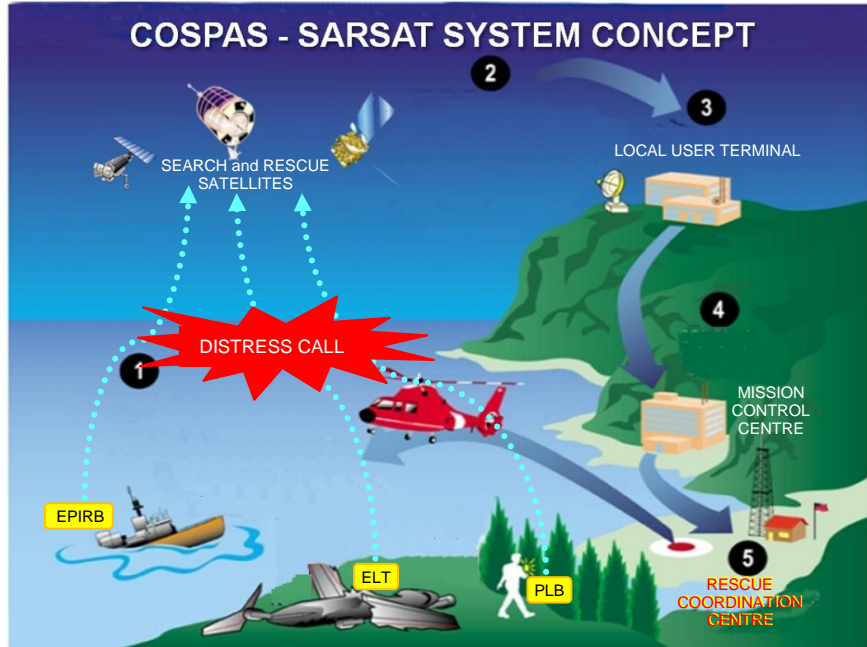


ELT

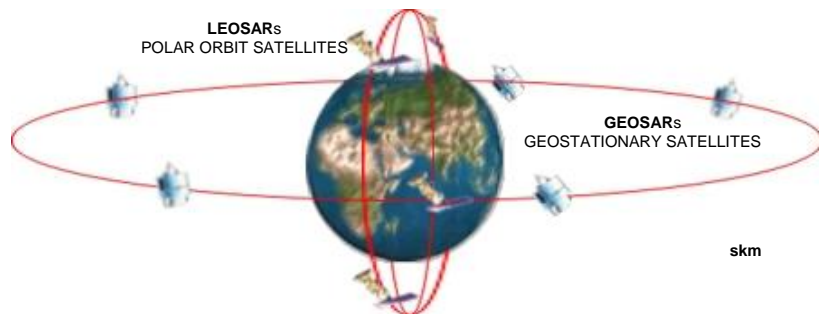
Emergency Locator Transmitter (ELT) is a compact, self contained radio transmitter carried on board airplanes to facilitate accurate location and timely rescue operation in event of any distress situation. COSPAS-SARSAT is a worldwide SAR (search and rescue) system, initially launched by Canada, France, Russia and the US in 1979. The number of member states of the organization has grown to 42 as on February 2010.

COSPAS-SARSAT CONCEPT. COSPAS (Russian words meaning - space system for the search of vessels in distress) and SARSAT (acronym for Search And Rescue Satellite-Aided Tracking) is an international satellite based search and rescue system available day and night throughout the year. Rapid detection and location of a downed aeroplane (using ELT), a ship (with EPIRB) or an individual in distress (having activated PLB), is made possible through orbiting satellites of this system.



The complete system as on February 2010 comprises.

- Six LEOSAR (Low-attitude Earth Orbit) satellites in polar orbits at 850 km above the Earth's surface. Each has a view of about 3000 km radius.
- Five GEOSAR (Geo-synchronous) satellites providing continuous coverage between latitudes 70°N and 70°S.
- 76 LUTs (Local User Terminals) or ground receiving stations (55 for LEOSAR and 21 for GEOSAR) which process the satellite signals and relay them further.
- 30 MCC (Mission Control Centers) for disseminating distress alerts for SAR services.
- More than 9,00,000 distress beacons operating on 406 MHz. Processing of old analogue technology beacons that transmit on 121.5 MHz and 243 MHz was ended in February 2009.



OPERATION. On activation of an emergency beacon in event of grave and imminent danger to lives at risk, the alert signals are received by the satellites. A distress is pinpointed in less than six hours in worst conditions and updated, if required, every two hours. The LUTs worldwide automatically receive the retransmitted signals from the satellites. Then the alerts are routed to a Mission Control Centre (MCC) in the country that operates the LUT. If the message is received by one of the LEOSARs, it would include the Doppler shift computed position of the distress beacon. Alerts received by GEOSAR provide instantaneous message and may include distress location only if the beacon is one of the self location transmitting type.

After the validation process from 406 MHz beacons, the alerts are relayed to another MCC or to appropriate Rescue Co-ordination Centre (RCC). Actual Search and rescue in most states is carried out by designated civil and military resources allocated for the purpose. The SAR service in India is organized by the Airports Authority of India in collaboration with the Ministry of Defence. The area of responsibility extends over entire Indian territory as well as airspace over high seas encompassing FIRs of Chennai, Kolkata and Mumbai. In addition to the Armed Forces along with Indian Coast Guard, all other Central and State Government departments, district administration, civil organizations and their resources may be used for the SAR purposes.

TRANSMITTER BEACON

The variety in design and operation of the specific distress beacons can be gauged by the number of manufactures that exceeds 32 as on date. Therefore, the description here should be considered as *general and illustrative only*. ELT used for aeronautical applications is certified to withstand impact and crash, resistance to flame, G shocks (100 to 500 G) water tightness and extreme temperature ranges (-20° to 55° for more than 48 hours). Weighing around two kg, the transmitter can be activated either automatically when a crash occurs or manually by switch on the transmitter or on a remote panel in the cockpit. The transmitter may be designed to transmit on all the three distress frequencies (121.5 MHz, 243 MHz and 406 MHz) or the old types may be upgraded to 406 MHz transmissions. Basic emergency frequencies of 121.5 and 243 MHz are being used for homing in the final stages of the rescue only.

Once activated, a digital message is transmitted on 406 MHz every 50 secs only for the first 24 hours of operation. This is to preserve the battery life as this transmission is at higher power. The message may either be identification or may also include the airplane's position if interfaced with on board navigation equipment. Continuous operation on 121.5 and 243 MHz at low power is maintained throughout after the activation. The battery should generally be replaced every six years and is capable of operating the transmitter for close to 100 hours.

TRANSMITTER UNIT. In helicopters the unit is generally placed near the tail in a bracket and held by a Valero strap, for quick removal. An external antenna is also installed near the tail. By connecting a small whip antenna (auxiliary antenna) available at the unit, the transmitter can be deployed as a survival ELT. The front panel on the ELT has following provisions, which are shown in the figure here;



Courtesy: KANNAD

- three position switch - ARM/ OFF/ ON, ①
- red Indicator, ②
- connector for remote panel, interface and programming equipment ③ and
- connector for antenna. ④

REMOTE CONTROL PANEL. A panel in the cockpit with the following controls to monitor the status and control the ELT by the pilots is available.

- Three position switch- ON, ARMED, RESET & TEST
- Red or amber visual indicator
- Beeper – not available on all installations.



Courtesy: KANNAD

WORKING MODES and OPERATION

OFF. As in this position no part of the unit is energized, this mode must only be selected for maintenance purpose, removal or during a long time parking.

ARM. This mode is *mandatory* during flight to enable automatic activation by G-switch or manual operation at remote control panel. Both, the panel and G-switch, are energized only when selection is on ARMED position at ELT.

SELF TEST. To be used as temporary mode for maximum five seconds for detailed testing purposes. Switches on ELT and remote panel must be selected to ARM and ARMED positions respectively. The check shall only be conducted during the first five minutes of any UTC, (co-ordinated universal time) hour, and restricted to not more than five seconds. The ATC should be also notified. The test, which is recorded should be periodically carried out, once a month by pilot or maintenance crew at the remote panel and not more than once a week for sake of conserving the battery life.

Visual / aural indications on conduct a typical self test and operation are summarized below:

Operation	Flashes	Buzzer	Result
SELF TEST	Short Series 1 Long Flash	Continuous Continuous	FAIL OK
TRANSMISSION 121.5/243 MHz 406 MHz	Periodic Long	2 Beeps / Sec Silence	OK OK

ON. Selection is possible at transmitter unit, on remote panel and automatic operation when a crash occurs. In latter two cases *provided* switch selection is on ARM position at ELT panel.

USE AS SURVIVAL ELT.

The transmitter can be used outside the helicopter in survival version on ground or fixed to a life raft in case of ditching. Removal of fixed antenna connection from the ELT at OFF position is required. After attaching the auxiliary antenna, to be kept vertical, the transmitter can be switched on. Visual and aural indications confirm auto self test sequence followed by transmission.

UNINTENTIONAL ACTIVATION.

Manually reset by selecting switch to OFF on ELT. Can be carried out on remote panel by selection to 'RESET & TEST' provided the switch is on ARM position on ELT. Regulations require intimation to ATC unit if such an event occurs.

REGISTRATION and PROGRAMMING. The protocol includes

- Serialized number
- Aircraft 24 bit address (same as Mode S of ATC Transponder)
- Operator's Designator (Serialized number up to 4096)
- Nationality and Registration Marking up to 7 characters.

The operation may be carried out by manufactures/ programming test equipment / or on board and takes just two minutes. International Beacon Registration Database (IBRD) is being maintained for proper operation of 406 MHz beacons. Owners are expected to register with appropriate national authority or with COSPOS-SARSAT organization at www.406registration.com.

MEOSAR (Medium attitude Earth Orbiting Satellites for Search and Rescue).

Work towards next generation SAR system has begun and is in proof of concept and in orbit validation phase. Using the GNSS facility, the future MEOSAR is intended to provide capability for RLS (return link service) to compatible distress beacons. The system is expected to achieve initial operational capability by 2015 and become fully operational from 2018 onwards.

SUMMARY

ELT Emergency Locator Transmitter carried on board airplanes to facilitate SAR (search and rescue).

COSPAS-SARSAT a worldwide SAR organization now with 42 member states. Responsible for rapid detection and location of a downed aeroplane, a ship or an individual in distress situation if using emergency transmission beacon.

Resources. Low altitude Earth orbiting and Geostationary satellites to receive signals at 406 MHz. Local ground stations process the satellite signals and relay them further to respective Mission Control Centres, which alert authorities for deployment of resources.

Position fixing. A distress is pinpointed in less than six hours in worst conditions and updated, if required. With location transmission as part of distress message immediate action is possible. Low orbiting satellites are capable of fixing position of distress beacon.

Transmitter Beacon. Rugged, withstands impact of crash, extreme temperatures and useable with life raft or as survival beacon.

Operation. Automatic on crash, manually on ELT and at remote panel in cockpit. Must always be at ARMED position during flight.

Frequency. 406 MHz transmission for first 24 hours but 121.5 MHz and 243 MHz would continue for final homing by search team.

Test Facility. Detailed component and operation test confirmed by aural and visual indications. Carried out sparingly to conserve battery life.

Unintentional Activation. Reset possible. Inform ATC.

Registration and Programming. Important for inclusion in International Registration Database and quick reaction in distress.

Future. MEOSAR system - medium altitude navigational satellites using SAR capabilities and provision of return link service.

SAMPLE QUESTIONS: ELT

1. COSPAS – SARSAT search and rescue system comprises number of satellites in
 - (a) geostationary orbits
 - (b) polar orbits
 - (c) orbits inclined to equator at 55°
 - (d) polar and geo stationary orbits.

2. International SAR system - COSPAS SARSAT is capable of fixing position of a distress beacon which transmits on
 - (a) any distress frequency 121.5MHz, 243 MHz or 406 MHz
 - (b) 406 MHz only
 - (c) 121.5 MHz and 243 MHz
 - (d) 243 MHz.

3. When distress message contains co-ordinates of the transmitter the position is conveyed to Local User Terminal
 - (a) within six hours
 - (b) whenever a LEOSAR receives it during its orbit
 - (c) immediately by GEOSAR
 - (d) every two hours.

4. An ELT may be activated by
 - (a) gravity switches on impact irrespective of ARMED switch position
 - (b) use of auxiliary antenna as a survival locator beacon
 - (c) pilot in cockpit panel by switching on RESET & TEST position
 - (d) using helicopters battery as stand by

5. Self Test facility provided in the cockpit should be used
 - (a) as preflight check every day
 - (b) only by maintenance crew
 - (c) sparingly between once a month and not more than once a week.
 - (d) Only during scheduled periodic servicing of the helicopter.

6. Unintentional activation of ELT may be remedied by
 - (a) manual setting to a OFF position on remote panel
 - (b) RESET & TEST position on remote panel
 - (c) OFF position on ELT.
 - (d) Either (b) or (c) above

7. Registration and programming of ELT on installation are important
 - (a) for pinpointing the location of crash
 - (b) for unique identification of the helicopter operator and nationality.
 - (c) otherwise SAR service may not be available
 - (d) to maintain international data base.

8. An SAR aircraft for homing to distress site would use direction finding equipment operating on
 - (a) 121.5 MHz
 - (b) 243 MHz
 - (c) 406 MHz
 - (d) 121.5 MHz and / or 243 MHz

9. ELT transmits continuously till the battery lasts, on
 - (a) all three frequencies
 - (b) only on 406 MHz
 - (c) 121.5 MHz and 243 MHz
 - (d) 243 MHz

10. Operation of the ELT in transmission mode
 - (a) can not be monitored
 - (b) may be confirmed by beeper
 - (c) may be indicated by light on remote panel
 - (d) may be indicated both at the unit and remote panel.

ANSWERS: ELT

Question	Option
1	d
2	b
3	c
4	b
5	c
6	d
7	b
8	d
9	c
10	d