

2010 Beacon Manufacturers' Workshop
San Diego, California
21 May 2010

Celebrating 30 years of success
Cospas-Sarsat Updates and
Beacon Activities

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Cospas-Sarsat Secretariat
Montreal



Cospas-Sarsat Update and Beacon Activities

- International Cospas-Sarsat Programme
- Space Segment and LUTs status
- Saves and Events
- Beacon population evolution
- MEOSAR System and status
- MEOSAR Return Link Service
- International Beacon Registration Database
- Results of the Beacon Manufacturers Survey (2009)
- Beacon Production Status
- Beacon Type Approval Activities



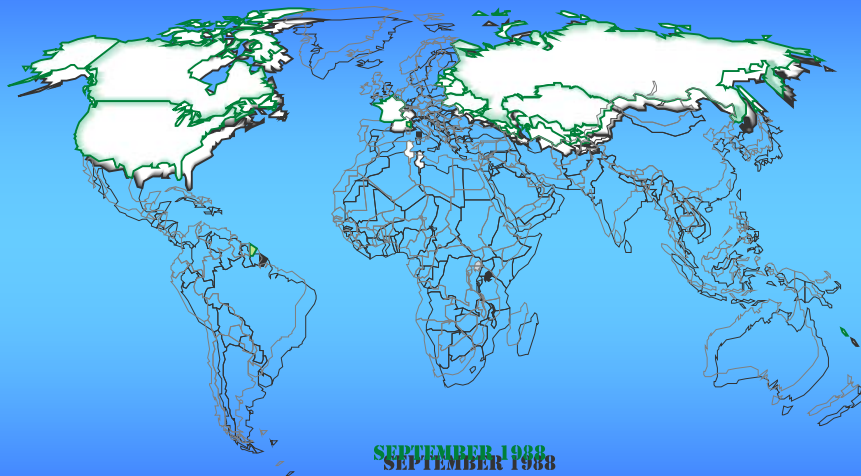
Cospas-Sarsat Mission and Objective



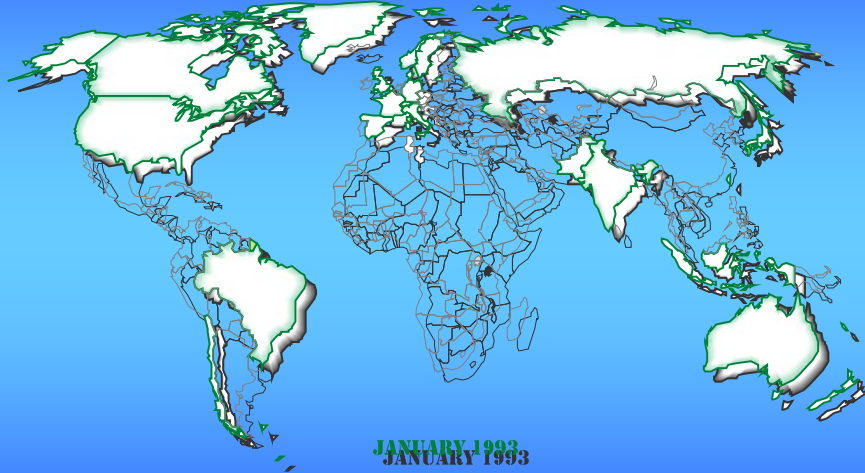
- Mission:** To provide accurate, timely and reliable distress alert and location data to help SAR authorities assist persons in distress.
- Objective:** To reduce, as far as possible, delays in the provision of distress alerts to SAR and the time to locate a distress and provide assistance.
- Strategy:**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



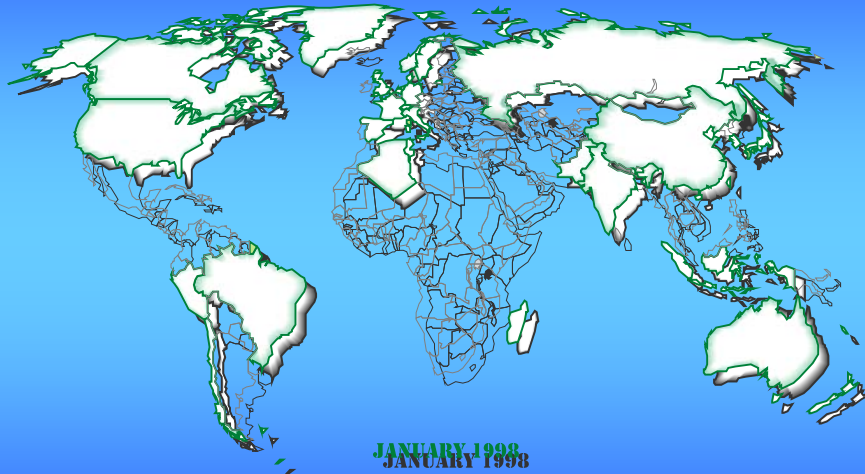
Cospas-Sarsat Participants



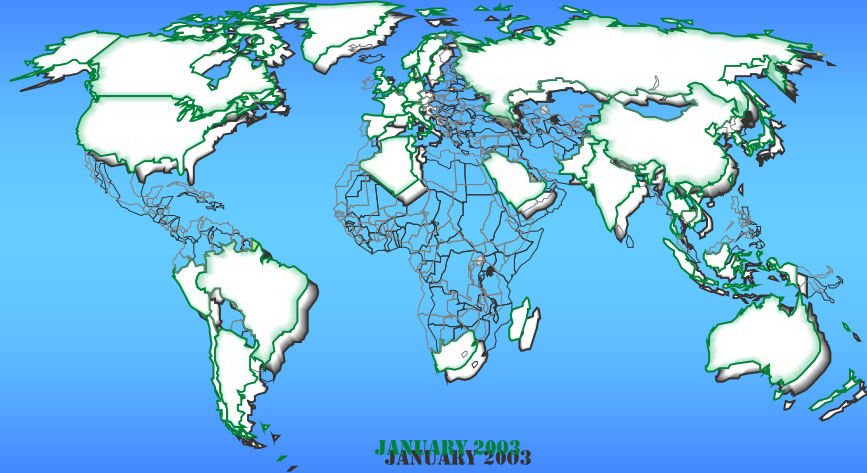
Cospas-Sarsat Participants



Cospas-Sarsat Participants



Cospas-Sarsat Participants



Cospas-Sarsat Participants

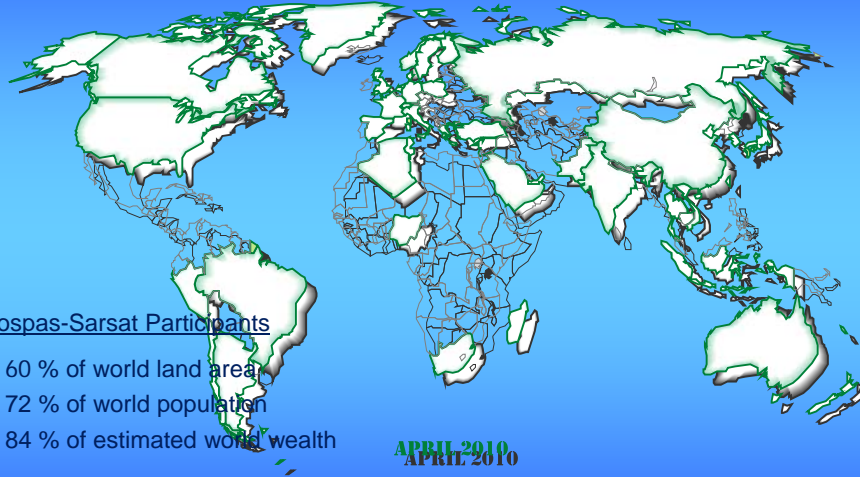


Cospas-Sarsat Participants

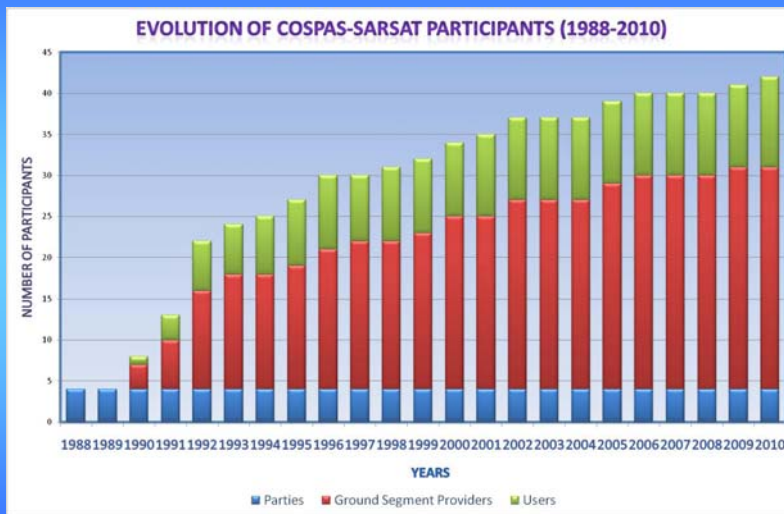
- 4 Parties
- 26 Ground Segment Providers
- 10 Users
- 2 Organisations



Cospas-Sarsat Participants



Cospas-Sarsat Participants



Cospas-Sarsat System Combined LEO / GEO Operations

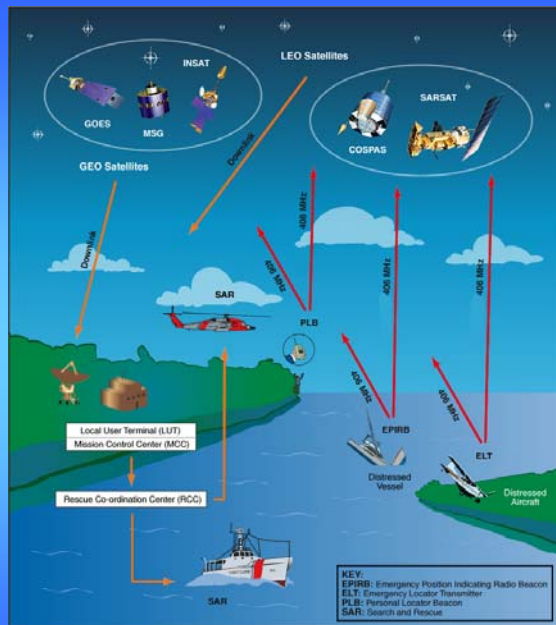


- LEOSAR: Sarsat (NOAA, MetOp) and Cospas (Sterkh)
- GEOSAR: GOES (USA), INSAT (India), MSG (EUMETSAT)



Cospas-Sarsat System 406 MHz only

(121.5/243 MHz satellite processing terminated as of Feb 1 2009)



Cospas-Sarsat LEOSAR Space Segment

6 LEO

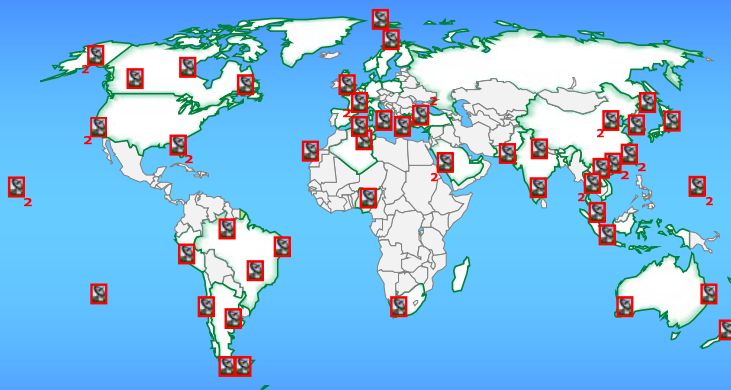
Cospas-Sarsat Payload	Spacecraft	SARP		
		Global Mode	Local Mode	SARR
Sarsat 7	NOAA-15	Operational	Operational	Operational
Sarsat 8	NOAA-16	Operational	Operational	Operational
Sarsat 9	NOAA-17	Operational	Operational	Operational
Sarsat 10	NOAA-18	Operational	Operational	Operational
Sarsat 11	METOP-A	Operational	Operational	Operational
Sarsat 12	NOAA-N'	Operational	Operational	Operational
Sarsat 13	METOP-B	2012	2012	2012
Sarsat 14	NPOESS-C1*	2014	2014	2014
Sarsat 15	NPOESS-C2*	2016	2016	2016
Cospas-11	Sterkh-1	Under test	Under test	Under test
Cospas-12	Sterkh-2	Under test	Under test	Under test
Cospas-13	Sterkh-3	2012	2012	2012
Cospas-14	Sterkh-4	2013	2013	2013

* Alternate spacecrafts currently being investigated



Cospas-Sarsat 55 LEOLUTs

COSPAS-SARSAT LEO LOCAL USER TERMINALS



JANUARY 2010



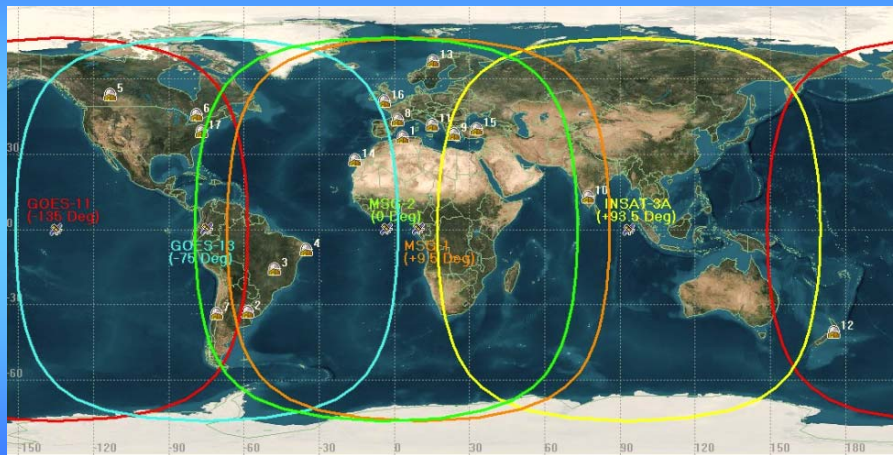
Cospas-Sarsat GEOSAR Space Segment

5 GEO

Spacecraft	Launch date	Position	Payload Status
GOES-11 (West)	May 2000	135° W	In orbit spare
GOES-12	July 2001	60° W	Not Operational
GOES-13 (East)	May 2006	75° W	Operational
GOES-14	June 2009	104.5° W	In orbit spare
GOES-15	March 2010	TBD	In orbit spare
GOES-16	2015	TBD	Projected
GOES-17	2016	TBD	Projected
INSAT-3A	April 2003	93.5° E	Operational
INSAT-3D	2010	83.5° E	Projected
MSG-1	August 2002	9.5° E	Operational
MSG-2	December 2005	0°	Operational
MSG-3	2011	TBD	Projected
MSG-4	2013	TBD	Projected
Electro-L No.1	2010	76° E	Projected
LUCH-5A	2011	95° E	Projected
Electro-L No.2	2011	18.5° W	Projected

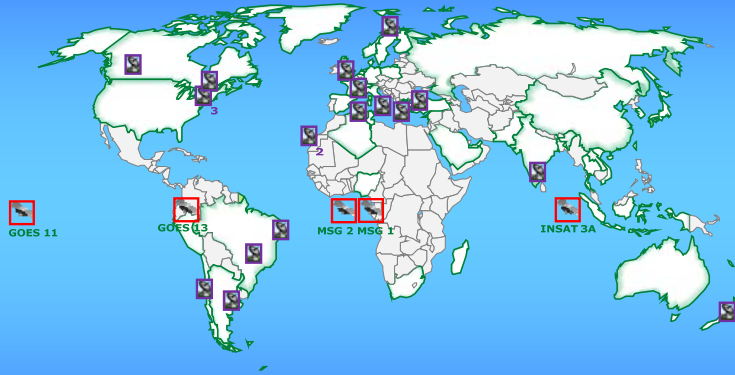


Cospas-Sarsat GEOSAR Coverage (April 2010)



Cospas-Sarsat 21 GEOLUTs

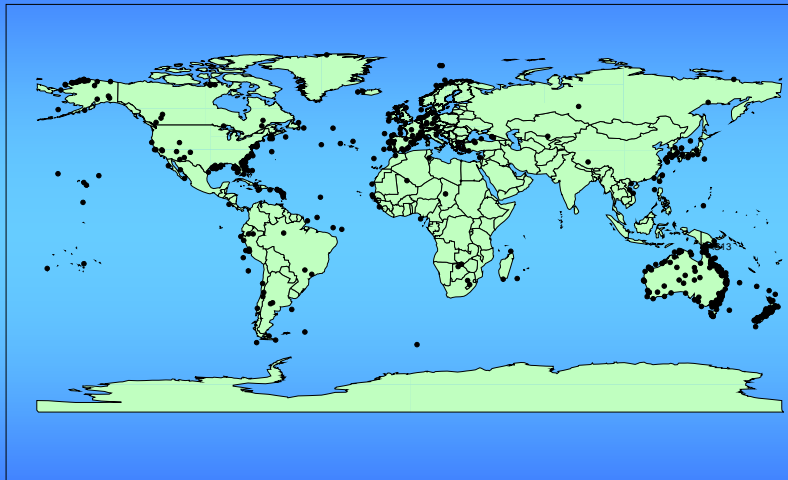
COSPAS-SARSAT GEO LOCAL USER TERMINALS



JANUARY 2010



Cospas-Sarsat 2009 - Alert Locations (preliminary)

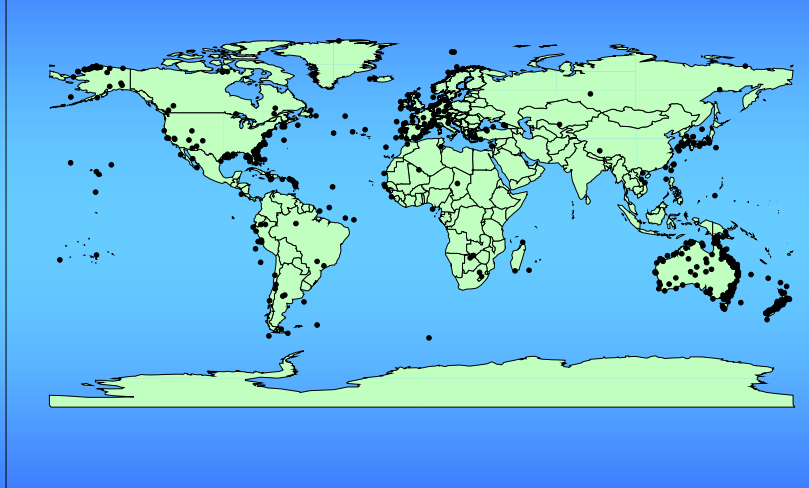


SAR Events: 482 (-3.0% from 2008)
P. Rescued: 1593 (-19.6% from 2008)



Cospas-Sarsat

2009 – 406 MHz Alert Locations (preliminary)

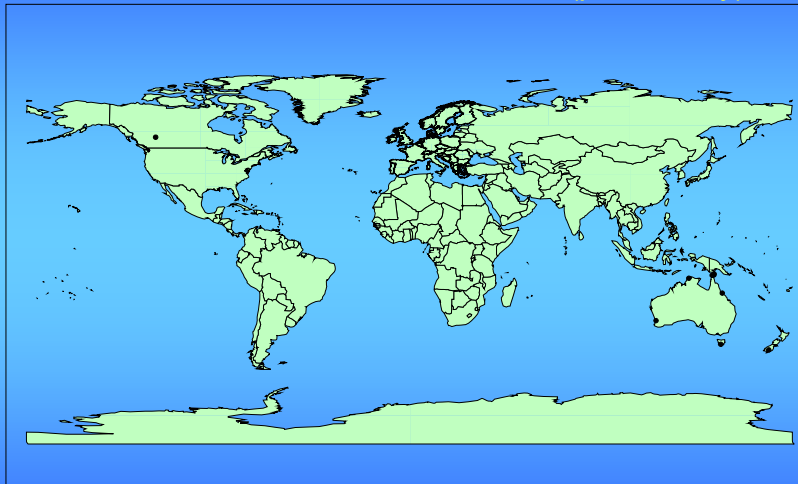


SAR Events: 462 (+26.9% from 2009)
P. Rescued: 1,569 (+3.4% from 2009)



Cospas-Sarsat

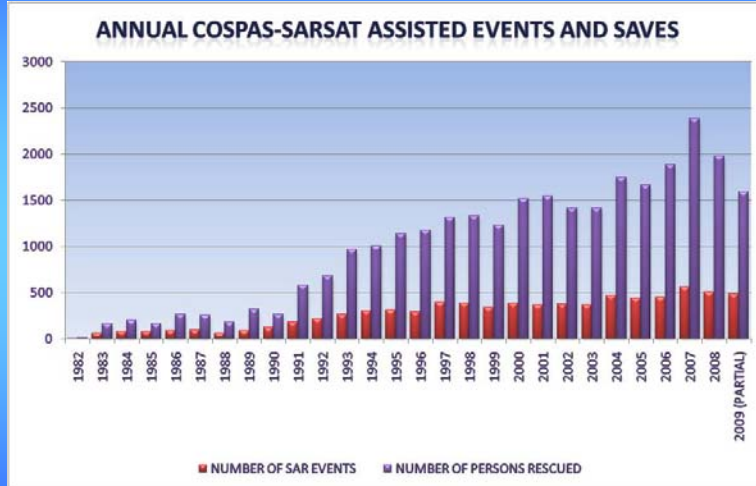
2009 - 121.5 MHz Alert Locations (preliminary)



SAR Events: 10 (-92.6% from 2009)
Rescued: 24 (-93.4% from 2009)

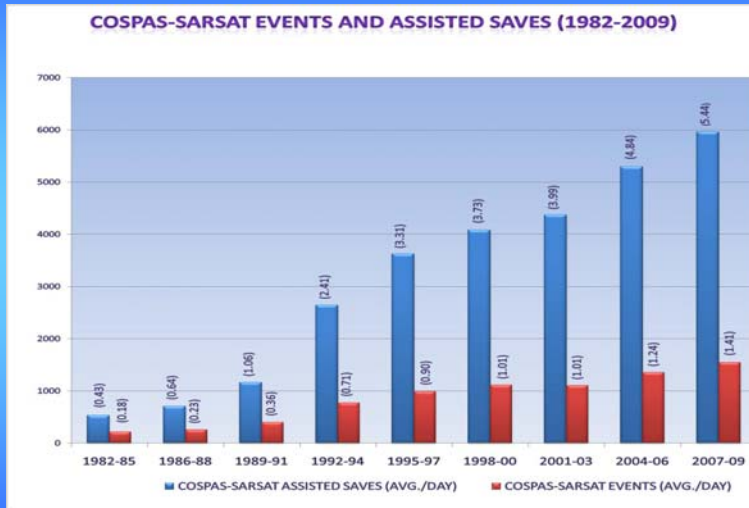


Cospas-Sarsat Rescue Operations Summary



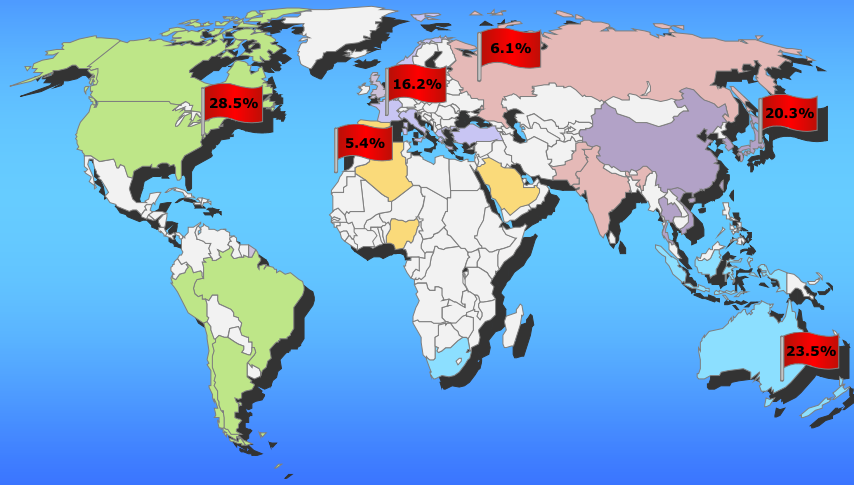
SAR Events (1982 / 2009) : > 7750
P. Rescued (1982 / 2009) : > 28,372

Cospas-Sarsat Assisted Rescues Evolution



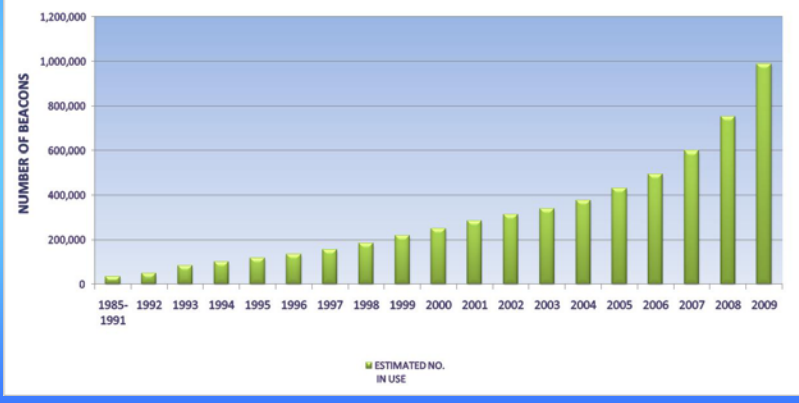
ON AVERAGE 5.44 ASSISTED RESCUES PER DAY IN THE LAST 3 YEARS

Cospas-Sarsat Assisted Rescues Distribution by Nodal MCCs (1994-2009)



Cospas-Sarsat Beacon Population Evolution

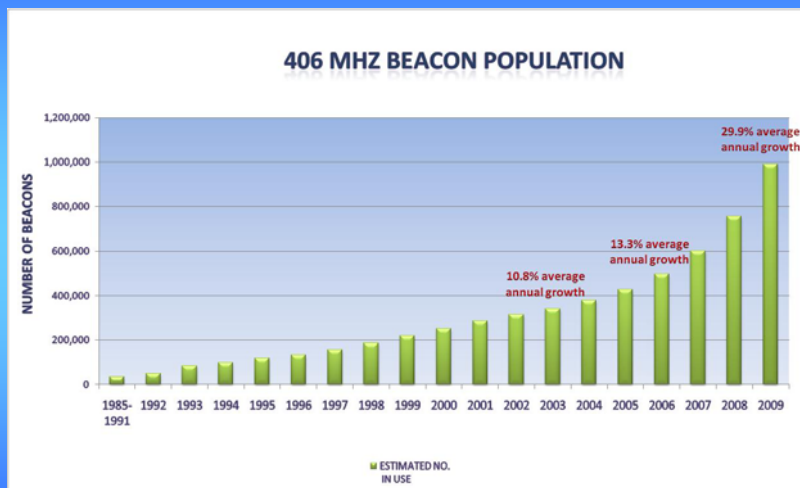
406 MHZ BEACON POPULATION



■ ESTIMATED NO. IN USE



Cospas-Sarsat Beacon Population Evolution

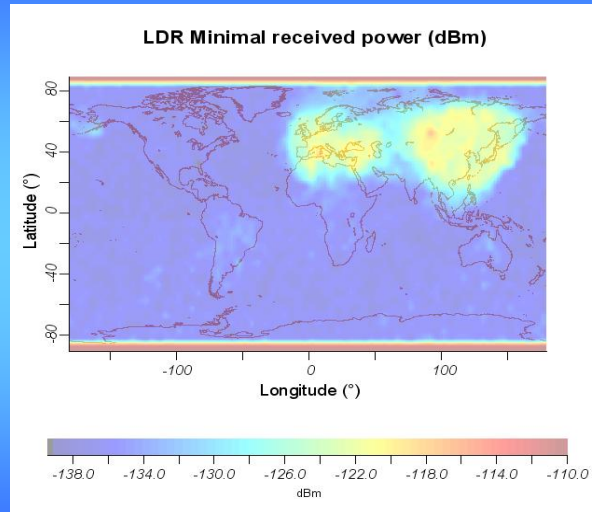


Cospas-Sarsat Current System Limitations

- **GEOSAR:**
 - Limited coverage beyond 70°N to 70°S
 - Fixed geometry Sat. to beacon (blockage)
 - No Doppler location
- **LEOSAR:**
 - Waiting time (up to 4Hr at the equator)
 - SARP on-board processing constraining the structure of beacon message and coding methods
- **System:**
 - Limited options for possible evolution of 406 MHz beacon signal and technology
 - Relatively wide band filters making payloads susceptible to emission in nearby frequencies
 - Limited number of channels within the band (Doppler effects)



Interference from nearby frequencies: The case of the SARP payloads



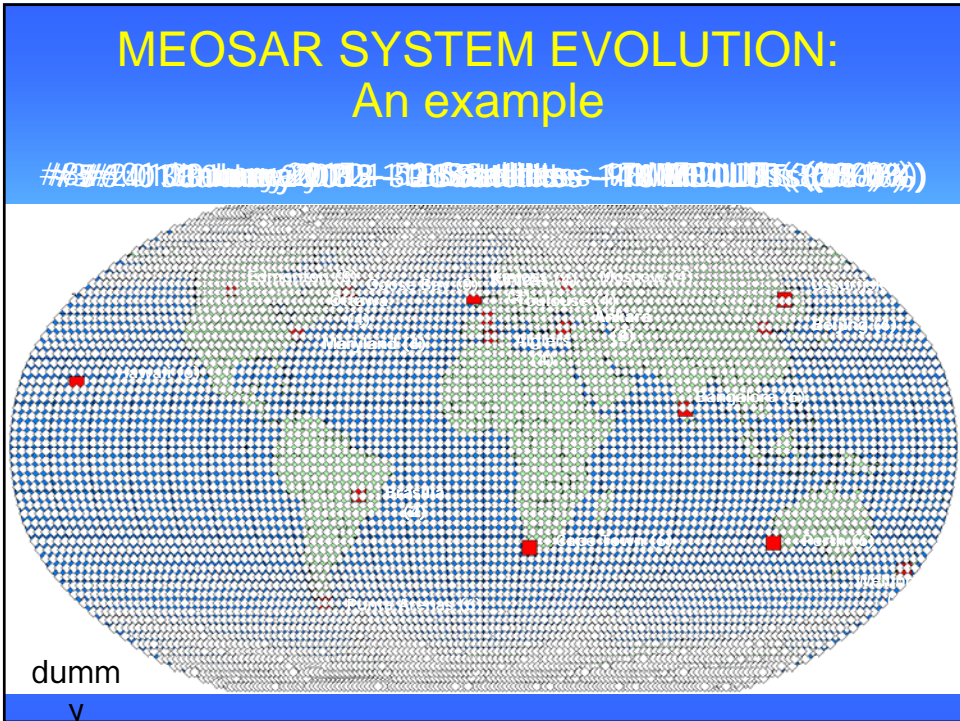
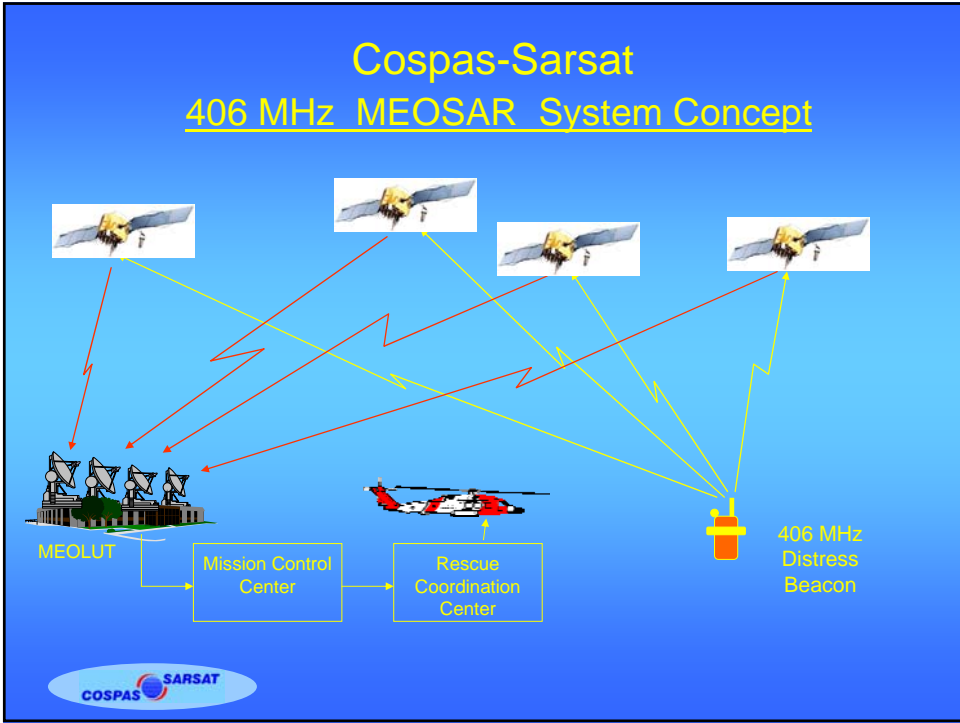
Cospas-Sarsat Operational MEOSAR System



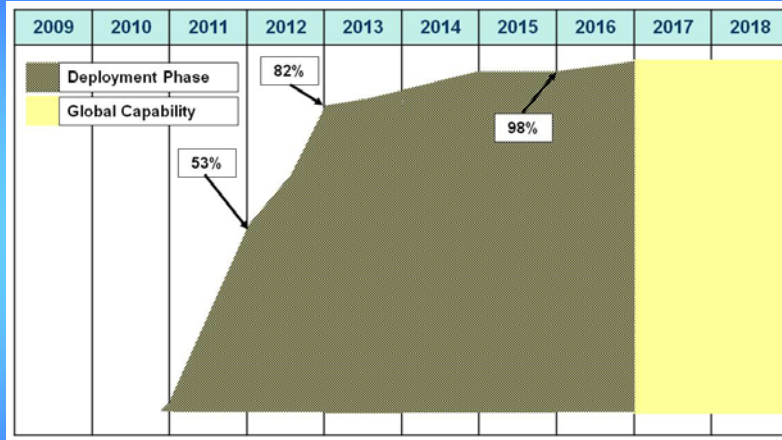
USA (GPS), Russia (GLONASS), and
ESA/EC (Galileo) plan to include 406 MHz
repeaters on future medium-altitude
Earth orbiting (MEO) satellite constellations

- 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.



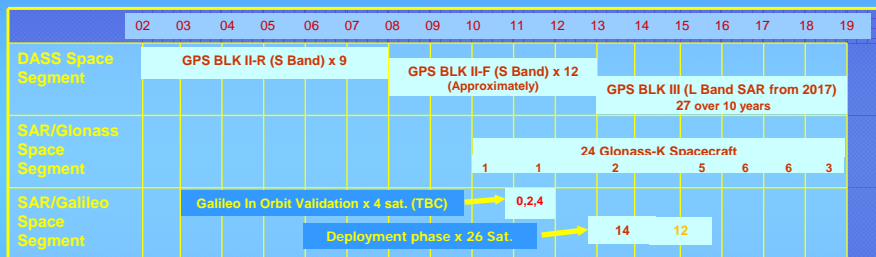


MEOSAR SYSTEM EVOLUTION:

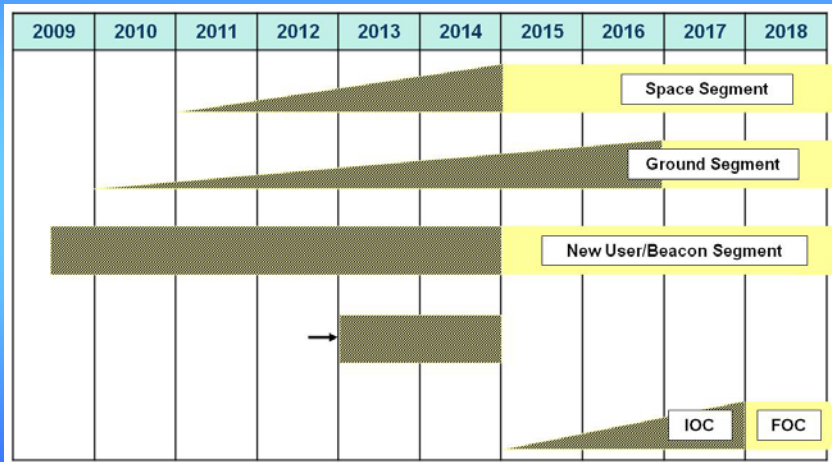


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Cospas-Sarsat Tentative MEOSAR Implementation Schedule



MEOSAR Schedule (based on EWG-1 2010 data)



Cospas-Sarsat

406 MHz MEOSAR Expected Performance

- Global coverage with real-time alerting and location data
- Single burst detection and location
- Accurate independent location capability
 - ◊ 5 km or better 95% of the time, no reliance on a navigation receiver
 - ◊ Higher accuracy with internal navigation receiver
- High level of satellite redundancy and availability
- Resilience to beacon-to-satellite link obstructions (i.e. satellite motion alleviates line-of-sight beacon-to-satellite blockages)
- Better resilience to out-of band interferences
- More efficient use of the allocated frequency band (406-406.1 MHz) allowing more channels to be used



Cospas-Sarsat

Possible 406 MHz Enhancements

Objectives:

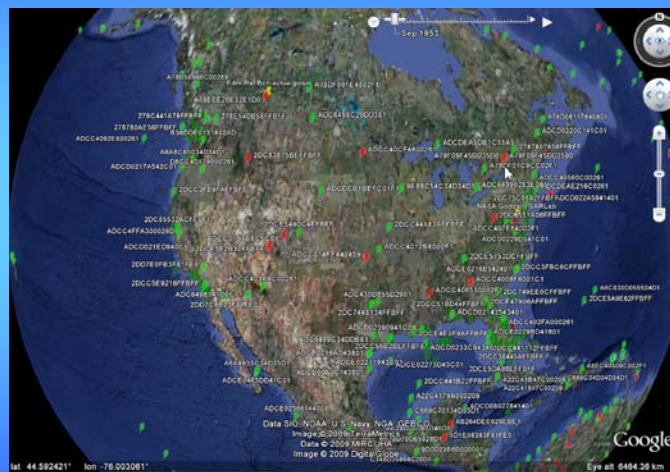
- Reduce cost, size of beacons
- Allow new functionalities (return link)
- Enhance performance (position accuracy and availability, false alert rate)

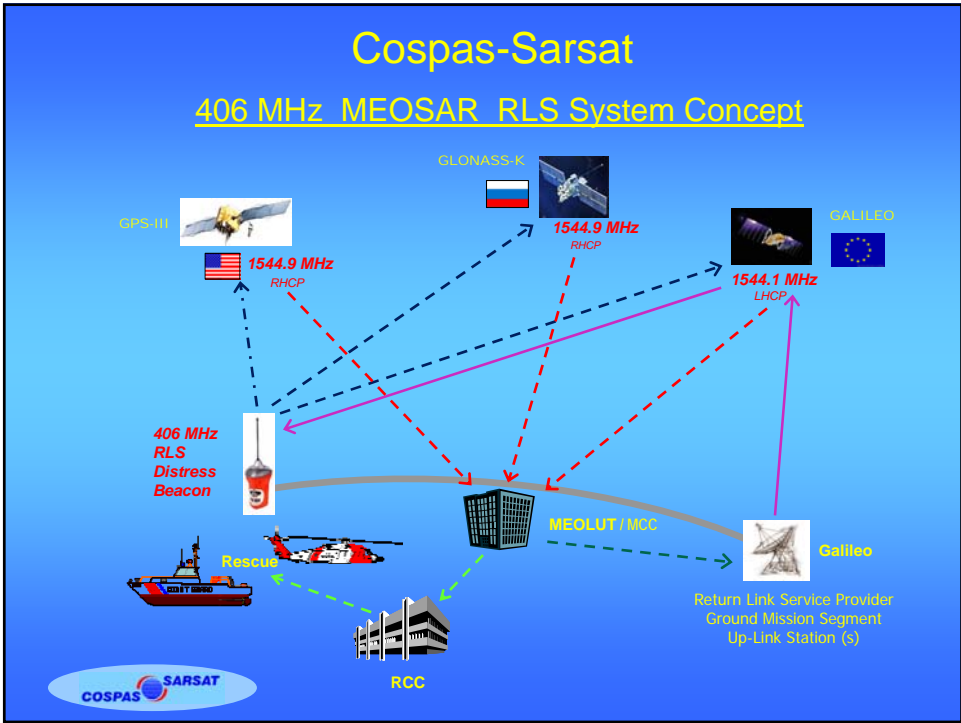
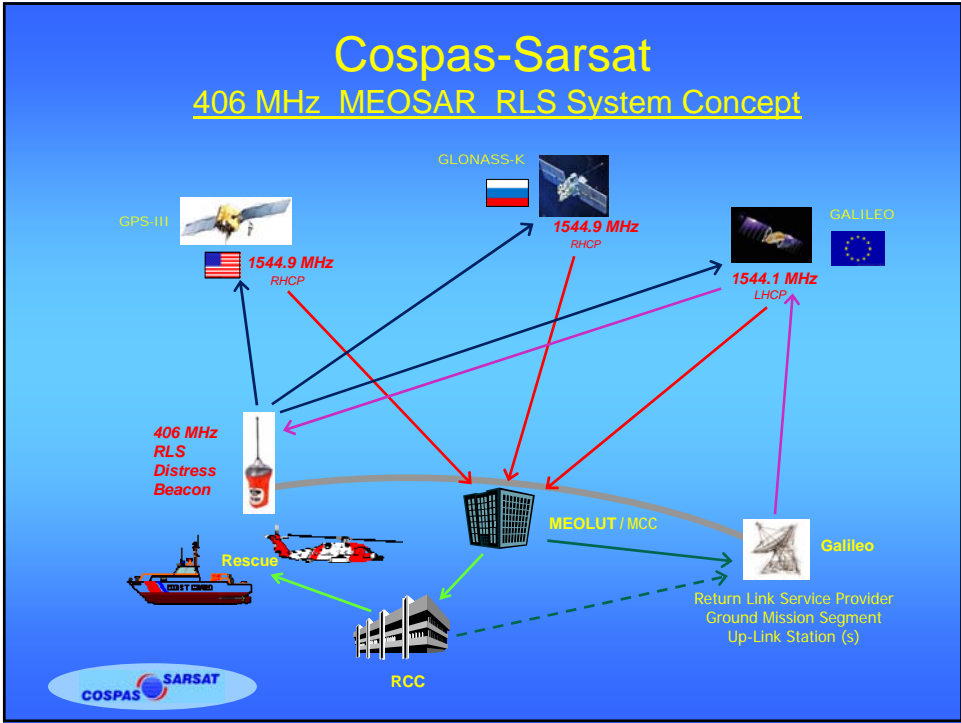
Possible beacon specification changes:

- MEO location accuracy not dependent upon medium term frequency stability.
- Enhanced coding (forward error correcting to replace BCH) might allow lower power requirements and/or higher bit rates
- New, simplified coding protocols for additional data, better accuracy of encoded position data

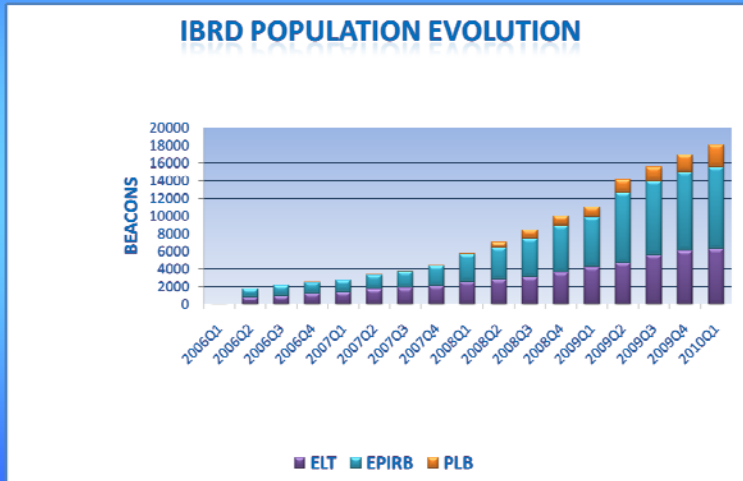


Detection and Localization possible with one burst !

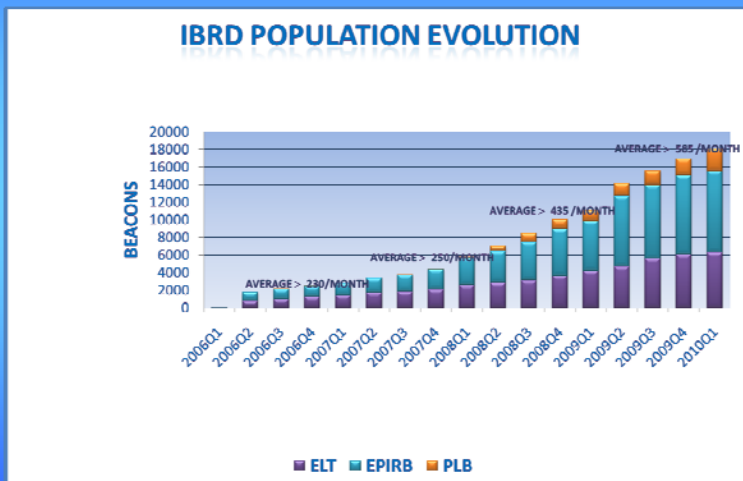




Cospas-Sarsat International Beacon Registration Database Registered beacons evolution (April 2010)



Cospas-Sarsat International Beacon Registration Database Registered beacons evolution (April 2010)



Cospas-Sarsat International Beacon Registration Database



More than 18500 beacons
from 102 Countries



Results of 2010 Survey of Beacon Manufacturers



Survey Highlights (1)

In 2009, **over 228,000** beacons were produced worldwide

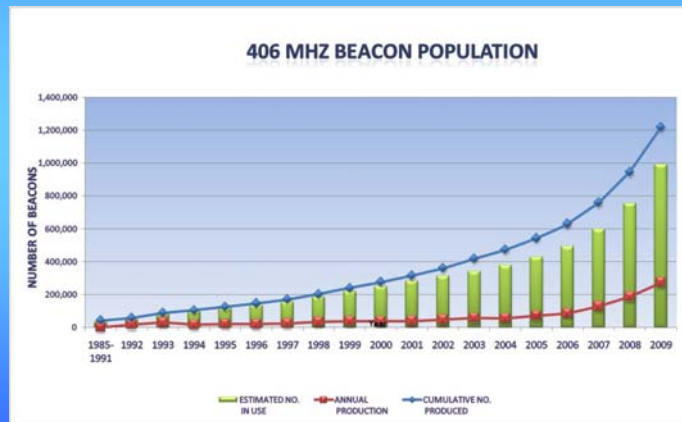
- In 2009: 22.5% annual increase in production over 2008
- In 2008: 186,000 beacons were produced (+45 % over 2007)
- In 2007: 128,000 beacons were produced(+50 % over 2006)
- In 2006: 85,000 beacons were produced (+ 20 % over 2005)



Survey Highlights (2)

~945,000 beacons operating at 406 MHz were in use at the end of 2009

- Annual increase in global beacon population : ~ 25%



Survey Highlights (3)

- Conducted by the Cospas-Sarsat Secretariat since 1991, annually
- 45 beacon manufacturers participated in 2010 survey
- Geographical distribution of participating manufacturers:

- Europe: 46%
- USA and Canada: 31%
- Asia and Australia: 23%



Photo: courtesy of ISC ISDE



Survey Highlights (4)

406 MHz beacon manufacturers in 2009:

- New manufacturers in 2009: 1 (2%)
- Manufacturers with 'zero' production: 11 (24%) , in 2008 - 22 %
- ...with 1 - 499 units produced in 2009: 13(29%), in 2008 – 29%
- ...with > 500 units produced in 2009: 21(47%), in 2008 – 47%



Survey Results

Over 228,000 beacons were produced in 2009 worldwide, including :

- 96,000 EPIRBs (annual production growth: + 25% against 2008)
 - production growth in 2005 (+23.5%); in 2006 (+31.4%), in 2007 (+20%) and in 2008 (+31%)
- 43,000 ELTs (annual production growth: + 3% against 2008)
 - production growth in 2005 (+31 %), in 2006 (- 10%) , in 2007 (+40%), in 2008 (+102%)
- 89,000 PLBs (annual production growth: +33% since 2008)
 - production growth in 2005 (+44 %), in 2006 (+ 30%), in 2007 (+125%), in 2008 (+37%)



Beacons with Location Protocols

in 2009, **~70,000** beacons produced with Location Protocols (LPs)

- 30% of all beacons manufactured in 2009
- PLBs (69%), EPIRBs (23%), ELTs (8%)

trend:

- In 2008: 41% of produced beacons were with LPs
- In 2007, 56 % of produced beacons were with LPs
- In 2006, 40 % of produced beacons were with LPs
- In 2005, 35 % of produced beacons were with LPs

NOTE: In 2005, **71,000** beacons produced worldwide



Cospas-Sarsat Frequency Channels

- 406.025 MHz
 - » Closed in 2002
 - » Population >302,000 in 2009 (annual decrease 8%)
 - » Annual production of 406.025 MHz beacons decreased by 49 % since 2007
- 406.028 MHz
 - » Opened in 2000, closed 1 January 2007
 - » Population > 559,000 (+ 35% since 2008)
 - » Annual production of 406.028 MHz beacons decreased by 2.3 % since 2008
- 406.037 MHz
 - » Opened in 2004
 - » “0” beacon population and “0” production in 2007
 - » Production of 406,037 MHz beacons in 2008: 69,000 units(~30% of 2009 global production) ~



Manufacturers' Plans for 2010

- **Over 250,000** beacons to be produced (+ 10 % over 2009)
 - 93,000 EPIRBs
 - 43,000 ELTs
 - 114,000 PLBs
- Global population is expected to reach 1,100,000 (annual growth is 23%)
- 31.2% of all produced beacons will be LP-beacons
- 65 % of produced beacons will operate in 406.037 MHz channel

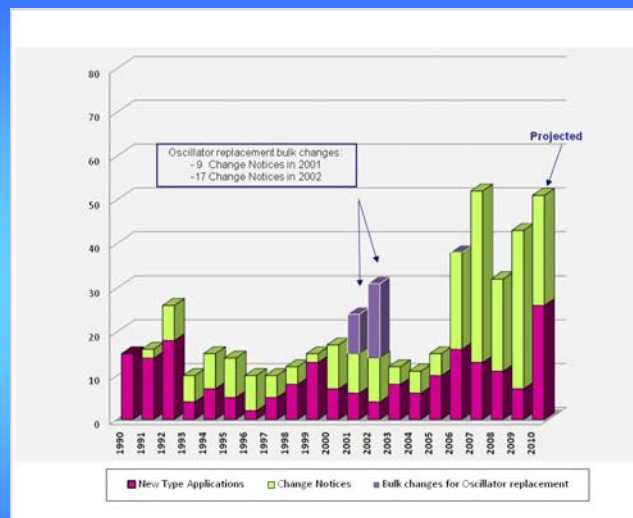


Accuracy of Beacon Manufacturers' Forecast

	Manufacturers' Forecast 2009	Actual 2009	2009 Actual over Forecast Discrepancy, %
EPIRBs and SSAS, 2009 production	95,600	95,200	(-0.3)
ELTs, 2009 production	68,200	43,300	(-36.5)
PLBs, 2009 production	109,600	88,400	(-19.3)
All beacon types, 2009 production	273,400	228,600	(-12.7)
Population, all beacon types	~788,000	~754,000	(-17.4)
TA applications	47	42	(- 10.6)



Type Approval Activity



In 2010, the Secretariat expects **26** TAs for new beacon models and **25** change notices



Thank you !

