

Survival Radios/Beacons

Survival radios are carried by ships and aircraft to facilitate rescue in an emergency. They are generally designed to transmit on [international distress frequencies](#). Maritime systems have been standardized under the [Global Maritime Distress Safety System](#).

History

The use of radio to aid in rescuing survivors of accidents at sea came to the forefront after the sinking of the [RMS Titanic](#) in 1912. Lifeboats were equipped with [spark gap transmitters](#) such as the [Marconi](#) Type 241, c. 1920.^{[1][2]} These operated using [Morse code](#) on [500 kHz](#), the international distress frequency at the time. This frequency had the advantage of long range due to ground-wave propagation and was constantly monitored by all large ships at sea after the *Titanic's* sinking. However, due to its wavelength of 600 meters, a long antenna was required to achieve good range. Long wires on the order of 1/4 wavelength held up by kites or balloons were often used. Spark-gap continued to be used in lifeboats long after the technology was banned for general communication.

The Gibson Girl



BC-778 "Gibson Girl" radio transmitter.

During World War II, Germany developed a hand-crank 500 kHz rescue radio, the "Notsender" (emergency transmitter) NS2. It used two [vacuum tubes](#) and was [crystal-controlled](#). The radio case curved inward in the middle so that a user seated in an inflatable life boat could hold it stationary, between the legs and above the knees, while the generator handle was turned. The distress signal, in Morse code, was produced automatically as the crank handle was turned. An NS2 unit was captured by the British in 1941, who produced a copy, the Dinghy Transmitter T-1333. Britain gave a second captured unit to the United States, which produced its own copy, the SCR-578. [United States Army Air Forces](#) aircraft carried the SCR-578 on over-water operations. Named the *Gibson Girl* because of its hourglass shape, it was supplied with a fold-up metal frame [box kite](#), or a balloon with a small hydrogen generator, for which the flying line was the aerial wire. Power was provided by a hand cranked generator. The transmitter component was the BC-778. The frequency was [500 kHz](#) at 4.8 watts, giving it a range of 200 miles (300 km; 200 nmi). Keying could be automatic [SOS](#), or manual. Crystals were a scarce item for the U.S. during the war and the SCR-578 was not crystal-controlled.

A post-World War II version, the AN/CRT-3, which added a frequency in the 8 MHz range, was in use by ships and civil aircraft until the early 1970s.^[3]

VHF era

The use of aircraft for [search and rescue](#) in World War II brought line-of-sight [VHF](#) radios into use. The much shorter wavelengths of VHF allowed a simple [dipole](#) or [whip antenna](#) to be effective. Early devices included the British Walter, a compact single vacuum tube oscillator design operating at 177 MHz (1.7 meter wavelength), and the German Jäger (NS-4), a two-tube [master oscillator power amplifier](#) design at 58.5 and, later, 42 MHz^[4] These were small enough to include in life rafts used on single-seat fighter aircraft.

Post-war designs included the British Search and Rescue and Homing beacon (SARAH) beacon, the U.S. AN/URC-4 and the Soviet R 855U. These operated on the [aircraft emergency frequencies](#) of 121.5 and 243 MHz (2.5 and 1.2 meter wavelengths).

Automated beacon systems

After a light plane with [two U.S. congressmen](#) on board went down in 1972 and could not be found,^[5] the U.S. began requiring all aircraft to carry an [Emergency Locator Transmitter](#) (ELT) that would turn on automatically in the event of a crash. Initially these units sent [beacon](#) signals on the 121.5 MHz aircraft emergency

frequency. These are being phased out in favor of [rescue beacons](#) that use a 406.025 MHz signal, which can be picked up by the [Cospas-Sarsat](#) international satellite system for search and rescue. Each 406 MHz beacon has a unique digital ID code. Users are required to register the code with the Cospas-Sarsat, allowing inquiries to be made when a distress signal is picked up. Some advanced models can transmit a location derived from an internal [GPS](#) or [GLONASS](#) receiver.

Maritime practice has shifted from rescue radios on 500 kHz distress frequency (which is no longer officially monitored) to the [Global Maritime Distress Safety System](#), which includes use of the [Cospas-Sarsat](#) system and other measures, including [radar transponders](#) and hand-held [marine VHF radios](#).

U.S. Military survival radios

Military organizations still issue pilots and other combat personnel individual survival radios, which have become increasingly sophisticated, with built-in [Distance Measuring Equipment](#) (DME), [Global Positioning Satellite](#) receivers, and satellite communication. United States military survival radios include:

- **AN/CRC-7** - World War II era set, 140.58 MHz^[6]



An AN/PRC-90 rescue radio.

- **AN/PRC-90** - Vietnam War era airman rescue set. AN/PRC-90-1 and AN/PRC-90-2 are improved, repairable versions. Operates on 121.5, 243 and 282.8 MHz AM. The PRC-90 also included a beacon mode, and a tone generator to allow the sending of Morse Code.^[6]^[7]
- **AN/PRC-103** - (Air Force) Rescue Swimmer Radio.^[6]^[8]
- **AN/PRC-112** - Offers Synthesized radio in the VHF and UHF aircraft bands. A PRC-112 and a hand held GPS were used by Capt. [Scott O'Grady](#) when he was rescued after being shot down over [Bosnia](#).^[9] The AN/PRC-112B, initially known as the Hook 112, is a PRC-112 modified to include a [GPS](#) receiver, allowing [encrypted](#) position information to be sent. Also has [Cospas-Sarsat](#) beacon. The latest model PRC-112G, built by [General Dynamics](#) can communicate with satellites as well.^[10] Over 31,000 radios in the PRC-112 family have been produced.^[11]
- **AN/PRC-125** (Navy) Rescue Swimmer Radio.^[6]^[8]
- **AN/PRC-149** Rescue Radio, replaces the PRC-90, PRC-112 and PRC-125 for non-combat use.^[3] Includes GPS and Cospas-Sarsat beacon.^[12] Operates on 121.5 MHz, 243.0 MHz, and 282.8 MHz and 406.025 MHz Built by [Tadiran](#), the PRC-149 uses standard [D cell](#) batteries, unlike other units that took special batteries.
- **AN/PRQ-7** Combat Survivor/Evader Locator (CSEL) combines selective availability GPS, UHF line of sight and UHF satellite communications along with a Sarsat beacon. It can send predefined messages digitally along with the user's location.^[13]^[14] As of 2008, the PRQ-7 cost \$7000 each, "batteries not included." A rechargeable [lithium-ion](#) battery pack cost \$1600, while a non-rechargeable lithium-manganese dioxide unit cost \$1520.^[15] As of Oct, 2011 [Boeing](#) has delivered 50,000 PRQ-7s.^[16]
- **AN/URC-4** - 121.5 and 243 MHz^[6]
- **AN/URC-11** - (243 MHz), "A" versions replaced one audio tube with transistors.^[6]
- **AN/URC-10** - The RT-10 are subminiaturized, completely transistorized UHF radio sets. They consist of a crystal-controlled receiver-transmitter, a 16-v dry battery, and a power cable assembly. The unit operates on one channel in the 240-260 mc band, usually 243 MHz. RT-60 and RT-60B1 were two frequency versions of the RT-10^[6]^[17]

- **AN/URC-14** - (121.5 MHz)

References

1. [^ MHS | Marconi Collection | Catalogue](#)
2. [^ \[1\]](#)
3. [^ Wireless for the Warrior](#)
4. [^ Wireless for the Warrior. Gibson Girl Part 2](#)
5. [^ Hale Boggs - Missing in Alaska](#)
6. [^ a b c d e f g h i i k U.S. Military Portable Radios](#)
7. [^ \[http://www.nj7p.org/history/90prc.html\] The AN/PRC-90 Legacy](#)
8. [^ a b AN/PRC-125 RESCUE SWIMMER RADIO](#)
9. [^ Combat Survivor/Evader Locator \(CSEL\)](#)
10. [^ Product Details - AN/PRC-112G Transceiver - AN/PRC-112 Overview](#)
11. [^ http://www.gdc4s.com/documents/D-112G-21-0706.pdf](#)
12. [^ \[2\]](#)
13. [^ Combat Survivor/Evader Locator \(CSEL\)](#)
14. [^ Boeing: Combat Survivor Evader Locator \(CSEL\) Home](#)
15. [^ Boeing: IT Products](#)
16. [^ Boeing Delivers 50,000th CSEL Search and Rescue Communications System](#)
17. [^ SERVICE TEST OF AN/URC-10 PERSONAL RESCUE RADIO](#)

See also

- [Distress radio beacon](#)
- [Distress signal](#)
- [Global Maritime Distress Safety System](#)
- [Search and Rescue Transponder](#)
- [Joint Electronics Type Designation System](#)
- [List of military electronics of the United States](#)