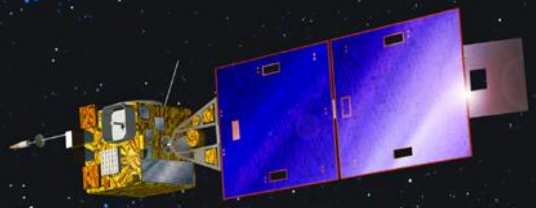
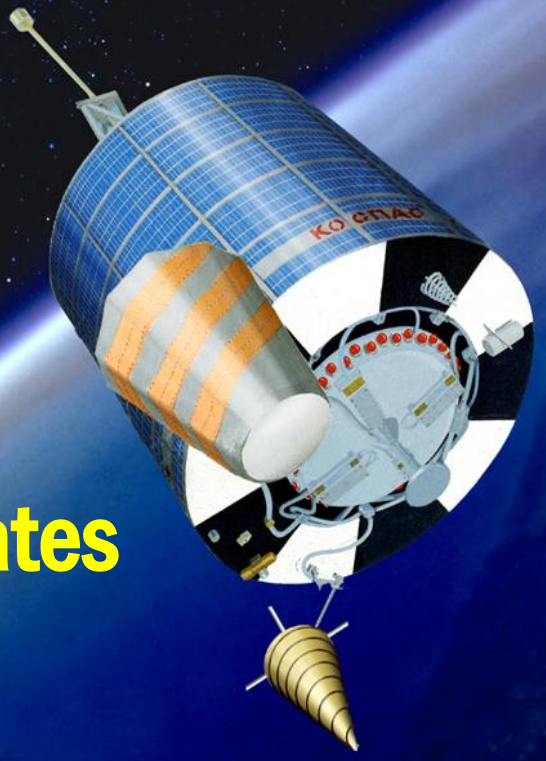
Beacon Manufacturers Workshop

Annapolis, Maryland
May 8th 2015





Cospas-Sarsat Programme Updates

Dany St-Pierre
Cospas-Sarsat Secretariat

•Source: CNES – D. Ducros

Cospas-Sarsat Programme

Cospas-Sarsat Programme Status

- Mission Statement
- Programme Participants
- System segment: Space, Ground, Beacon
- Assisted Saves
- IBRD Status

Cospas-Sarsat Programme Evolution

- MEOSAR Impacts
- MEOSAR Status and Timeline
- Second Generation Beacon Timeline
- Recent & Upcoming Cospas-Sarsat and Beacon-related meetings
- How will MEOSAR and SGB improve SAR Operations

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.

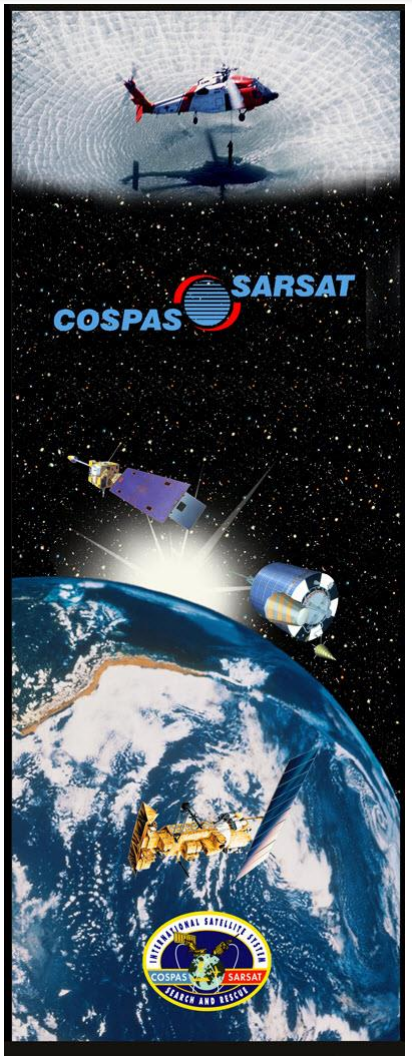
Objective

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 world-wide and free of charge for the user in distress.



Cospas-Sarsat Participants

Cospas-Sarsat Participants

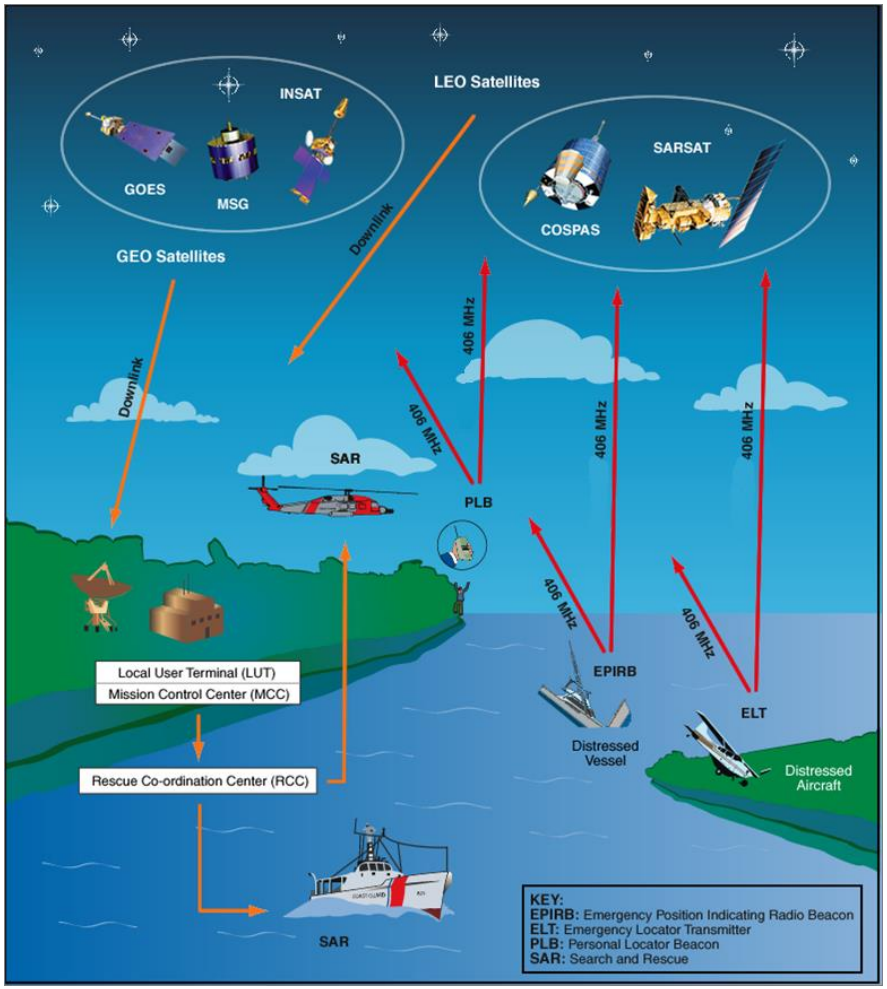
- 4 Founders: Canada, France, Russia and the USA
- 26 Ground Segment Providers
- 10 User States
- 2 Organisations

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)
Netherlands
New Zealand
Nigeria
Norway
Pakistan
Peru
Poland
Russia
Saudi Arabia
Serbia
Singapore
South Africa
Spain
Sweden
Switzerland
Thailand
Tunisia
Turkey
UAE
UK
USA
Vietnam

Space Segment

Two Types of Operational Systems

- Low Earth Orbiting Search And Rescue (LEOSAR)
- Geostationary Orbiting Search And Rescue (GEOSAR)



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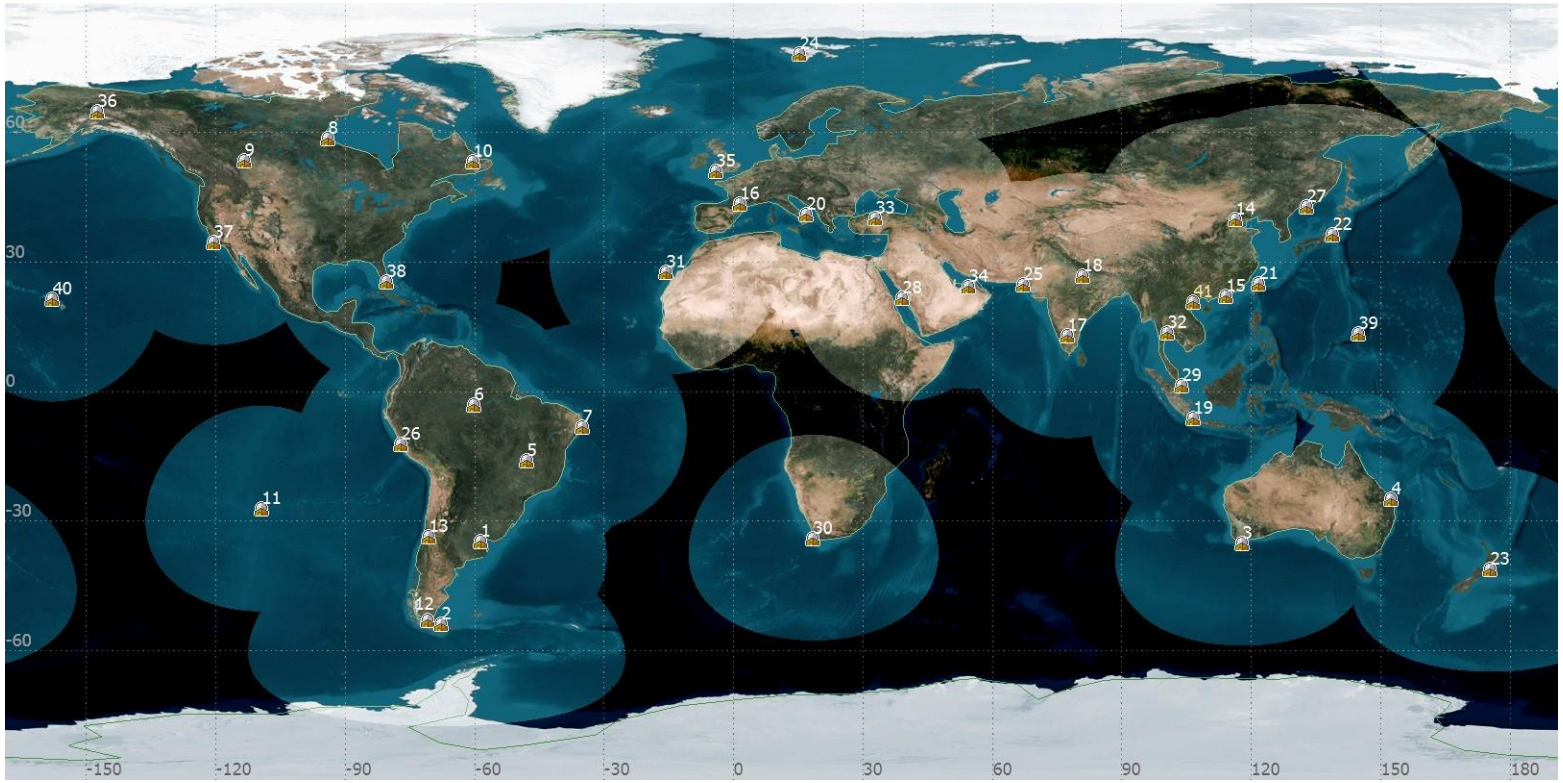
Cospas-Sarsat Components

Space Segment:	- 5 LEO payloads (3 more still planned to be deployed by 2019) - 7 GEO payloads + 2 additional under in-orbit tests (5 more planned before 2019)
Ground Segment:	- 53 Operational LEOLUTs + 1 in development - 23 Operational GEOLUTs + 2 under re-test - 31 Operational Mission Control Centres
Distress Beacons:	- >1.5 million 406 MHz beacons (end of 2014) - about 50 active manufacturers

LEOSAR System Visibility



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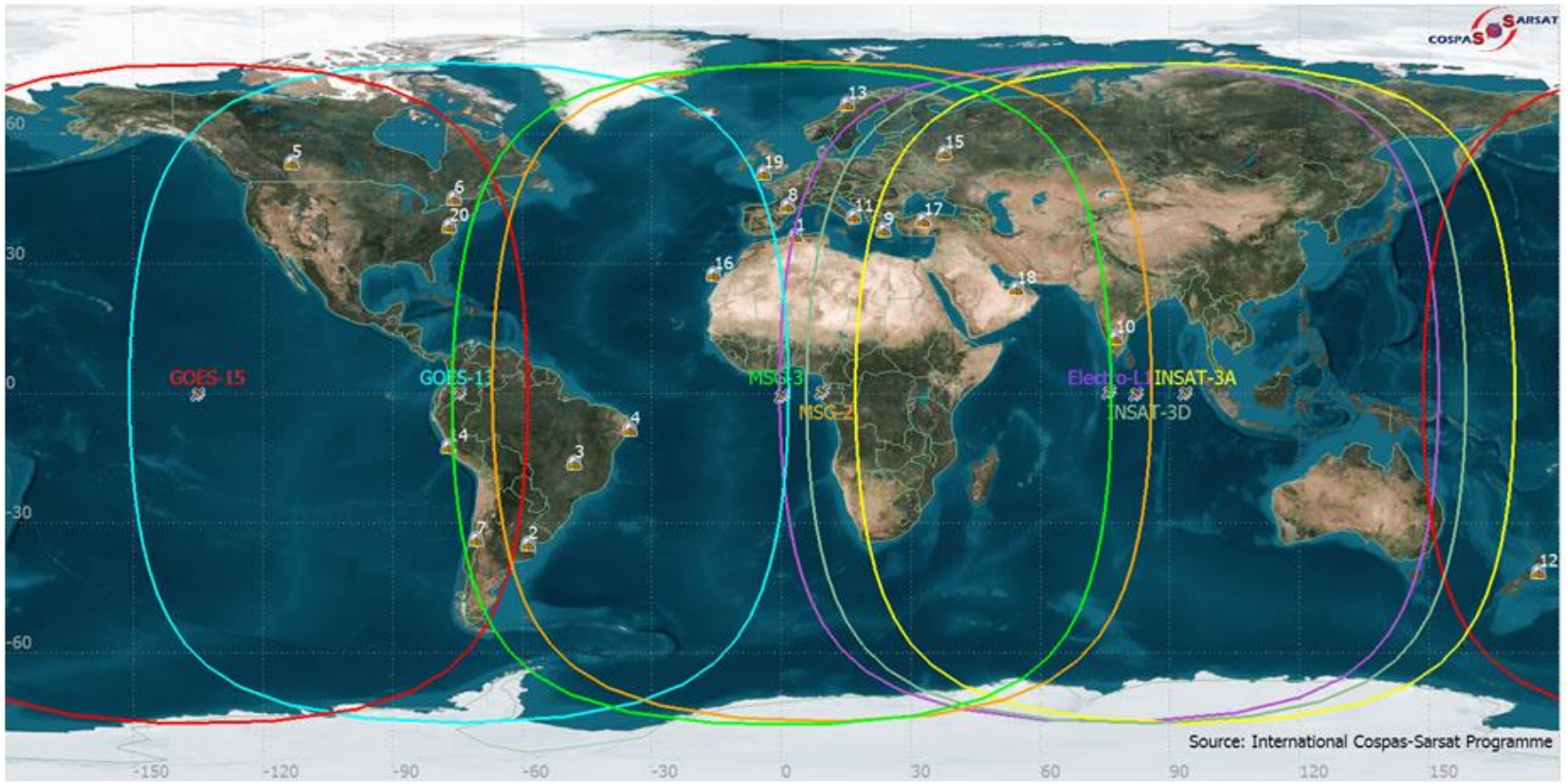
Space Segment: GEOSAR Coverage

As of May 2015



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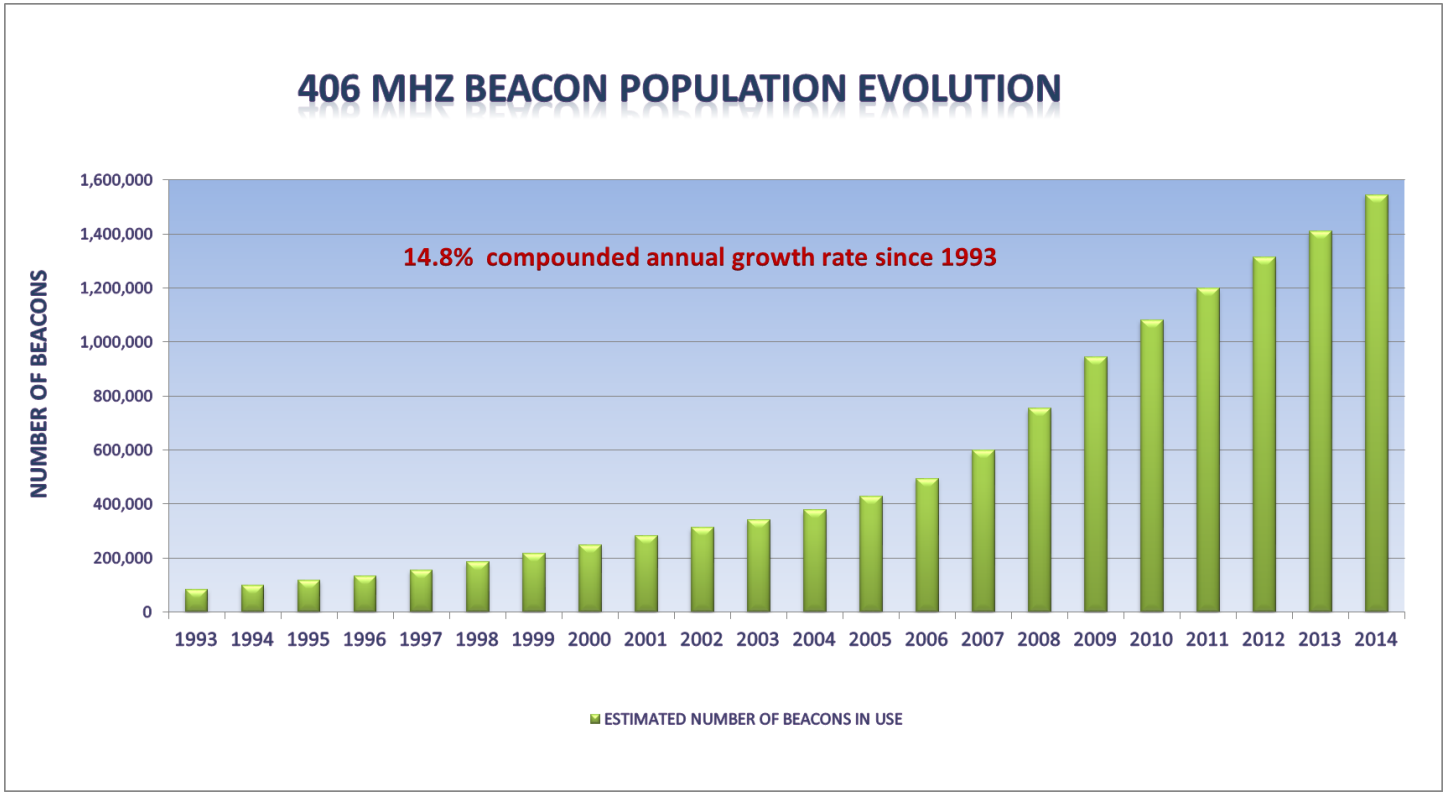
Beacon Population Evolution



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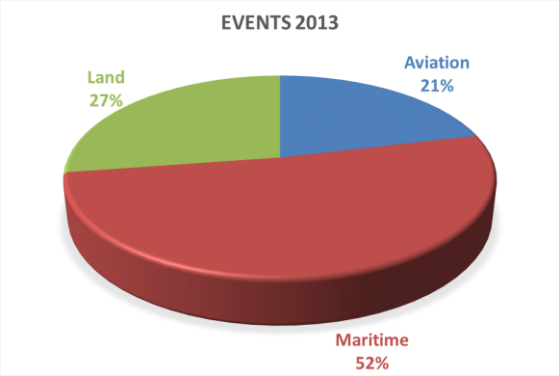
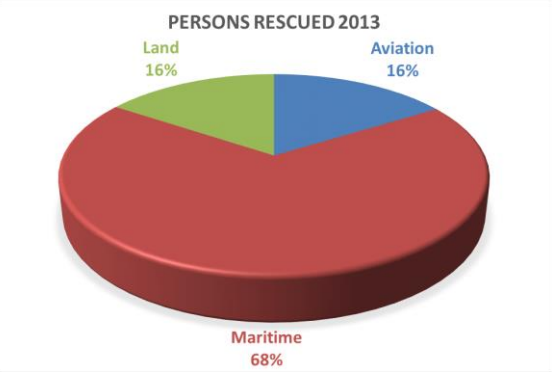
Cospas-Sarsat
SAR Events and Assisted Saves

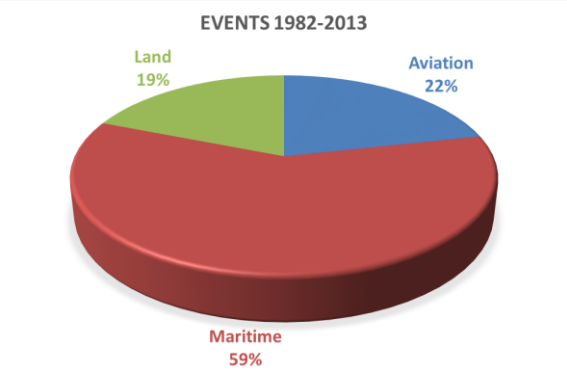
	2013
SAR Events:	720
P. Rescued:	2156

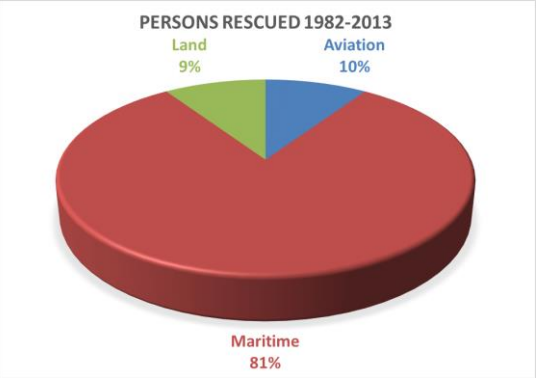




SAR Events (1982 / 2013) :
> 10385

P. Rescued (1982 / 2013) :
> 37,211





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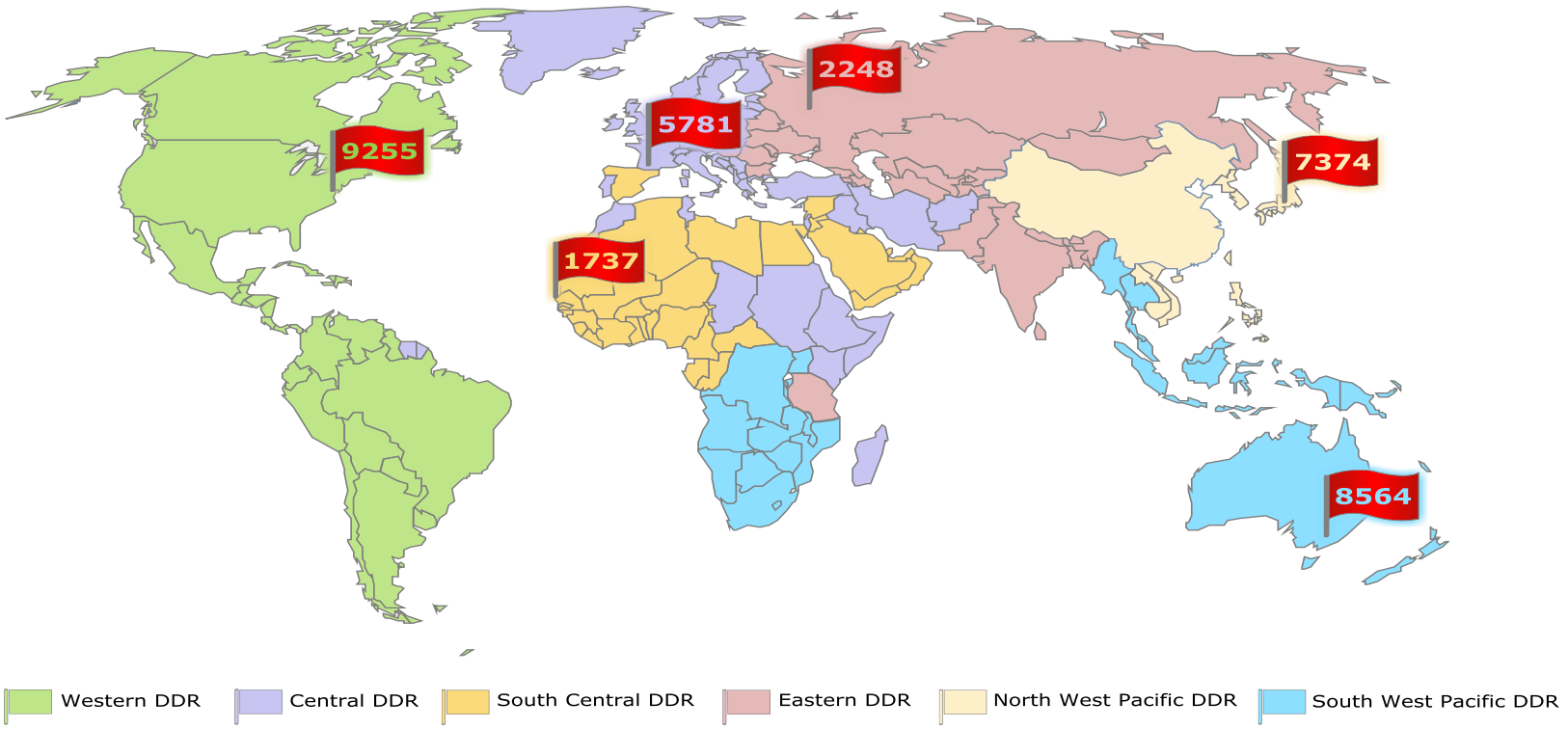
Distribution of assisted save locations



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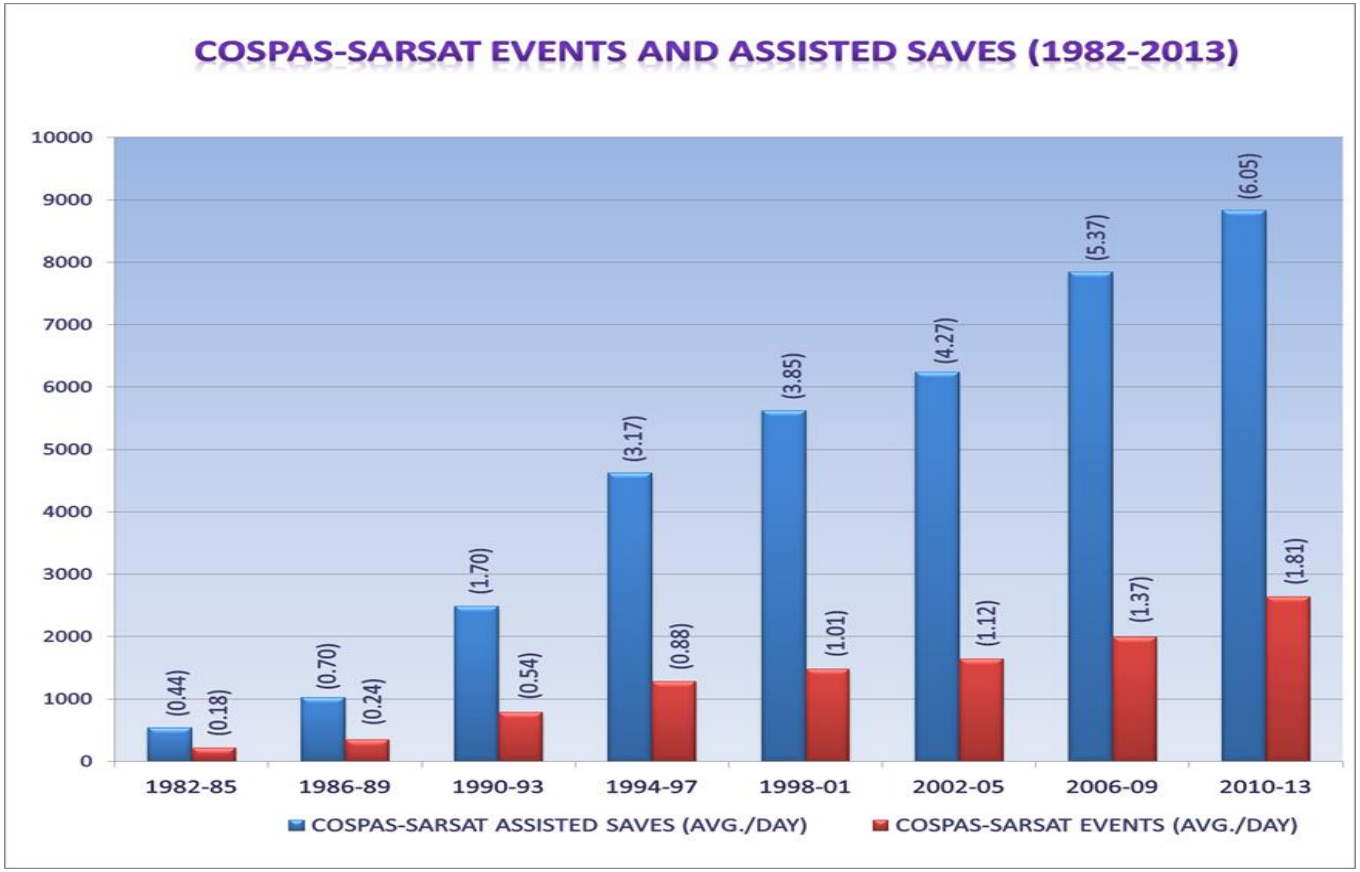
Cospas-Sarsat Saves Evolution



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ON AVERAGE 6 ASSISTED RESCUES PER DAY SINCE 2010

International Beacon Registration Database (IBRD)

- Cospas-Sarsat operates the International 406 MHz Beacon Registration Database (IBRD) which is freely available to users with beacons coded to a country with no national registration facilities, or with beacons coded to an Administration that wishes to allow use of the IBRD.
- IBRD helps to facilitate the availability of beacon registration data to SAR services.
- In 2014, there were over 7,300 new beacon registrations in the IBRD, which now holds more than 48,500 registration records for beacons from 126 Administrations, of which only 16 had more than 500 beacons registered (none above 7000 beacons).
- The search and rescue community has continued consistent use of the IBRD, with an average of 308 SAR users per month logging in to the IBRD in 2014.

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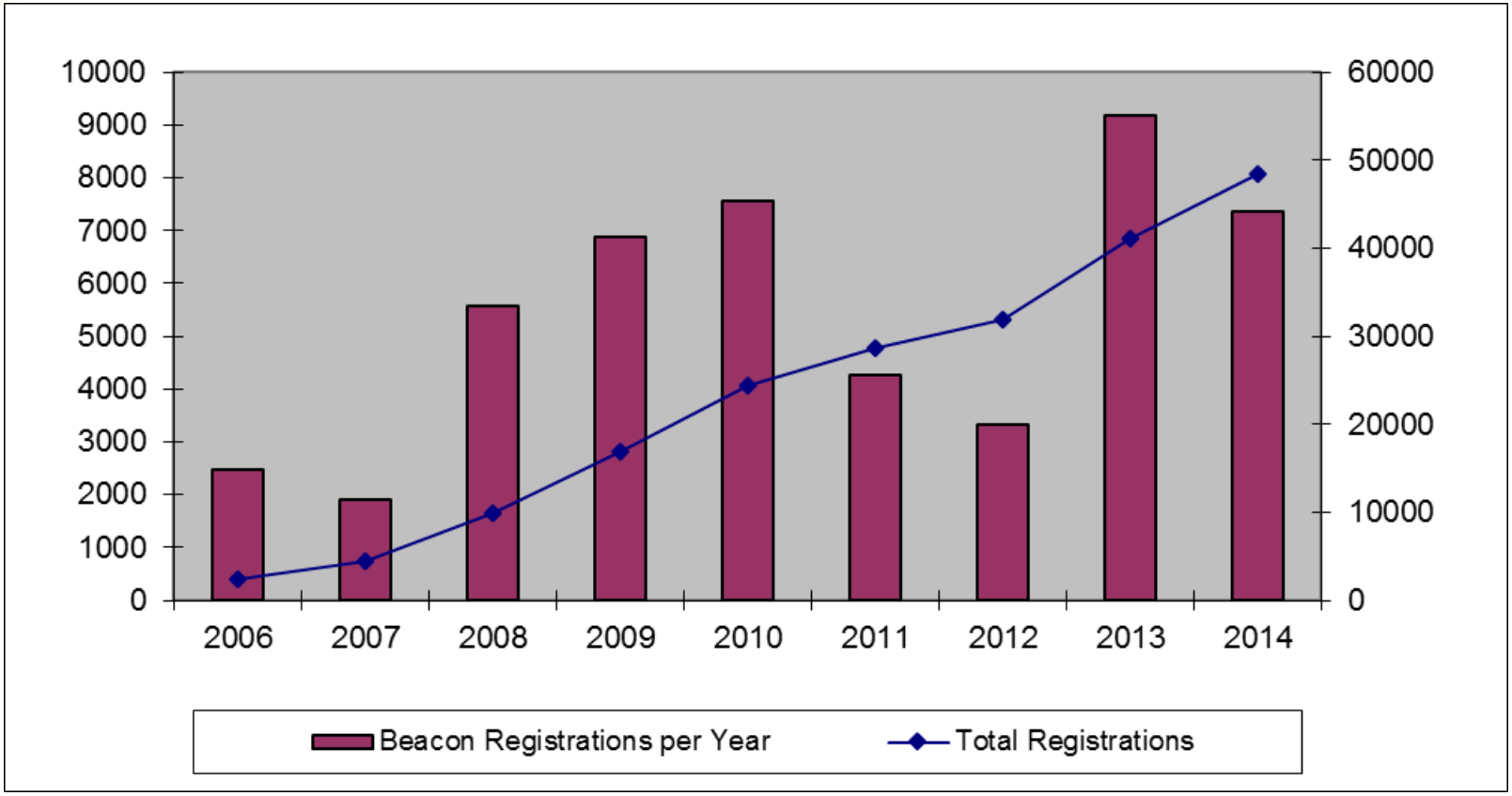
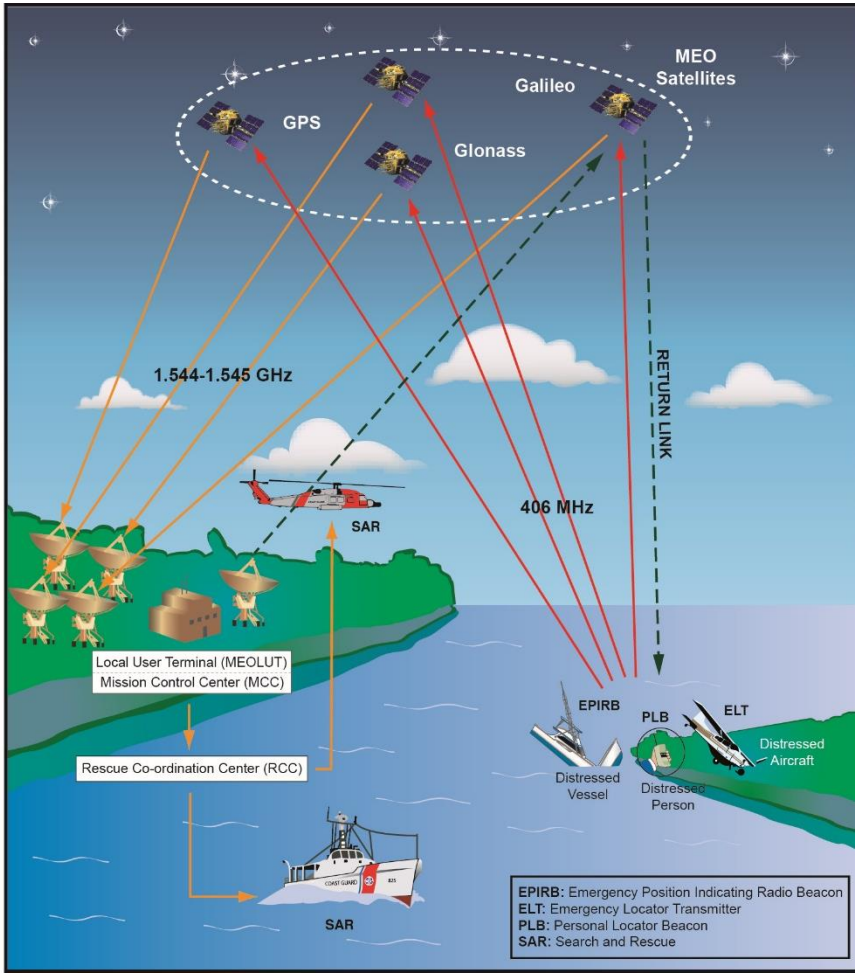
International Beacon Registration Database (IBRD)



Upcoming Space Segment

Future Operational system under test

- Medium Earth Orbiting Search And Rescue (MEOSAR)



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MEOSAR Components already in place

Space Segment: - 25 MEO payloads (17 S-band, 8 L-band) of which 20 are currently available for MEOSAR D&E test (6 more planned for deployment by the end of 2015)

Ground Segment: - 12 Experimental MEOLUTs used in MEOSAR D&E tests (at least 7 more planned by the end of 2016)
- 15 MCCs planned to be MEOSAR-ready by the end of 2015)

Why MEOSAR ?

- Improve speed and reliability of detecting and locating 406 MHz distress alerts (near-real-time):
  - ✓ Can locate beacons on single burst : First Burst Detection and Location
  - ✓ Continuous detection and location
  - ✓ Independent location accuracy improving over time
- Moving beacons can be tracked:
  - ✓ on life raft adrift at sea
  - ✓ on aircraft in emergency in flight (before a crash)
- No Doppler mirror image location generated
- Additional features e.g. Return Link Service, cancellation of false alerts
- High level of satellite redundancy and availability (multiple path less susceptible to blockage)
- Possibly improve beacon performance and affordability (SGB)

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but MEOSAR also means…

- Reduced uplink communication link margins (C/N_0 of 41.3 dBHz for LEOSAR vs 35.7 dBHz for MEOSAR):
  - Detection rate expected to decrease more rapidly when conditions are departing from nominal environment
  - Lack of detection expected at high elevation angles (Monopole antenna)

- More demanding Space Segment (min of 4 LEOSAR payloads vs 24 MEOSAR payloads)
  - More significant investment from Space Segment Providers
  - Higher cost to commission and operate the Space Segment infrastructure
  - Longer time required to deploy the infrastructure.

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furthermore…

- More complex Ground Segment
  - Several antennae by MEOLUT requiring more complex tracking algorithm
  - More complex independent location processing algorithm
  - Interaction between ground infrastructure (MEOLUT networking)

- No on-board data storage
  - Require MEOLUTs to be a located around the globe to provide global coverage
  - Satellites need to be tracked at all time otherwise data (pairs of TOA/FOA) is lost

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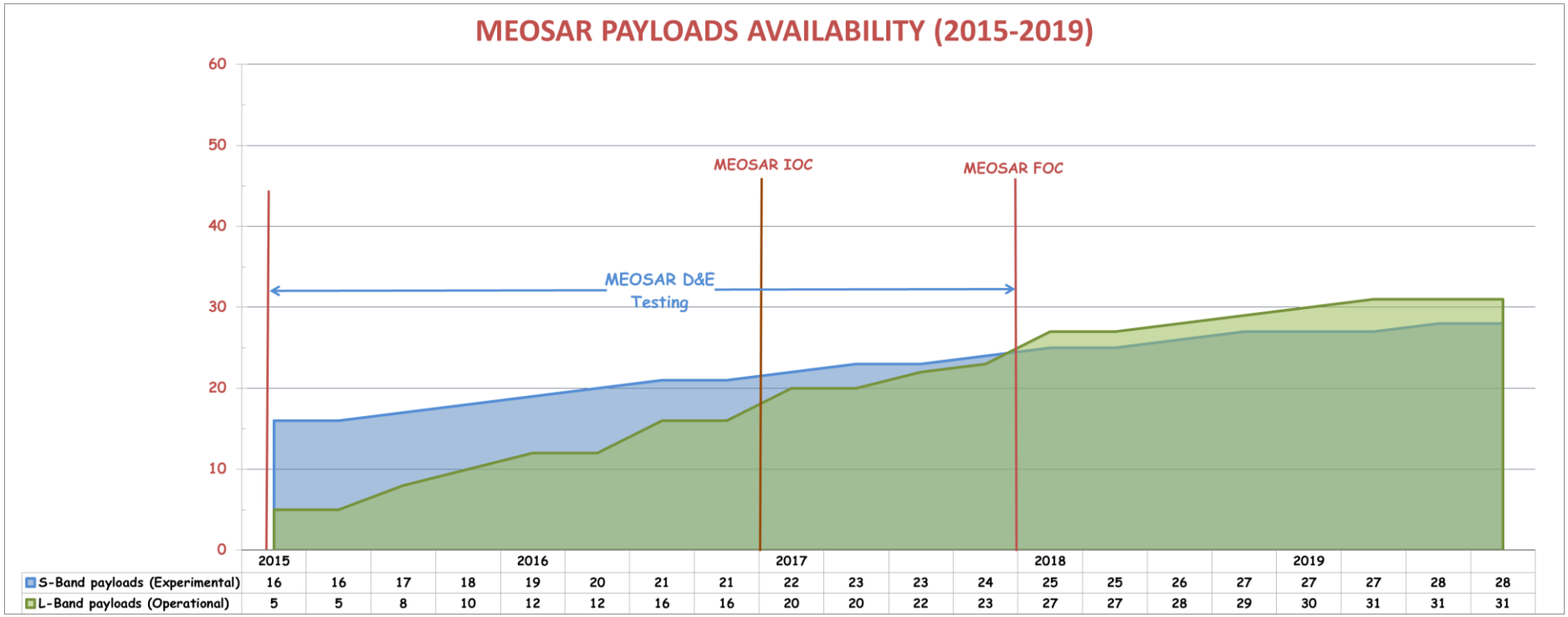
MEOSAR Space Segment Planned Availability



	2015				2016				2017				2018				2019			
S-Band payloads (Experimental)	16	16	17	18	19	20	21	21	22	23	23	24	25	25	26	27	27	27	28	28
L-Band payloads (Operational)	5	5	8	10	12	12	16	16	20	20	22	23	27	27	28	29	30	31	31	31

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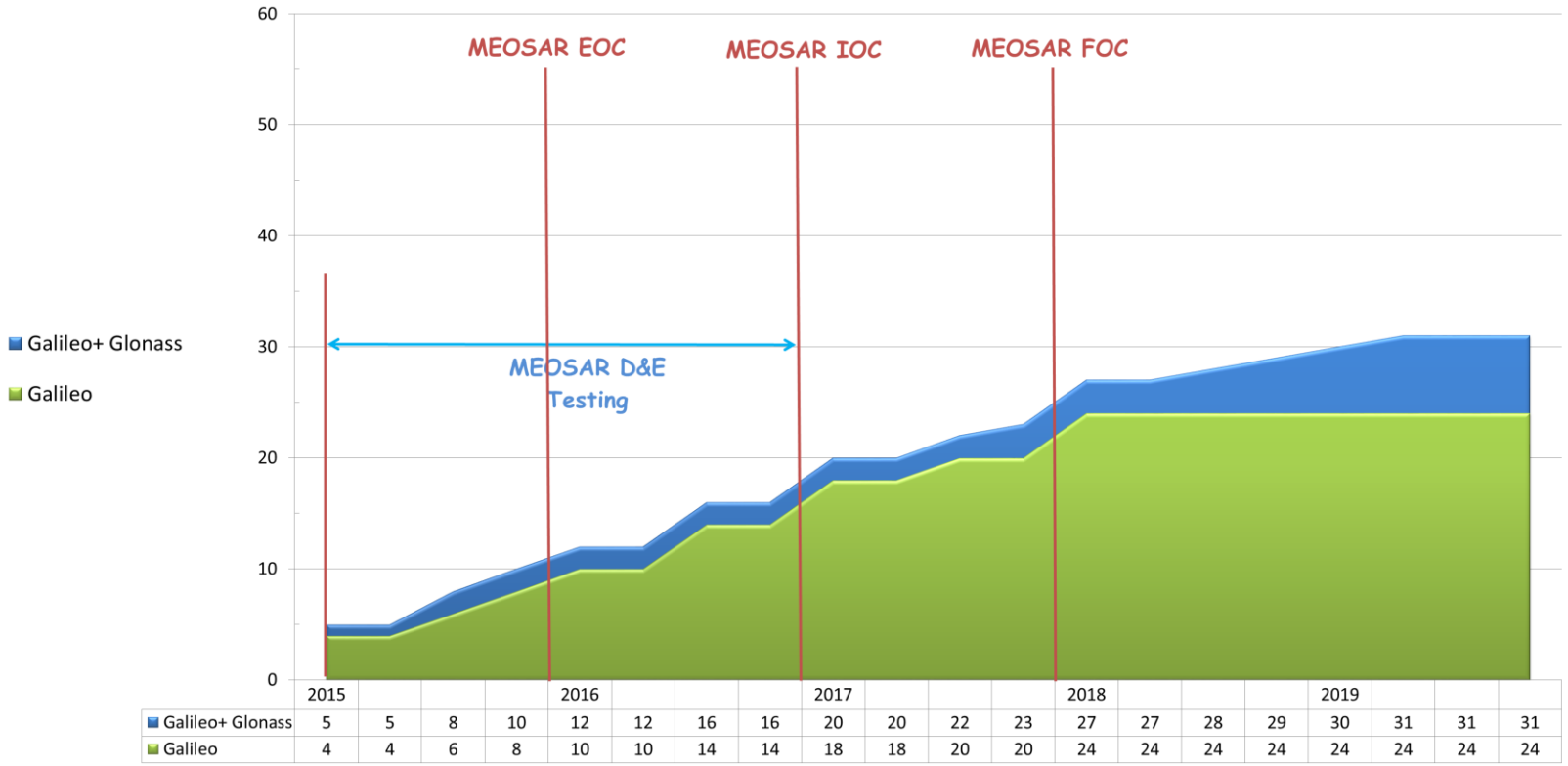
MEOSAR Operational Space Segment Planned Availability



	2015				2016				2017				2018				2019			
Galileo+ Glonass	5	5	8	10	12	12	16	16	20	20	22	23	27	27	28	29	30	31	31	31
Galileo	4	4	6	8	10	10	14	14	18	18	20	20	24	24	24	24	24	24	24	24

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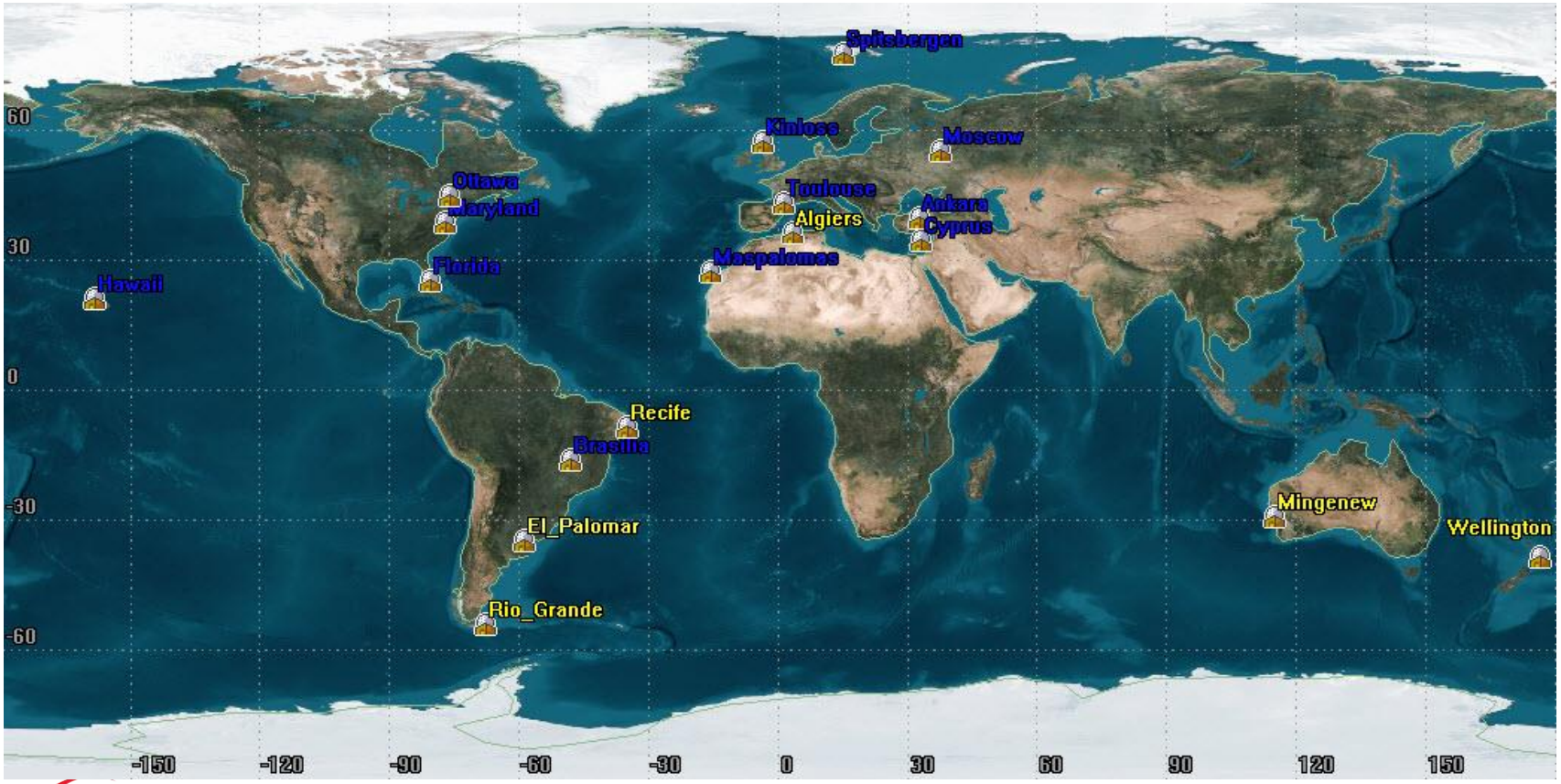
Existing and Planned Experimental MEOLUTs



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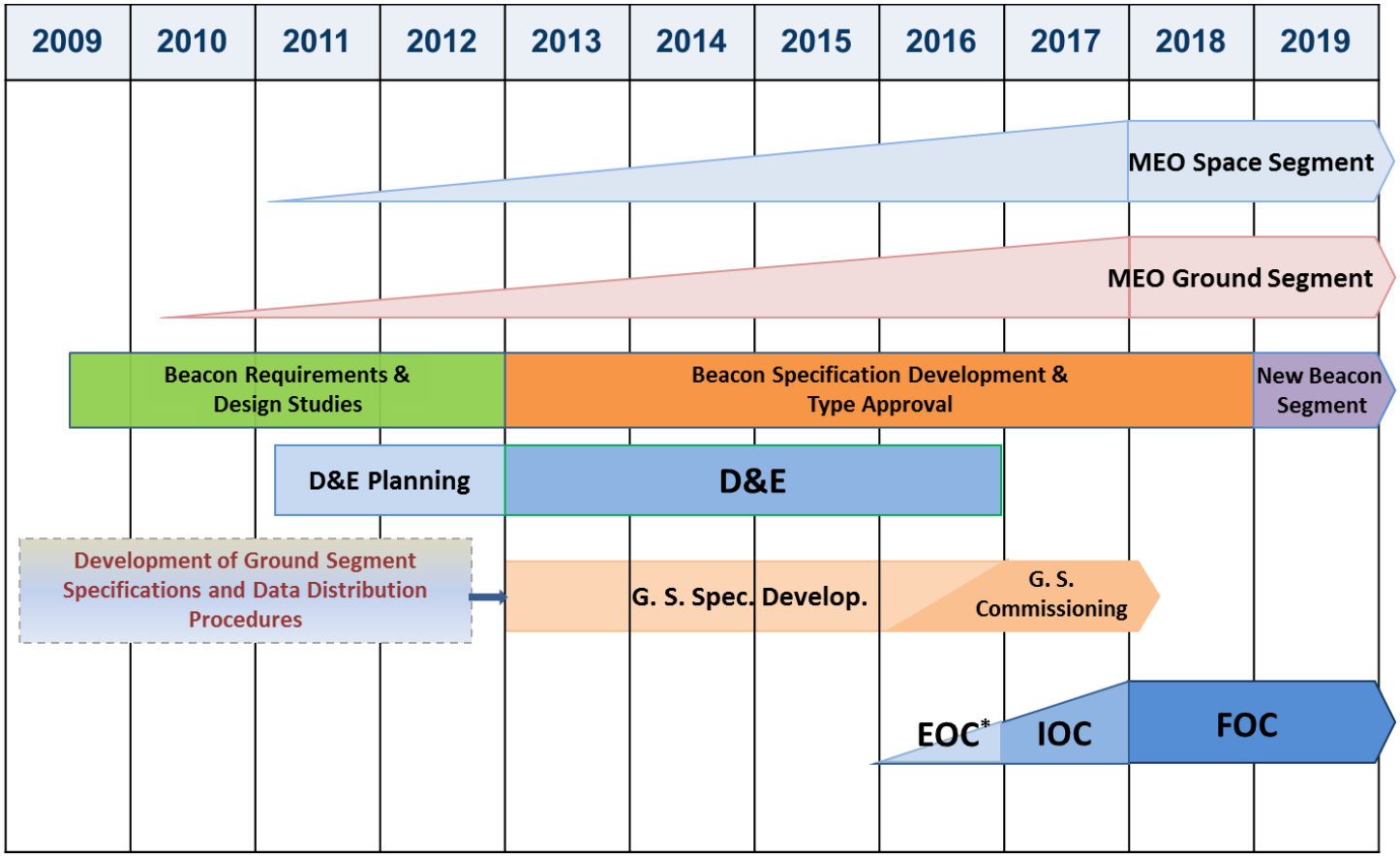
Cospas-Sarsat MEOSAR Timeline (to be reassessed at CSC-55)



* Early Operational Capability

Second Generation Beacon Goals

- Improve system performance to meet new, more demanding requirements
  - ➢ including detection probability, location accuracy and system capacity
- Optimize beacon signal to take advantage of the MEOSAR system
- Work with beacon manufacturers to obtain the most competitive end product that is attractive to customers

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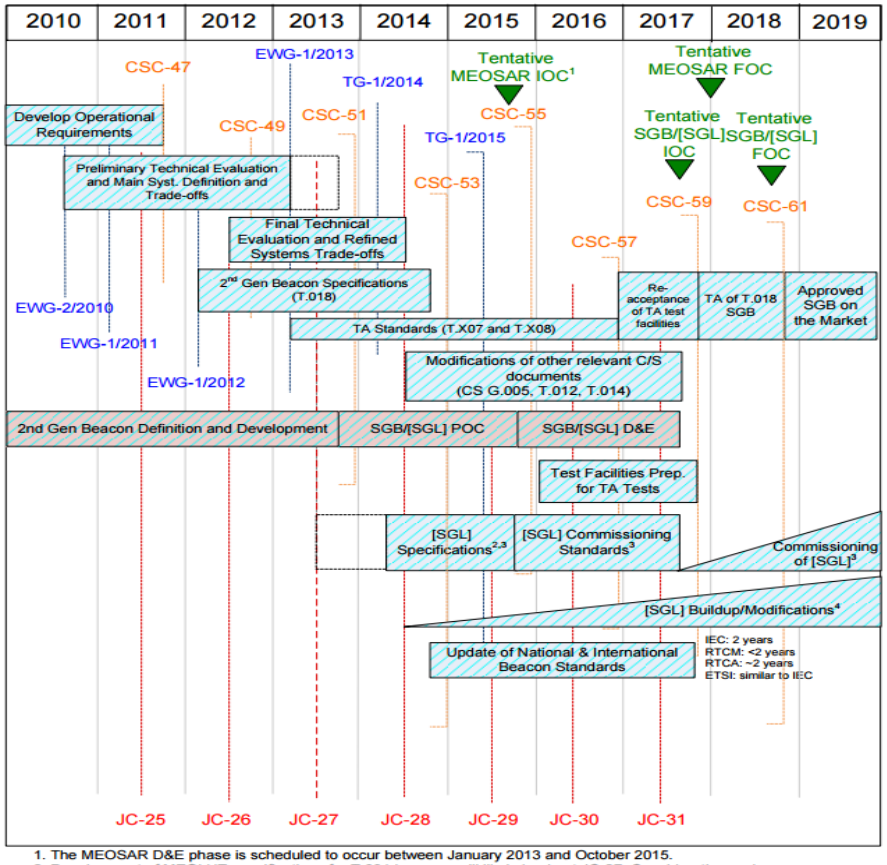
SGB Implementation Timeline (agreed at CSC-53)

- Some of the prerequisites required to make SGBs available on the market:
  - ✓ Cospas-Sarsat SGB specification and type approval documents to be completed.
  - ✓ National Administrations document amendments (RTCM, RTCA, Eurocae, IEC, ETSI etc.) to be completed.
  - ✓ Test laboratories ready and validated as compliant to perform the new type approval procedures and tests.
  - ✓ International documents to be amended (IMO, ICAO, ITU).
  - ✓ Specification and commissioning procedure for SGB compatible MEOLUTs to be completed.
  - ✓ A sufficient number of SGB-capable MEOLUTs is commissioned to provide worldwide coverage.
- SGB not planned to be on the market earlier than 2019

Figure 1: Second Generation Beacon Implementation Schedule



1. The MEOSAR D&E phase is scheduled to occur between January 2013 and October 2015.
2. Development of MEOLUT specifications for T.001 beacons will likely begin at JC-27. Consideration and preliminary development of [SGL] specifications can begin at this time as well.
3. [SGL] refers to Second Generation MEOLUTs and Second Generation GEOLUTs.
4. Modifications to MCCs will also be needed during this phase.

Cospas-Sarsat and 406 MHz beacon-related meetings since May 2014

- Expert Working Group Meeting on MEOSAR D&E Test Results (September 2014) [*Preparation of MEOSAR D&E Phase 2 test campaign*]
- Task Group Meeting on Second Generation 406-MHz Distress Beacon Specification (February 2015)
- Task Group Meeting on MEOSAR D&E Phase (April 2015) [*Draft Operational documents for MEOSAR, review how MEOSAR alerts are to be combined with LEOSAR and GEOSAR alerts*]
- Joint RTCA/Eurocae Working Group Meetings on revised ELT specifications (September 2014, January 2015 and April 2015)

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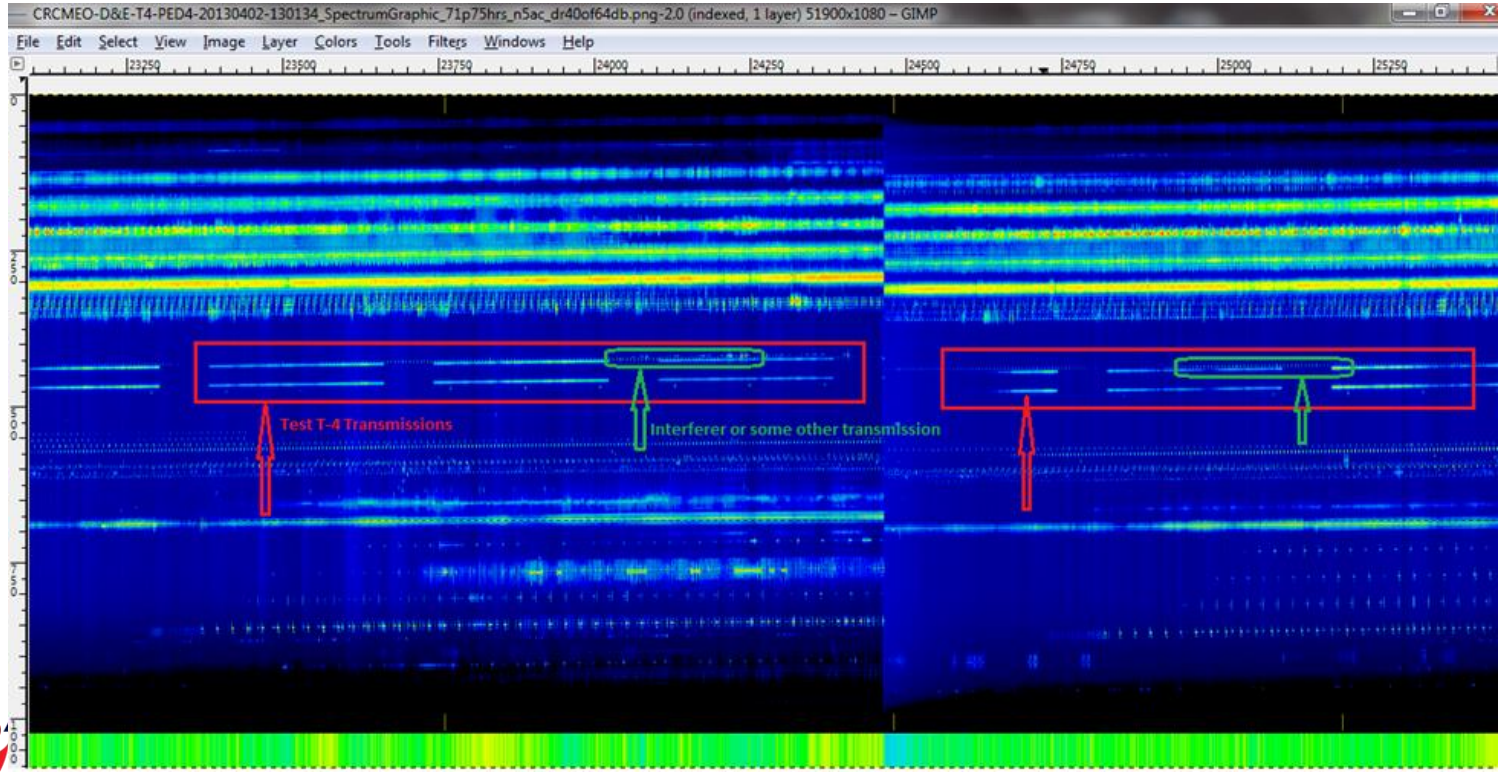
Important Cospas-Sarsat and 406 MHz beacon-related meeting since May 2014

- ITU CPM (March-April 2015) [*Propose modifications to RRs to enhance the protection of the Cospas-Sarsat systems from out-of-band/adjacent band emissions from other services*]



Upcoming Cospas-Sarsat and 406 MHz beacon-related meetings

- Task Group Meeting on MEOSAR D&E Phase Test Results (June 2015) [*Review the MEOSAR D&E phase 2 test results, update MEOLUT, MEOSAR technical documents*]
- 29th Joint Committee Meeting (September 2015) [*Complete all documentation required to initiate MEOSAR EOC*]
- 55th Council Meeting (December 2015) [*Approved all documentation required to initiate MEOSAR EOC*]
- Joint RTCA/Eurocae Working Group Meetings on revised ELT specification (September and December 2015)
- ITU WRC-15 (November 2015) [Decide on new RRs]

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Correspondence Working Groups

- The combined development of the MEOSAR and SGB documentation associated with challenging schedule has raised the need for coordinated efforts among Participants, especially outside formal Cospas-Sarsat meetings.
- Correspondence Working Groups are now intensively used by Cospas-Sarsat participants to conduct numerous specific tasks.
- More than 12 Correspondence Working Groups are currently active within the Cospas-Sarsat Programme in addition to the MEOSAR Test Coordination meetings and the RTCA/Eurocae Correspondence Working Group. Among these CWGs:
  - Closing and Opening of new frequency channel
  - Multiple beacon activations
  - T.018/T.X007 document development (SGB)
  - Homing and Intelligent Transmission Scheduling Correspondence Group (SGB)

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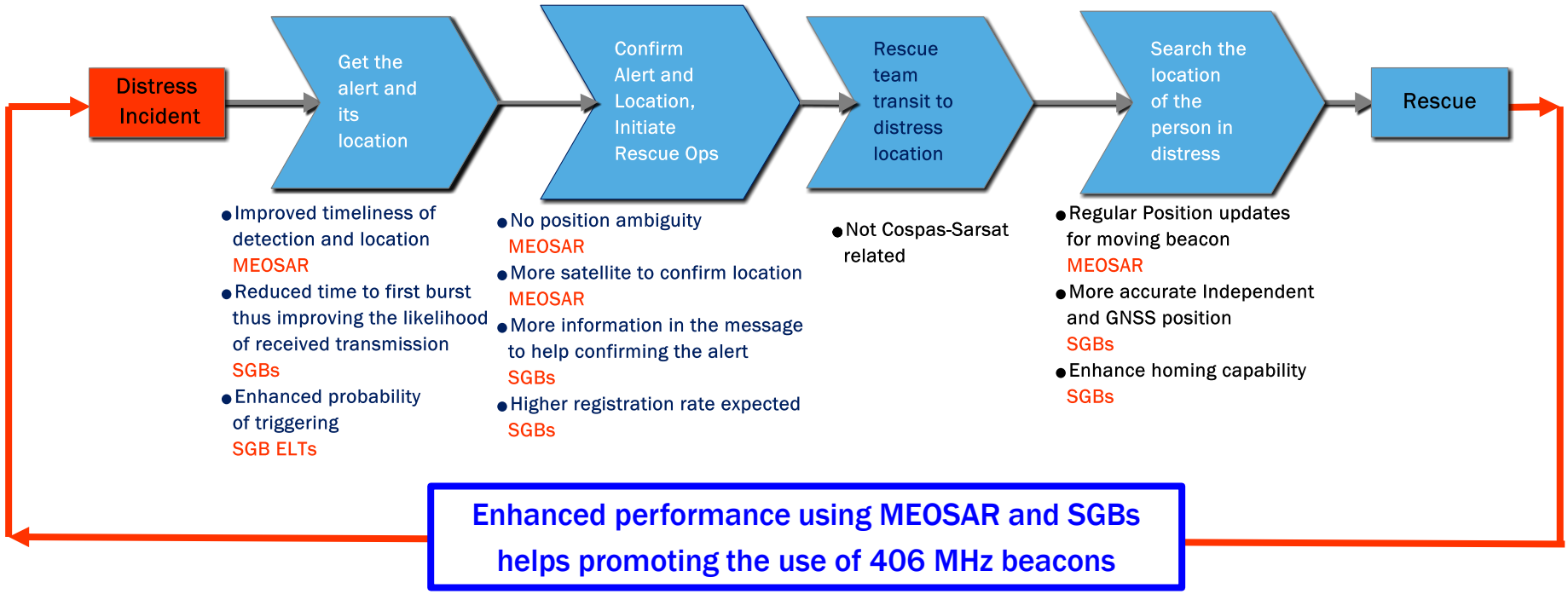
How will MEOSAR and SGBs improve SAR operations



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For More Information

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