

MAURITRON TECHNICAL GUIDE

Pages on SARAH extracted from:

Military Surplus
Equipment Manual

- 5 -

MP-137

For all your Service Manuals contact

MAURITRON TECHNICAL SERVICES,
8 CHERRY TREE ROAD,
CHINNOR,
OXFORDSHIRE,
OX9 4QY.

Telephone:- (0844) 51694

Fax:- (0844) 52554

S A R A H

(SEARCH AND RESCUE AND HOMING)

Introduction

1. The purpose of the SARAH (Search And Rescue And Homing) equipment (*fig. 1*) is to assist in the location of the survivors of a wrecked craft.
2. The complete SARAH equipment comprises:—
 - (1) A man-carried automatic distress beacon.
 - (2) A search equipment which may be installed in either an aircraft or a launch.

RESCUE BEACON

3. The rescue beacon, SRI.23006 (*fig. 2*), is a miniature lightweight radio transmitter-receiver. It comprises a transmitter-receiver, a speech unit, a coding unit and a power supply; the first three items are permanently interconnected and all units are completely sealed. No attempt should be made below third line servicing to open these items or to disconnect them from one another.
4. Attached to the transmitter-receiver portion is a leaf spring aerial which folds up to very small dimensions; it is held in the folded position by a removable cover. When the rescue beacon is required for use the cover should be removed by

pulling the toggle (*fig. 2*). The aerial will then erect itself and, since the cover is attached by a cord to the on-off plunger switch, the rescue beacon switch will become operational.

5. An aerial winding jig is available as an accessory to the rescue beacon and simplifies the operation of re-winding the aerial after testing the beacon. The reference number is given in the Leading Particulars.

6. The life jacket Mk. 4 is specially constructed so that a rescue beacon, SRI.23006, may be fitted to it. The instructions for fitting are given in A.P.1182E. The rescue beacon may also be fitted to certain types of inflatable dinghy; these dinghies are described in A.P.1182C.

7. The rescue beacon (SRI.23006) has three modes of operation. In the normal ("beacon") condition, pulses of radio frequency (243 Mc/s) are being automatically transmitted. The pulses are transmitted in pairs at a rate of approximately 210 pairs per second. The spacing between the two pulses in each pair is determined by the coding unit and is the distinguishing feature between the rescue beacons.

8. When operating in the "beacon" mode the pulse repetition frequency of 210 c/s can be heard as an audio frequency in the microphone-telephone and thus the survivor is given confidence in the equipment.

9. The peak power output of the rescue beacon transmitter-receiver when operating in the "beacon" mode is 15 watts. In this mode, at an ambient temperature of 5°C, the combined battery unit will last for approximately 20 hours and the transistorized power supply battery for approximately 16.5 hours. The transmission can be received at a range of 60 miles by an aircraft flying at 10 000 feet; in the case of a rescue launch, with aerials mounted at 25 feet, the maximum range is approximately 6 miles.

10. Two way speech communication with the rescue craft is possible using the TALK and LISTEN buttons and the microphone-telephone which are part of the speech unit. The range on R/T is considerably less than that on "beacon" and the power consumption is increased. The R/T facility should therefore only be used when the rescue craft can be seen or heard.

11. It is important to note that the type of modulation used for transmission is quite different to that used for reception and for this reason R/T communication between rescue beacons is not possible. This is an advantage because it prevents any unnecessary conversation between survivors; their chances of rescue are therefore increased since in the "beacon" condition the rescue beacon gives increased range with reduced battery consumption.

12. The power supplies for the rescue beacon are obtained from either a sealed combined battery unit or a transistorized power supply consisting of an

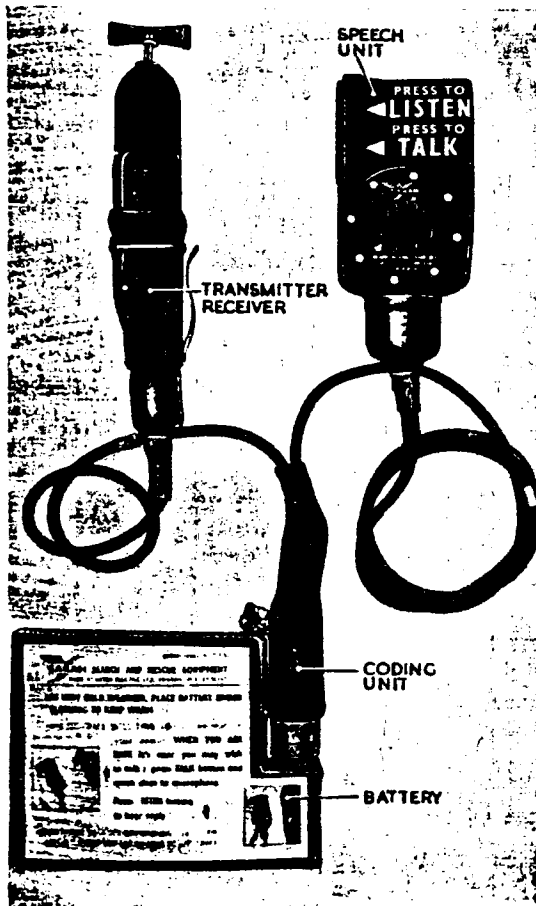


Fig. 2. Rescue beacon SRI.23006

l.t. battery attached to a transistor power unit. Both these items have an isolating switch and are described in Part 1, Sect. 2, Chap. 1 of this publication and the reference numbers are given in the Leading Particulars.

Note . . .

Since the transistorized power supply is a later innovation any reference in this publication to the "SARAH battery" should be read "SARAH battery" (or transistorized power supply)".

SEARCH EQUIPMENT

13. The Sarah search equipment, which comprises a transmitter-receiver TR.8088 or a transmitter-receiver TR.8971, and a power unit PU.8094, can be installed in an aircraft, a helicopter or a launch. The aircraft or helicopter installation is known as the ARI.5876 and the launch installation as the SRI.23024.

14. The power unit PU.8094 may be attached to the rear of the transmitter receiver (fig. 3), the units are then interconnected by a multi-way plug and socket. If required, the power unit may be detached from the transmitter-receiver unit and installed separately in another part of the aircraft; a multi-way cable will then be required to interconnect the units.

15. The power unit PU.8094 operates from the aircraft a.c. supply of 80-volt or 115-volt at 400 c/s or 800 c/s—2400 c/s. The power unit provides the h.t. and l.t. supplies for the transmitter-receiver. The equipment also requires an input from the 28-volt d.c. supply.

16. The transmitter-receiver TR.8971 is similar to the TR.8088 and the two are directly interchangeable. The main difference between the two types of transmitter-receiver is that the aerial and X-plate change-over switches on the TR.8088 are operated by an electric motor, while those of the TR.8971 are controlled by a system of relays. Two of the front panel controls on the TR.8971 have slightly different operations than those of the TR.8088.

17. Three aerials are required on an aircraft, one mounted on the port side, one on the starboard side and the third, a transmitting aerial, mounted at any convenient point, preferably underneath the aircraft

18. The front panels of the transmitter-receiver units carry the operational controls and an aperture through which the $1\frac{1}{4}$ in. cathode ray tube can be viewed. A visor, with built-in lens can be fitted to the unit in which case the screen is magnified to about $2\frac{1}{4}$ in.

19. The search equipment operates as follows: the first pulse in each pair received from the rescue beacon initiates a linear vertical trace on the

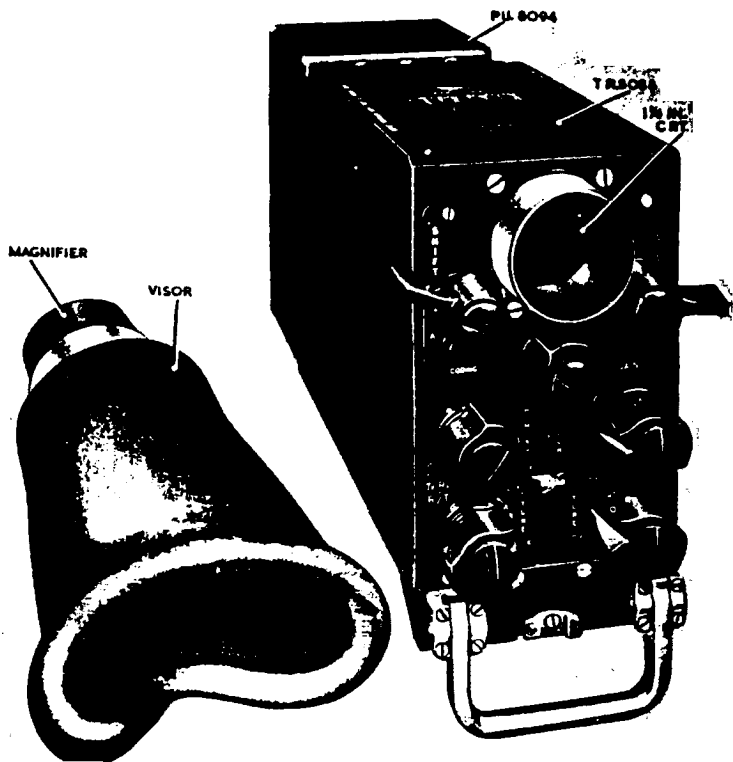


Fig. 3. Search equipment TR.8088 and PU.8094—general view

cathode ray tube while the second pulse deflects the trace on the horizontal plane. Since the beacon repeats this signal at a rate of approximately 210 c/s the display on the cathode ray tube is continuous.

20. Signals received by the aerial mounted on the port side of the aircraft will deflect the trace to the left while the signals received by the starboard aerial will deflect the trace to the right. The port and starboard aerials are connected alternately to the receiver so that equal deflection to the right and left indicates that the beacon is straight ahead.

21. The aerial and X-plate change over has three speeds of operation. At slow speed, about 5 seconds on each aerial, adequate time is allowed for the trace to be inspected for a received signal. At this speed the receiver may be automatically tuned over a range of approx. 3 Mc/s; the automatic tuning is synchronized with the aerial switching.

22. When a signal is visible on the trace, the automatic tuning should be stopped and the receiver manually tuned to the beacon signal. As the beacon is approached, and the beacon signal strength increases, the switching speed can be increased

23. At close range the aerial switching can be further increased. In this case the deflections to the right and left are visible simultaneously and more accurate determination of relative amplitude is possible.

Introduction

1. The rescue beacon SRI.23006, consists of a transmitter-receiver unit, a speech unit, a coding unit and a power supply. The first three items (fig. 1) are sealed, plastic filled units; the interconnections are also sealed and no part of the assembly should be disconnected or opened. Unsuitable rescue beacons should be returned for third line servicing. Details of the power supply are given in para. 4.

2. The rescue beacon may be attached to a Mk. 4 life jacket (fig. 2) where it is immediately available for use. Details for fitting the rescue beacon to the life jacket is given in A.P.1182E. The rescue beacon may be fitted to certain types of inflatable dinghy, these are described in A.P.1182C.

3. Four rescue beacons are available with different pulse coding (para 14). The coding of each beacon, identified by a coloured rubber sleeve on the interconnecting cables, is as follows:—

Code	Colour
A	Red
B	Blue
C	Yellow
D	Green

Reference numbers are given in the Leading Particulars.

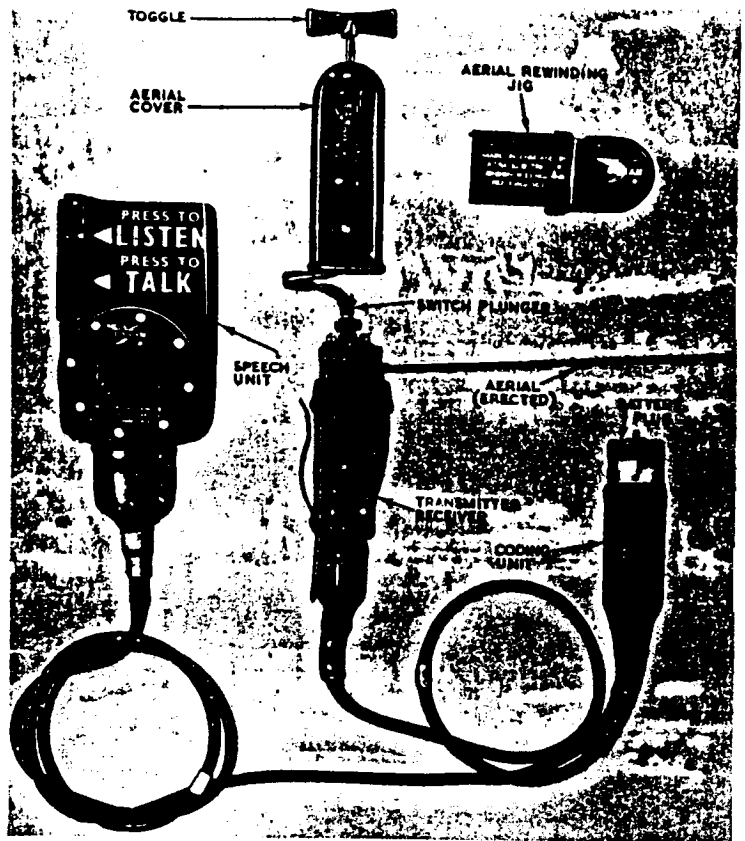


Fig. 1. Rescue beacon—aerial erected

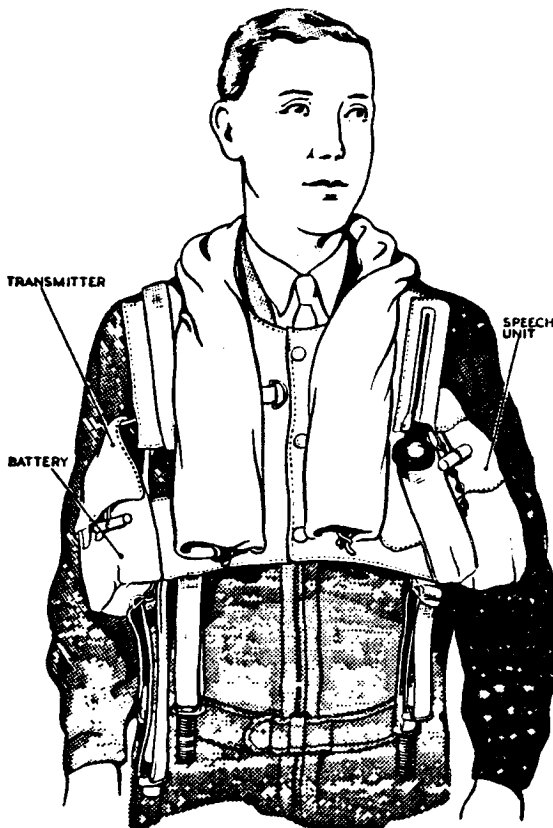


Fig. 2. Rescue beacon fitted to life jacket

Power supplies

4. The rescue beacon operates from either a sealed combined battery unit or a transistorized power supply consisting of a battery and transistor power unit. Both types of power supply are of uniform shape and size. The output voltages are as follows:—

Power Supply	Voltage	Source
Combined battery unit	H.T.1—90 volts	Leclanche cells.
	H.T.2—435 volts	
	L.T.—6.3 volts	
Transistorized power supply	H.T.1—90 volts	Transistor power unit.
	H.T.2—450 volts	
	L.T.—7.5 volts	

Kalium cells are described in Part 2, Sect. 1, Chap. 3 of this publication. Details of the transistor power unit are given in Chapter 3 of this section.

5. Both forms of power supply are fitted with an isolating switch normally held in the "off" position by a pin which fits through a hole in the switch plunger. To switch "on" the power supply the pin should be removed—a normal operation when removing the transmitter-receiver from its stowage in the life jacket. To switch "off" the combined battery unit the plunger should be pulled out and the pin refitted (fig. 3); to switch "off" the transistorized power supply, the plunger should be lifted by operating the hand lever on top of the battery and the pin refitted (see Chap. 3 of this section).

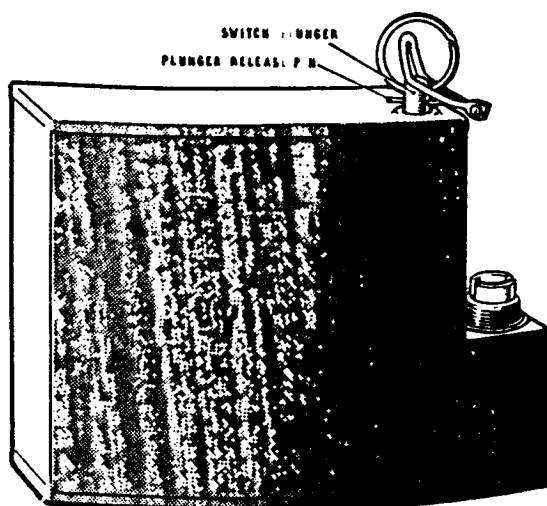


Fig. 3. Combined battery unit

6. In order to test the beacon power supply special facilities are required which are available on the performance tester Type 8326. The performance tester is described in Part 2 Sect. 1, Chap. 1 of this publication: the instructions for testing the SRI. 23006 and the combined battery unit, using the performance tester, are given in Part 2, Sect. 1, Chap. 2: Chap. 4 gives details for testing the transistorized power supply

Rescue beacon

7. The transmitter-receiver portion of the SRI. 23006 contains a one-valve r.f. oscillator for the frequency of 243 Mc/s. This oscillator may operate either as a pulse transmitter or as a squegging detector.

8. Attached to the transmitter-receiver portion is a leaf-spring aerial which is normally coiled up and housed under a removable cover. On removing the cover, the aerial automatically erects itself and, since the cover is attached by a nylon cord to a

plunger type switch, the beacon transmitter will become switched on. The aerial is 0.62 of a wavelength long (approx. 28.5 in.) which has been found to be the optimum length for the equipment.

Note . . .

Do not allow the aerial to make metallic contact with the combined battery unit after the transmitter-receiver has been switched off, since it will discharge the l.t. section of the battery regardless of the setting of the h.t. switch fitted to the battery.

9. An aerial winding jig is available for rewinding the aerial as detailed in Part 2, Sect. 1, Chap. 2 of this publication.

10. The speech unit has a combined microphone/telephone, a three-position rocker type switch, and two audio amplifying valve stages. With the switch in its neutral position (no buttons pressed) and the rescue beacon switched "on" (para. 8), the rescue beacon will automatically transmit pulse signals for homing by the searching craft. A 210 c/s note can be heard in the microphone/telephone when the rescue beacon is operating, thus the survivor is given confidence in the equipment.

11. By using the TALK and LISTEN buttons and the microphone/telephone, the survivor may communicate with the rescue craft. The output power of the rescue beacon is however considerably reduced in the TALK condition and the battery consumption increased. This R/T facility should therefore not be used unless the rescue craft can be seen or heard.

Note . . .

The type of modulation employed does not permit communication between rescue beacons.

12. The coding unit determines the operational characteristics of the signal transmitted by the rescue beacon; in this way the search craft is able to distinguish between more than one beacon operating in the same area.

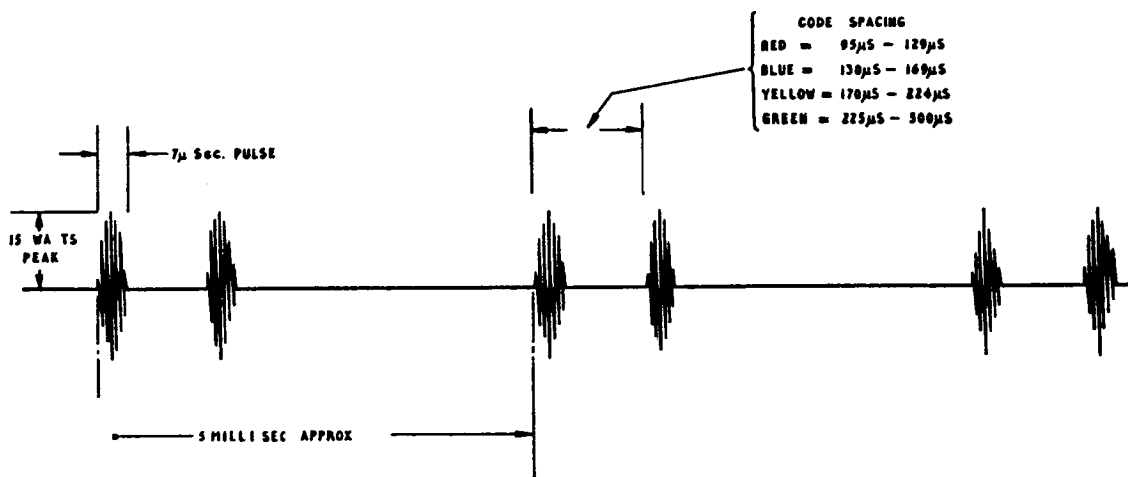


Fig. 4. Beacon pulsing

13. At one end of the coding unit there is a plug which connects the beacon assembly to the power supply. This plug should be carefully fitted and then, with a suitable spanner, screwed down tight to prevent the ingress of moisture.

Principles of operation

14. In the normal (beacon) mode, the rescue beacon is transmitting pairs of r.f. pulses repeated at approximately 210 c/s. The spacing between the pulses in each pair is determined by the coding unit and the rescue beacons are grouped as follows:—

A Red	95—129 μ s
B Blue	130—169 μ s
C Yellow	170—224 μ s
D Green	225—300 μ s

Details of the beacon pulsing are illustrated in fig 4

15. The pulse power in the beacon mode is 15 watts, which is sufficient for a range of 60 miles to

an aircraft flying at 10 000 ft. In the case of a rescue launch with airdrops mounted 25 ft above sea level a range of 6 miles is to be expected.

16. Upon reception, the signal is amplified and detected in the search equipment and the first pulse in each pair initiates a linear trace on the C.R.T. while the second pulse gives a deflection somewhere along the trace. The position of the deflection from the start of the trace is dependent on the coding of the beacon and thus it is possible to differentiate between a number of beacons.

17. When the TALK button is pressed, the transmission is changed to 2 μ s pulses repeated at regular rate of approximately 9 kc/s. Speech frequencies from the microphone/telephone can then be superimposed on the pulse repetition frequency to be varied up to 1 kc/s on either side of its steady rate. This is illustrated in fig. 5.

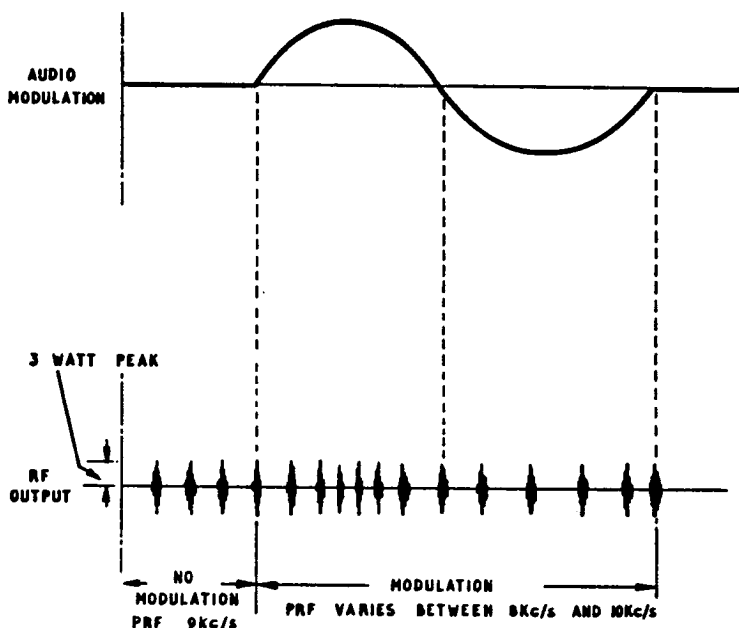


Fig. 5. TALK modulation

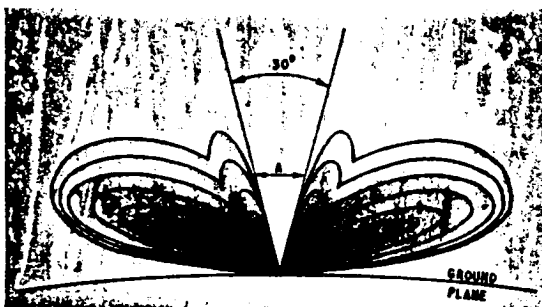


Fig. 6. Radiation polar diagram

18. With the LISTEN button pressed, amplitude modulated signals from the rescue craft can be received, and are heard in the microphone/telephone. The transmitter-receiver portion of the rescue beacon in this condition is operating as a squelch oscillator-detector so that the weak, characteristic r.f. signals are being transmitted and homing by the rescue craft can continue uninterrupted. The quench frequency is approximately 100 kc/s.

19. The radiation polar diagram of the rescue beacon aerial in the vertical plane is shown in fig. 6. The cone of silence directly above the beacon provides a fix for the homing aircraft. Radiation in the horizontal plane is omnidirectional.

