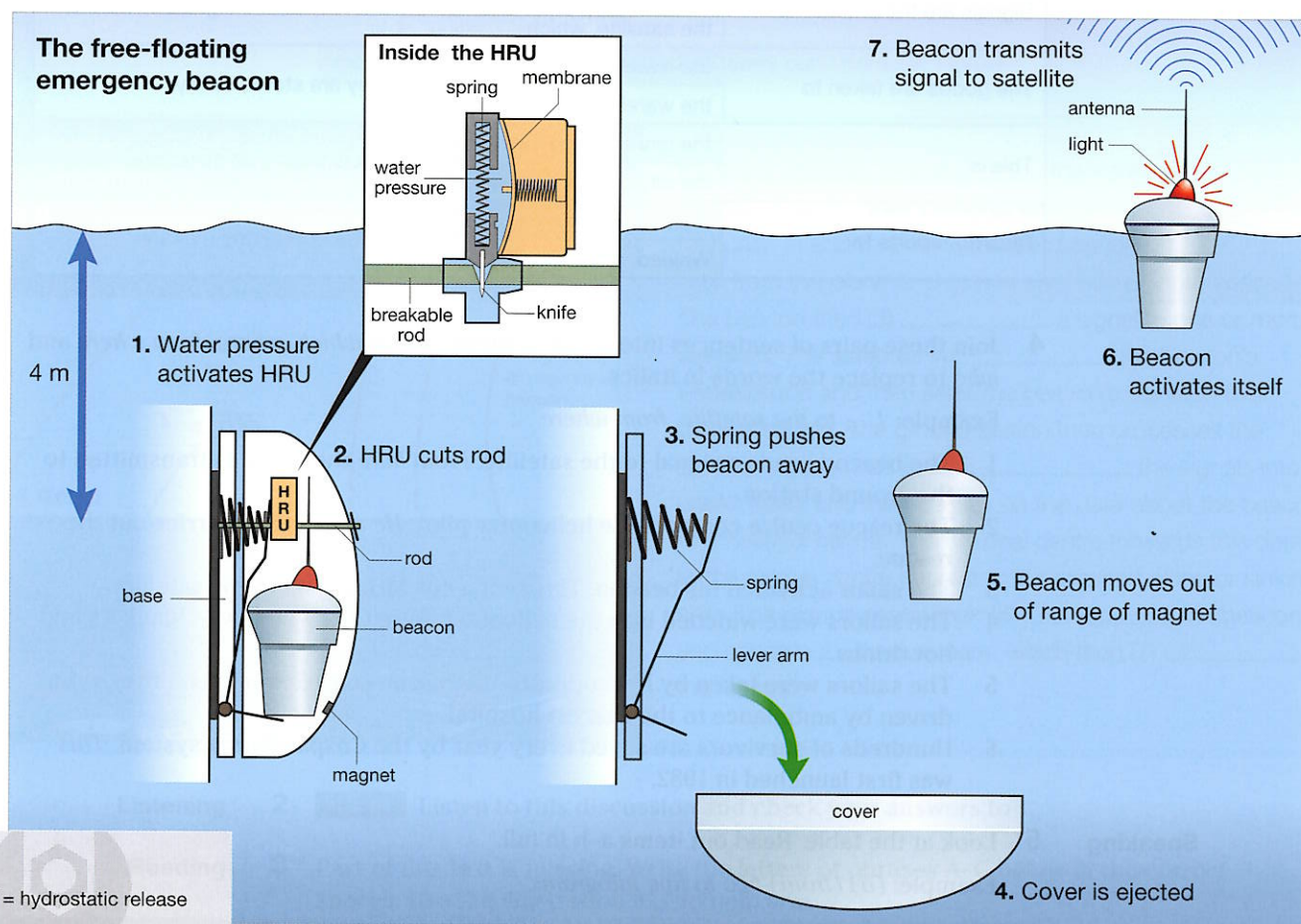
- Task 6** Match items 1–8 with the correct items a–h in the table in 5.

- 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.

- When was the first Cospas-Sarsat satellite launched?
- Which four countries started the Cospas-Sarsat system?
- 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.



HRU = hydrostatic release unit  
hydro- = water  
hydrostatic = operated by water pressure

- 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 <i>is submerged</i>                     | a) <i>frees</i> it ( <i>allows</i> it to move away) |
| 2 the rod breaks and this <i>releases</i> the cover  | b) <i>away from the force of</i>                    |
| 3 the cover <i>is ejected</i> from the base          | c) <i>sinks under water</i>                         |
| 4 the beacon moves <i>out of range of</i> the magnet | d) <i>switches itself on</i>                        |
| 5 the beacon <i>activates</i> itself                 | e) <i>is pushed away</i>                            |

**Task** 3 With your group, match questions 1–5 with answers a–e.

- |   |  |
|---|--|
| 1 What does the rod do?   | a) Pressure from the spring and the lever arm.                           |
| 2 What makes the knife cut the rod?   | b) Because it moves out of range of the magnet.                          |
| 3 After the knife has cut the rod, what pushes the cover away from the base?      | c) It fixes the cover to the base.                                       |
| 4 What does the magnet do?  | d) It prevents the beacon from switching on when it is inside the cover. |
| 5 When the beacon floats away from the base, why does it switch on automatically? | e) The pressure of the water and the force of the spring in the HRU.     |



- Writing 4** With your group, write the *How It Works* section of an operating manual for the emergency beacon. Use all the information from the previous page. Complete the sentences to explain the seven stages in the diagram in 1.

Produce a single copy for your group. Each group member should work on different stages. Check and correct each other's work before you finalise the complete document.

Free-floating emergency beacon for Cospas-Sarsat rescue system

## HOW IT WORKS

**1** If the boat sinks, and the beacon is submerged below four metres of water, the water pressure activates the HRU (hydrostatic release unit) automatically.

**2** The water pressure inside the HRU ...

**3** This releases ...

**4** The lever arm then ...

**5** The beacon then ...

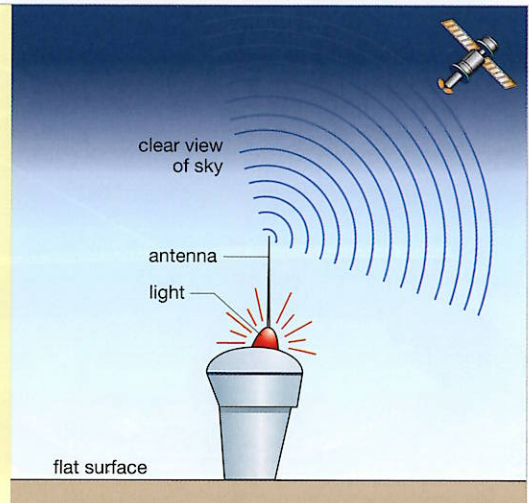
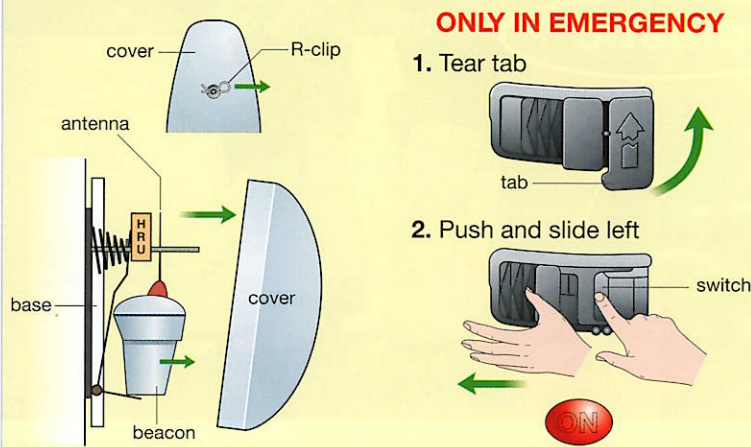
**6** As a result, the beacon ...

**7** When it reaches the surface ...

- 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 beacon manually



### How to activate the emergency beacon manually

If the vessel is not sinking, but there is some immediate danger, you can activate the beacon manually. Follow these instructions:

- 1 Pull the R-clip.
- 2 tear off the cover and detach the beacon from its base.
- 3 touch the tab. Underneath the tab is the switch.
- 4 push the switch down and slide it to the left.
- 5 place the beacon on a flat surface and ensure that the antenna is upright. Check that the antenna has a clear view of the sky.
- 6 Do not push the antenna while it is transmitting.

- 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.