

ARCTIC RESCUE CAPABILITY DEMONSTRATED

ARCTIC MASS SEARCH AND RESCUE OPERATION (AMRO) SHOWCASES THE POWER OF NEW COSPAS-SARSAT TECHNOLOGIES AT VERY HIGH LATITUDES UNDER EXTREME CONDITIONS

October 2021. As remote as it might be, the Arctic is also a busy place. Energy, mining, fishing, transport and cruise ships operate in the region, and use of the Arctic is expected to grow even more in coming years. The expected vessel and aviation traffic increase will bring more people to the frequently hostile environment. When they get into trouble, search and rescue (SAR) may be challenging in the remote region with scarce communications, rough seas, constantly moving ice floes, low light in the long polar nights, harsh weather and freezing temperatures.

When an emergency strikes, the timely and reliable delivery of Cospas-Sarsat distress messages can be the critical tool in a SAR mission that saves lives.

PRACTICE MAKES PERFECT - THE "ACCIDENT"

To ensure preparedness in case of an emergency, SAR first responders often conduct training exercises.



On 8 October 2021, a mass rescue exercise was performed in the freezing temperatures (-8°C or 17.6°F) of the Svalbard archipelago.

Norway and the European Union Agency for the Space Programme undertook a full-scale live exercise simulating a fire aboard a cruise ship with 200 passengers. Located offshore, well above the Arctic Circle, the captain of the "distressed" ship made a "Mayday, Mayday, Mayday" call. When no response was received the captain turned to a consistently reliable distress-alerting tool and activated the vessel's Cospas-Sarsat compatible 406-MHz emergency position-indicating radio beacon (EPIRB).

The beacon was a newer model with the Return Link Service (RLS) feature that uses Europe's Galileo satellite constellation to provide confirmation of receipt of the distress message.



A 406 MHz EPIRB with RLS capability. Some models are similar in size to a drinking glass.

The Return Link Service (RLS) is a new feature that uses an indicator on the beacon to confirm to the beacon user that the distress signal from an activated beacon has been localised by the Cospas-Sarsat System and is being sent to responsible SAR authorities.

Although the expected end-to-end RLS latency from beacon activation to acknowledgment signal reception was designed to be less than 30 minutes, the observed RLS performance is far better. On the day of the SAREX event, acknowledgement arrived at the beacon in only 2 minutes and 20 seconds.

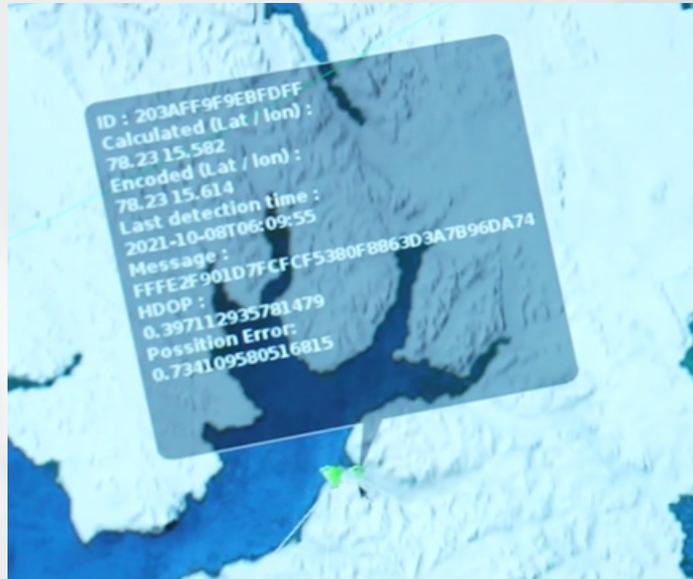
The Return Link Service (RLS)

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COSPAS-SARSAT MEOSAR SYSTEM RESPONSE

In any SAR event time matters, and on the day of the exercise Cospas-Sarsat's MEOSAR system provided timely, reliable and accurate data to SAR forces, as well as RLS confirmation of receipt of the distress message in under two and a half minutes. The MEOSAR (medium-altitude earth orbiting search-and-rescue) satellite system is Cospas-Sarsat's most recent technology innovation. It uses distress signal repeaters presently installed on 45 satellites of the GPS, Galileo and Glonass navigation satellite constellations, providing continuous coverage of the entire earth.

In this exercise the EPIRB was manually activated at 06:06:36 UTC. Following the normal "boot up" of the electronics, the beacon transmitted the first distress message "burst" at 06:07:26 UTC that was received by a ground station in Toulouse, France. The Toulouse MEOLUT (MEOSAR local user terminal) calculated the location of the beacon from its signal characteristics. This "independently" determined location was the first information about where the distress was occurring.



The SAR Galileo ground segment in Toulouse provides near real-time monitoring.

Cospas-Sarsat uses a sophisticated data distribution plan to route received distress messages to the proper authorities worldwide. This routing is executed by mission control centers (MCCs). The Toulouse MEOLUT data was sent by the French MCC (FMCC) to the Norwegian MCC (NMCC) at 06:07:49 UTC, a mere 23 seconds after the first beacon transmission.

Fifty seconds later, at 06:08:16, the second distress message "burst" from the beacon was independently calculated by MEOLUTs to be at 78.230N, 15.582E. This location turned out to be accurate within 500 meters. A third burst at 06:09:04 had included a GNSS (encoded) location in the distress message, a position determined from a navigation satellite chip in the beacon (using GPS, Galileo and/or Glonass). That location was very nearly the same as the one independently calculated by the MEOLUTs, providing high confidence about the actual location of the distress. In addition, in accordance with the data distribution plan, at 06:08:39 UTC a request was sent to the Galileo Return Link Service Provider (RLSP) facility hosted by France to have acknowledgment of receipt of the distress message (and confirmation of the successful localization of the distress event) sent over the Galileo satellites to the beacon.

The request was swiftly processed by the RLSP, and the "acknowledgement" return link message (RLM) was uplinked to the appropriate Galileo satellite and received by the beacon at 06:08:56 UTC. The beacon's indicator (blue light in the photograph above) then provided assurance to those on the distressed vessel that help had been alerted.

ARCTIC RESCUE CAPABILITY DEMONSTRATED



SAR Galileo Service Centre (RLSP host), Toulouse, France

COSPAS-SARSAT MEOSAR EXCEEDING EXPECTATIONS

Cospas-Sarsat's legacy LEOSAR (low-altitude Earth orbiting search-and-rescue) system of five satellites still provides valuable data in many distress events. But as can be seen in the table below, the MEOSAR innovation greatly improves the chances of saving lives. In particular in this case, MEOSAR provided a 25-minute "first alert" advantage over LEOSAR.

THE TABLE BELOW SUMMARIZES THE SAREX RESULTS

Beacon ("Distress Event") Position	78.230 N	15.603 E
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Beacon Encoded GNSS Position	78.230 N	15.614 E
Location Accuracy Error GNSS	250 meters	

MEOSAR RESULTS

MEOSAR Independent Position	78.230 N	15.582 E
Location Accuracy Error DOA	480 meters	
Time to Detect	Instantaneous	
Time to Confirm Position	1 minute 40 seconds	
Time to Notify SAR forces	Under 1 minute	
End-to-End Return Link Latency	2 minutes 20 seconds	

LEOSAR RESULTS

LEOSAR Independent Position	78.240 N	15.620 E
Location Accuracy Error	1,300 meters	
Time to Detect	25 minutes	
Time to Confirm Position	58 minutes	

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The MEOSAR system provided an initial alert 25 minutes earlier than the first LEOSAR alert. The MEOSAR system also had an independently-calculated location-accuracy improvement of almost 1 km, provided 58 minutes earlier than the LEOSAR system.



Spitzbergen European MEOLUT, one of several satellite-receiving earth stations of the European Union supporting Cospas-Sarsat

Just over a year after its initial introduction, the RLS functionality within Cospas-Sarsat was declared at full operational capacity by the Cospas-Sarsat Council in March 2021. The RLS is now available globally, with no restrictions.



The Joint Rescue Coordination Centre Bodø, Norway

THE RESCUE

With the NMCC informed of the distress event and the information forwarded to Norwegian rescue authorities, the rescue was quickly organized. Meanwhile, the ship's crew was reassured that the SOS signal from the EPIRB had been well received thanks to the RLS.



Sea King helicopter from the 330 squadron of the Norwegian Airforce

The successful "rescue" itself was no small undertaking as it involved the evacuation of 200 passengers with a wide range of (simulated) injuries, some requiring immediate medical attention. A joint endeavour was assembled with tight coordination between the Svalbard SAR forces, the Red Cross, Norwegian Coast Guard and the Norwegian Royal Air Force, scrambling air and sea assets.

If the worst befalls you in the Arctic, or anywhere else in the world, activation of a 406-MHz beacon will help ensure that Cospas-Sarsat gets rescuers to you!

COSPAS-SARSAT: TRACKING AIRCRAFT IN DISTRESS

COSPAS-SARSAT RESPONDS TO UN AGENCY'S QUEST FOR IMPROVED AWARENESS OF AIRCRAFT IN DISTRESS

How is it possible for a commercial passenger airliner to vanish? That was the frequently asked question following the disappearance of Malaysian Airlines flight MH370 in 2014. An earlier incident might have seemed almost unique in its rarity when it took almost two years to find the flight recorders of Air France flight AF447 after it crashed in 2009. Despite modern airspace surveillance technologies, it became increasingly evident that there were places and circumstances in which a finding a distressed aircraft could become like looking for a needle in a haystack.

An objective of ICAO's GADSS is to quickly identify when an aircraft is in distress and to support SAR and accident investigation authorities by making relevant information available in a timely manner, including to support retrieval of flight recorder data.

ICAO has developed a Global Aeronautical Distress and Safety System (GADSS), borrowing terminology from the Global Maritime Distress and Safety System of its sister organization in the UN, the International Maritime Organization.

GADSS includes normal Aircraft Tracking, Autonomous Distress Tracking, and Post Flight Localisation and Data Recovery.

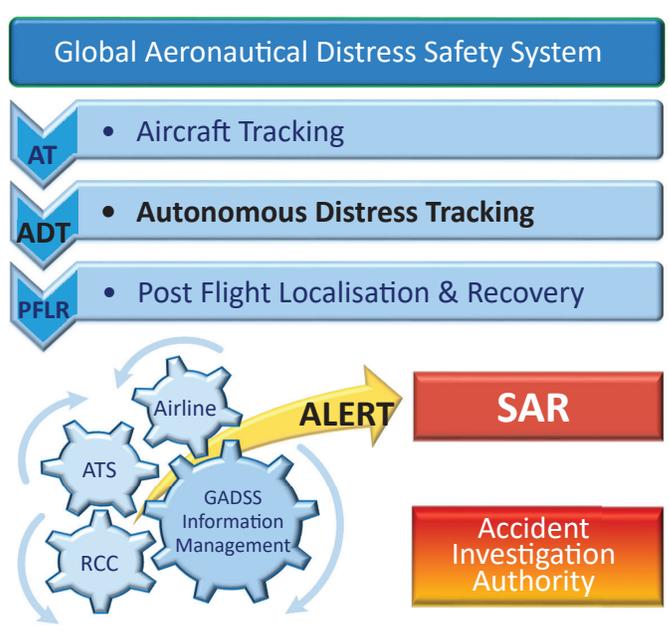
GADSS reduces the normal reporting period for aircraft location (important, for example, in oceanic airspace) from

In 2016 Cospas-Sarsat technology was proving its value in such incidents when Egypt Air flight MS804 crashed in the Mediterranean Sea. Seven minutes after the last contact with air-traffic control, the plane's emergency locator transmitter (ELT) was manually activated and its signal received by Cospas-Sarsat. Analysis by Cospas-Sarsat-affiliated engineers, particularly at France's Centre national d'études spatiales (CNES), was instrumental in narrowing the search area.

one hour to 15 minutes. Moreover, it addresses the three incidents above by requiring that an aircraft's location be autonomously reported (without intervention by the flight crew) once each minute when an aircraft is in a distress condition.

As new Cospas-Sarsat technology was then coming online, the United Nations-affiliated International Civil Aviation Organization (ICAO) was developing new regulatory expectations to be applied to most aircraft on international routes. A synergistic relationship rapidly formed, with ICAO developing a functional specification for tracking of aircraft in distress and Cospas-Sarsat developing technology solutions to satisfy the new ICAO requirements. ICAO allows for non-Cospas-Sarsat technologies to be used to meet its requirements, but major aircraft manufacturers have publicly expressed a preference for the heritage, experience and familiarity of ELTs that can be detected and located by Cospas-Sarsat.

So what is ICAO's framework and how is Cospas-Sarsat satisfying it?



COSPAS-SARSAT: TRACKING AIRCRAFT IN DISTRESS

This autonomous distress tracking (ADT) is triggered when the aircraft enters predefined, exceptional states of operation that indicate distress. The autonomous nature of it means that the flight crew is neither distracted by needing to signal distress, nor able to interfere with it.

The Cospas-Sarsat community is providing a technical solution to the GADSS ADT requirement through an ELT designed for distress tracking (ELT(DT)). The Cospas-Sarsat Participant governments have approved the specifications for ELT(DT)s and are building the infrastructure to receive on the ground the signals relayed by satellites and to distribute these messages to those who can take action. Commercial manufacturers of Cospas-Sarsat-compatible ELT(DT)s have been refining their designs to meet the rigorous expectations.

When an ADT message is received, ICAO expects it to be made available to the aircraft operator (the airline, which has ultimate responsibility for knowing the location and safety of its aircraft), the air traffic service unit (ATSU, the air traffic controllers for the area of flight) and rescue coordination centers (RCCs, that would coordinate a rescue if the distress situation is not resolved).

All alerts received by Cospas-Sarsat are routinely routed to RCCs. To make ADT information readily available to aircraft operators and ATSUs (as well as RCCs) ICAO is planning to implement a Location of Aircraft in Distress Repository (LADR), an automated system for collecting and sharing ADT data, particularly the location of the incident.

ICAO anticipates that its LADR will be operational by the end of the year, consistent with its regulations that will require that most newly-manufactured aircraft on international routes be equipped with an ADT device starting 1 January 2023.

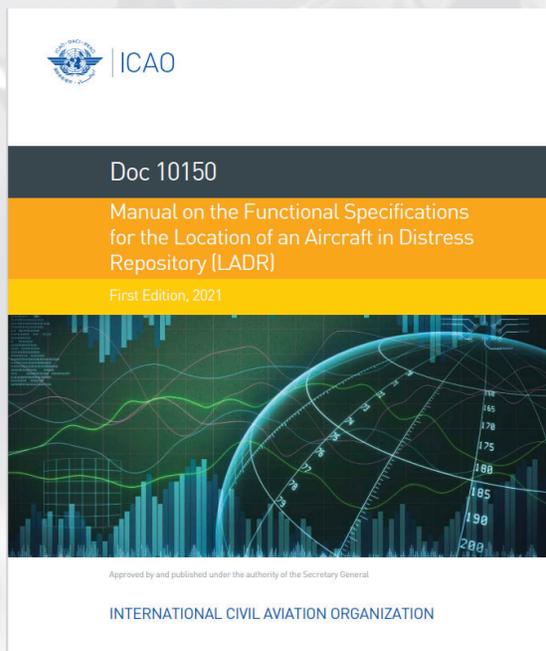


A 406 MHz ELT(DT)

When activated, the ELT(DT) alert data will be made available by the Cospas-Sarsat System to the LADR in addition to being distributed directly to the appropriate RCC(s) (see “How Does the Cospas-Sarsat System Work?” in this Bulletin).

Some ELT(DT)s will be incorporated into deployable flight recorders, a module that ejects from a crashing aircraft, safely carrying with it data about the flight prior to the crash.

The Cospas-Sarsat community shared in the grief felt globally about the lives lost in flights AF447, MH370 and MS 804, among other aviation tragedies. Cospas-Sarsat, together with ICAO and other partners are taking extraordinary steps to ensure the quickest, most successful response to distress incidents in the future.



Cospas-Sarsat beacon types

2021 NOTABLE SAVES



TWO SWIM TO SHORE FROM CRASHED AIRCRAFT AT HUMPBACK LAKE, ALASKA

2 LIVES SAVED

On 7 August 2021, a PLB was detected 50 miles southeast of Ketchikan, Alaska, USA.

It was activated when a Cessna 180 aircraft, with two people on board, crashed in Humpback Lake. The passengers swam to shore from the plane, taking a dry bag equipped with clothes and supplies.



Coast Guard District 17 received a satellite call from the owner, who then manually activated his PLB to provide his location.

An MH-60 Jayhawk helicopter from Coast Guard Air Station Sitka was deployed to the position, safely hoisted both uninjured passengers from shore, and transported them to Ketchikan.

“They actually had a personal locator beacon that they were able to set off that basically led our responders to their exact location,” noted the US Coast Guard.

[\(https://www.krbd.org/2021/08/07/privately-owned-float-plane-crashes-coast-guard-rescues-both-passengers/\)](https://www.krbd.org/2021/08/07/privately-owned-float-plane-crashes-coast-guard-rescues-both-passengers/)

ARGENTINE NAVY AIDS FISHING VESSEL AFTER EPIRB ACTIVATION

1 LIFE SAVED

On 12 November 2021 at 0156 UTC, the Argentine Mission Control Center received an alert from an EPIRB registered to the fishing vessel “7 de Agosto” and sent the alert to RCC Puerto Belgrano.

A large and well-coordinated operation ensued, involving specially trained personnel, the Coast Guard vessel GC-71 “La Plata” and GC-25 “Azopardo” from the ports of San Antonio Oeste and Puerto Madryn, and a helicopter with rescue swimmers with a doctor on board from the Argentine Naval Prefecture.



SAR operations were coordinated with the ship that were in the area and able to go to the site of the incident.

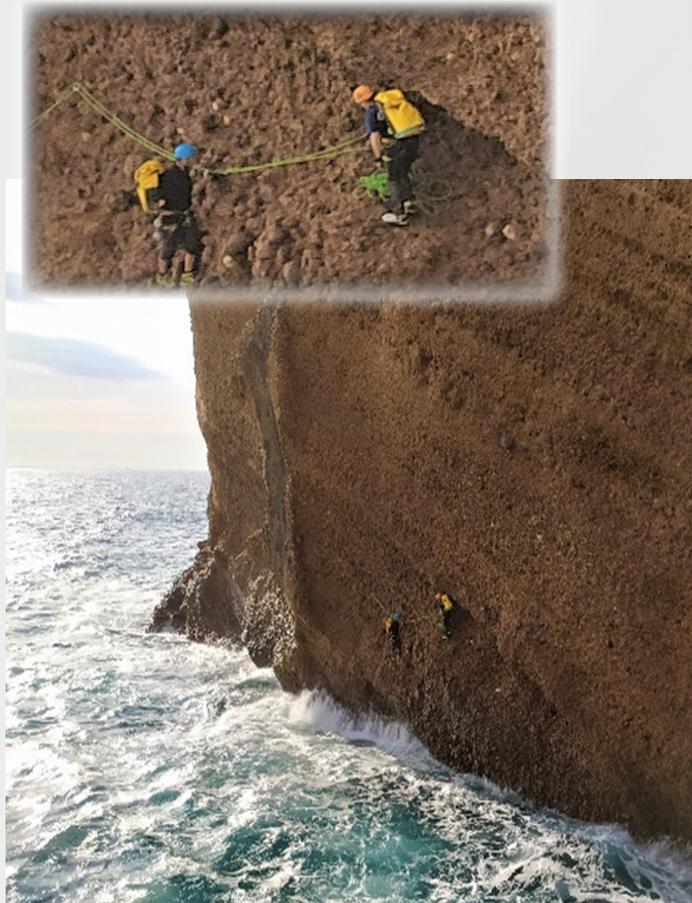
One of the three crew members of the fishing vessel was found alive but hypothermic and was immediately assisted.

In this case, the fishing vessel’s EPIRB provided the first and only alert.

2021 NOTABLE SAVES

WAVE INJURES CLIFF CLIMBER

1 LIFE SAVED



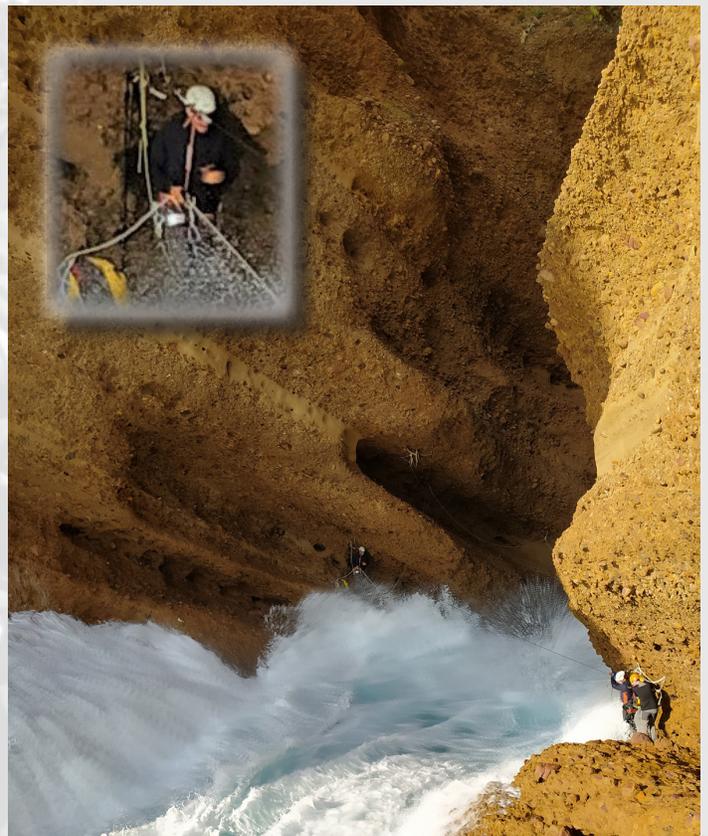
On 11 November 2021, one person participating in a climbing activity was rescued at the foot of a cliff near La Ciotat, France. While crossing a rocky wall just above the sea, a wave hit one group member causing a severe knee injury, preventing them from exiting the climb and returning to the hiking trail. No telephone networks were available, so a Personal Locator Beacon was activated.

The first unlocated alert was detected at 1419 UTC by the French MEOLUT and transmitted to the FMCC. The first location arrived at 1423 UTC. Despite the surroundings rocky walls, the signal was quickly detected and located by the MEOSAR system.

All information was sent to ARCC Lyon (as it was a PLB) and to MRCC CROSS Gris-Nez (location close to the sea). At 1424 UTC, a new position matched with the first one.

The emergency contact listed in the French Beacon Registry was called four minutes after the reception of the first alert by the ARCC and confirmed the activity and location. One hour and thirty minutes after the first alert, the wounded person was evacuated to the nearest hospital.

This mountain club recommends always carrying a Cospas-Sarsat beacon, which can be instrumental in saving lives.



2021 NOTABLE SAVES



© Erik Sleutelberg / AirHistory.net

ELT FIRST ALERT: CRASH IN CANADIAN NORTH WITH FIVE ON BOARD

5 LIVES SAVED

On 2 November 2021 at 0053 UTC, a DeHavilland DHC-6 SERIES 300 crashed 8 kilometres north of Fort Providence in the Northwest Territories of Canada.

The onboard ELT provided the first alert for this incident - the Fort Providence airport radio operator was unaware the aircraft had gone down.

At 0101 UTC, JRCC Trenton tasked two Royal Canadian Air Force assets to respond: a CC-138 Twin Otter from 440 Squadron and a CC-130H Hercules aircraft from 435 Squadron.

Unfortunately, due to the distance involved, the Hercules was estimated to arrive on scene no earlier than 0500Z.

There were five people on board the crashed aircraft and all survived, with minor injuries.

They had crashed in a swamp far from any road and had soaked clothing in 5 degrees Celsius temperatures. Fire Rescue personnel from Fort Providence headed to the crash site on ATVs at 0156 UTC and were the first on scene at 0310 UTC, followed shortly thereafter by the 440 Squadron Twin Otter at 0315 UTC.

The fire crew managed to help all survivors out of the swamp and took them to Fort Providence in the ATVs.

AUSTRALIAN NAVY AND MARINE RESCUE AID CATAMARAN IN DISTRESS IN NEW SOUTH WALES

3 LIVES SAVED



© Marine Rescue Ulladulla

AMSA coordinated the rescue of three crew after a catamaran capsized near Ulladulla on 30 November 2021.

The Australian Navy provided support until marine rescue arrived on scene.

The crew are safe and well - we thank everyone involved.



© Marine Rescue Ulladulla

2021 NOTABLE SAVES

ELT ALERT FROM HEAVILY DAMAGED SWISS HELICOPTER

4 LIVES SAVED



On 18 December 2021, a Lama helicopter took off from a Swiss airfield in Raron with the intention of dropping three passengers at Mount Alphubel, at 3,782 m in the Swiss Pennine Alps.



© skitourguru.com

During the landing attempt, the light helicopter was severely damaged.

The automatic ELT installed on board provided the first alert to the Swiss Aeronautical Rescue Coordination Center (ARCC) in Zurich, including the location of the accident as generated by the MEOSAR system.



© KAPO Wallis

The first alert was detected by the French MEOLUT, with a first location sent to the Swiss SPOC at 0925 UTC, confirmed shortly thereafter at 0932 UTC.

Thanks to proper registration of the ELT in the International Beacon Registration Database (IBRD, 406registration.com), details about the helicopter, its operator and the associated emergency contacts were immediately available to SAR services, allowing them to provide a prompt and appropriate response.



© KAPO Wallis

PARTICIPATING COUNTRIES AND ORGANIZATIONS

2022

Algeria
Argentina
Australia
Brazil
Canada
Chile
China (P.R. of)
Cyprus

Denmark
Finland
France
Germany
Greece
Hong Kong (China)
India
Indonesia

Italy
ITDC
Japan
Korea (Rep. of)
Malaysia
Netherlands (The)
New Zealand
Nigeria

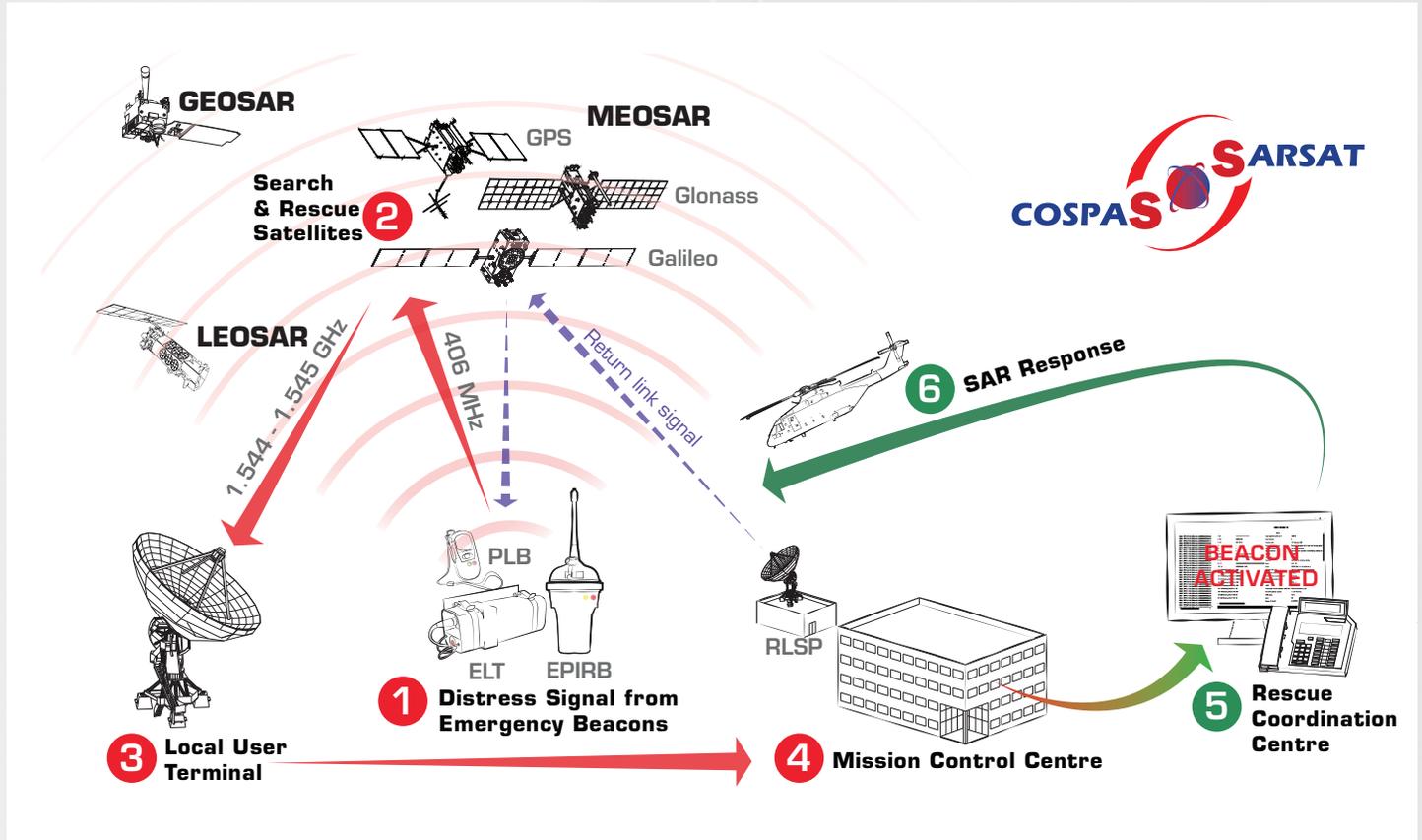
Norway
Pakistan
Peru
Poland
Qatar
Russian Federation
Saudi Arabia
Serbia

Singapore
South Africa
Spain
Sweden
Switzerland
Thailand
Togo
Tunisia

Turkey
UAE
UK
USA
Vietnam
Total: 45



HOW DOES THE COSPAS-SARSAT SYSTEM WORK?



The Cospas-Sarsat System provides distress alert and location information to search and rescue (SAR) services throughout the world for maritime, aviation and land users in distress. The System is comprised of:

- Satellites in low-altitude earth orbit (LEOSAR), geostationary orbit (GEOSAR) and medium altitude earth orbit (MEOSAR) that process and/or relay signals transmitted by distress beacons.
- Ground receiving stations, called “local user terminals” (LUTs), which process the satellite signals to locate the beacon.
- Mission control centres (MCCs) that distribute the distress alert information to SAR authorities.

The Cospas-Sarsat System detects distress beacons that operate at 406 MHz.

WE SAVE LIVES

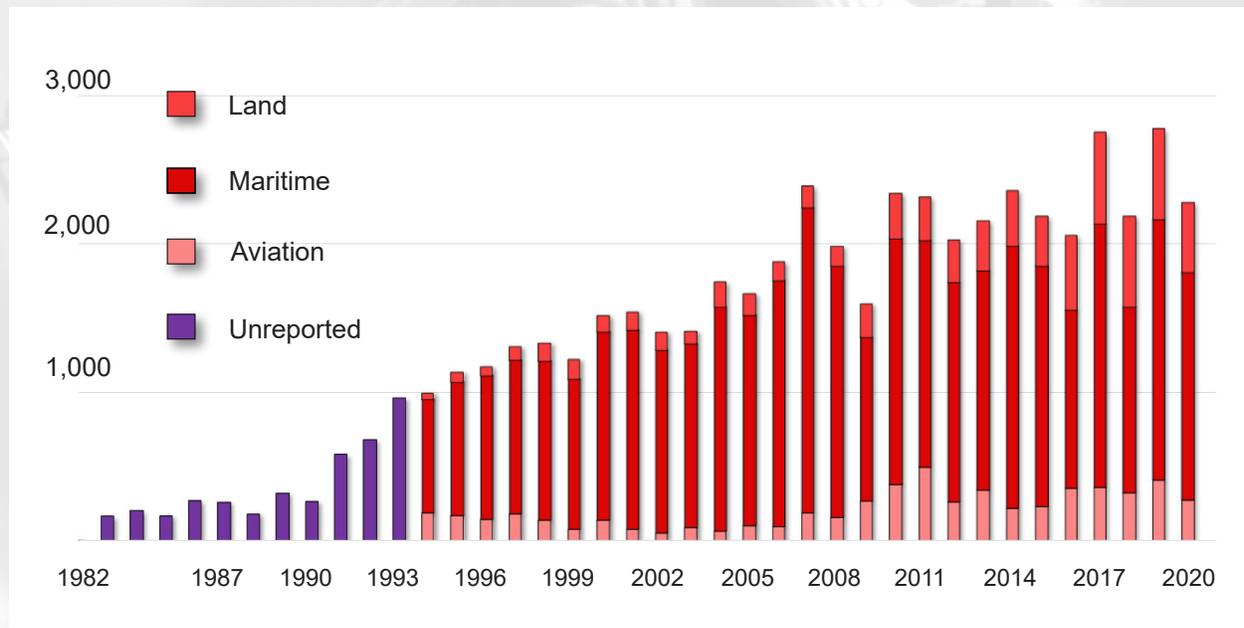
2020

951 SAR Events

2,278 Persons Rescued



STEADY GROWTH AND EXPONENTIAL SUCCESS

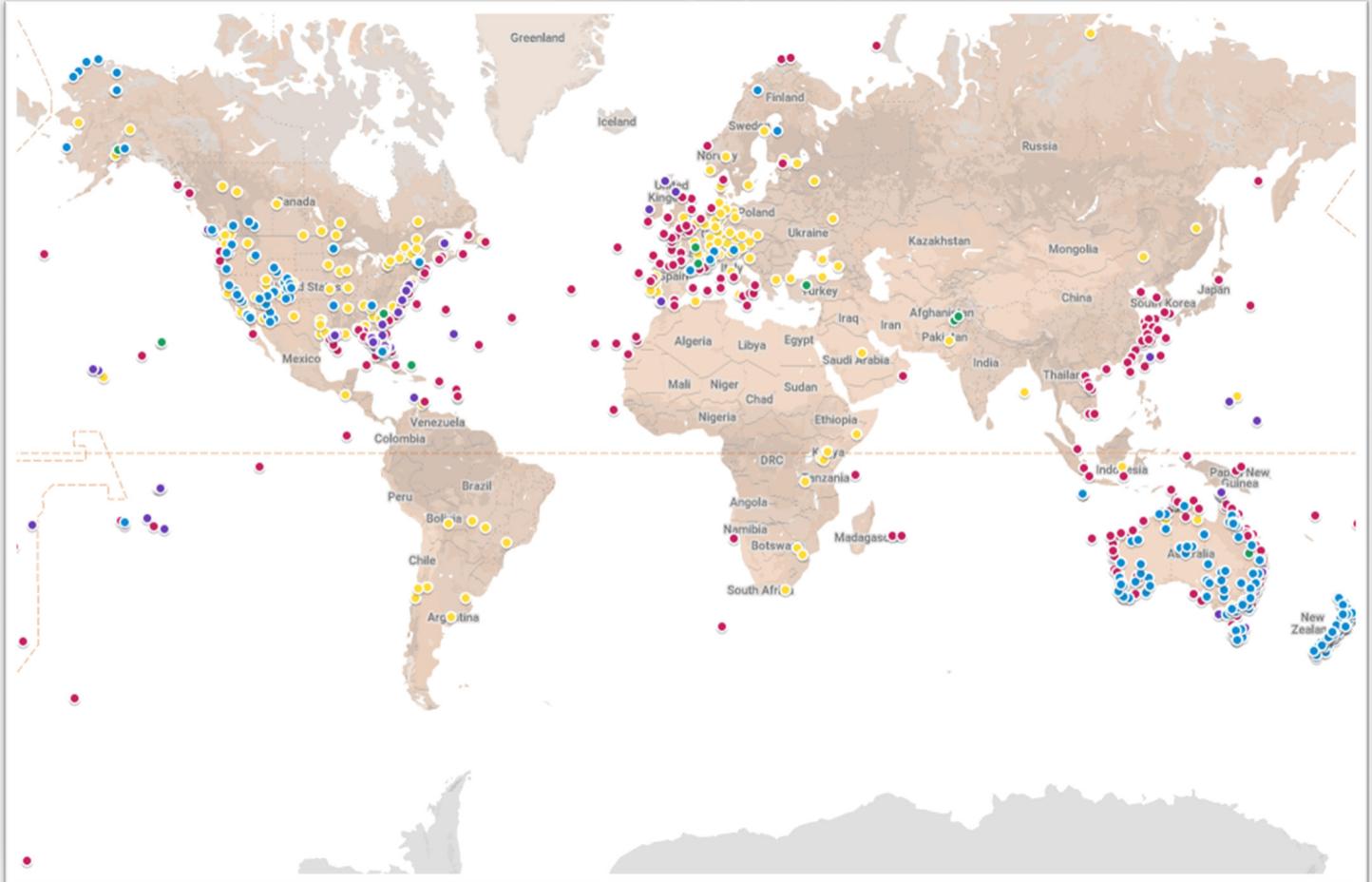


Since September 1982, the Cospas-Sarsat System has provided assistance in rescuing at least 53,790 persons in 16,514 SAR events.

WE SAVE LIVES

2020 SAR EVENTS

LEGEND: Yellow (ELTs), Red (EPIRBs), Blue (Land PLBs), Green (Aviation PLBs), Purple (Maritime PLBs).



SAR OPERATIONS (Year 2020)

From January to December 2020, the Cospas-Sarsat System provided assistance in rescuing 2,278 persons in 951 SAR events.

Type of Distress	SAR Events	Persons Rescued
Aviation	220	280
Maritime	382	1,528
Land	349	470
TOTAL	951	2,278