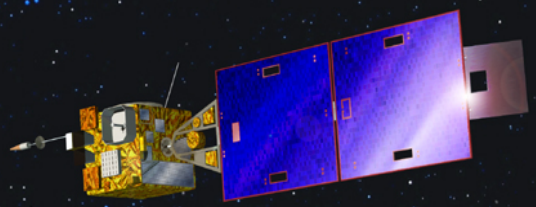
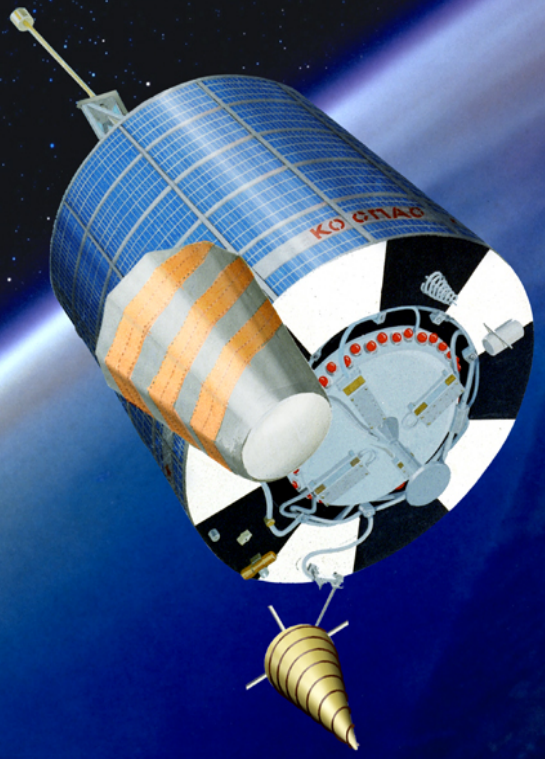
Committee on the Peaceful Uses of Outer Space

Fifty-second session

June 10, 2009

Vienna, Austria





# Update on COSPAS-SARSAT Programme Activities

Yana Gevorgyan

Satellite and Information Service

NOAA, USA

Source: CNES – D. Ducros

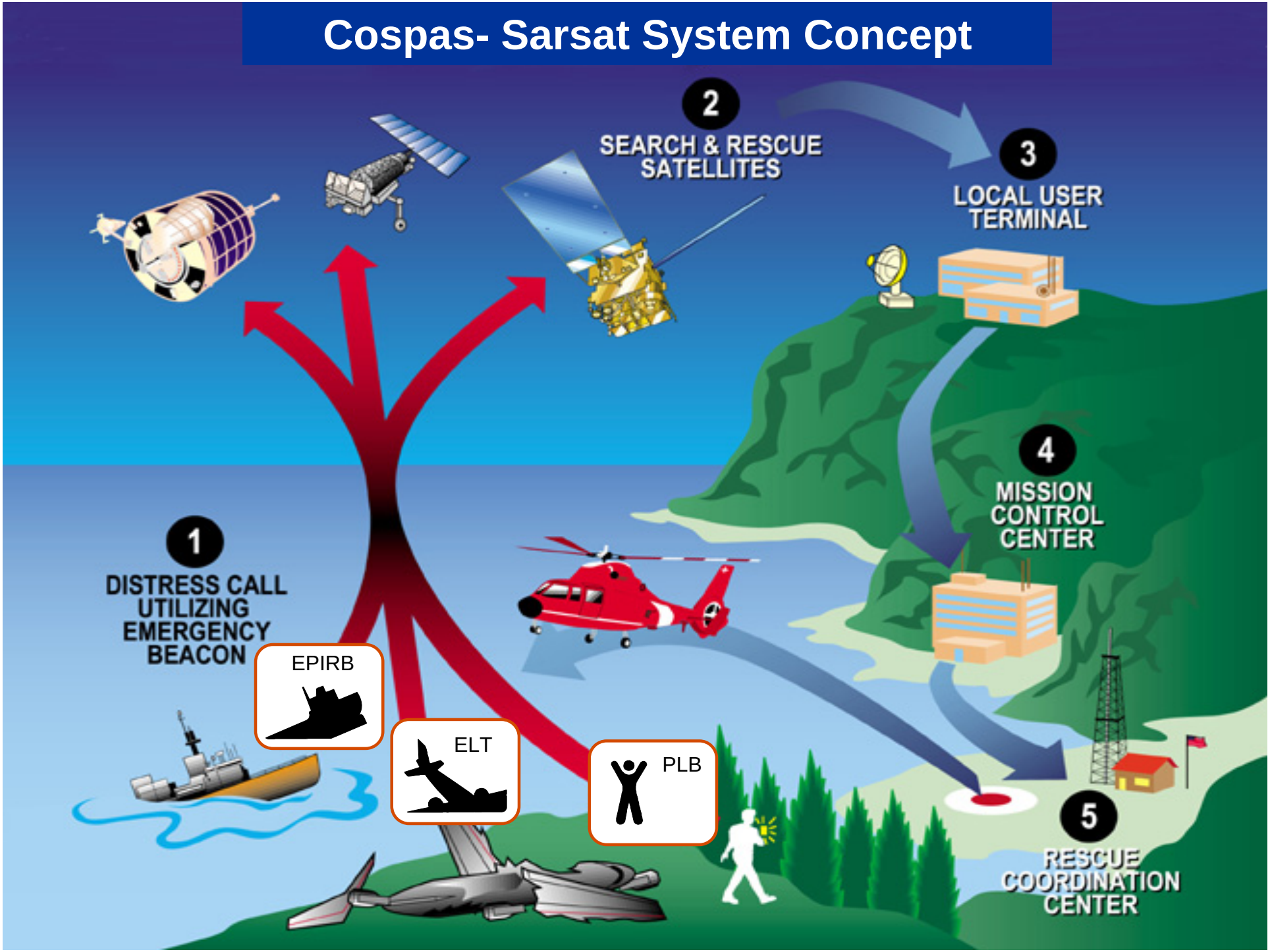
# International Cospas-Sarsat Programme

- C/S provides distress alert and location information to Rescue Coordination Centres (RCCs) for aviation, maritime and land users in distress

- Services are provided world-wide and free of charge for the user in distress

- Alerts are provided using satellite systems to relay and process the transmissions of distress radio-beacons operating on 121.5 or 406 MHz

**In short, COSPAS-SARSAT takes the "search" out of Search & Rescue**


Cospas- Sarsat System Concept
2
SEARCH & RESCUE SATELLITES
3
LOCAL USER TERMINAL
4
MISSION CONTROL CENTER
1
DISTRESS CALL UTILIZING EMERGENCY BEACON
EPIRB
ELT
PLB
5
RESCUE COORDINATION CENTER

# Cospas-Sarsat Overview

## Participating Countries in 2009

**4** Founders: Canada, France, Russia and the USA

**25** Ground Segment Providers

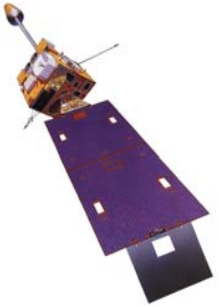
**9** User States

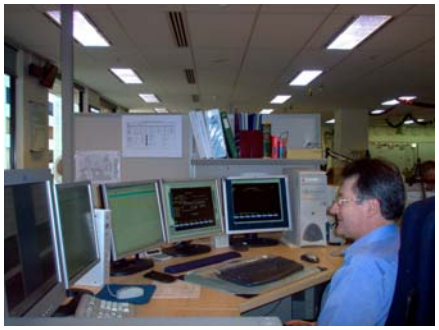
**2** Organisations

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

# Elements of the C/S System

- User
- Beacon
- Space Segment
  - LEOSAR
  - GEOSAR
- Ground Segment
  - Local User Terminal
  - Mission Control Center





Alerts relayed to RCCs

# Emergency Beacons

- **Two types:**
  - **121.5/243 MHz and**
  - **406 MHz (GNSS and non-GNSS)**
- **Three applications:**
  - **Emergency Position Indicating Radio Beacons (EPIRB)**
  - **Emergency Locator Transmitters (ELT)**
  - **Personal Locator Beacons (PLB)**

# Emergency Beacons

EPIRBs

ELTs

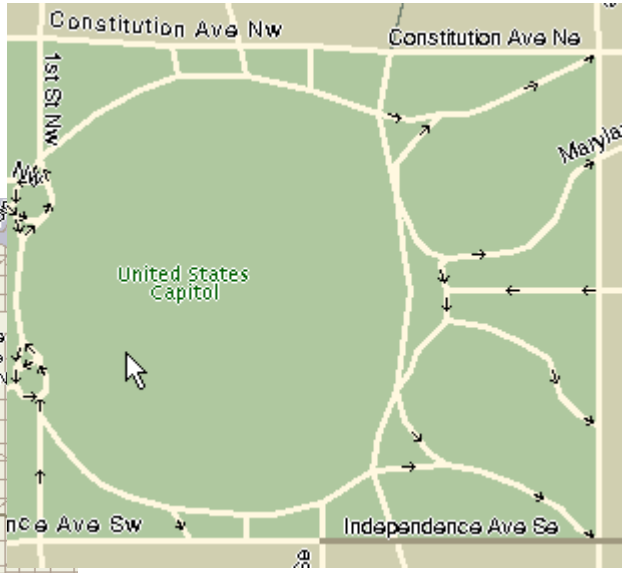
PLBs

SSAS

# Emergency Beacons

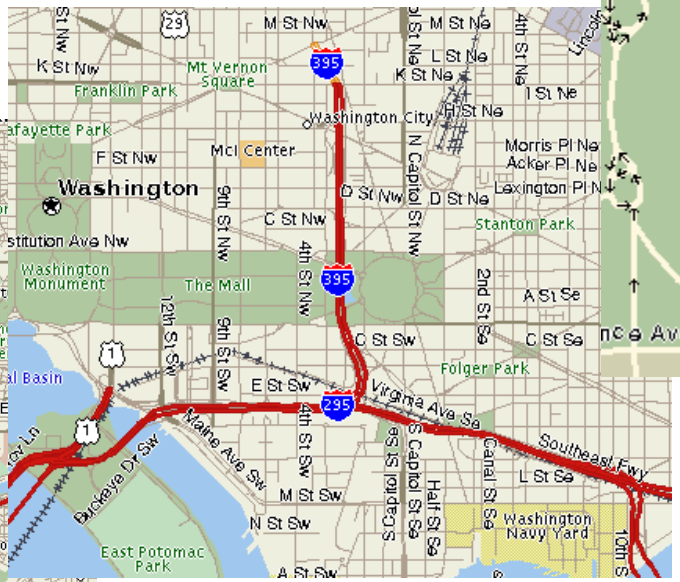
## Comparison of 121.5 MHz vs 406 MHz

### 406 MHz with GPS



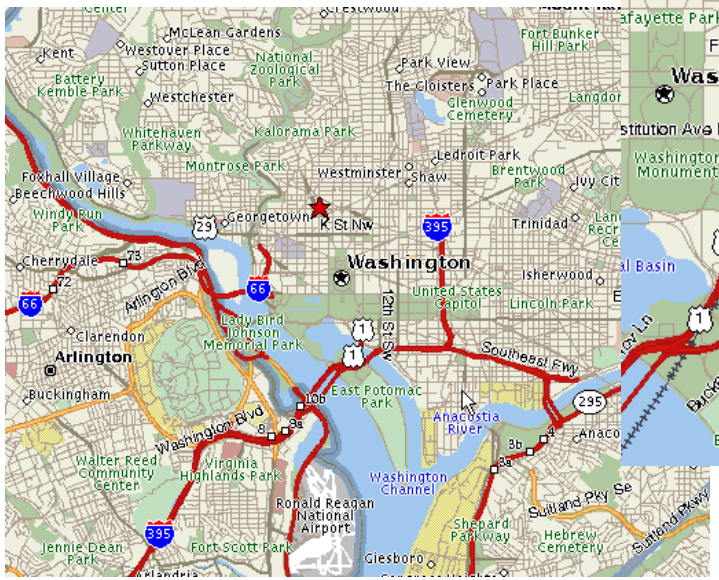

**Search Time = Minimal**

### 406 MHz




**Search Time = 2 - 3 hours**

### 121.5 MHz




**Search Time = 12+ hours**

# Switch to 406 !

- **From February 2009 the Cospas-Sarsat satellite system will no longer process the 121.5 MHz frequency**
- 406 MHz beacons exhibit better performance than "old" 121.5 MHz beacons, but are more expensive - currently about US$ 500 retail price (in the US) for simplest device
- Users could be denied Cospas-Sarsat services if they do not transition to 406 MHz before 2009
- The 406 MHz beacon population was 600,000 at the end of 2007, up 21 % from 2006

# INTERNATIONAL 406 MHz BEACON REGISTRATION DATABASE

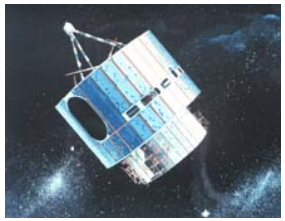
- Beacon registration essential to SAR operation efficiency
- Beacon registration is the responsibility of States
- Too many unregistered 406 MHz beacons
- Cospas-Sarsat implemented an international registration database to assist States in January 2006
- International database is Internet based and allows:
  - States to use database and control entries if they wish
  - Users to register directly if no other option
  - SAR services to access registration data through Internet

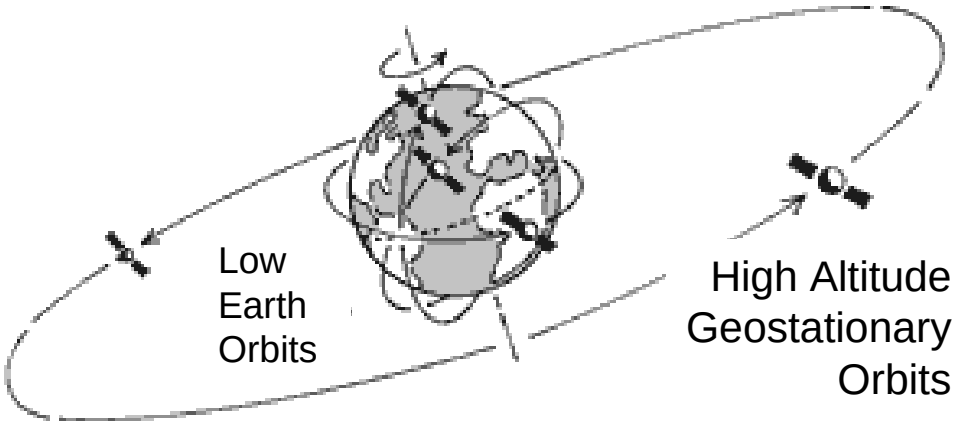
# Space Segment

## 2 Types of Satellites

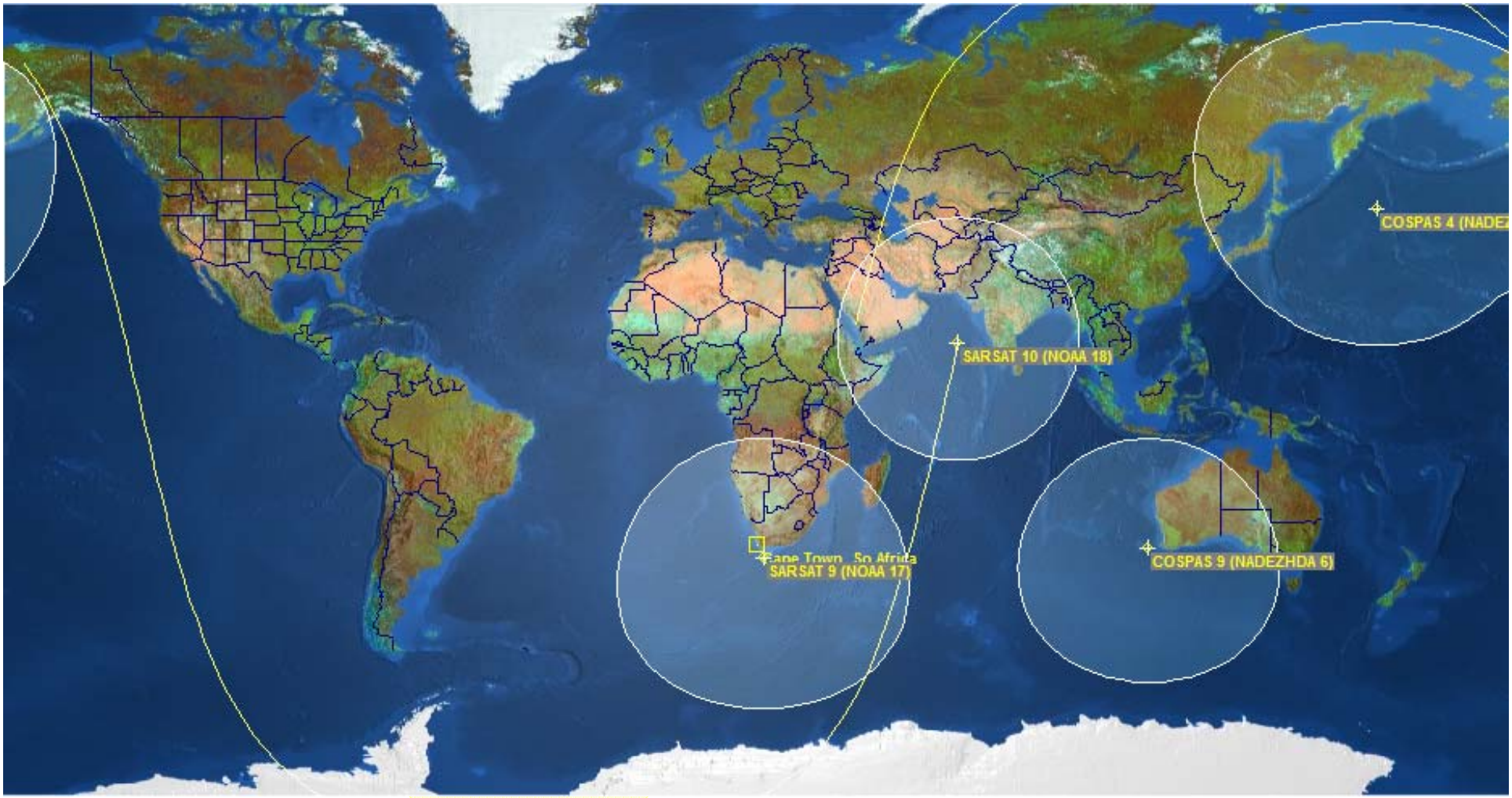
- **Low Earth Orbiting Search And Rescue (LEOSAR)**

- **Geostationary Orbiting Search And Rescue (GEOSAR)**



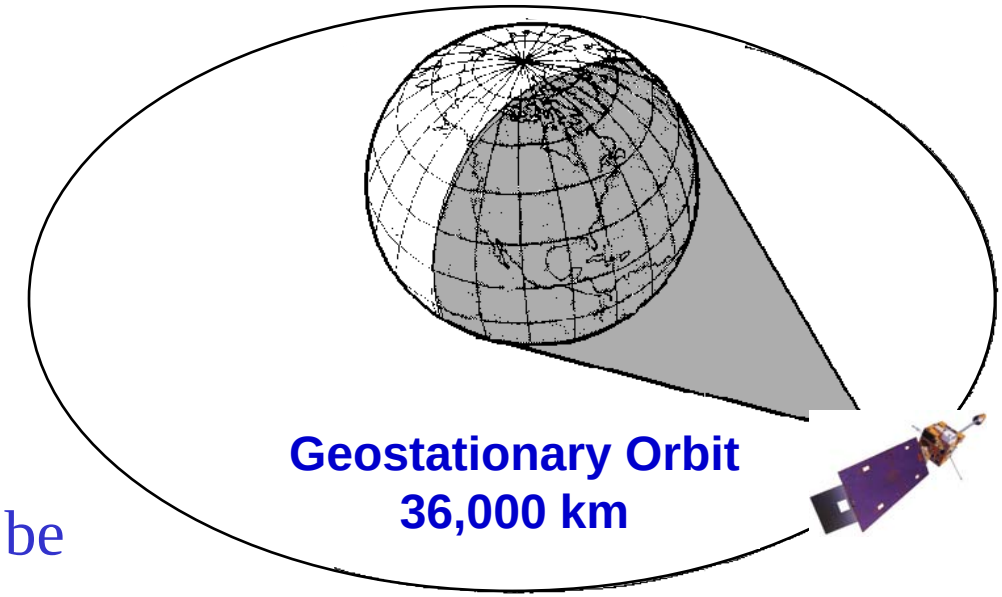


# LEOSAR Footprints



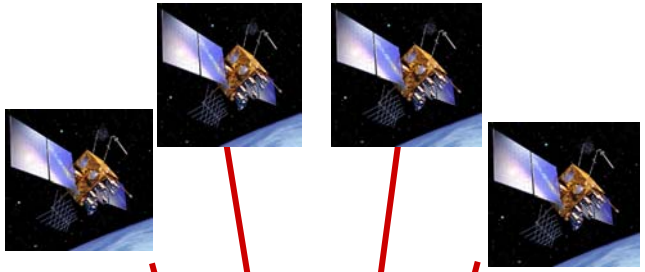
# GEOSAR

- GEOLUTs detect transmissions from 406 MHz beacons relayed by high altitude geostationary satellites
- **Continuous** coverage between 70N and 70 S
- Position information must be acquired from GNSS and encoded in beacon message

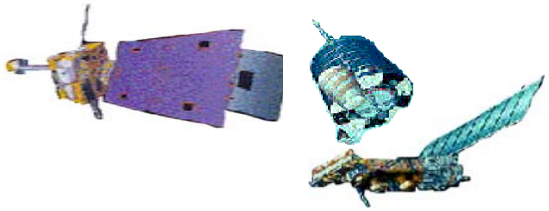


# Use of GNSS in Location Protocol Beacons

4 GPS Satellites



406 MHz Message with Embedded GPS location



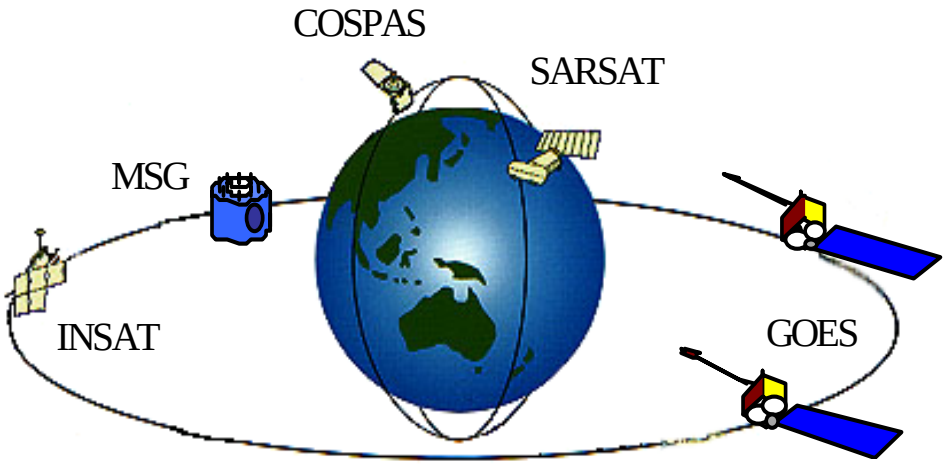
C/S Satellites

LUT

20% of beacons are Location Protocol

# Cospas-Sarsat Today: Combined LEO/GEO System

- At 406 MHz, the Cospas-Sarsat system combines the benefits of its LEO and GEO components:
  - Global LEOSAR coverage
  - Real-time GEOSAR alerting
  - Independent LEOSAR Doppler positioning capability




  - Highly accurate GNSS positioning (some beacons only)
  - High probability of LEO detection even when GEO blocked
  - High system capacity

# Current Space Segment

5 LEO

5 GEO

(Last Updated September 2008)

**Status of Cospas-Sarsat LEOSAR Payload Instruments**

| Satellite | Repeater Instruments | | | SARP | | Comments |
|---|---|---|---|---|---|---|
| | 121.5 MHz | 243 MHz | 406 MHz | Global | Local | |
| Sarsat-7 | F | NO | F | F | F | |
| Sarsat-8 | NO | NO | F | F | F | |
| Sarsat-9 | F | F | F | F | F | |
| Sarsat-10 | F | F | F | F | F | |
| Sarsat-11 | F | F | F | F | F | |

**Status of Cospas-Sarsat GEOSAR Payload Instruments**

| Satellite | Status | GainControl | Comments |
|---|---|---|---|
| GOES-East (75° W) | F | AGC | |
| GOES-West (135° W) | F | AGC | As of 7 April 2008, the SARR on GOES-West has returned to normal operations. |
| GOES-13 (105° W) | NO | AGC | During the period when GOES-11 is affected by the solar eclipse, GOES- 13 will be turned on and will remain on for the duration of the solar eclipse season to provide partial coverage for LUTs in view of GOES-13. GOES-13 will be on from 14 August to 19 October 2008. |
| INSAT 3A (93.5° E) | L | TBD | System not fully commissioned, however, alerts are used operationally by SAR services. |
| MSG-1 (9.5° E) | F | Fixed | Reactivated on 11 August 2008. |
| MSG-2 (0°) | F | Fixed | |

# Ground Segment

## Local User Terminals

- Ground based receiving station
- Tracks satellites, receives beacon signals
- Calculates and transmits beacon positon

## Mission Control Centers

- Display and merge beacon locations
- Generate alerts for RCCs
- Communicate with other MCCs

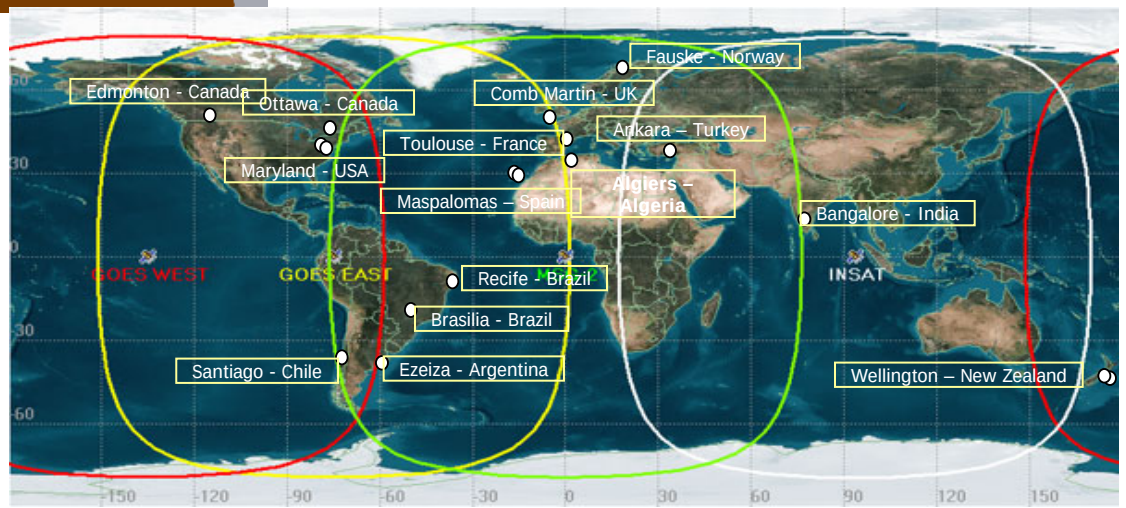
# LEOLUTS and GEOLUTS


**Ground Segment**

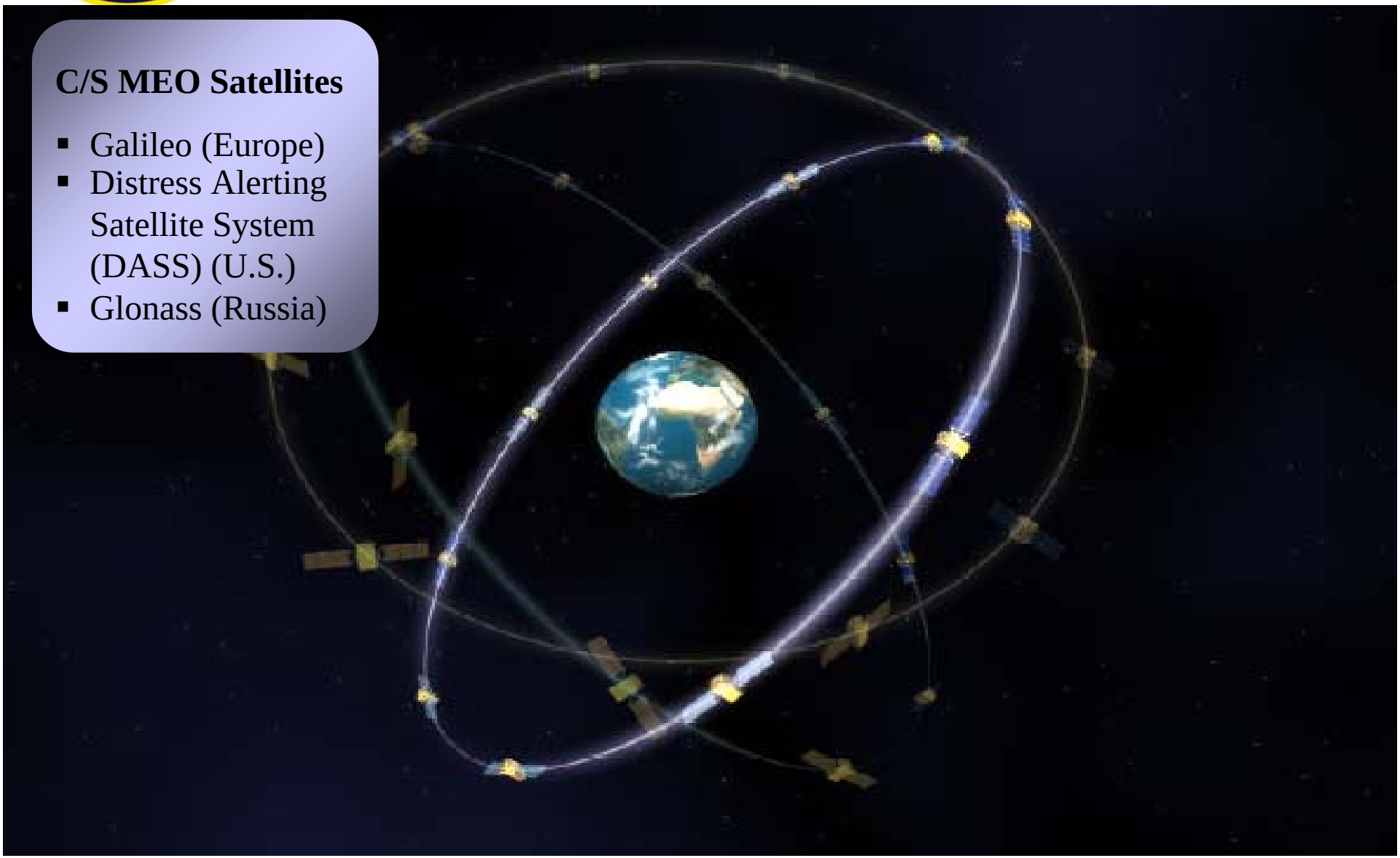
29 Mission Control Centres (MCCs)

45 Local User Terminals (LEOLUTs) in the LEOSAR System

19 Local User Terminals (GEOLUTs) in the GEOSAR System



# Evolution of Cospas-Sarsat: MEOSAR System



**C/S MEO Satellites**

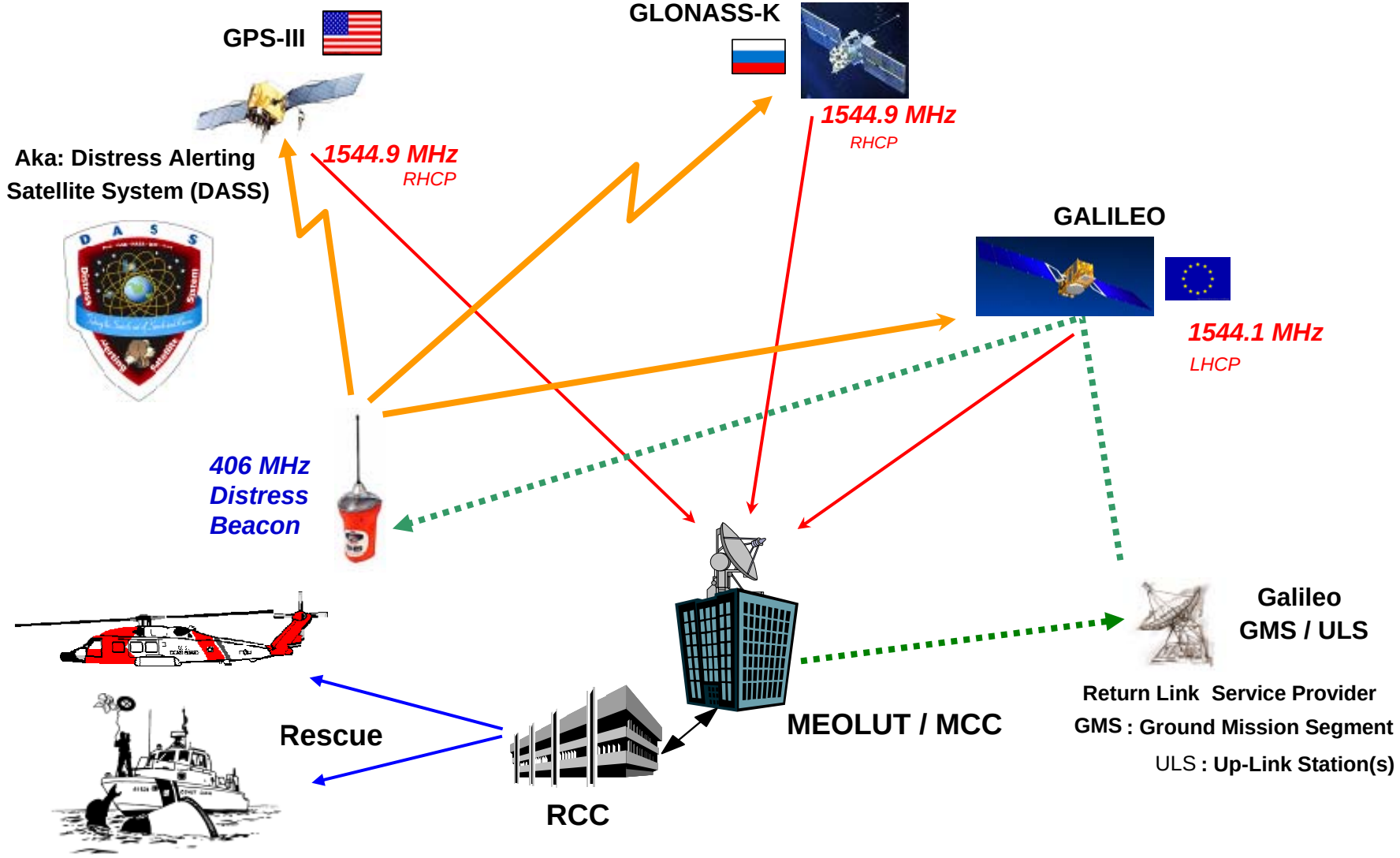
- Galileo (Europe)
- Distress Alerting Satellite System (DASS) (U.S.)
- Glonass (Russia)

# Cospas-Sarsat Tomorrow: MEOSAR

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

- Constellations will be fully compatible
- Coordinating with C/S on specifications and compatibility
- Operational alerts could be available in System from 2013 – 2015 time frame

# MEOSAR System Concept



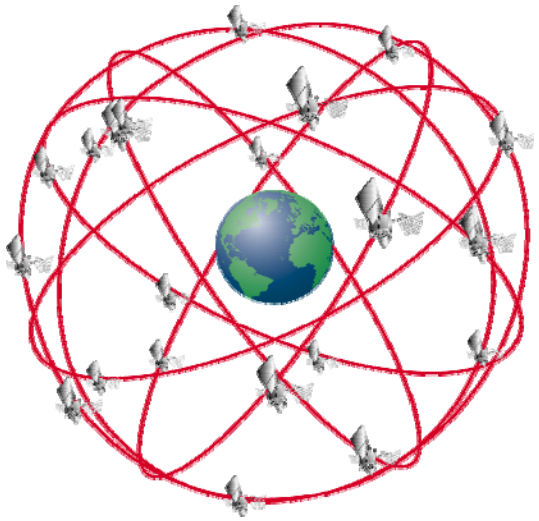
# 4 LEOSAR Footprints

# 1 MEOSAR and 4 LEOSAR Footprint

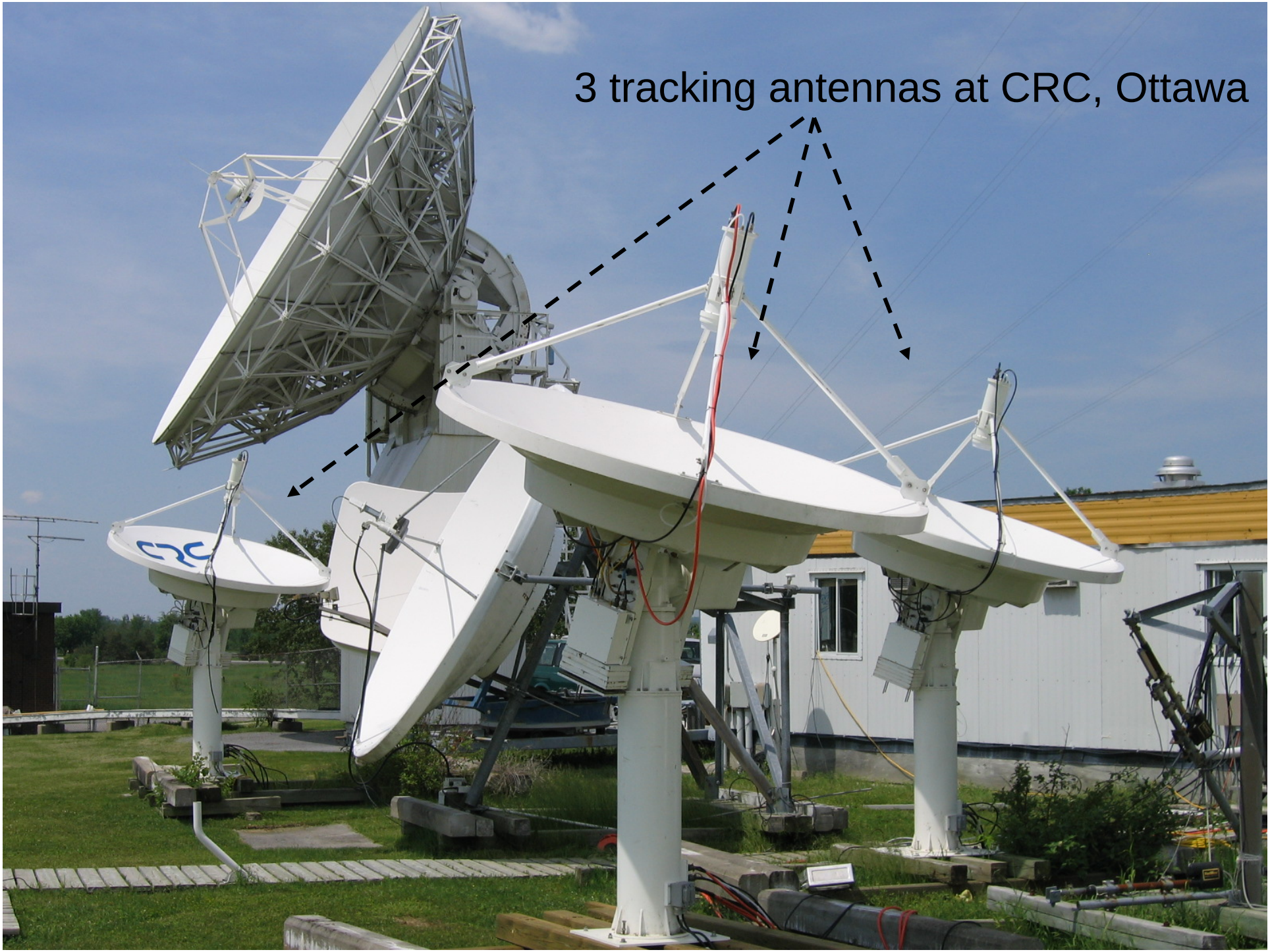
# MEOSAR Benefits

MEOSAR benefits:

- continuous, global coverage
- multiple signal paths for more reliable reception
- beacons located quickly (in seconds)
- LEO is like slower, dial up Internet
- MEO is like high speed Internet, always connected



- more effective use of SAR resources
- better SAR service, more lives saved
- MEOSAR enhancements will improve system well into 21st century


3 tracking antennas at CRC, Ottawa

# Cospas-Sarsat Strategic Plan

## 5 Strategic Goals:

1. Continuous and effective System operation
2. A comprehensive management structure to support System evolution and ensure Program continuity
3. Worldwide support for the Program
4. Participants, users and customers use and operate the System to its full potential
5. A robust industrial base to support system operations

# Cospas-Sarsat Strategic Plan

***Some related objectives and actions...***

- Coordinate with ICAO, IMO, and other appropriate bodies to identify SPOCs and ensure that proper arrangements and systems are in place to deliver and receive distress alerts
- Develop the Int'l Cospas-Sarsat Handbook for RCCs and Competent Authorities (*now available online for download*)
- Identify Administrations that would benefit from using the System and support their use of C-S alert data
- Encourage a wider use of the Int'l Beacon Registration Database (IBRD)
- Work with int'l agencies to conduct training seminars for non-Participants
- Consider opportunities to lower beacon costs…*(to bring the technology into the hands of those who need it)*

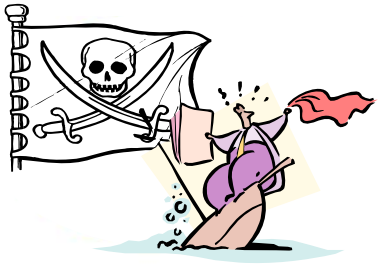
# COSPAS-SARSAT Workshops

**UN co-sponsored workshops on Satellites-aided Search and Rescue**

| | |
|---|---|
| 1998; 1999 | UN/Spain for Western African States; Maspalomas, Spain |
| 2002 | UN/India for Indian Ocean region; Bangalore, India |
| 2004 | UN/USA for Latin America and the Caribbean; Miami Beach, United States |
| 2005 | UN/Australia for the Oceania region; Canberra, Australia |
| 2006 | UN/South Africa; Cape Town, South Africa |
| 2009 | UN/USA for Latin America and the Caribbean, Miami Beach, United States |

19-23 January 2009, Miami Beach, USA –

22 nations participated in training to promote an awareness of the COSPAS-SARSAT System and to establish a formal interface with user countries for better understanding and coordination of the system's operations.

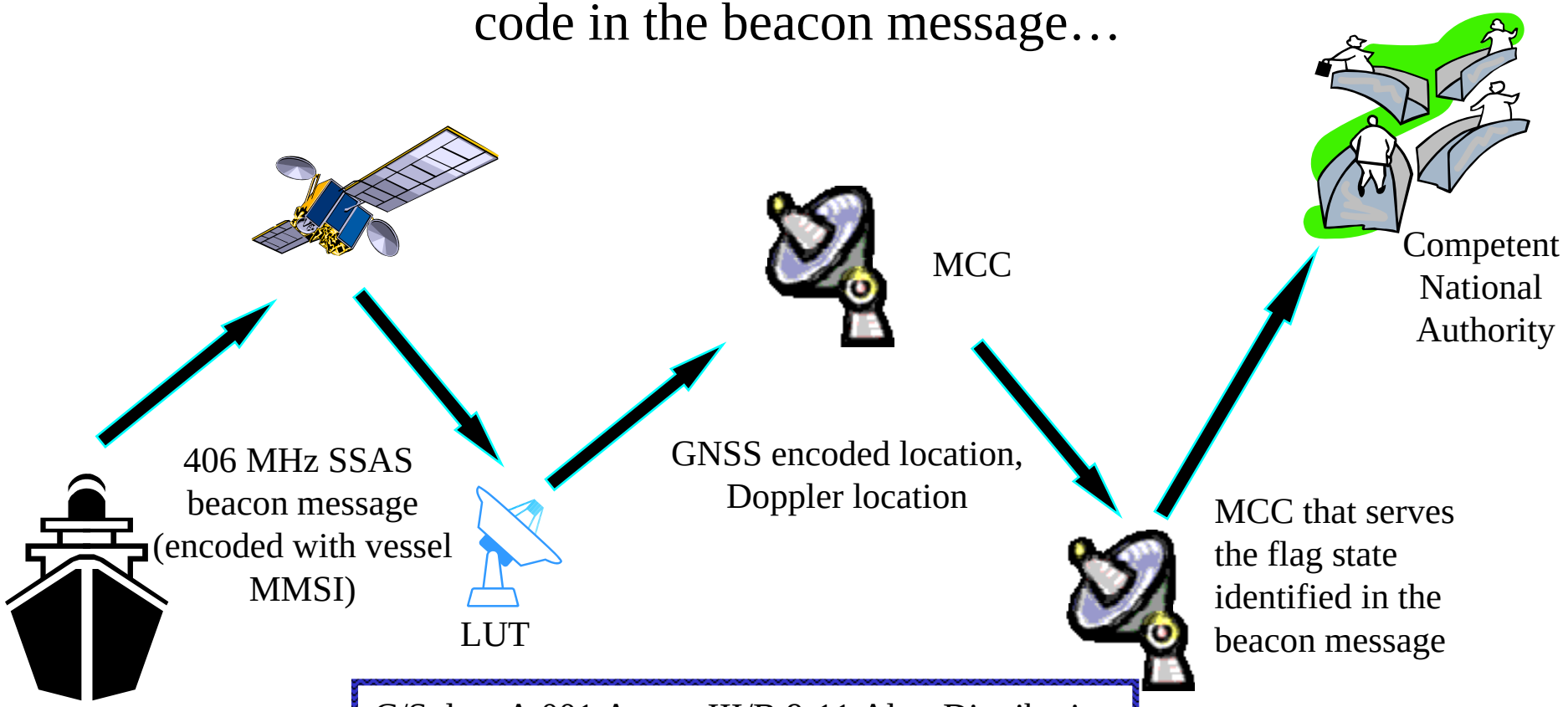


# Ship Security Alert System

- Cospas-Sarsat has implemented a SSAS service based on 406 MHz transmitters as decided at CSC-31 (October 2003)
- Required minimal modifications to the System were implemented and tested by 1 July 2004
- Requirements for SSAS were outlined by IMO in SOLAS Chapter XI-2 “Special Measures to Enhance Maritime Security”

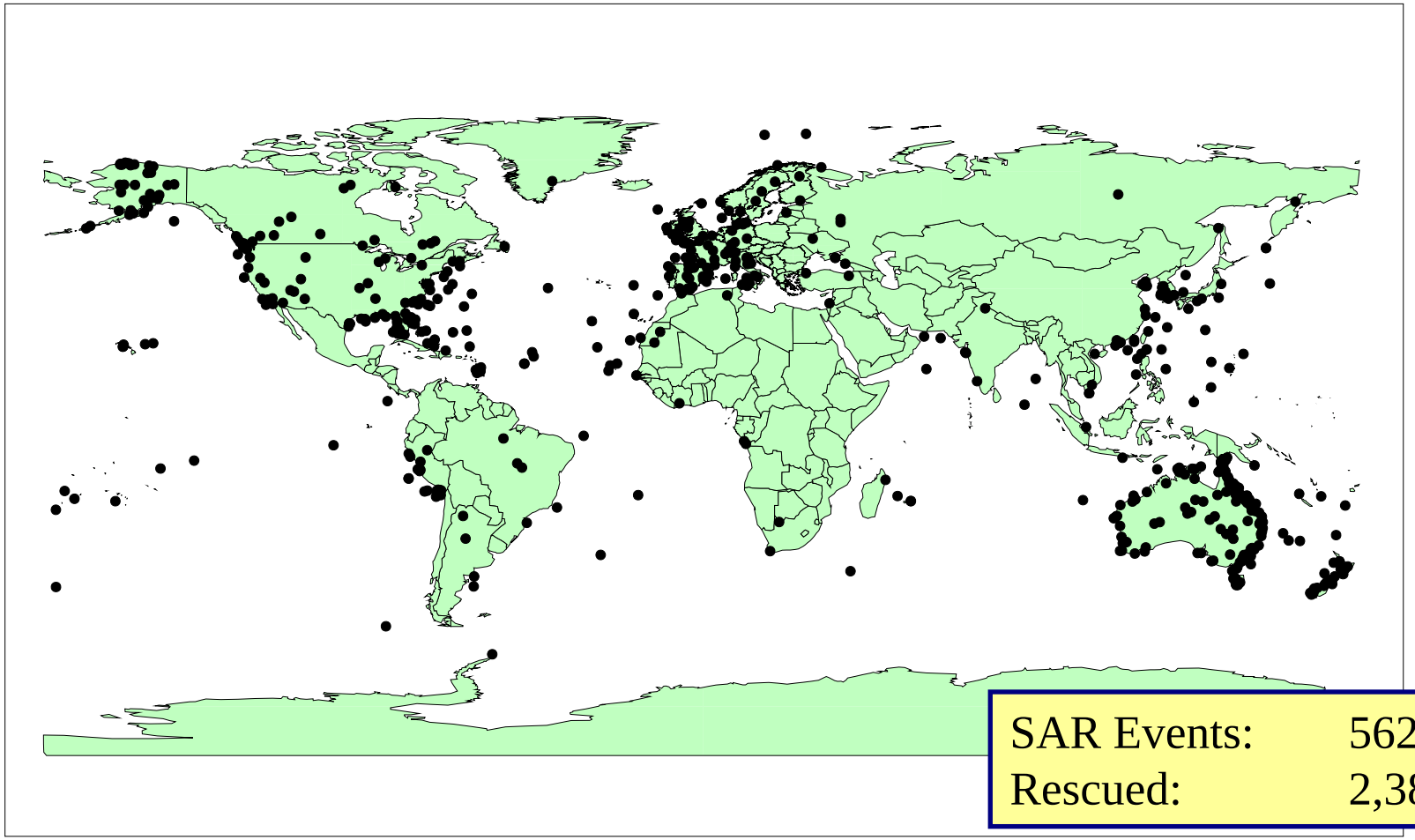
# Alert Distribution Procedure

…the alert should be processed according to the same procedures that apply for 406 MHz distress alerts except that the resulting ship security alert message will be forwarded based only on the country code in the beacon message…




C/S doc. A.001 Annex III/B.9-11 Alert Distribution

# Cospas-Sarsat Overview
## 2007 - Alert Locations



| | |
|---|---|
| SAR Events: | 562 |
| Rescued: | 2,386 |

# SAR EVENTS and RESCUES

**System Operations**

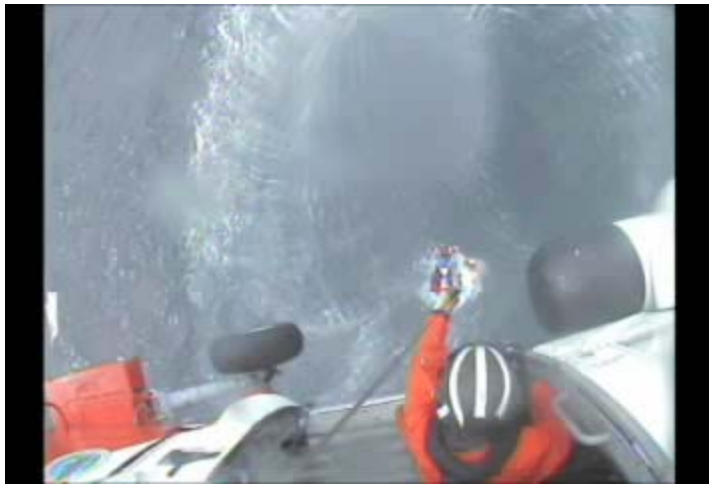
From January to December 2007, the Cospas-Sarsat System provided assistance in rescuing 2,386 persons in 562 SAR events:

| | |
|---|---|
| • Aviation distress: | 194 persons in 98 SAR events |
| • Maritime distress: | 2,048 persons in 369 SAR events |
| • Land distress: | 144 persons in 95 SAR events |

The 406 MHz system was used in 340 of these events (1,927 persons rescued) and the 121.5 MHz system was used in the other 222 SAR events (459 persons rescued).

From September 1982 to December 2007, the Cospas-Sarsat System provided assistance in rescuing at least 24,798 persons in 6,766 SAR events.


AP



# For More Info…

**Visit Our Website! www.cospas-sarsat.org**

**Email: mail@cospas-sarsat.int**