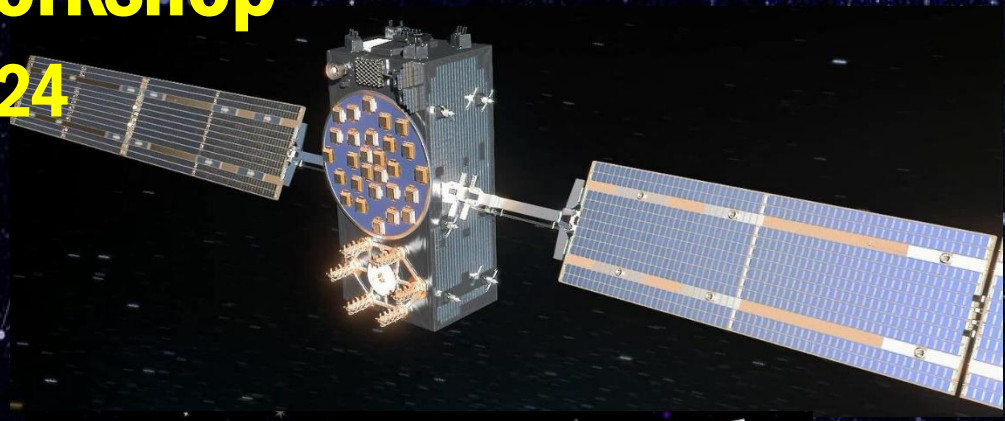
Beacon Manufacturers Workshop

Jacksonville, Florida, 10 May 2024



Cospas-Sarsat Programme updates

Dany St-Pierre

Cospas-Sarsat Secretariat

Overview

- Overall Mission and Participants
- Status of various elements: Space segment, Ground Segment, Beacon population
- Assisted Saves distribution and evolution
- 2023-24 Expert Working Groups outcomes
- CSC-69, CSC-70 outcomes and decisions
- ELT(DT) Implementation outcome
- Expectations for 2024-2025

COSPAS SARSAT

Cospas-Sarsat Mission

Mission Statement

The International Cospas-Sarsat Programme provides accurate, timely and reliable distress alert and location data to help search and rescue authorities assist persons in distress.

Objective

The objective of the Cospas-Sarsat system is to reduce, as far as possible, delays in the provision of distress alerts to SAR services, and the time required to locate a distress and provide assistance, which have a direct impact on the probability of survival of the person in distress at sea or on land.

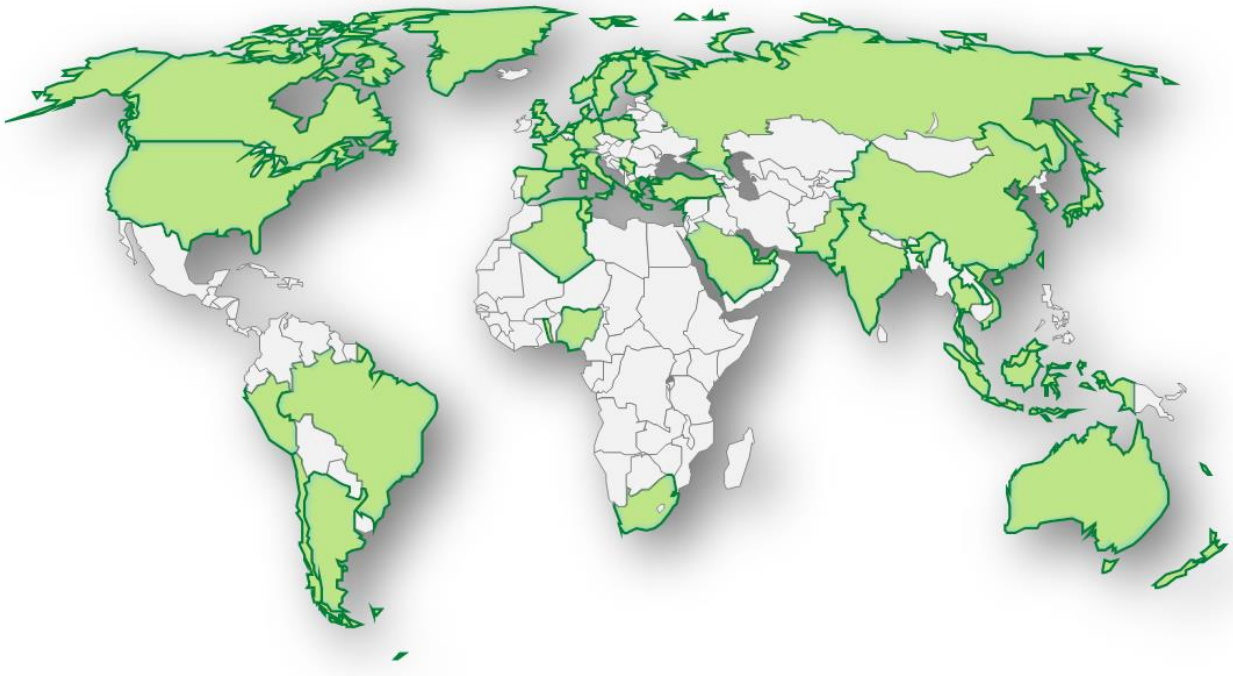
Strategy

Cospas-Sarsat Participants implement, maintain, co-ordinate and operate a satellite system capable of detecting distress alert transmission from radiobeacons and of determining their position anywhere on the globe. The distress alert and location data is provided by Cospas-Sarsat Participants to the responsible SAR services.

Services are provided worldwide and free of charge for the user in distress.

Cospas-Sarsat Participants

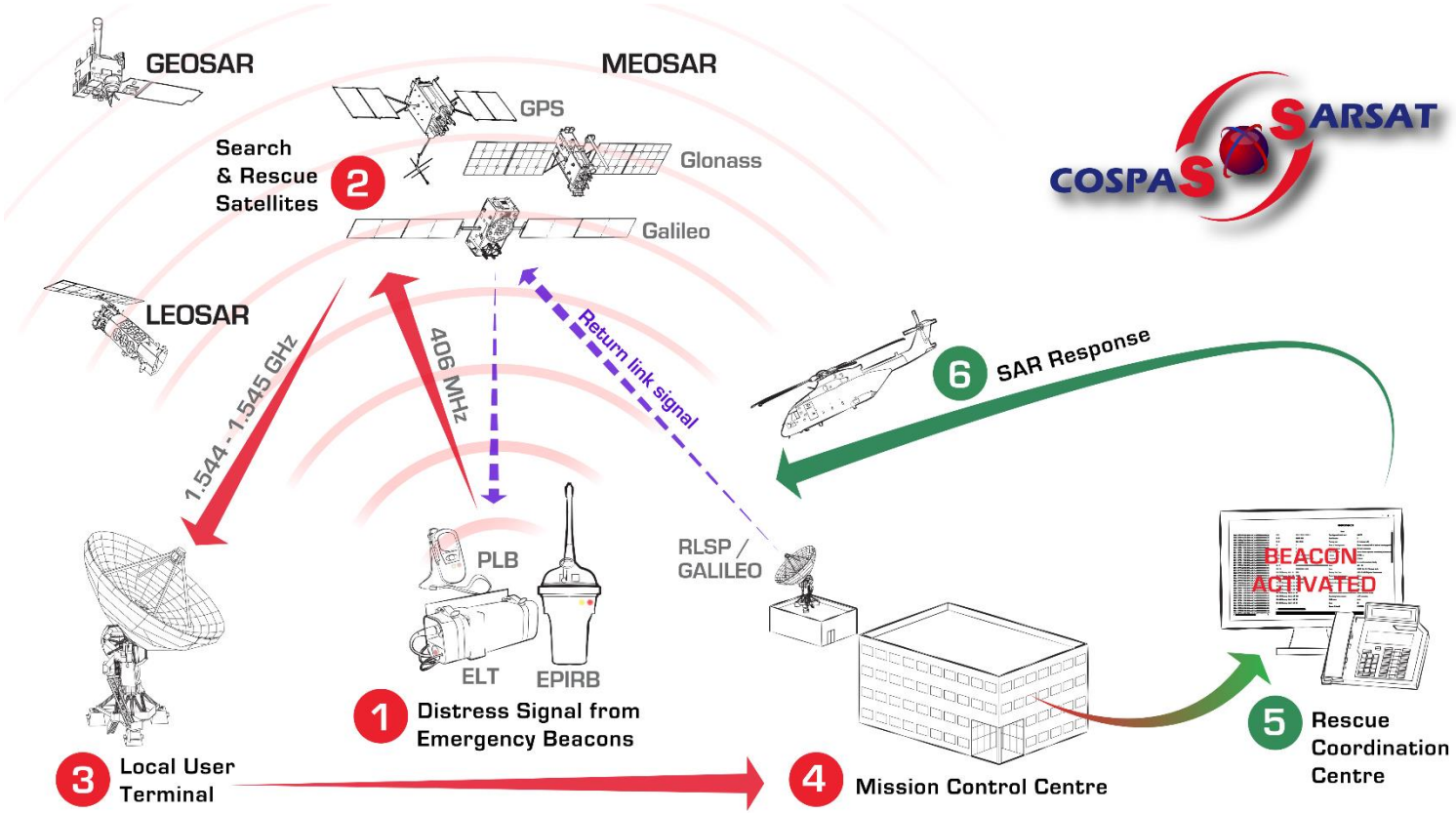
Cospas-Sarsat Participants (45)



>75% of World Population
>85% of World Wealth

Algeria
Argentina
Australia
Brazil
Canada
Chile
China (P.R.)
Cyprus
Denmark
Finland
France
Germany
Greece
Hong Kong
India
Indonesia
Italy
ITDC
Japan
Korea (R. of)
Malaysia
Netherlands
New Zealand
Nigeria
Norway
Pakistan
Peru
Poland
Qatar
Russia
Saudi Arabia
Serbia
Singapore
South Africa
Spain
Sweden
Switzerland
Thailand
Togo
Tunisia
Turkey
UAE
UK
USA
Vietnam

Cospas-Sarsat System



Cospas-Sarsat Satellite Systems

3 Types of Satellite Systems

- LEOSAR: Legacy System first payload deployed in 1982. Main operational system since the beginning of the Cospas-Sarsat Programme.
- GEOSAR: first payloads deployed in the mid-late 90s to provide early alerts and complement the LEOSAR system and in the future MEOSAR system.
- Medium Earth Orbiting Search And Rescue (MEOSAR): First payloads deployed in the early 2000s, first operational payload deployed in 2012 (Galileo), declared at Initial Operational Capability in 2023.

Cospas-Sarsat LEO-GEO Components

Space Segment:

- 4 LEO payloads in operation (all beyond their designed life), one additional LEO payload turned off to avoid ground interference and not planned to be turned on before Dec 2024). Two additional Cospas LEO payloads under test with two more planned to be launched in 2027 and 2028.
- 10 GEO payloads in operation (+ 7 in-orbit spares), one GEO payload under test. At least 2 more GEO payloads expected to be launched by 2026.

Ground Segment:

- 53 LEOLUTs (in 41 locations) in operation of which 10 are LEO/MEO capable.
- 27 GEOLUTs in operation + one back-up GEOLUT, 2 GEOLUTs under test and 3 more under development.
- 32 Mission Control Centres in operation + 2 MCCs in development.

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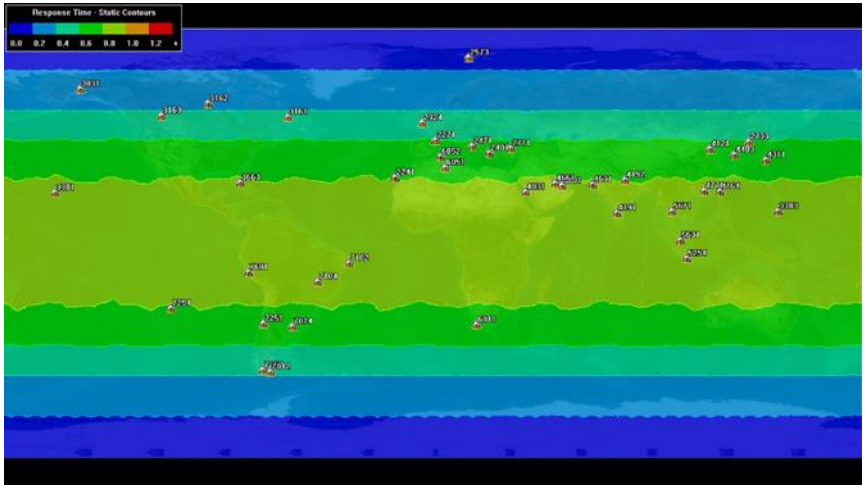
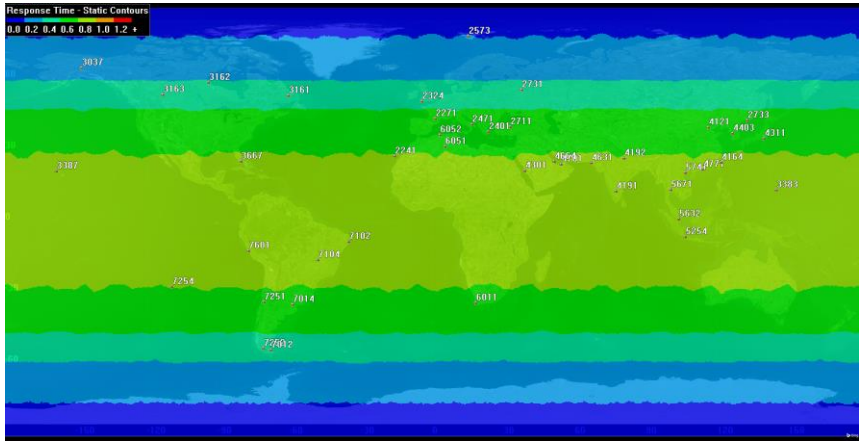
Latencies to satellites (2023 vs 2024)

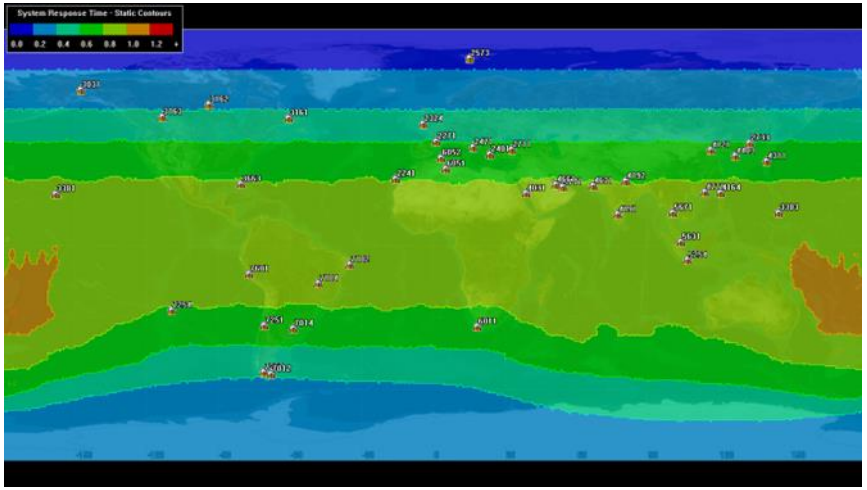


Average latency time to satellites (2023)

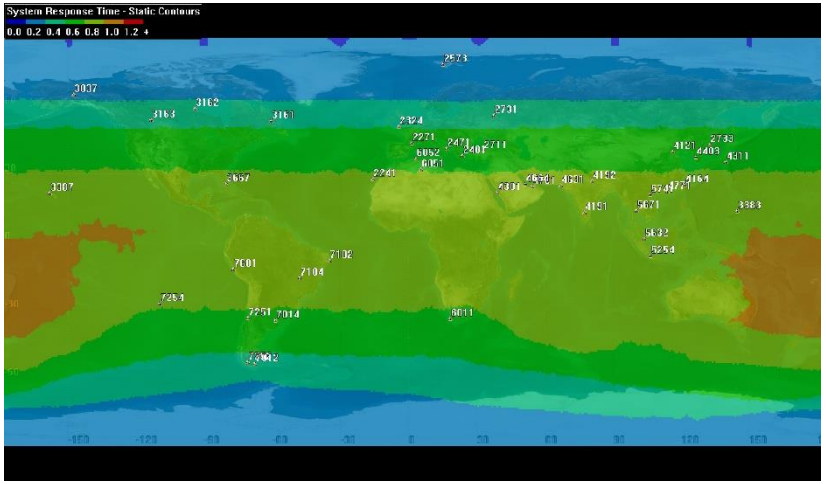


Average latency time to LEOLUTs (Current)

Latencies to Leoluts (2023 vs 2024)



Average latency time to LEOLUTs (2023)



Average latency time to LEOLUTs (Current)

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MEOSAR payload status

- Galileo: 23 SAR/Galileo payloads operational. 2 additional payloads launched on April 27, 2024, with 2 more planned later in 2024. Six additional SAR/Galileo planned to be deployed by 2026. Galileo Second Generation payloads expected to be deployed from 2026.
- GPS: 21 DASS payloads used operationally (17 on DASS/GPS II 4 on DASS/GPS III), Additional DASS/GPS III to be deployed in the upcoming years. First L-band payloads on GPS III to be deployed no earlier than 2026.

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MEOSAR payloads status (2)

- Glonass: 2 SAR/Glonass K1 payloads operational. Two SAR/Glonass payload expected to be commissioned in 2024 (one K1 and one K2). 2 SAR/Glonass payloads (one K1 and one K2) planned to be put in orbit in 2024.
- BEIDOU: Six SAR/BDS operational (awaiting availability of the satellite ephemeris to be made available to MEOLUTs).
- 46 MEOSAR payloads currently in use.

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MEOSAR payloads status (3)

Constellation	Operational	In Use	Under test	Spare	To be tested	Planned (2024-2025)	Planned 2026+
Galileo	23	23	0	1	2	8	G2G
GPS	21	21	0	0	0	3 (TBC)	GPS IIIF L-Band
Glonass	2	2	2	0	0	2	-
Beidou	6	0	0	0	0	-	-

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MEOSAR Ground Segment status

- **29 MEOLUTs commissioned (same as in 2023) of which:**
  - 13 MEOLUTs commissioned to FGB IOC/FOC standards (10 in 2023),
  - 18 MEOLUTs commissioned FGB ELT(DT) capability (16 in 2023),
  - 6 MEOLUTs commissioned for FGB+SGB ELT(DT) capability (3 in 2023),
  - 5 MEOLUTs commissioned for SGB capability (1 in 2023).
- 20 MCCs with commissioned LGM capability (17 in 2023) +4 more expected to be commissioned in 2024.

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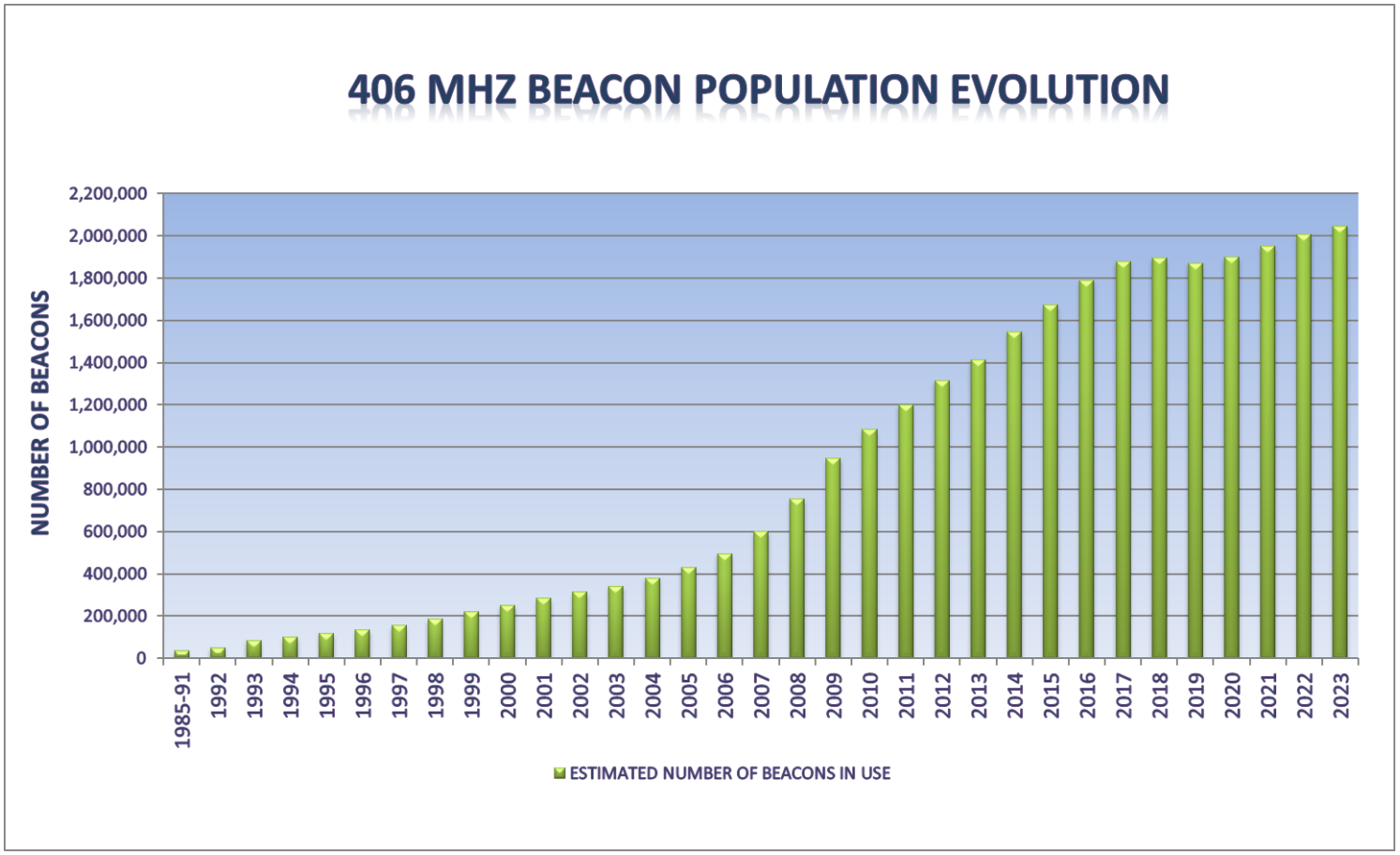
Beacon Population Evolution



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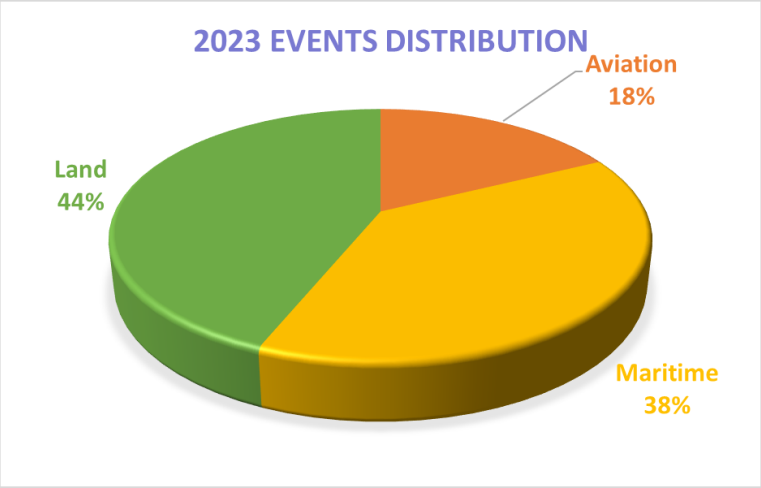
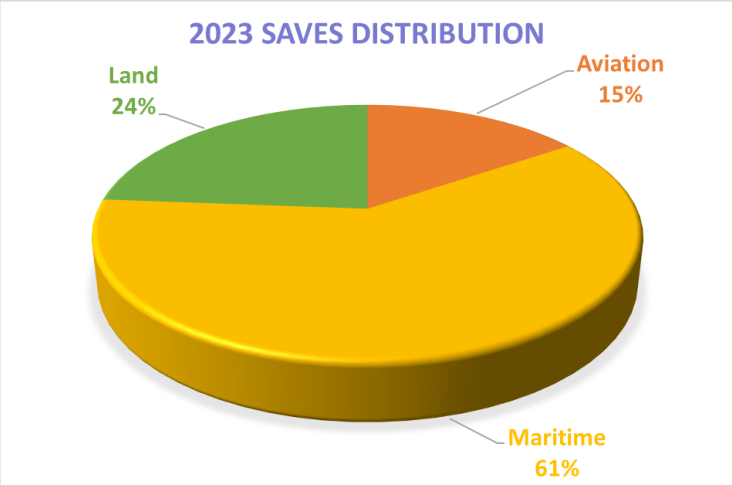
SAR Events and Assisted Saves

2023

SAR Events:	≈1,100	SAR Events (1982 / 2023) : ≈ 19,900
P. Rescued	≈3,100	P. Rescued (1982 / 2023) : ≈ 63,750





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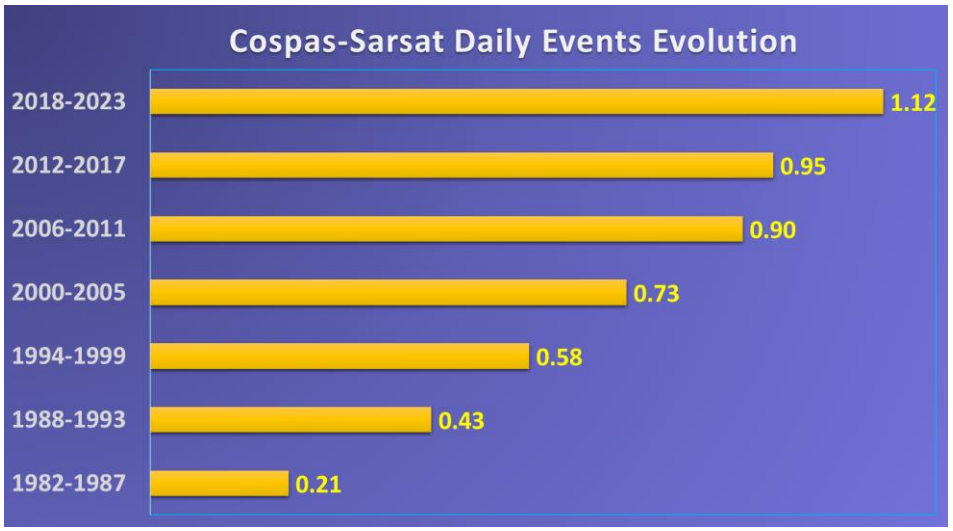
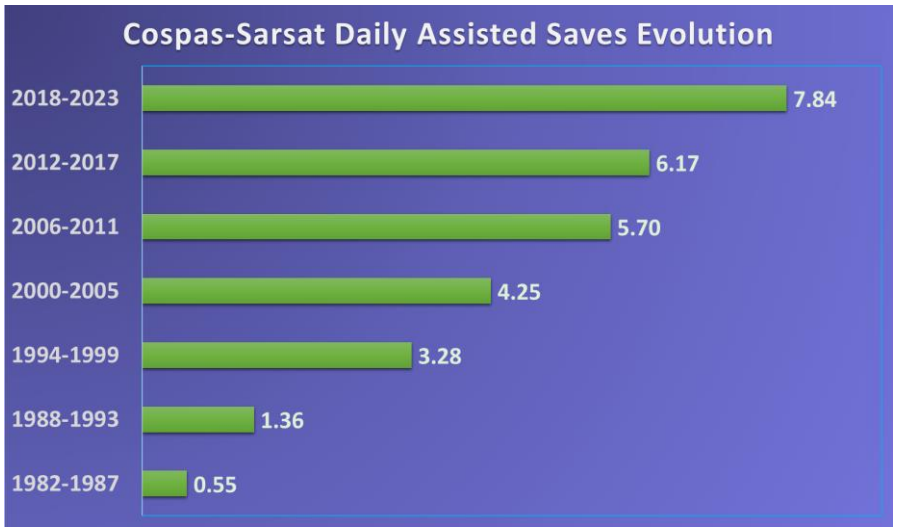
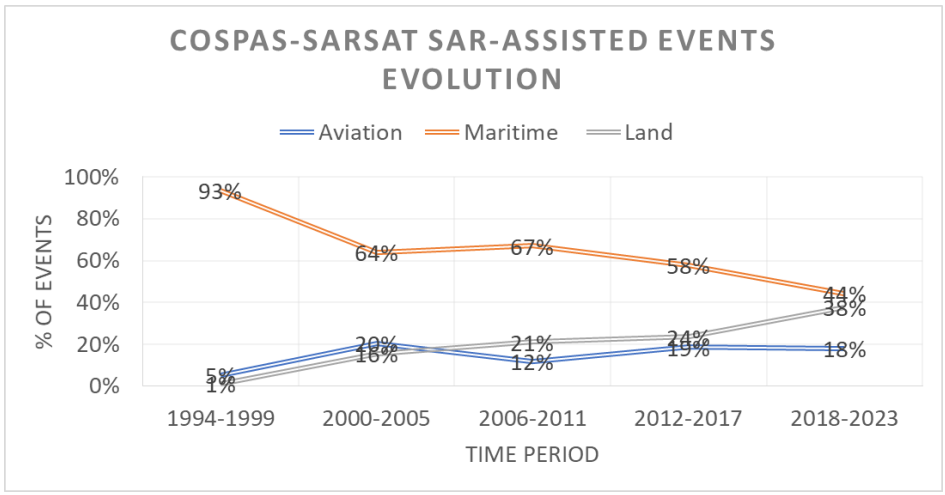
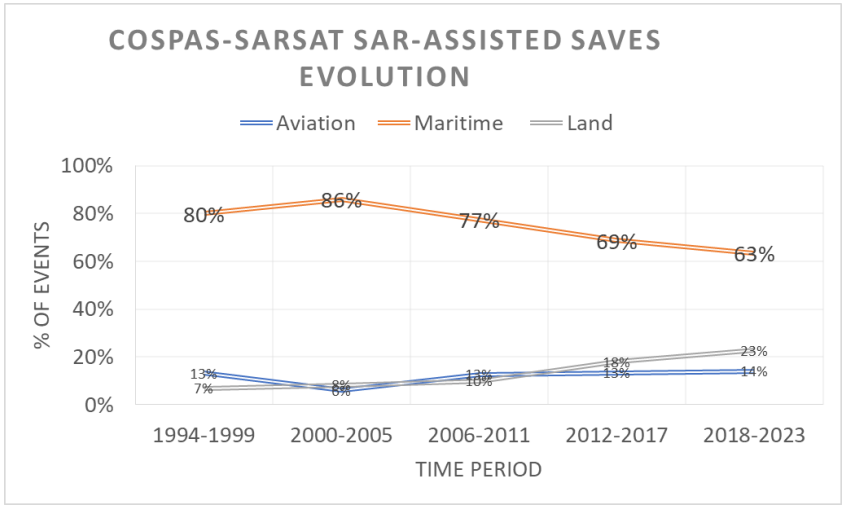
Cospas-Sarsat
SAR Events and Assisted Saves (2)





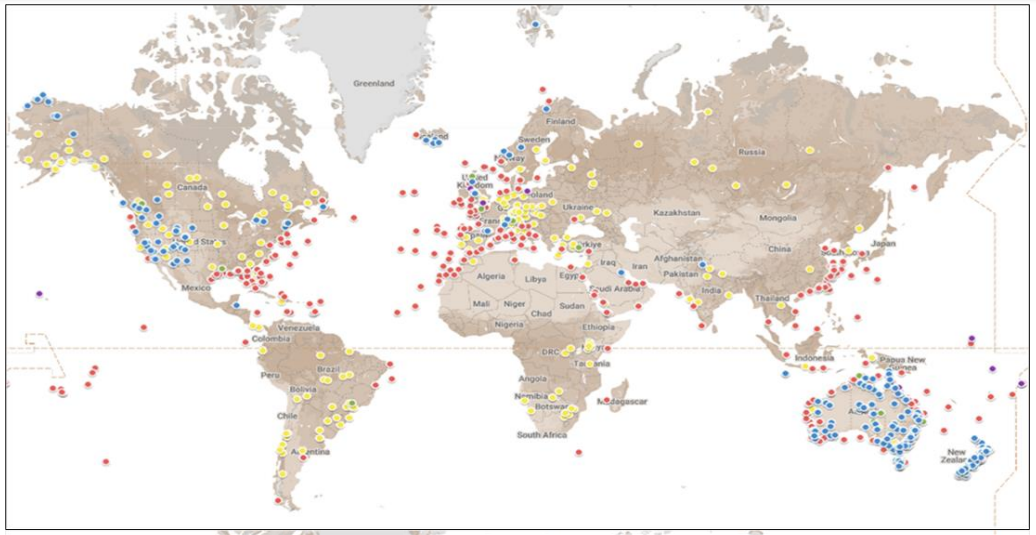
Cospas-Sarsat
SAR Events and Assisted Saves Trends





Cospas-Sarsat events distribution

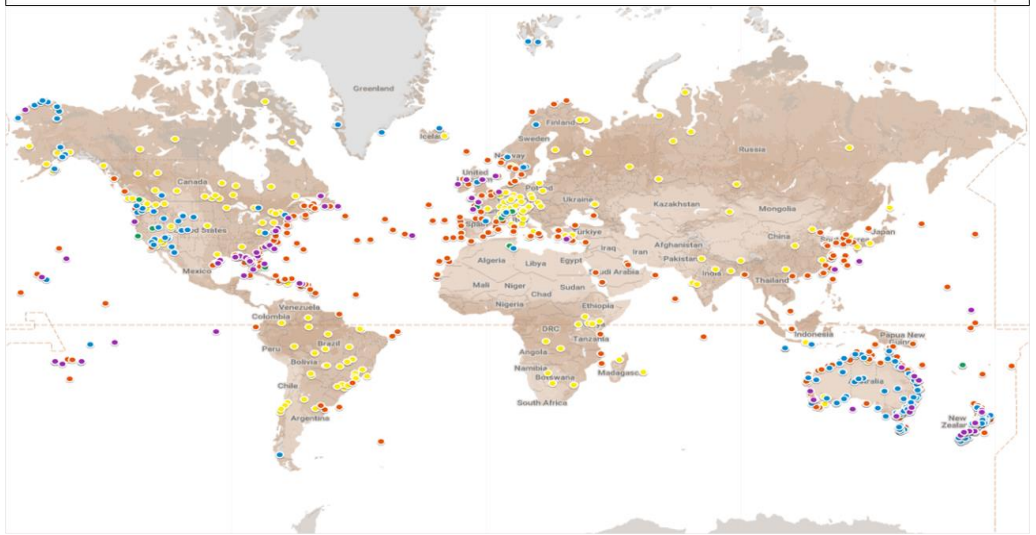
•2022



Legend:

- In yellow: ELTs
- In red: EPIRBs
- In blue: PLBs (Land)
- In green: PLBs (Aviation)
- In purple: PLBs (Maritime)

•2023



Cospas-Sarsat 2023 EWGs outcomes

- **Experts Working Group Meeting on Evaluation of MEOSAR Global Coverage:**
  - Main outcomes: Coverage assessments of new Cospas-Sarsat capabilities (SGB ELT(DT) capability in 2023) and recommendations to CSC-69. To be continued in 2024.
- **Experts Working Group Meeting on Commissioning of MCCs**
  - Main outcomes: Review of LGM MCC commissioning reports (CNMCC, AEMCC and SAMCC at LGM; AUMCC with FGB ELT(DT) and SGB capability in 2023) and recommendations to CSC-69. To be continued in 2024.

Cospas-Sarsat 2023 EWGs outcomes (2)

- **Experts Working Group Meeting on Commissioning of LUTs**
  - Main outcomes: Review of commissioning LEO, GEO and MEO LUTs reports and recommendations to CSC-69. In 2023:
    - Singapore and Guam(2) LEOLUTs,
    - Khabarovsk and Ottawa GEOLUTs,
    - MEOLUTs for Hawaii 6+6 (for FGB IOC/FOC, ELT(DT) and SGB capability) Mingenew and Taupo (for FGB IOC/FOC, ELT(DT) and SGB capability) Mingenew and Taupo in networking operation mode and La Reunion (for SGB ELT(DT) capability.
  - To be continued in 2024.
- **Experts Working Group Meeting on Commissioning of Space Segment Assets**
  - Main outcomes: Review of commissioning reports for the new SAR repeaters (Louch 5V, GOES-18 and MTG-1 GEOSAR in 2023.) and provision of recommendations to CSC-69. To be continued in 2024.

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Cospas-Sarsat 2023 EWGs outcomes (3)

- **Extended Test Facility Capabilities and New Beacon Types Expert Group**
  - Main outcomes: Recommendation to Council to remove the interim qualifier and accept the extension of capabilities allowing the US Army Electronics Proving Ground (EPG) test facility to perform type approval testing of SGB ELT(DT)s. To be continued in 2024

CSC-69 Main Outcomes

- Approved amendments to 12 T-Series documents, 4 O-Series documents, 3 G-Series documents, 1 P-Series document and 1 R-Series document
- Declaration of Full Operational Capability (FOC) for second generation-based ELT(DT)s starting 1 January 2024

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CSC-69 Main Outcomes (2)

- **Approved Terms of Reference for 2024 Experts Working Group Meeting on:**
  - Updating documentation related to ELT(DT) data distribution (EWG-1C/2024)
  - Evaluation of MEOSAR Global Coverage (EWG-2C/2024, Closed Council)
  - Commissioning of MCCs (EWG-3C/2024)
  - Commissioning of LUTs (EWG-4C/2024)
  - Commissioning of Space Segment Assets (EWG-5C/2024)
  - Experts Working Group Meeting on Two-Way Communication (EWG-6/2024)
  - Experts Working Group Meeting on Finalization of SGB Type Approval and Related Documents (EWG-7/2024)

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Cospas-Sarsat 2024 EWG outcomes

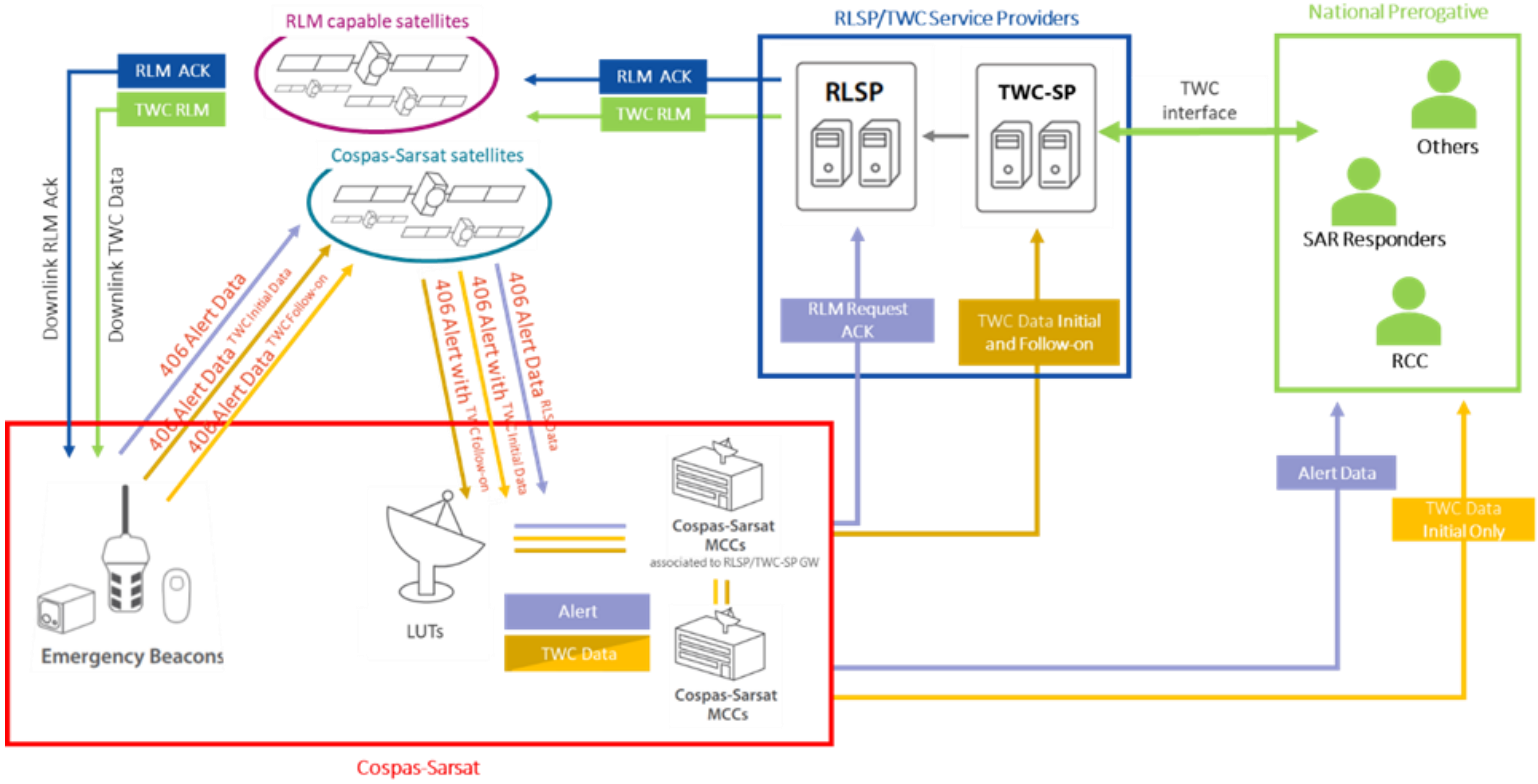
Experts Working Group Meeting Updating documentation related to ELT(DT) data distribution

- Main outcomes: Review of ELT-(DT) data distribution. Amendments to A.001 and A.002 recommended for approval by CSC-70. Action item to refine the requirements for MCCs to process and distribute ELT(DT) data from an aircraft in a post-crash scenario.

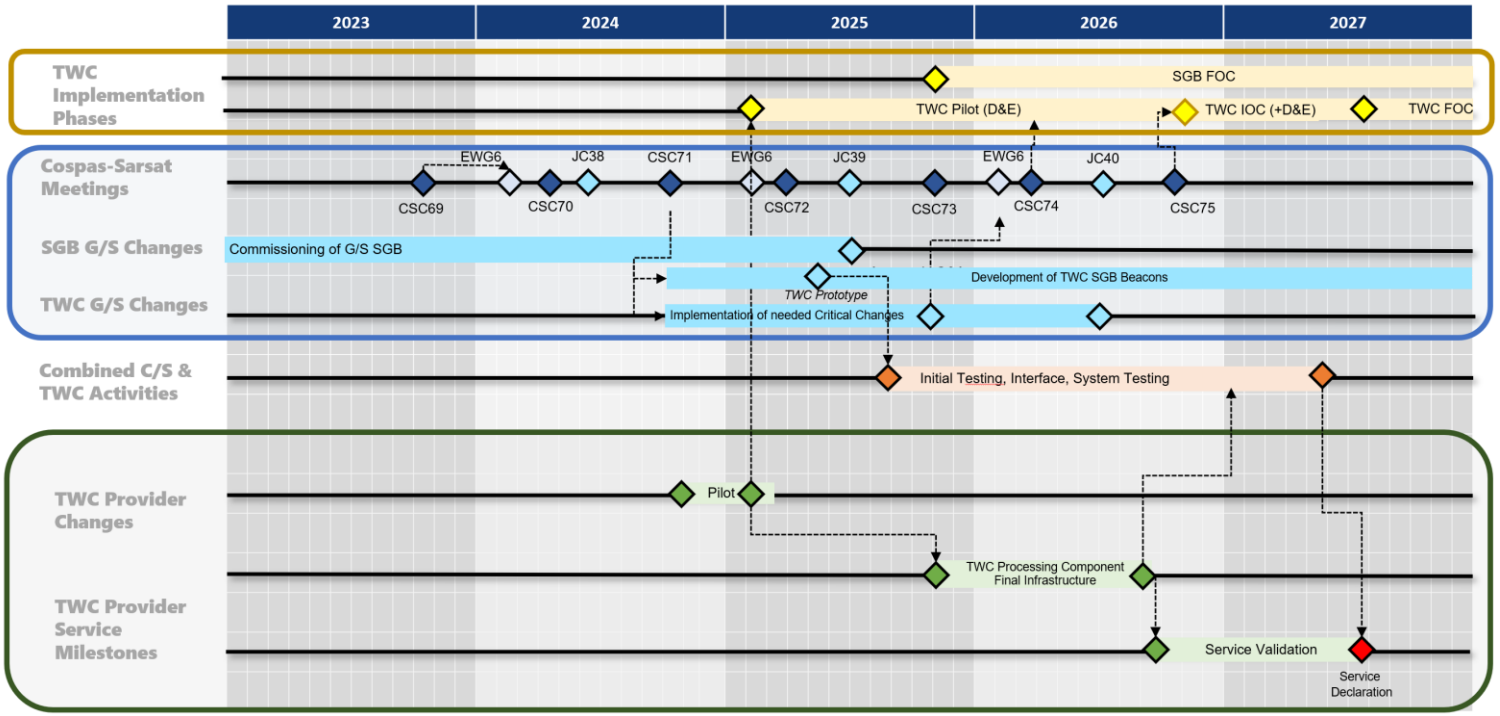
Experts Working Group Meeting on Two-Way Communication

- Main outcomes: Preparation of Draft C/S R.02x document. Preliminary TWC timeline. 10 action items inviting participants to further TWC Data distribution, functionality, interfaces and questions and answers, to further continue development as JC-38

TWC Concept
(Preliminary version to be further developed)

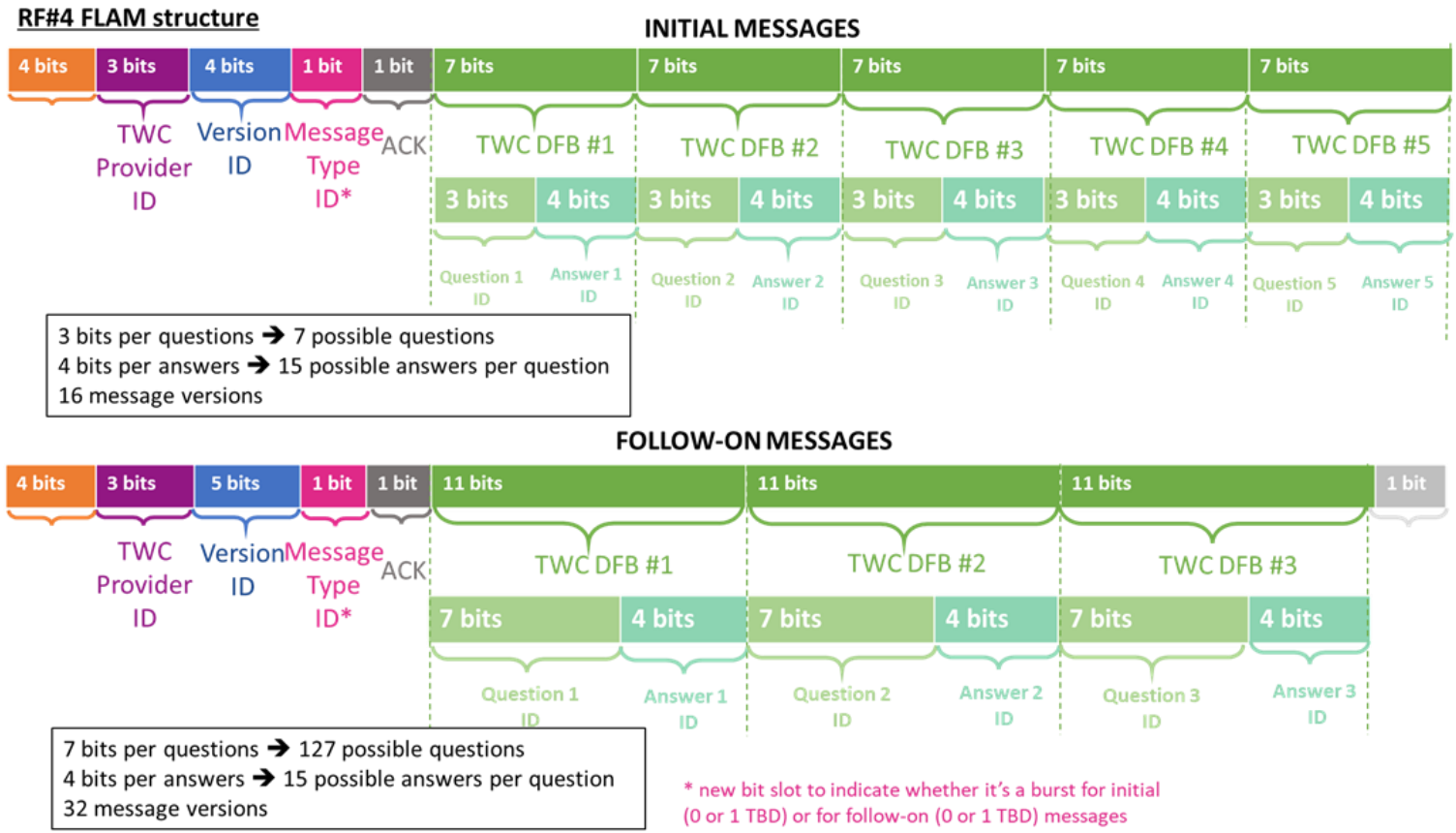


TWC Timeline (Preliminary)



TWC messages

Example of a possible bit allocation scheme concept



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Key CSC-70/CLD Decisions

- Approval of amendments proposed by EWG-1C to documents A.001 and A.002
- The Joint Committee to address as matters of priority both:
  - post-crash independent localization of ELT(DT)s, working from the results of EWG-1C/2024.
  - the large number of ELT(DT) non-distress activations currently being detected by the System.

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ELT(DT) Implementation Timeline

- The first discussions on the feasibility of developing a new type of ELT that could, using the MEOSAR system, reliably provide distress locations prior to an aircraft crash were held at EWG-2/2010
- The Concept was further developed over time and several Cospas-Sarsat meetings leading to an FGB ELT(DT) System FOC declaration by the Programme effective 1 January 2023 and a similar SGB ELT(DT) System FOC declaration effective 1 January 2024.
- ELT(DT) specification requirements were introduced in 2016 and the first FGB ELT(DT) type approval was granted in November 2022, allowing FGB ELT(DT)s to be used operationally following the FGB ELT(DT) FOC declaration.
- The first SGB ELT(DT) type approval expected to be granted in 2024 allowing the operational use of SGB ELT(DT)s shortly thereafter.

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ELT(DT) Main characteristics

Designed to provide positions of a fast-moving aircraft in unusual attitudes during events which could be very short using the MEOSAR system, with the expectations of reliably providing distress locations prior to an aircraft crash.

- Up to 3 means of activations (for crash survivable ELT(DT)s) compared to 2 for typical ELT(AF).
- Much shorter first burst delay (5 seconds vs either 15 (automatic) or 50 (manual) seconds for ELT(AF))
- Enhanced repetition rate, particularly in the first 5 minutes after activation (i.e. 42 bursts in the first 5 minutes) but also in the long term (burst every 28.5 sec for ELT(DT) vs 50 sec for ELT(AF))
- Each cancellation of ELT(DT) transmission initiate the transmission of a 10- burst cancellation message sequence (i.e. 10 burst provided every 10 seconds)
- Each beacon alert and associated position received is expected to be transmitted to RCCs and to the LADR
- ELT(DT) models expected to be developed in a timeline allowing aircraft manufacturer to comply to ICAO GADSS requirements

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ELT(DT) Main characteristics (2)

Because of these intrinsic main characteristics ELT(DT)s:

- are more prone to false alert activations (i.e., because of their additional means of activation and their shorter burst delay).
- generate more beacon transmissions (burst) every time a beacon is triggered.

while each ELT(DT) alert :

- generates more traffic and work at MCC level.
- will be more visible to several stakeholders (i.e. particularly when alerts will be formally forwarded to the ICAO LADR).

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ELT(DT) implementation feedback

From 1 January 2023 until 18 April 2024:

- ELT(DT)s have been embarked on aircraft for the equivalent of 28306 days
- No real ELT(DT) alerts recorded
- No in-flight triggering of ELT(DT)s other than those generated by planned tests, but 3 aircraft activated on the ground flew with activated beacons for several hours allowing the positions of the aircraft to be known during these activations
- 739 unique False alerts ELT(DT) activations were collected by the USMCC. These false alert activations provided approximately 18400 minutes of ELT(DT) transmission and led to approximately 58500 ELT(DT) bursts transmitted

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ELT(DT) implementation feedback (2)

- **Of the 739 ELT(DT) false alert activations:**
  - 83.5% used aircraft operator protocols (aircraft in operation)
  - 13.8% used beacon serial and TAC numbers protocols (aircraft not delivered yet)
  - 1.8% used test protocols
  - 47.6% were activated by the aircraft avionic
  - 47.2% were manually activated
  - 5.1% were activated automatically (shock/deformation sensors)
- **Very variable false alerts activation rates were noticed from operators in possession of aircraft equipped with ELT(DT)s**
  - Most aircraft operators had only one or two false alert activations
  - 18 aircraft operators had no activation recorded by the USMCC
  - 10 operators had more than 10 activations each with one operator having a total of 160 activations for all its aircraft

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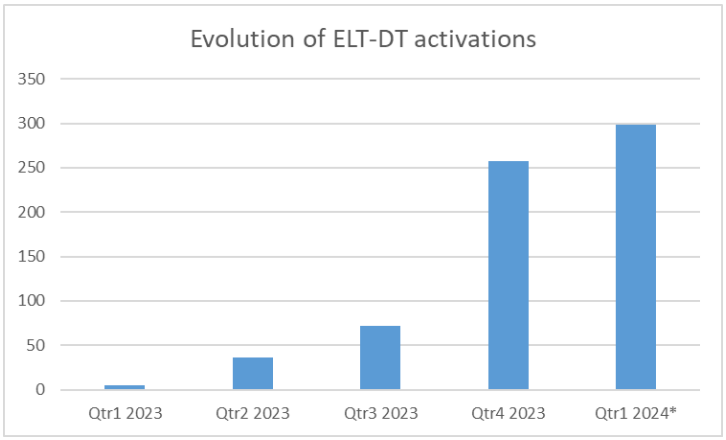
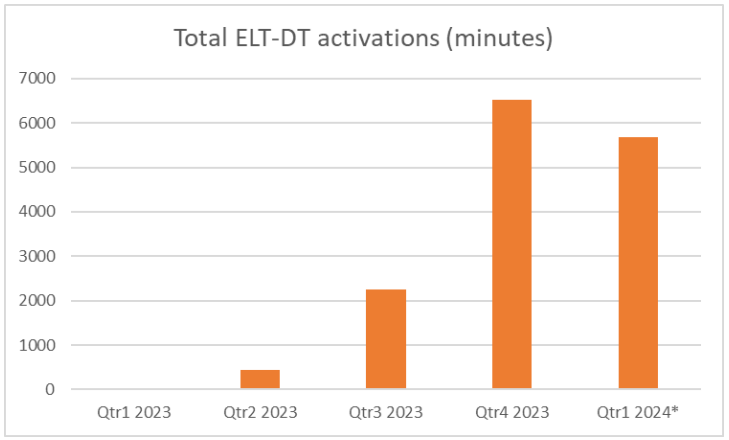
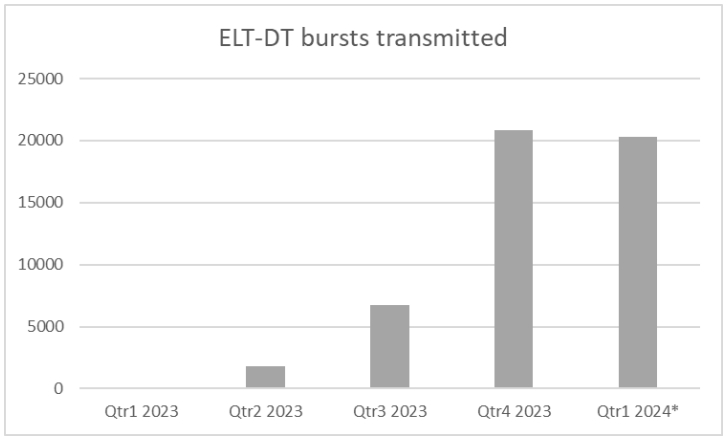
ELT(DT) implementation feedback (3)







ELT(DT) implementation issues

- The ELT(DT) false alert activations and associated data are placing a significant load on LUT and MCC processing and to the supporting communication networks throughout the Cospas-Sarsat Ground Segment. As with all false alerts, there is always a potential to interfere or mask beacon transmissions for an actual distress. In addition, it can place a burden on SAR personnel who may be unduly distracted or misdirecting SAR forces. This traffic will likely continue to grow as more aircraft equipped with ELT(DT)s continues to be delivered in 2024.
- The ICAO LADR is not yet operational but, when it will be, all unique ELT(DT) false alerts will be forwarded to it. These particular false alerts will likely lead to a negative impact on the reputation of the Programme if the LADR is inundated with false alerts from ELT(DT)s.

ELT(DT) implementation issues (2)

- The number of burst generated in the last year by the small number of ELT(DT)s currently in service is more than 1/3 of the traffic monitored in 2022 for the 406.031 MHz channel. Each ELT(DT) in service is currently on average generating approximately 295 times the traffic of an ELT (AF). Such traffic, if not urgently addressed, could potentially saturate the 406.031 MHz beacon channel much more rapidly than anticipated. This is further exacerbated by the fact that other FGB ELT(DT) models will used the same frequency channel.

ELT(DT) additional observations

- The fear that ELT(DT)s might generate a high rate of false alerts while in flight due to inappropriate parameters implemented in the avionic logic did not seem to be an issue so far but this assessment will continue to be monitored as new aircraft manufacturers, aircraft models and operators will begin operations in 2024.
- At this time, data collected from the USMCC seems to indicate that all ELT(DT) activations from aircraft in operations were initiated from ground activations. The fact that these activations were triggered almost equally from manual and autonomous triggering and that the rates and durations of activations varied greatly from one aircraft operator to another, suggests that there could be more than one root cause for these activations or that some operators may have taken additional actions to address the matter in a way to reduce both the occurrence and durations of ELT(DT) false activations.

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ELT(DT) implementation mitigation measures

- Cospas-Sarsat to address the matter of ELT(DT) false alert activations as a priority hence the inclusion of the CSC-70 decision in the invitation to JC-38.
- Some MCCs have implemented ELT(DT)s traffic monitoring programmes to monitor the ELT(DT) false alert activations evolution.
- 406.031 MHz channel traffic to be more closely monitored from JC-38.
- Discussion with aircraft manufacturers and aircraft operators on the matter of ELT(DT) false alert activation have been initiated in Q1 2024. Information on ELT(DT) activations collected is now shared with relevant aircraft manufacturers to help them further Investigate the root causes of ELT(DT) activations. Corrective measures are expected to be implemented as early as Q2 and in Q3 2024 once the root causes of the ELT(DT) activations have been determined.
- The high rate of manually activations might suggest that some operators are not sufficiently educated about the ELT(DT)s particular characteristics nor familiar with the capability of the MEOSAR system to constantly detect 406 MHz transmissions anywhere.

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2024-2025 Cospas-Sarsat Programme Expectations

- Additional Ground Segment assets (LUTs and MCCs) being commissioned for various additional new capabilities (i.e., IOC/FOC, ELT(DT) and SGB)
- Further development of the Two-Way Communication Concept including Cospas-Sarsat documents amendments related with this functionality
- Additional space segments being launched and commissioned (LEOSAR, GEOSAR and MEOSAR)
- Possibly more accepted test labs made available for the type approval of FGB ELT(DT)s and SGBs
- Refine the QMS requirements that would be expected for the declaration of MEOSAR at FOC.
- Adequately address the matter of ELT(DT) false alert activations

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