Maják transmitter and power unit with a wall or table mounting bracket and connector cable.

Maják (Lighthouse)

Country of origin: Czechoslovakia

DATA SUMMARY

Organisation: Civil Defence, Czechoslvakia.

Design/Manufacturer: Tesla, Pardubice.

Year of introduction: 1970.

Purpose: Search and rescue of trapped persons in (air raid) shelters.

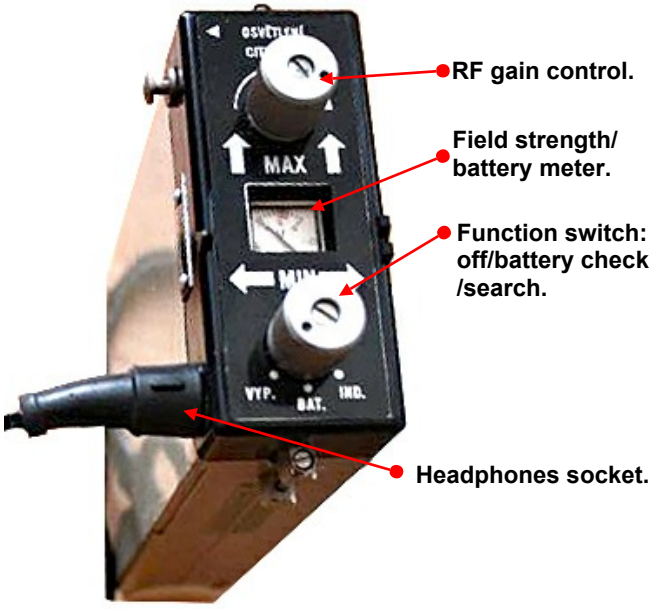
Transmitter:

Frequency: 96kHz.
Transmitter RF output: Estimated 2W.
Aerial: Frame, integrated in the transmitter enclosure.
Power Supply: Hand cranked alternator providing 12V DC at 5W on a turning rate of 65 rpm.
Size (cm): Height 7, length 30, width 30.

Search receiver:

Frequency: 96kHz.

Accessories: Headphones, spare NiCad batteries and AC mains charger for the Maják search receiver. Charging adapter. Emergency charging unit. Box with spare parts for the Maják transmitter.



Maják search receiver used by rescue parties.

Remarks

Maják (translated as Lighthouse or Beacon) was a low-frequency (96 kHz) radio-based system developed to search for, locate, and rescue trapped survivors in underground bunkers and fallout shelters. It was designed and manufactured by Tesla in Czechoslovakia for the Czech Civil Defence organisation during the Cold War era. Based on the periodic inspection dates listed in a Maják transmitter maintenance manual, the system remained in use until 2001.

Following military actions, debris and wreckage often blocked emergency exits or entrances to underground shelters and bunkers. The Maják system enabled survivors to establish one-way contact with rescue teams. The system consisted of a Maják transmitter, pre-installed in or near the exit shaft of an air raid shelter, and connected via cable to a hand-cranked alternator located inside the shelter. Civil Defence rescue teams were equipped with corresponding Maják search receivers.

Operation

In an emergency, survivors set up a hand-cranked alternator inside the main shelter and connected it to a cable leading to the pre-installed remote transmitter located in or near an exit shaft.

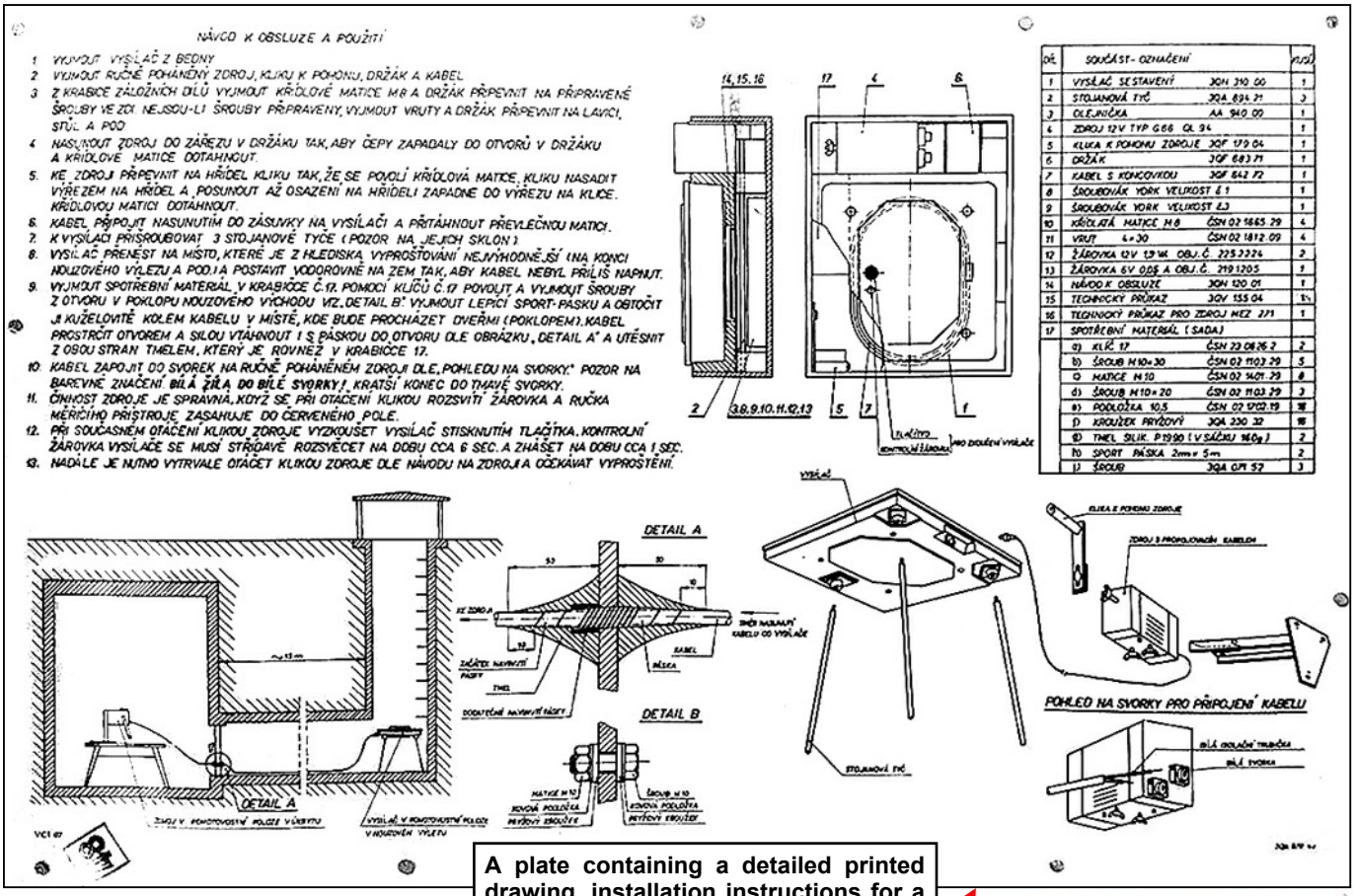
When operated, the alternator powered the transmitter to emit a radio frequency (RF) carrier at 96 kHz for approximately five seconds, followed by a one-second pause. This cycle continued for as long as the alternator was cranked. Civil Defence rescue teams could then receive the signal using a search receiver equipped with a ferrite directional aerial, allowing them to locate the position of the buried shelter exit.

The 96 kHz frequency was selected for its ability to effectively penetrate debris. The transmitter assembly—a square unit measuring 30 cm across and 7 cm high—contained both the transmitting circuitry and the frame aerial. The aerial was a horizontal frame positioned beneath the top lid of the transmitter assembly. Three legs were screwed into the bottom of the unit and secured in a suitable location.

Alternator

Power for the Maják transmitter was supplied by a hand-cranked alternator connected via a 15-meter long cable. A pilot lamp on the front panel provided illumination. To ensure proper operation, the crank had to be rotated at approximately 65 rpm, with the output monitored by a voltmeter mounted on top of the alternator.

The operating instructions advised trapped individuals to remain calm and steadily turn the power handle. The first five minutes were considered the most challenging, but once the hand adjusted to the motion, continuous cranking could be sustained for up to two hours without significant fatigue.

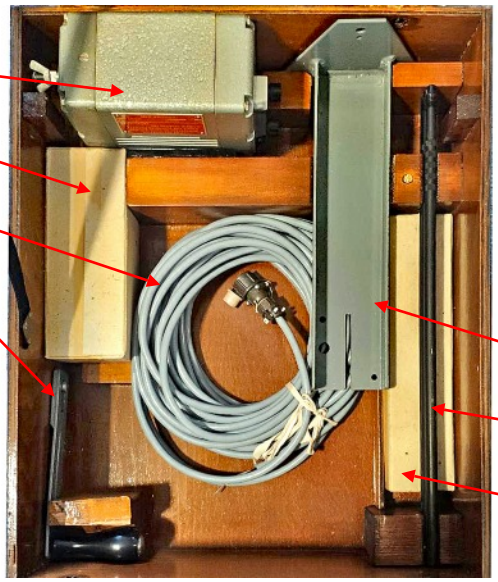


A plate containing a detailed printed drawing, installation instructions for a typical Maják setup in a shelter, and a list of components was attached inside the transmitter's transit case.

Transport box.

In addition to spare parts and mounting hardware, the transmitter's transport box contained the transmitter assembly with frame aerial, three support legs, an alternator with cranking handle and mounting bracket, spare parts and a power supply cable.

Transmitter and frame aerial assembly.



Alternator unit.

Mounting hardware.

15m cable.

Cranking handle.

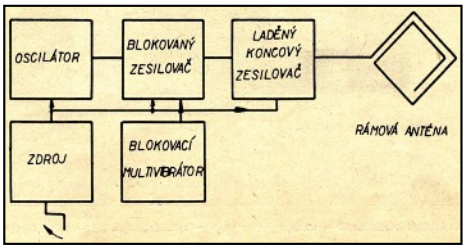
Mounting bracket.

Three legs.

Spare parts.

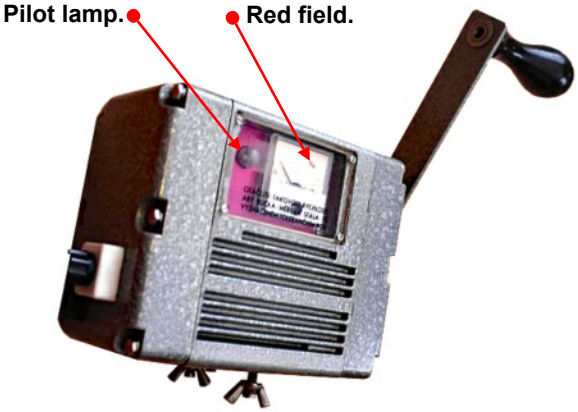
Transmitter block diagram.

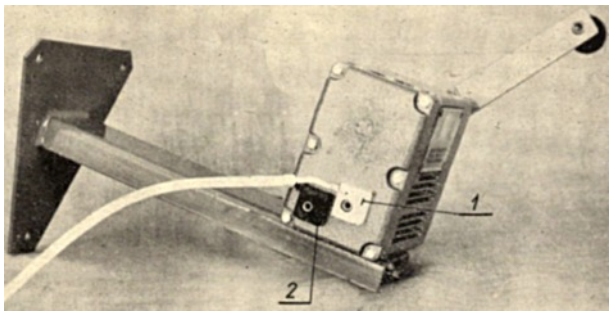
Block circuit diagram of the Maják transmitter assembly, frame aerial, and power unit. The oscillator, operating at 96 kHz, was followed by a driver for the RF amplifier stage. The RF output was fed into a horizontal frame aerial—actually a tuned printed circuit board—which formed part of the transmitter assembly.
The output from an astable multivibrator connected to the driver stage opened the signal for 4–9 seconds and blocked it for 0.75–2 seconds. This cycle repeated continuously and was intended to allow reception of a possible second emergency signal during the pause.



Hand cranked alternator.

The transmitter power source consisted of a two-phase synchronous alternator with its AC output rectified by diodes and stabilised by a Zener diode, providing 12 volts DC at 5 amperes. It was necessary to keep the crank's rotational speed at around 65 rpm. The voltmeter scale displayed a red field to indicate this. The three screws for fixing the unit to a wall or other object were already installed in a shelter or bunker.





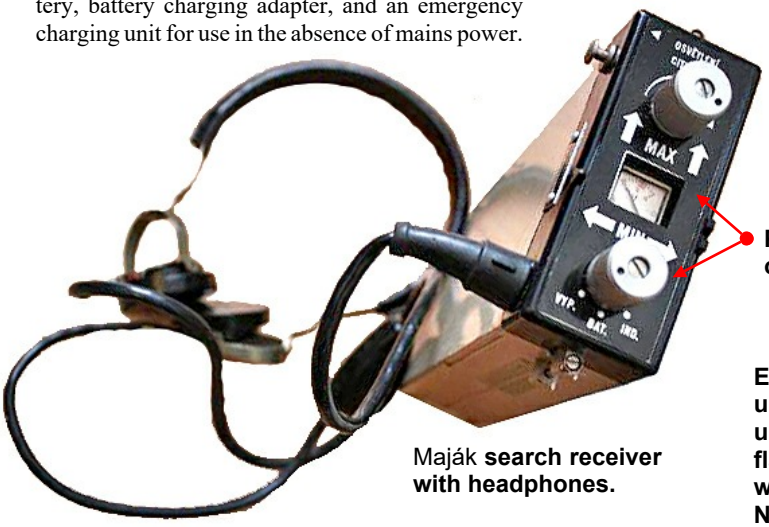
Alternator mounted on its bracket before fitting it to a wall or clamping to any suitable and stable object.

Maják search receiver.

The self-contained search receiver used headphones and was powered by an internally housed rechargeable NiCad battery. It featured a signal strength indicator meter, which also served to check the battery status. Inside the receiver was a ferrite directional antenna.
The unit was shipped in a carton containing the search receiver, headphones, a mains battery charger with connecting cable, rechargeable battery, battery charging adapter, and an emergency charging unit for use in the absence of mains power.

Items Included in the Maják receiver carton.

Maják search receiver shipping carton.



Pointers to direction of the signal.

Maják **search receiver with headphones.**

Emergency battery charging unit and cover (Right). The unit housed three 4.5V flat torch batteries and was used to recharge a NiCad battery when mains power was unavailable.

Rechargeable battery and charging adapter (left).

Acknowledgements:

- Many thanks to Jan Bednář, who introduced me to the 'Maják'.
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- I am indebted to Jiří Vaněrek for the scans of documents and permission to use photos from his website (See link below).
- https://www.jirivanerek.cz/clanky/souprava-majak-pro-vyhledavani-zasypanych-osob-v-ukrytu/