

2011 Beacon Manufacturers' Workshop
St-Pete , Florida
20 May 2011

Cospas-Sarsat Updates and Beacon Activities

Dany St-Pierre/Andryey Zhitenev
Cospas-Sarsat Secretariat
Montreal





Cospas-Sarsat Update and Beacon Activities

- **International Cospas-Sarsat Programme**
- **Space Segment and LUTs status**
- **Saves and Events**
- **MEOSAR System and status**
- **Main Cospas-Sarsat Beacon Related meetings (late 2010-early 2011)**
- **International Beacon Registration Database**
- **Website Updates (general)**
- **Performance of beacons in mountainous areas**
- **Results of the Beacon Manufacturers Survey (2010 data)**
- **Beacon Type Approval Activities and related matter**
- **Upcoming Cospas-Sarsat Website changes (beacon related)**

Cospas-Sarsat Programme

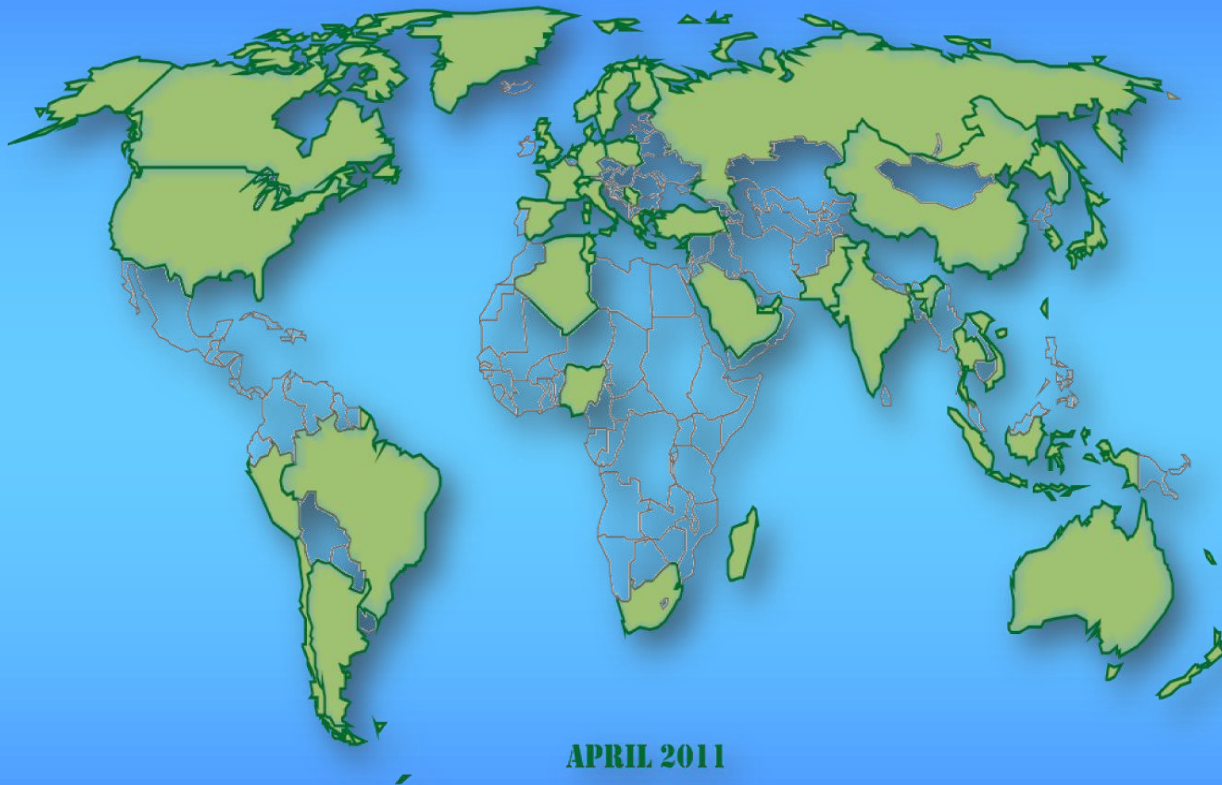
Mission and Objective



- **Mission:** To provide accurate, timely and reliable distress alert and location data to help SAR authorities assist persons in distress.
- **Objective:** To reduce, as far as possible, delays in the provision of distress alerts to SAR and the time to locate a distress and provide assistance.
- **Strategy:** To implement, maintain, co-ordinate and operate a satellite system capable of detecting transmissions from radio-beacons that comply with C/S specifications.



Cospas-Sarsat Participants



APRIL 2011

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

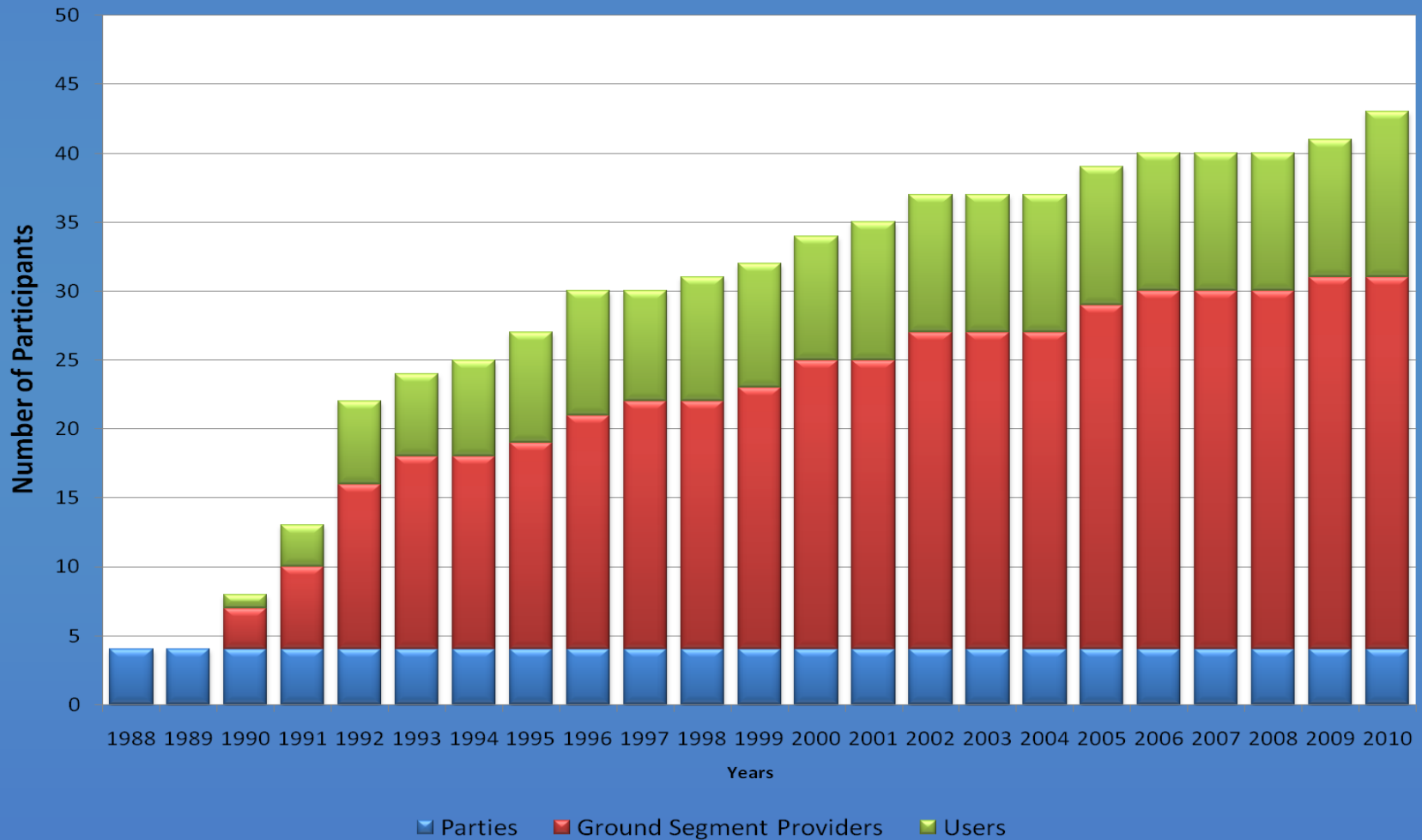
- 4 Founders: Canada, France, Russia and the USA
- 26 Ground Segment Providers
- 11 User States
- 2 Organisations

- 60 % of world land area
- 72 % of world population
- 84 % of estimated world wealth



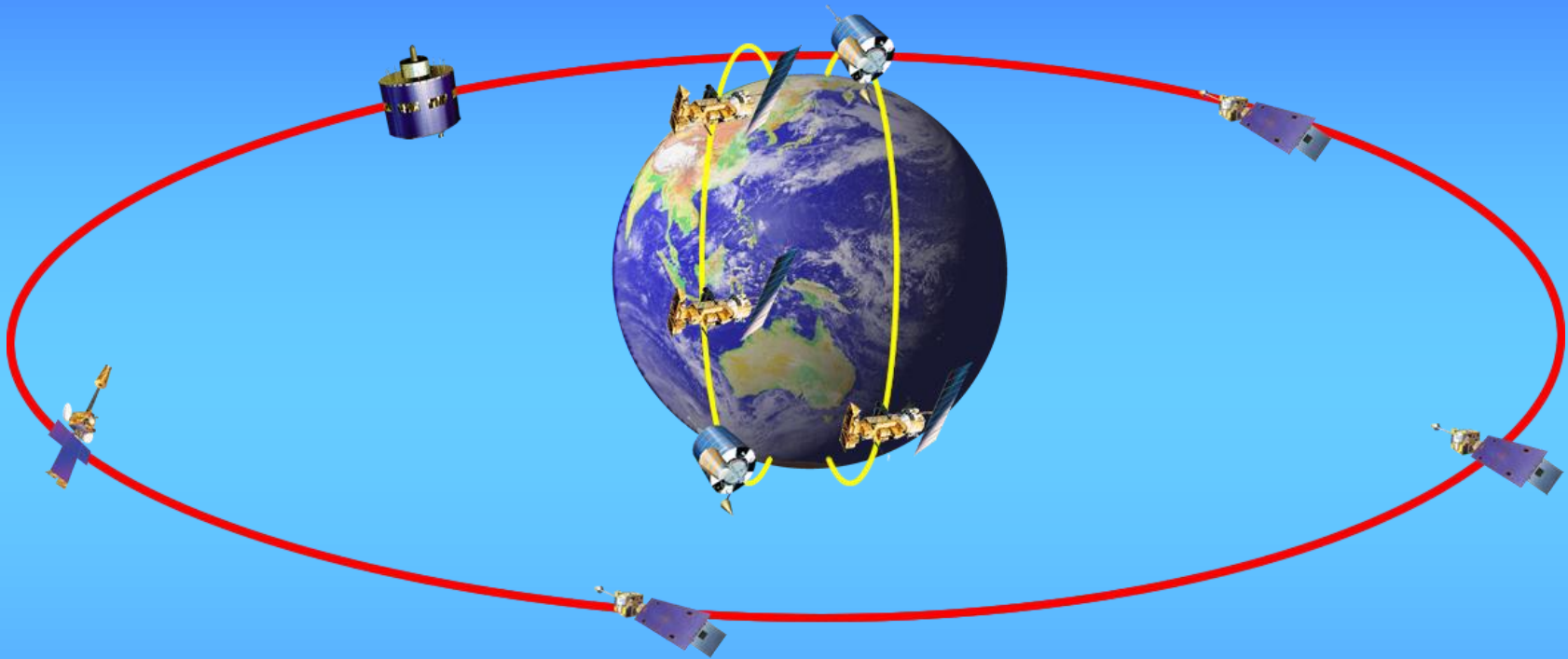
Cospas-Sarsat Participants

EVOLUTION OF COSPAS-SARSAT PARTICIPANTS (1988-2010)



Cospas-Sarsat System

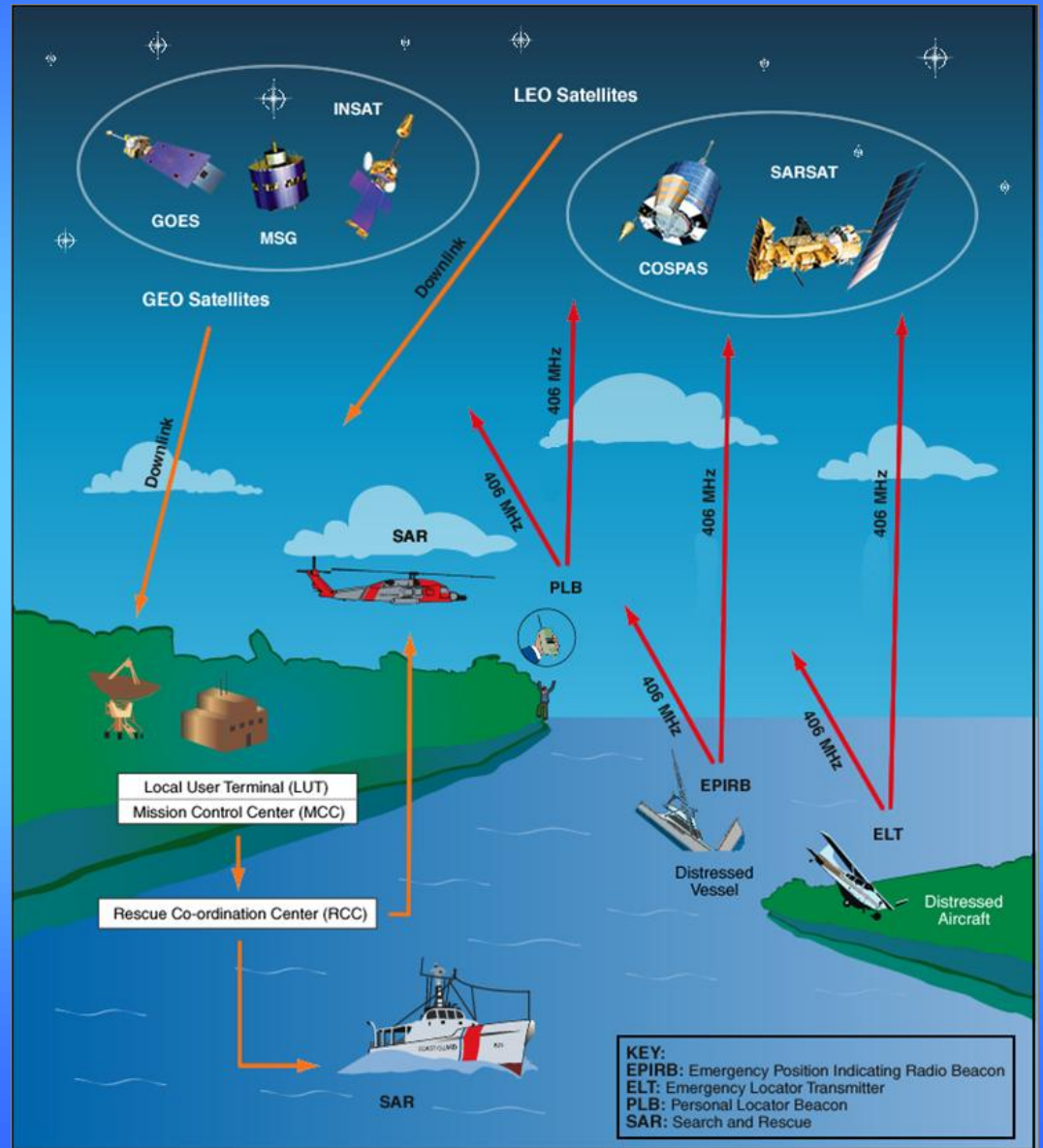
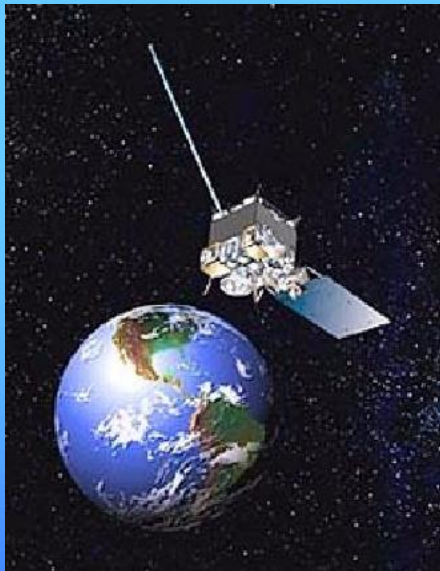
Combined LEO / GEO Operations



- **LEOSAR:** Sarsat (NOAA, MetOp) and Cospas
- **GEO SAR:** GOES (USA), INSAT (India), MSG (EUMETSAT), Electro-L (Russia) planned for 2011

Cospas-Sarsat System

406 MHz only



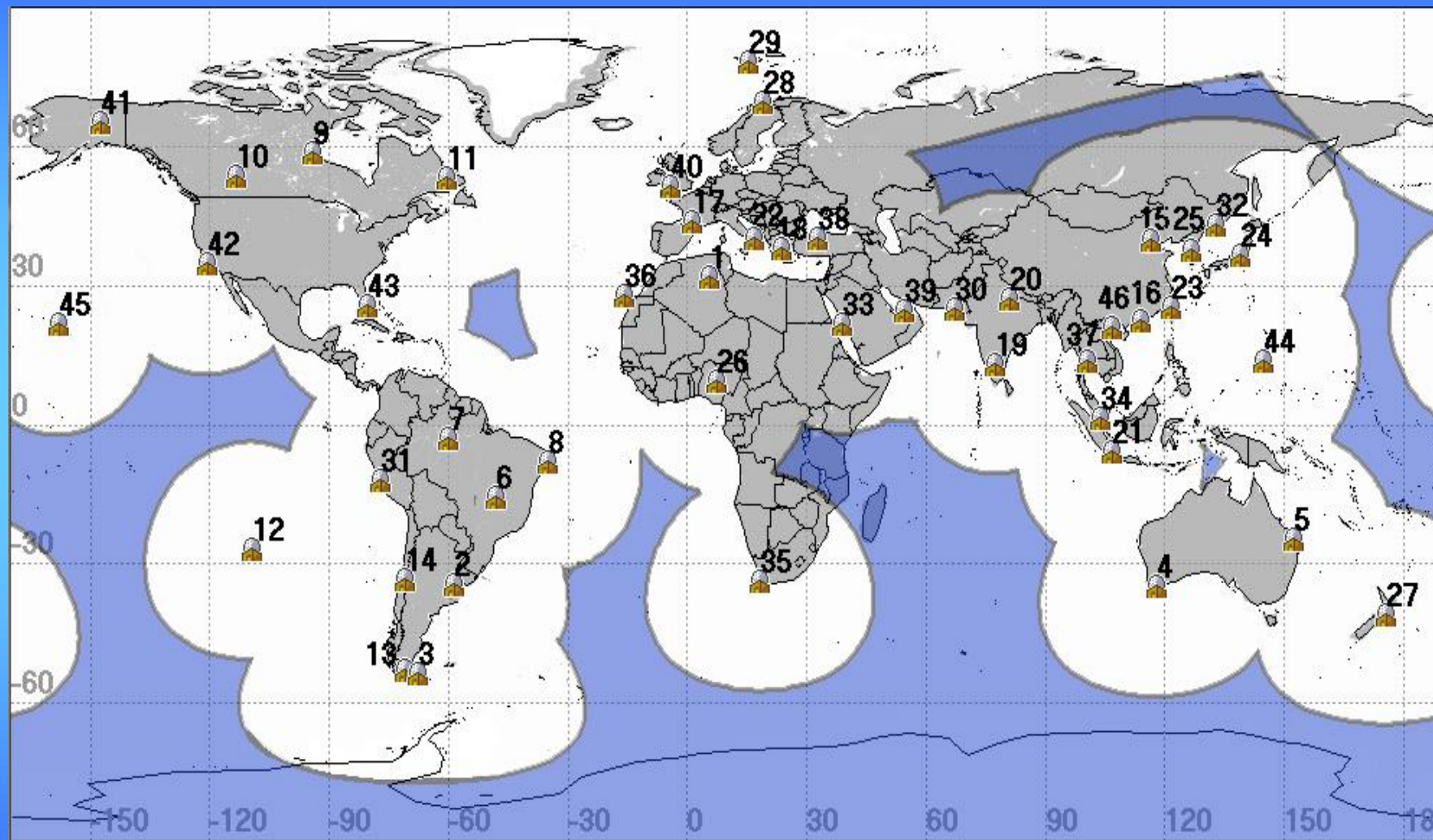
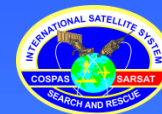
Cospas-Sarsat LEOSAR Space Segment Status



Sarsat-7	NOAA-15	May 1998	In operation
Sarsat-8	NOAA-16	September 2000	In operation
Sarsat-9	NOAA-17	June 2002	In operation
Sarsat-10	NOAA-18	May 2005	In operation
Sarsat-11	METOP-A	October 2006	In operation
Sarsat-12	NOAA-N'	February 2009	In operation
Sarsat-13	METOP-B	Projected 2012	-
Cospas-13	MKA-N1	Projected 2013	-
Cospas-14	MKA-N2	Projected 2014	-

- 6 LEO in operation
- 3 still to be deployed
- 2 still to be defined

Cospas-Sarsat 57 LEOLUTs



Cospas-Sarsat GEOSAR Space Segment Status



Spacecraft	Launch Date	Position	Status
GOES-11 (West)	May 2000	135° W	In operation
GOES-12	July 2001	60° W	In-orbit spare
GOES-13 (East)	May 2006	75° W	In operation
GOES-14	June 2009	105° W	In-orbit spare
GOES-15	March 2010	89.5° W	In-orbit spare
GOES-16	2015	-	Projected
GOES-17	2016	-	Projected

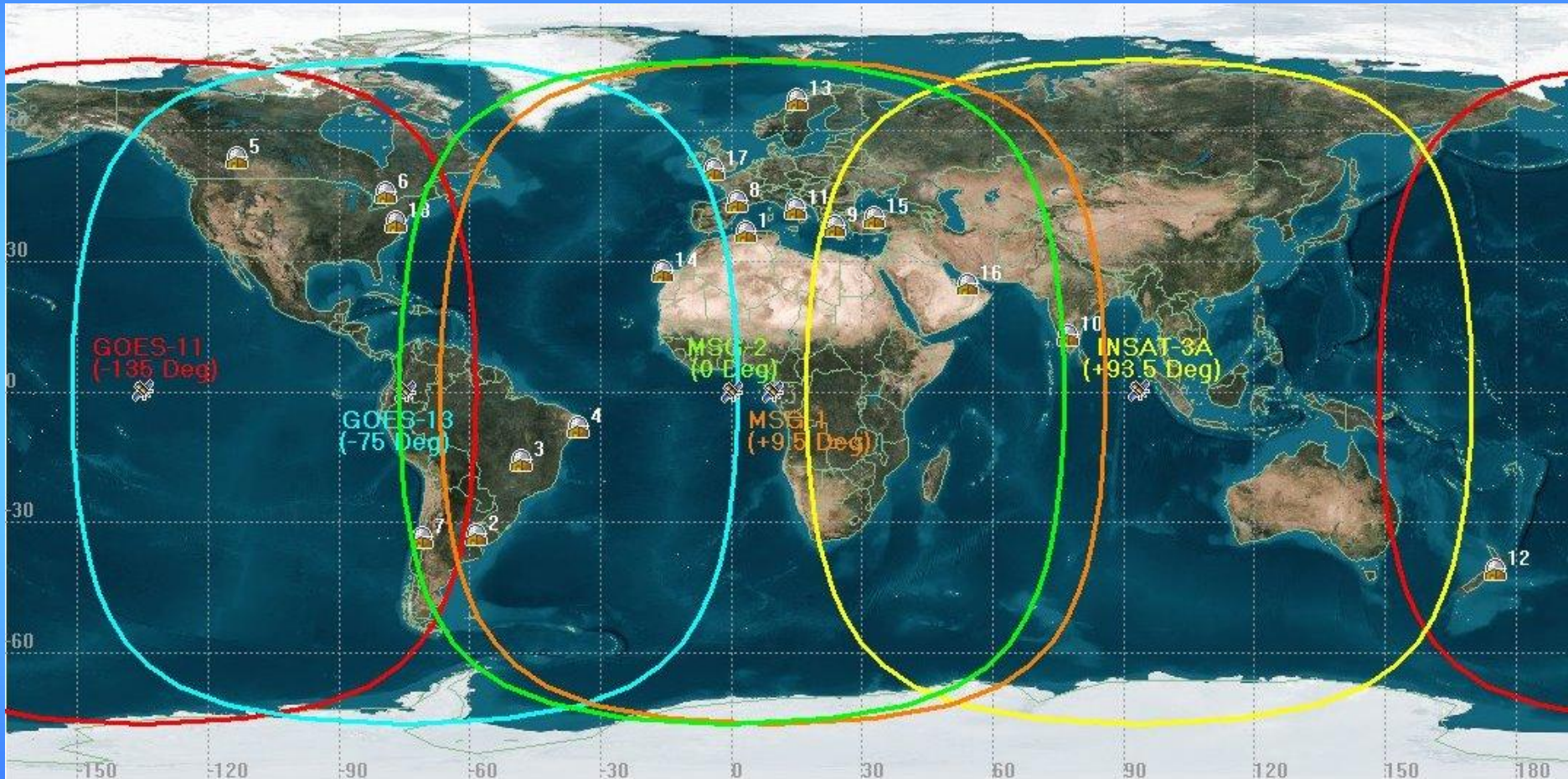
INSAT-3A	April 2003	93.5° E	In operation
INSAT-3D	2011	83.5° E	Projected

MSG-1	August 2002	9.5° E	In operation
MSG-2	December 2005	0°	In operation
MSG-3	2013	-	Projected
MSG-4	2014	-	Projected

Electro-L No.1	Dec 2010	76° E	In testing
Luch-5A	2011	14.5° W	Projected
Electro-L No.2	2012	16° W	Projected

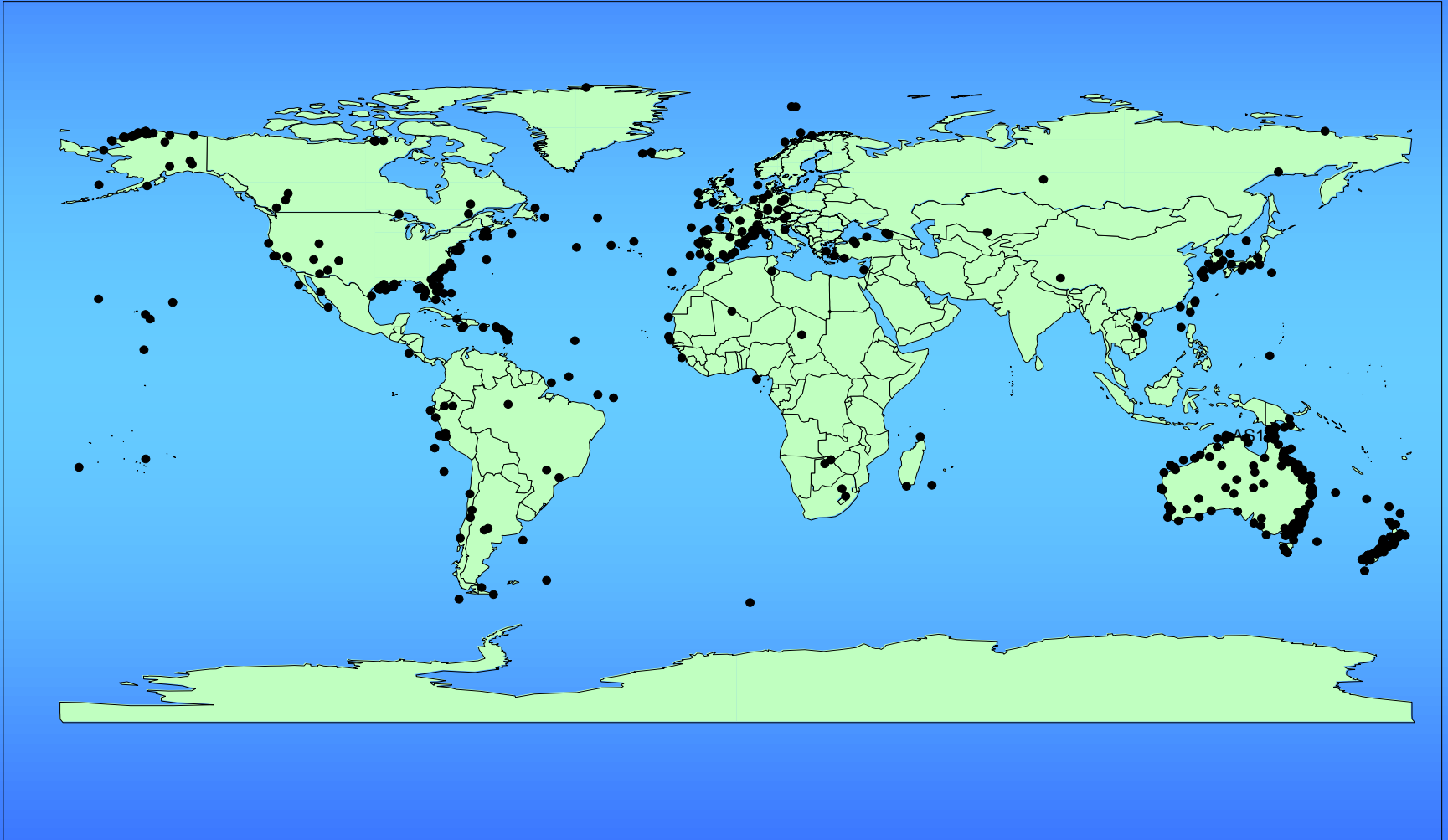
- 5 GEO in operation
- 1 in testing (new position)
- Many more to come

Cospas-Sarsat 20 GEOLUTs



Cospas-Sarsat

2009 – Alert Locations





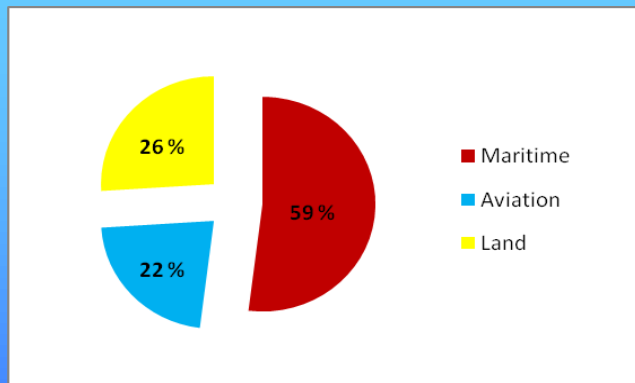
Cospas-Sarsat

Rescue Operations Related Statistics

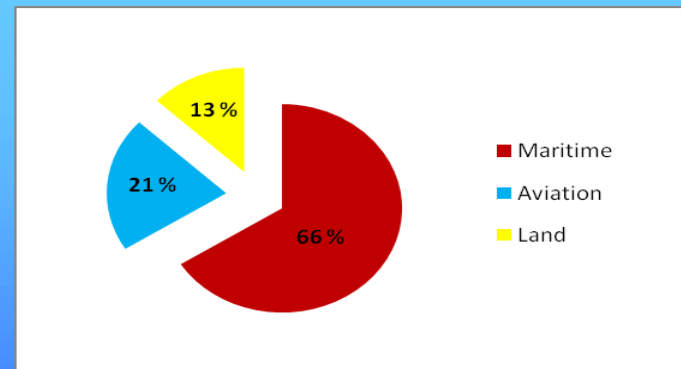
	2009	2010 (so far compiled)
SAR Events:	482 (-3.0% from 2008)	604 (+25% from 2009)
P. Rescued:	1597 (-19.6% from 2008)	2362 (+48% from 2009)

SAR Events (1982 / 2010) : > **8,350**

P. Rescued (1982 / 2010) : > **30,737**



TYPE OF SAR EVENTS
(January - December 2010)



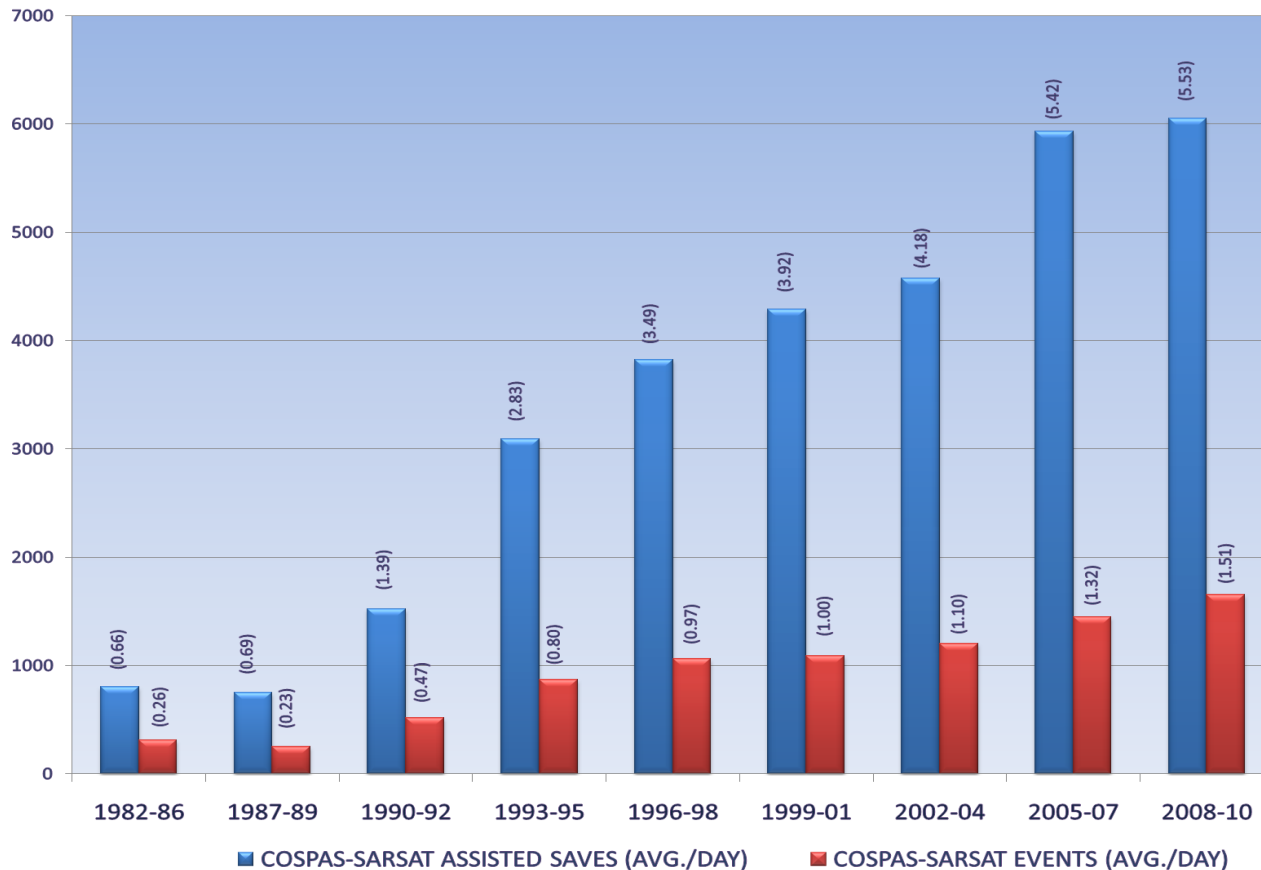
PERSONS RESCUED BY TYPE OF SAR EVENT
(January - December 2010)



Cospas-Sarsat

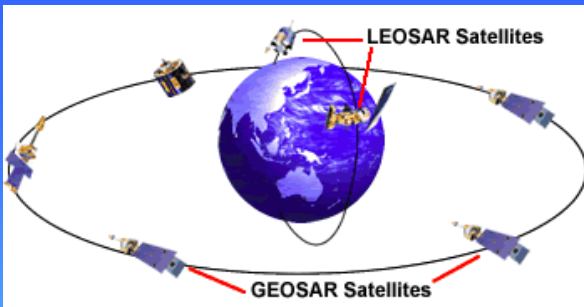
Rescue Operations Related Statistics

COSPAS-SARSAT EVENTS AND ASSISTED SAVES (1982-2010*)



*preliminary, some data for 2010 still to be compiled

ON AVERAGE 5.53 ASSISTED RESCUES PER DAY IN THE LAST 3 YEARS



Cospas-Sarsat

Current System Limitations

- Independent location determination from LEOSAR is global but with a latency (average waiting time for satellite passage is approximately 45 min. near equator and 35 min. in mid-latitude). Sometimes a second satellite passage is required to resolve a position ambiguity.
- Instantaneous detections and locations (for beacon equipped with GNSS) limited to approximately 90% of the globe.
- Encoded location in 2 Dimensions only with limited accuracy (500 meters).
- Encoded Positions updates every 20 minutes.
- Delay of 50 seconds between a beacon activation and the transmission of a first message.



Cospas-Sarsat

Operational MEOSAR System

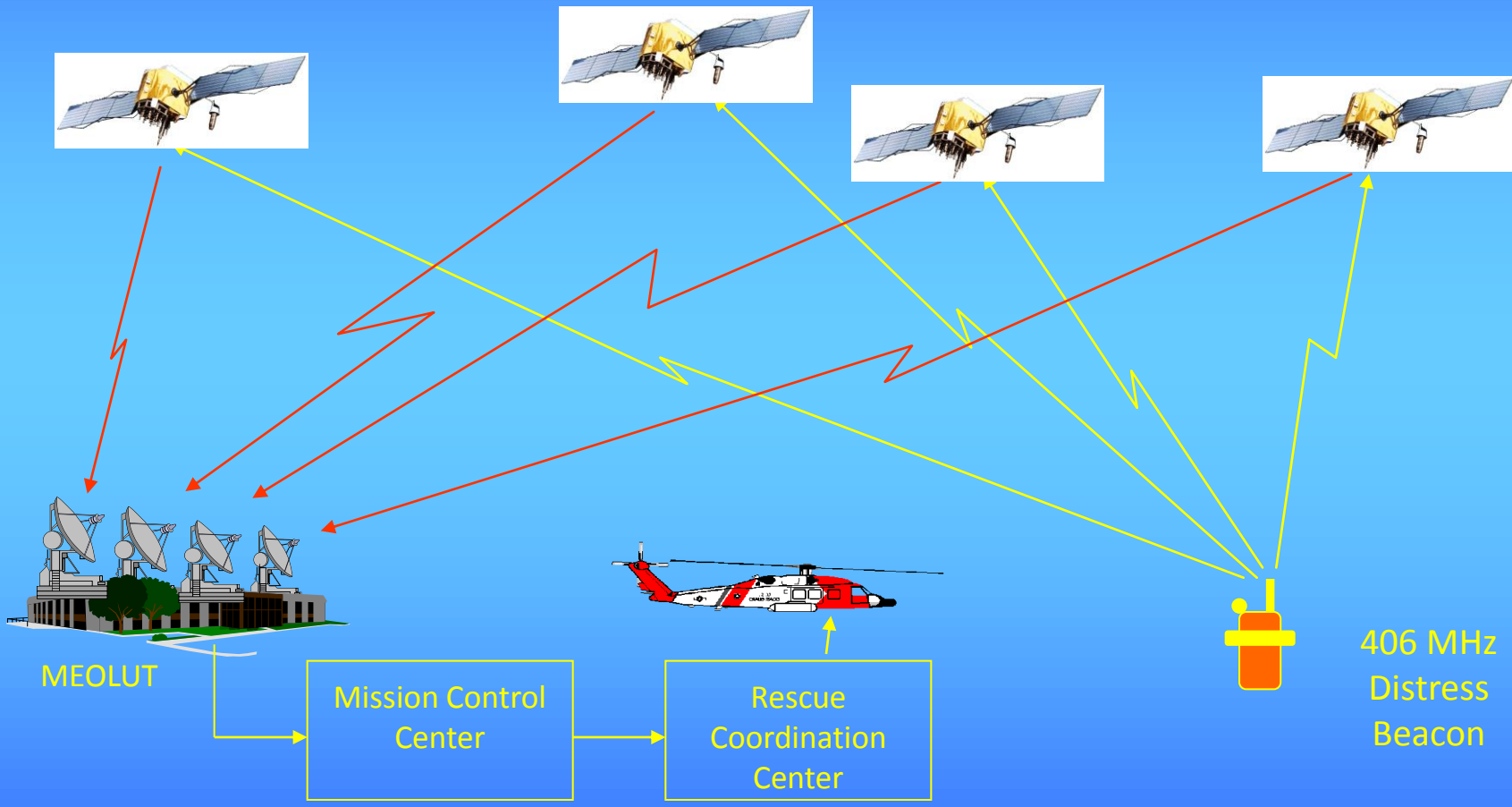
USA (GPS), Russia (GLONASS), and ESA/EC (Galileo) plan to include 406 MHz repeaters on future medium-altitude Earth orbiting (MEO) satellite constellations



- Backward compatible with C/S T.001 406MHz Beacons;
- SAR components of constellations will be fully interoperable;
- C/S R.012 “MEOSAR Implementation Plan” approved by Council.

Cospas-Sarsat

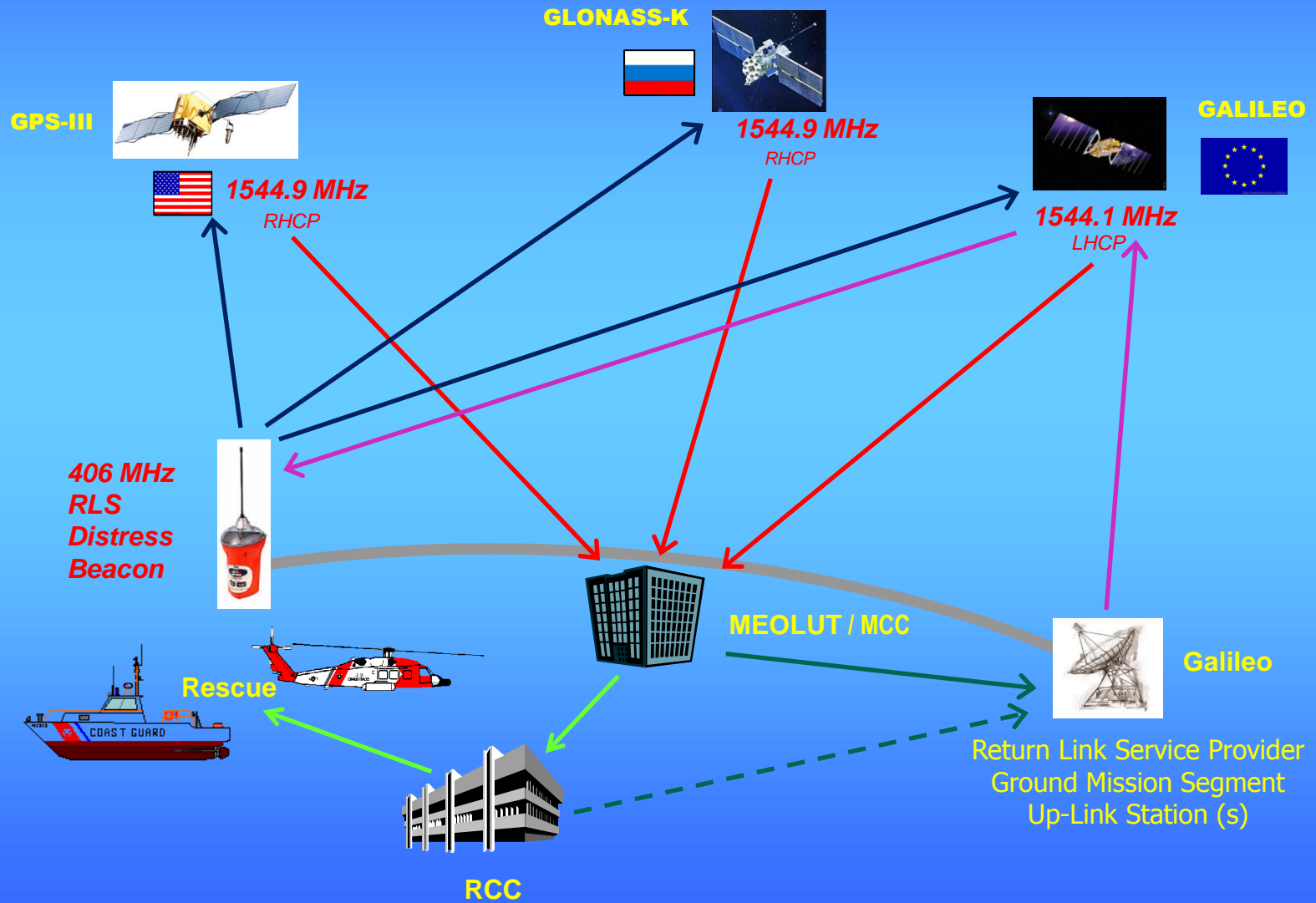
406 MHz MEOSAR System Concept





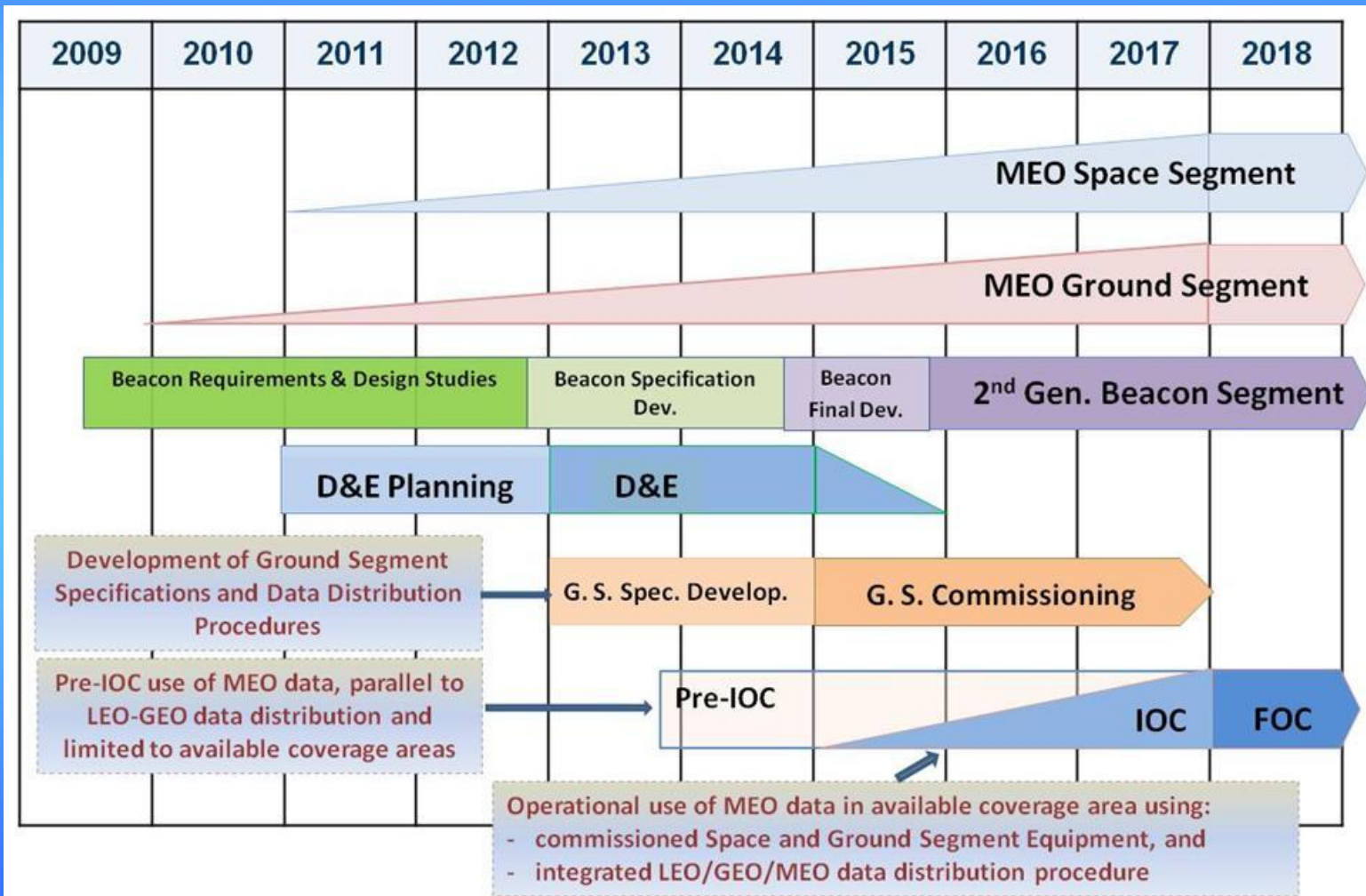
Cospas-Sarsat

406 MHz MEOSAR RLS System Concept



Cospas-Sarsat

Tentative MEOSAR Implementation Schedule



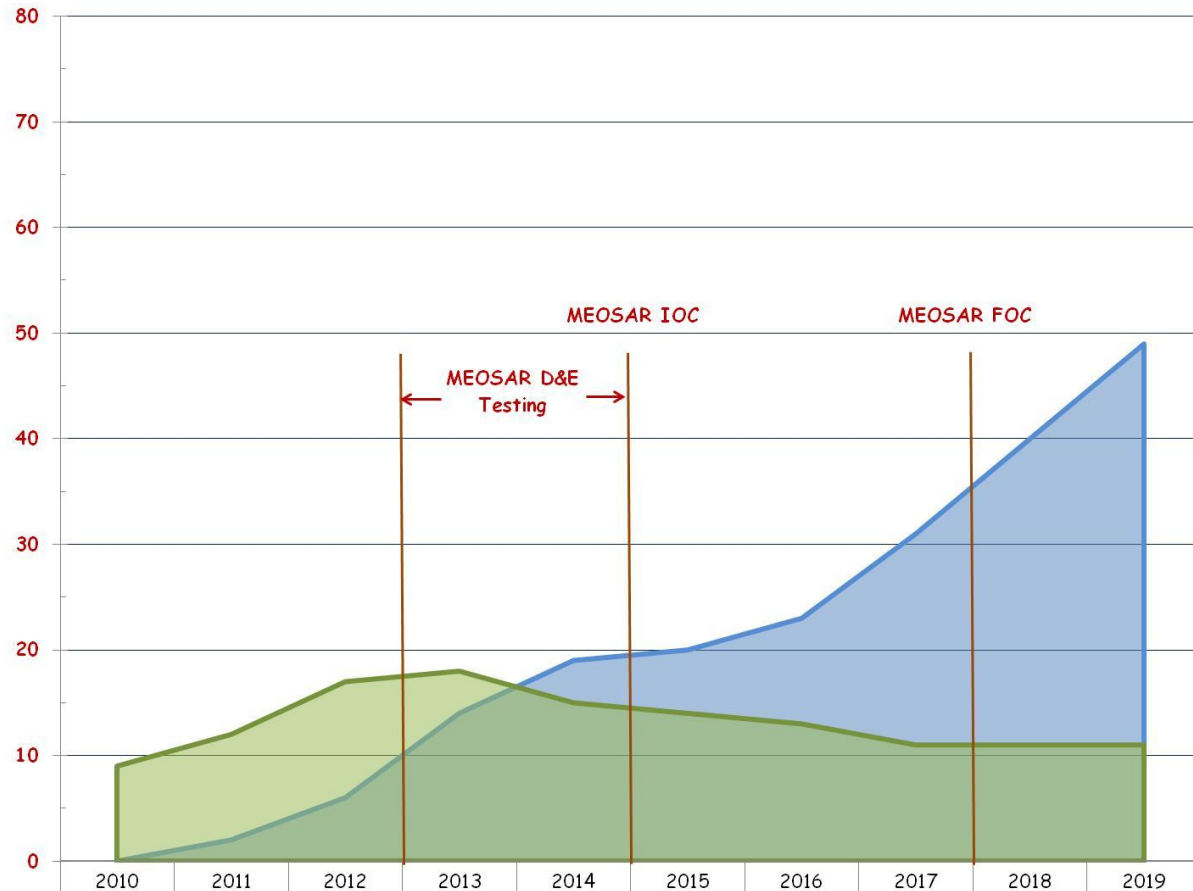


Cospas-Sarsat MEOSAR Space segment Status

- Currently 9 DASS POC payloads (S-Band) in orbit, used by Cospas-Sarsat Participants for MEOSAR system development. Eleven more payloads expected to be deployed by 2013.
- One operational MEOSAR payload (Glonass-K) launched in early 2011 is currently under testing. A second one is expected to be deployed at the end of 2011. A total of 49 operational payloads planned to be deployed by the end of 2019.

Cospas-Sarsat MEOSAR Space segment

Planned MEOSAR Payloads Availability



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
L-Band payloads (Operational)	0	2	6	14	19	20	23	31	40	49
S-Band payloads (Experimental)	9	12	17	18	15	14	13	11	11	11



Cospas-Sarsat MEOLUT Deployment Status

- Experimental MEOLUTs currently used for MEOSAR testing in:
Brazil, Canada, France, Russia, UK, USA and Turkey.
- Operational MEOLUTs planned to be deployed in:
Australia/New-Zealand (2), Brazil, Canada (2), Cyprus, France, India, Norway, Russia(2), Spain and the USA(2).
- Additional MEOLUTs locations expected to be announced in the upcoming years.



Main Cospas-Sarsat 2nd Generation Beacon Activities and Events (Late 2010-Early 2011)

- BEA “Triggered Transmission of Flight Data Working Group” activities and Final Report.
- Expert Working Group Meetings on Next Generation Beacon Requirements.



Triggered Transmission of Flight Data Working Group activities

- Prompted by the difficulties experienced in recovering the flight data recorders of AF447, as well as other difficult sea recovery operations, the “Bureau d’Enquête et d’Analyse (BEA)” of France gathered a group of experts to investigate the matter. After a few months of investigation a “Triggered Transmission of Flight Data Working Group” was created. The concept of triggering the transmission of flight data consists of:
 - a) detecting, using flight parameters, whether an emergency situation is upcoming and if so,
 - b) transmitting data automatically from the aircraft until either the emergency situation ends, or the aircraft impacts the surface. The buffered data containing the moments prior to the emergency could also be sent.
- The Group contacted Cospas-Sarsat in July 2010 to seek information of the possible use of 406 MHz beacons to address this issue. Despite different objectives (search of debris to recover black boxes vs. search of survivors to rescue) it was determined that both organizations had a common interest in facilitating the location determination of a aircraft in distress prior to the impact of the aircraft with a surface. Members of both organizations participated in Cospas-Sarsat and BEA WG meetings.



Triggered Transmission of Flight Data

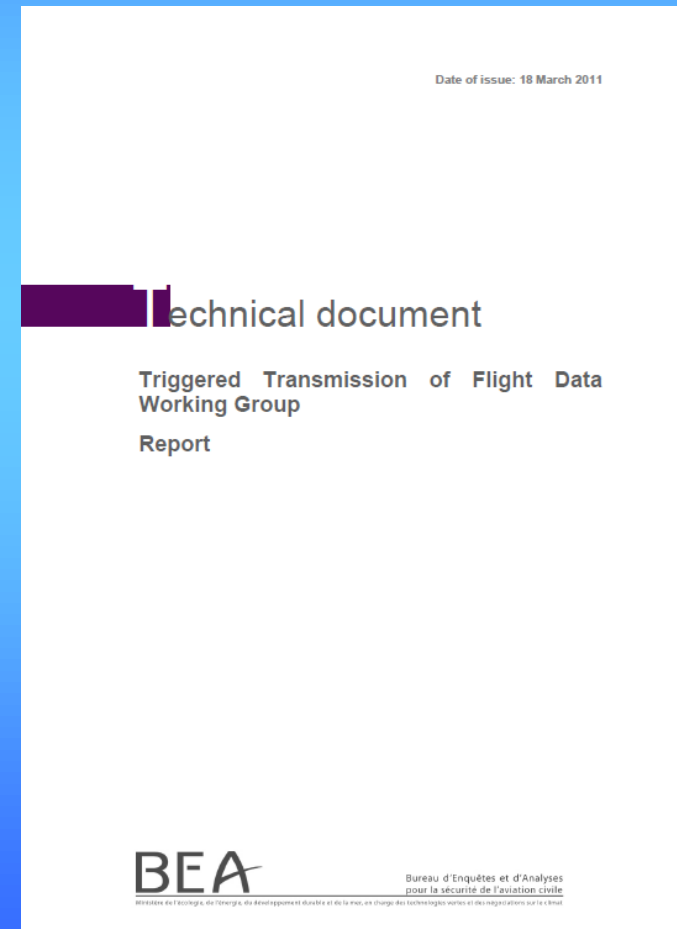
Working Group activities

- Analyses made by the BEA WG were used to derive some of the operational requirements for the 2nd generation beacons (reduced time for first transmission and increased repetition rate for the first 30 sec in particular) and incorporate in document C/S R.017.
- Acknowledging the new potential offered by the Cospas-Sarsat 2nd generation beacon, the BEA working group included “Automatically activating next generation ELTs prior to impact” as one of the three technical solutions which could be used to significantly reduce the search area for wreckage. The BEA and France are looking forward discussing this issue at the next ICAO meeting in July 2011. The availability of the proposed technical solutions will support proposed amendments to Annex 6 of the ICAO convention to ICAO’s Air Navigation Commission requiring that aeroplanes with a maximum certificated take-off mass of over 27 000 kg shall install a means of automatically transmitting sufficient information to determine the position of an accident over water to within 4 NM before 2018 (aircraft with first certificate) or 2020 (aircraft with existing certificates).



Triggered Transmission of Flight Data Working Group activities

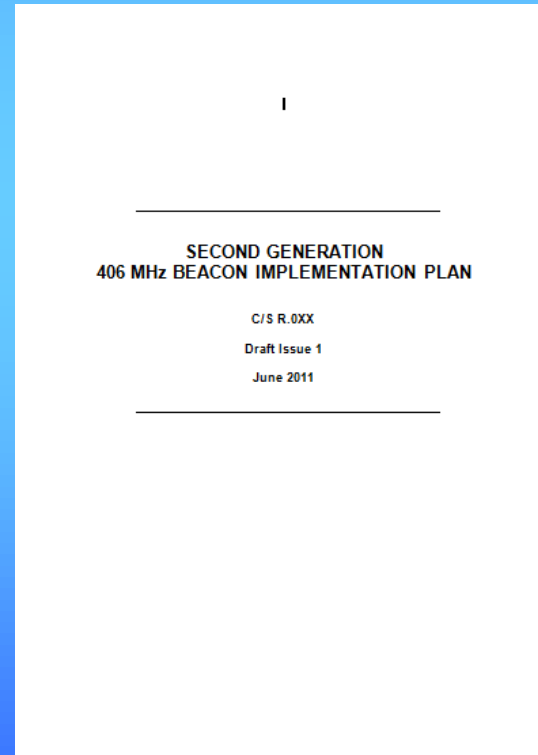
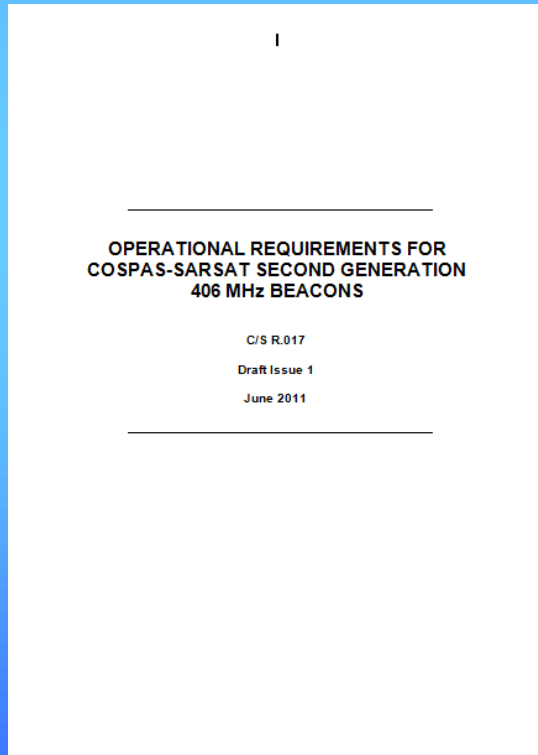
- Further analysis are required to demonstrate the performance which could be achieved by second generation beacons operating in a MEOSAR environment. For example independent location accuracy of a fast moving object or antenna coverage required to successfully received beacon message during unusual flight orientations generally associated with a plane in distress.
- Possible analyses and tests to assess the performance of second generation ELTs automatically-activated prior to impact will be discussed at the upcoming JC-25 meetings (paper 5/8).



Outcomes of Cospas-Sarsat EWG on 2nd Generation Beacons



- Operational Requirements for Cospas-Sarsat Second Generation 406 MHz Beacons
- Second Generation 406 MHz Beacon Implementation Plan
 - **Both documents will be reviewed at JC-25.**



Highlights of New Operational Requirements for Beacons



Minimum Operational Requirements (ELTs, EPIRBs and PLBs)

(preliminary requirements still to be approved by the Cospas-Sarsat Council)

- First burst transmission after 3 sec. to allow independent location determination: 5 km with [90]% probability
- Higher repetition rate to allow for enhanced performance during first 30 sec. of transmission (ensure 99.9 % detection, 95% location < 5 km)
- Independent location accuracy to improve with time (1 km/95% within 5 minutes, 100 m/95% within 30 minutes)
- Self test
- Cancellation function of false alerts by user
- Verification of beacon registration
- Homing and on-scene locating

Highlights of New Operational Requirements for Beacons



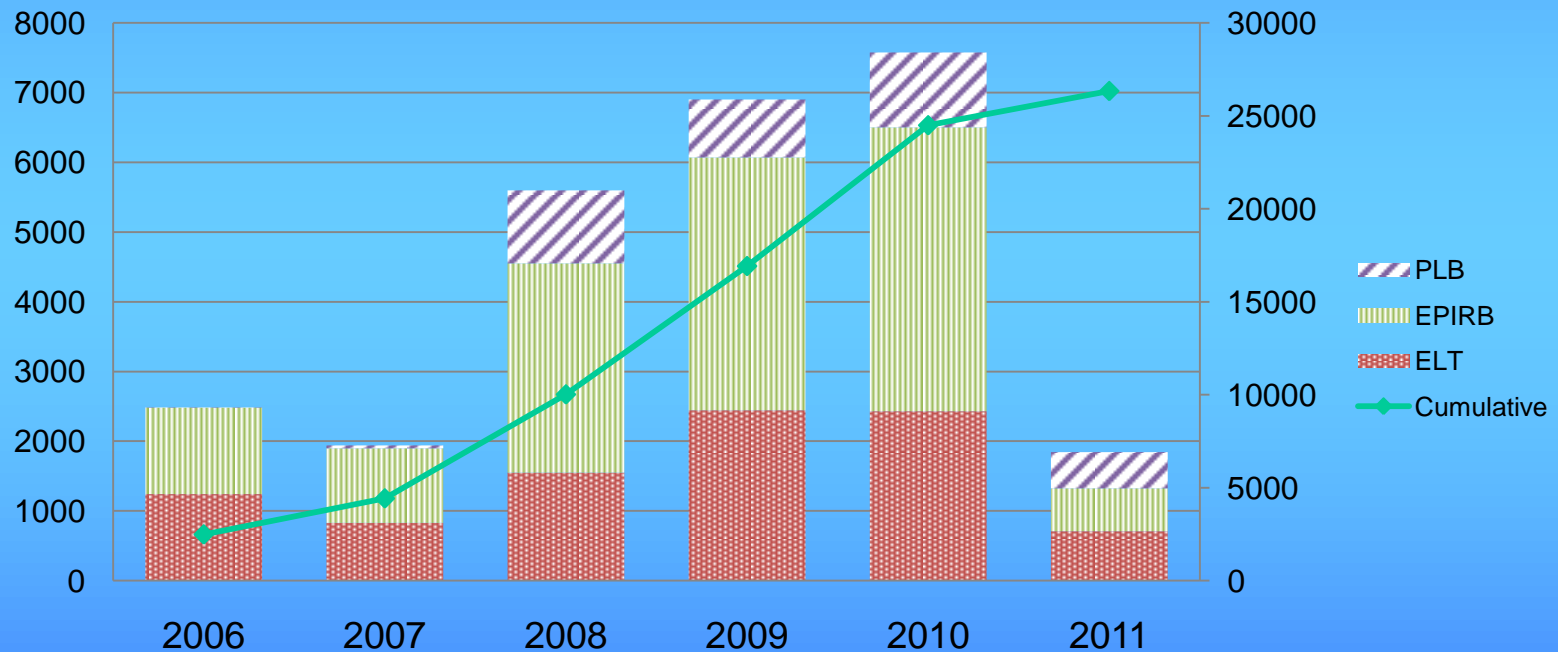
Objective Operational Requirements (Not applicable to all beacons)

(preliminary requirements still to be approved by the Cospas-Sarsat Council)

- High resolution (30m) 2D encoded GNSS location data in beacon message with date/time of encoded data
- Altitude of aircraft encoded with GNSS location (50m)
- Automatic ELT activation on indication of emergency (prior to crash)
- Return link capability for acknowledgement of alert and other services
- Battery status indicator
- Additional bits for expanded message content

Cospas-Sarsat IBRD Statistics

Beacon Registration

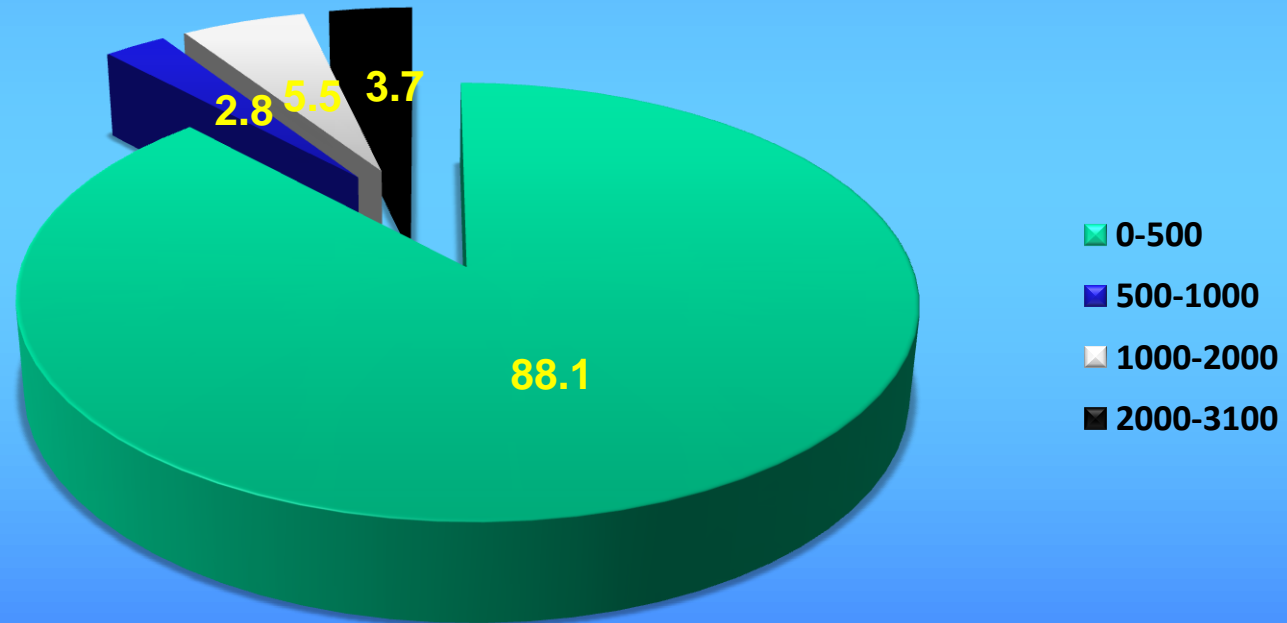


26340 beacons registered from 109 different Administrations
 (as of May 14 2011)

Cospas-Sarsat IBRD Statistics



Number of Beacons Registered by Administrations -
Distribution en % (Total 109)



Cospas-Sarsat IBRD

Recent and Upcoming Developments



- Possibility to use the database in an offline mode (for users with poor communication connections).
- More capabilities provided for National Data providers (such as search features).
- Capability to register a beacon by Country Code and by Beacon type.
- Capability for Block Owner to register several beacons with the same contact information.

Cospas-Sarsat Website

Recent and Upcoming Developments



- Archive documents (meeting reports and others) available from the website and added to the content of search engine.
- Meeting section redefined allowing download of selected documents including a provisional list of documents (zip format).
- New website interface available (planned for the summer of 2011). The new interface will provide enhanced visibility and easier interface for information related with Beacons, LUTs, MCCs, and Cospas-Sarsat payloads status.
- Notifications of changes in key points of contacts for pre-registered Participants (new service).



Special Presentation

Location determination of 406 MHz Beacons in Mountainous Areas



Results of 2011 Survey of Beacon Manufacturers

Survey Highlights (1)

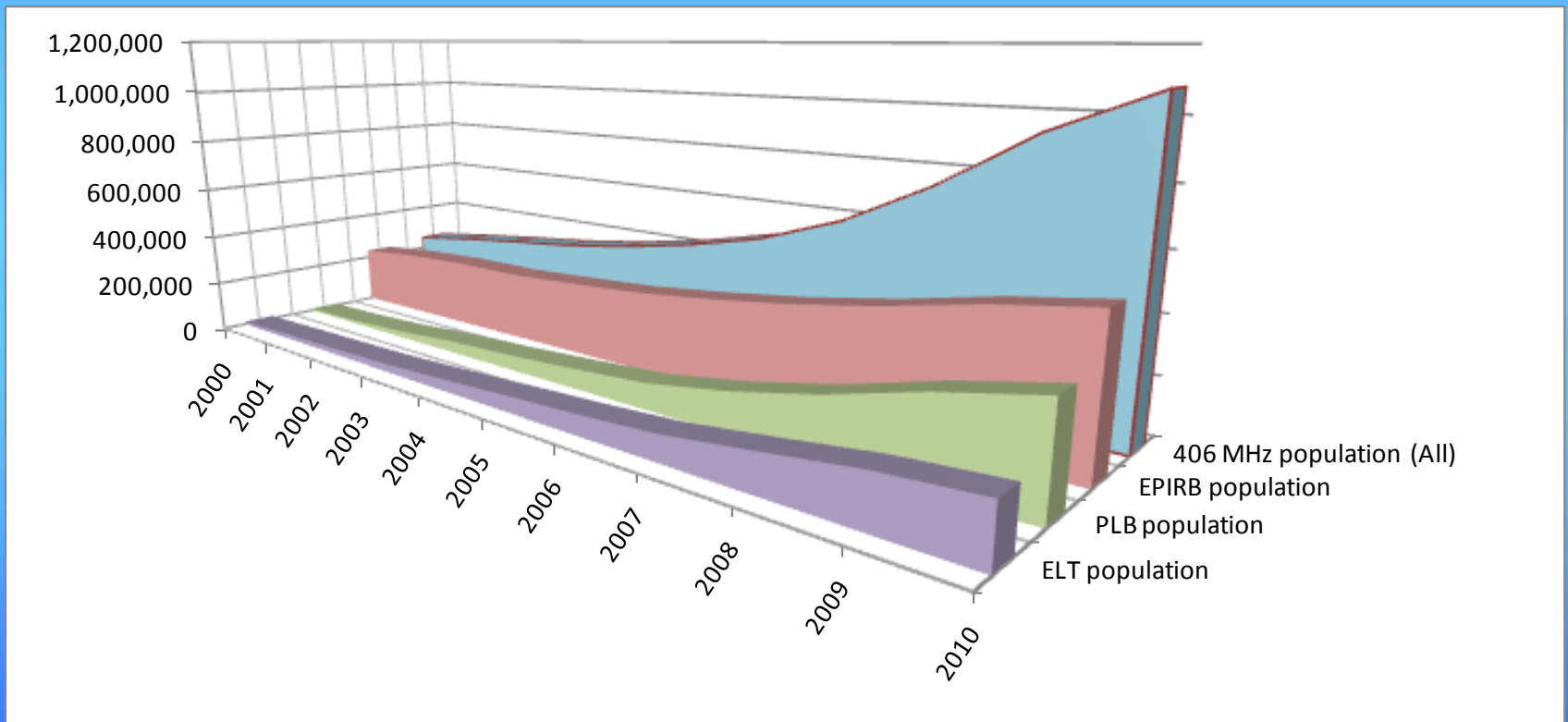
In 2010, **over 172,000** beacons were produced worldwide

- In 2010: Decrease in annual production by **24 %**
- In 2009: 228,000 beacons were produced (+22.5% over 2008)
- In 2008: 186,000 beacons were produced (+45 % over 2007)
- In 2007: 128,000 beacons were produced(+50 % over 2006)



Survey Highlights (2)

- Over 1,082,000 beacons operating at 406 MHz were in use at the end of 2010
 - Annual increase in global beacon population : ~ 14.4%





Survey Highlights (3)

- Conducted by the Cospas-Sarsat Secretariat since 1991, annually
- **50** beacon manufacturers participated in 2010 survey
- Geographical distribution of participating manufacturers:
 - Europe: **40%**
 - USA and Canada: **36%**
 - Asia and Australia: **24%**



Survey Highlights (4)

50 manufacturers of 406 MHz beacons provided their inputs:

- Manufacturers with 'zero' production: 11 (22%) , in 2009 : 24 %
 - ...with 1 - 499 units produced in 2010: 14(28%), in 2009 : 13%
 - ...with > 500 units produced in 2010: 25(50%), in 2009 : 21%



Survey Results (1)

~173,000 beacons were produced in 2010 worldwide, including :

- 77,000 EPIRBs (decrease in annual production: - 38% against 2009)
 - production growth in 2005 (+23.5%); in 2006 (+31.4%),
 - in 2007 (+20%) , in 2008 (+31%) and in 2009 (+25%)

- 27,000 ELTs (decrease in annual production: - 20% against 2009)
 - production growth in 2005 (+31 %), in 2006 (- 10%) ,
 - in 2007 (+40%), in 2008 (+102%) and in 2009 (+3%)

- 69,000 PLBs (decrease in annual production: - 22% against 2009)
 - production growth in 2005 (+44 %), in 2006 (+ 30%),
 - in 2007 (+125%), in 2008 (+37%) and in 2009 (+33%)

Survey Results (2)

> **97,000** (or 56 % of all) 406 MHz beacons produced by 22 beacon manufacturers in 2010 were LP- capable, including:

- 23, 000 EPIRBs
- 66,000 PLBs
- 8,000 ELTs



> **89,000** beacons operating in 406,037 MHz channel were produced in 2010, annual increase of 406.037 MHz beacon production : 42.6 %.



Survey Results (3)

60 % of active beacon manufacturers reported decrease in production volumes in 2010

2 companies decided to go out of beacon production business



Main reasons of 2010 production slow-down (*)

- Global economical recession, sharp drop in production of new vessels (ships and aircraft);
- Growing competition;
- Delays in new models development, caused by budget limitations;
- Government programmes put “on-hold”;
- Non-materialised legislation expectations (e.g. in ELT carriage requirements);
- Changes in product distribution network; and
- Delays related to Cospas-Sarsat type approval testing and approval of new models.

(*) Based on information provided by 10 beacon manufacturers



Manufacturers' plans for 2011

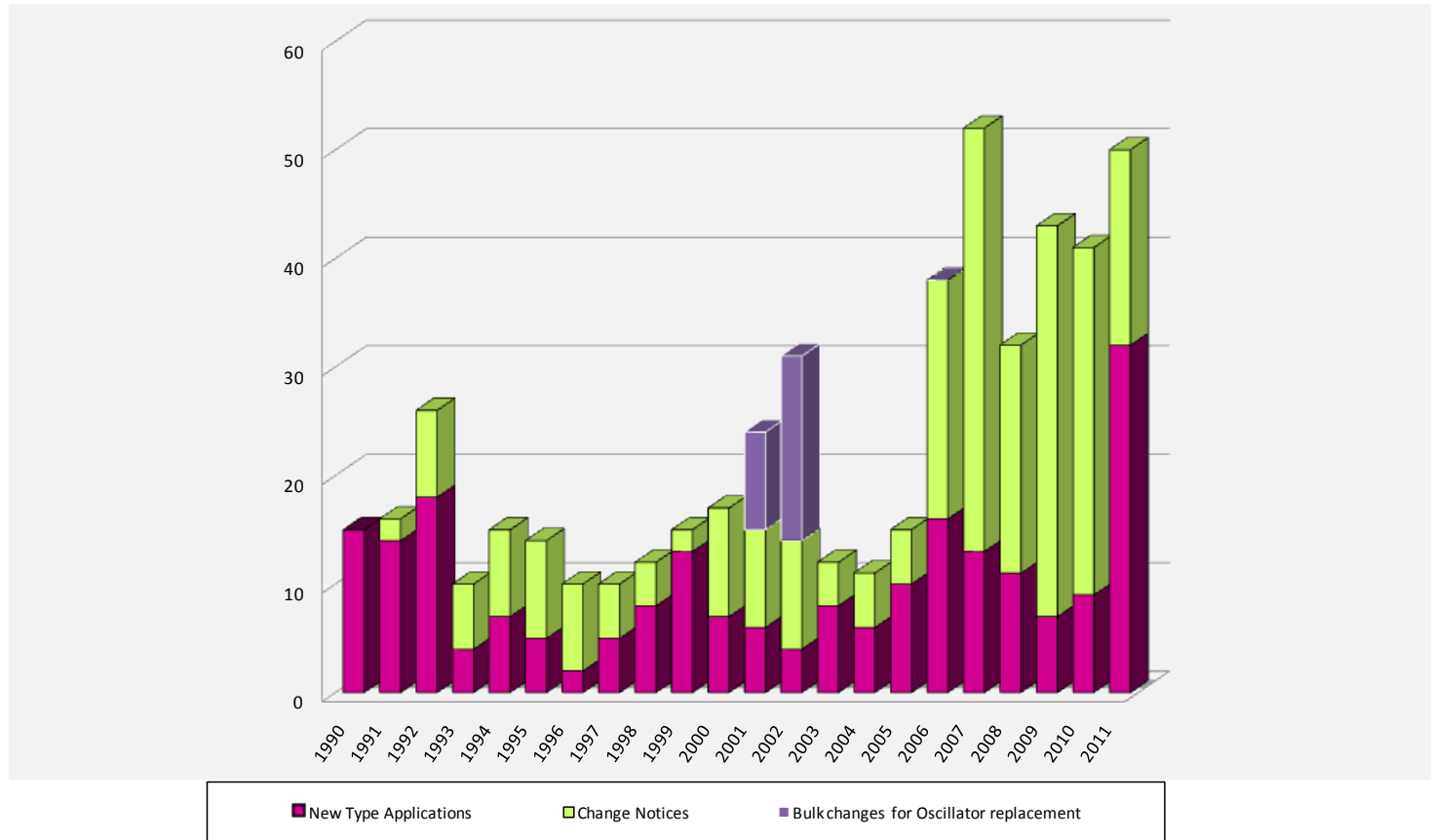
- **Over 226,000** beacons to be produced (+ 31 % over 2010) , including:
 - 80,000 EPIRBs
 - 45,000 ELTs
 - 101,000 PLBs
- Global population is expected to reach 1,270,000 (annual growth is 17%)
- 67 % of all produced beacons will be LP-beacons
- 72 % of produced beacons will operate in 406.037 MHz and 406.040 MHz channels



Accuracy of Beacon Manufacturers' Forecast

	Manufacturers' Forecast 2010	Actual 2010	2010 Actual over Forecast Discrepancy, %	2009 Actual over Forecast Discrepancy, %
EPIRBs and SSAS, 2009 production	93,400	77,000	(-17.6)	(-0.3)
ELTs, 2009 production	43,000	26,800	(-37.7)	(-36.5)
PLBs, 2009 production	114,000	69,000	(-39.3)	(-19.3)
All beacon types, 2009 production	250,000	173,000	(-31.0)	(-12.7)

Type Approval Activity



In 2011, the Secretariat expects **32** TA applications for new beacon models and **18** change notices from **22** beacon manufacturers

Type Approval Test Facilities

- Eurofins, Berlin, Germany
- EPG, Fort Huachuca, Arizona, USA
- Mayak, Moscow, Russia
- OMEGA, Sevastopol, Ukraine
- TÜV SÜD (UK) , Fareham, Hampshire, UK

In March 2011, Intespace has informed the Secretariat of their decision to close Cospas-Sarsat test facility in Toulouse, France





New Features on Cospas-Sarsat website

- Fresh, better structured beacon model reports
- More details will be shown in the list of type approved models and reports, including:
 - Beacon model production status
 - Tested configurations and Applicable standards
 - Full list of approved message protocols
 - Beacon thumbnail image
- Sort and select functionality
- Print preview, Print and Save of selected reports in pdf-format
- Mapping of manufacturers locations with Google-Map
- Implementation date: Q3 2011





For more information...

***Cospas-Sarsat Programme
Suite 2450***

***700 de la Gauchetiere Street West
Montreal, Quebec H3B 4L1
Canada***

Telephone: +1 514 954 67 61

Fax: +1 514 954 67 50

General e-mail mail@cospas-sarsat

Website: www.cospas-sarsat.org