SARSAT System Overview (including Space Segment)

SAR Controllers Workshop 2019

March 5 – 7, 2019

Allan Knox

NOAA SARSAT

Program Analyst and Acting USMCC Manager

Introduction/Presentation Plan

- Provide Overview of US operated Search and Rescue Satellite Aided Tracking (SARSAT) System
  - Space Segment
  - Ground Segment
  - Beacon Segment
- Questions?
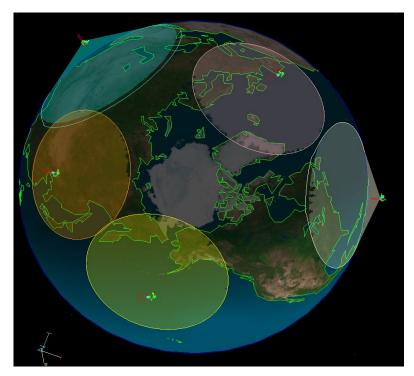
SARSAT System Overview

Satellite Types - LEO

There are 3 types of operational satellites used by SARSAT:

1. The US is currently operating 5 Low-Earth orbiting (LEO) satellites

Each satellite is orbiting at an altitude ~ 850 km has ~ 6% Instantaneous Field of View Coverage on the Earth & completes ~14 orbits/day, covering every location on the earth at least twice.
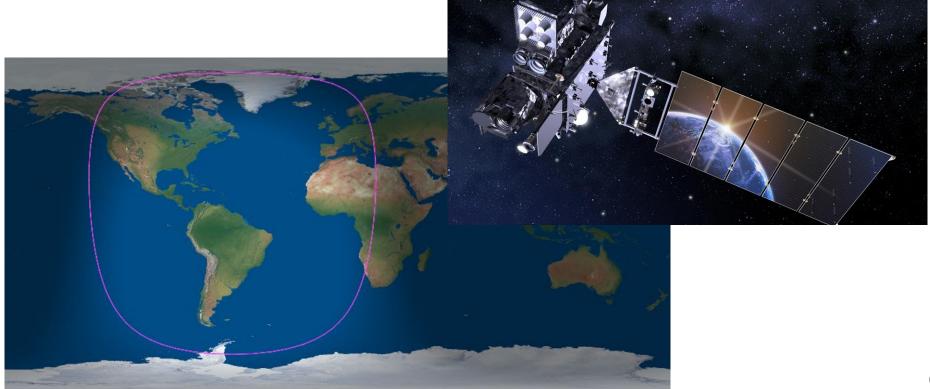
LEOSAR Space Segment Status

- LEOSAR Space Segment

  o Metop-B (launched SEP 12) 5 yr design, beyond its design life

  o NOAA-15 (launched in MAY 98) 2 yr design, 19 yrs on orbit,
    17 yrs beyond its design life

  o NOAA-18 (launched MAY 05) 2 yr design, 12 yrs in orbit, 10 yrs beyond its
    design life

  o Metop-A (launched SEP 06) 5 yr design, 11 yrs in orbit, 6 yrs beyond its
    design life

  o NOAA-19 (launched FEB 09) 2 yr design, 6 yrs in orbit, 4 yrs beyond its
    design life

  NOAA to Decommission SARSAT 15, 18, 19 in FY-2022

Satellite Types - GEO

2. **The US currently operates 2 Geosynchronous Earth orbiting (GEO) satellites**
Each satellite is orbiting at an altitude ~ 36000 km
& has ~ 40% Instantaneous Field of View Coverage
on the Earth & completes ~1 orbits/day.

GEO Space Segment status

- GEOSAR Space Segment

  o Electro-1, (launched JAN 11), 10 yr design, 7 yrs on orbit

  o INSAT-3A, (launched APR 03), 12 yr design, 15 years on orbit 3 yrs beyond design life

  o MSG 3, (launched JUL 12), 7 yr design, 6 yrs on orbit

  o Luch 5A, (launched DEC 11), 10 yr design, 7 yrs on orbit

  o GOES-15, (launched MAR 10), 10 yr design life, 8 yrs on orbit

  o GOES-16, (launched NOV 16), 10 yrs design life, 2 yrs on orbit

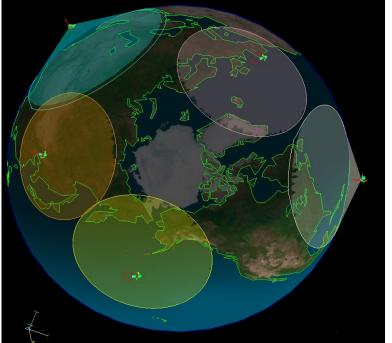 o GOES-17, (launched MAR 18), 10 yr design life. 8 months on orbit

Satellite Types - MEO

3. **The US currently is operating 22 Medium Earth Orbiting (MEO) satellites**

Each satellite is orbiting at an altitude ~ 20000 km & has ~ 33% Instantaneous Field of View Coverage on the Earth & completes ~2 orbits/day. Constellation size ensures that ALL areas of the earth are covered in real-time!
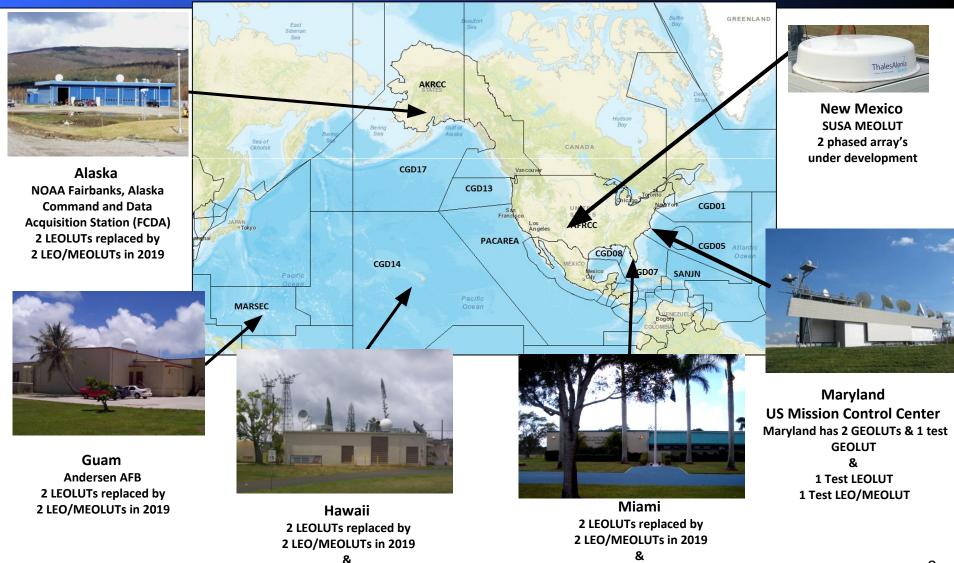

There are now 17 Galileo w an L-band SARR payload (13 in use by US)

US SARSAT Ground Segment

Alaska
NOAA Fairbanks, Alaska
Command and Data
Acquisition Station (FCDA)
2 LEOLUTs replaced by
2 LEO/MEOLUTs in 2019

New Mexico
SUSA MEOLUT
2 phased array's
under development

Guam
Andersen AFB
2 LEOLUTs replaced by
2 LEO/MEOLUTs in 2019

Hawaii
2 LEOLUTs replaced by
2 LEO/MEOLUTs in 2019
&
6 antenna MEOLUT

Miami
2 LEOLUTs replaced by
2 LEO/MEOLUTs in 2019
&
6 antenna MEOLUT

Maryland
US Mission Control Center
Maryland has 2 GEOLUTs & 1 test
GEOLUT
&
1 Test LEOLUT
1 Test LEO/MEOLUT

Ground Segment

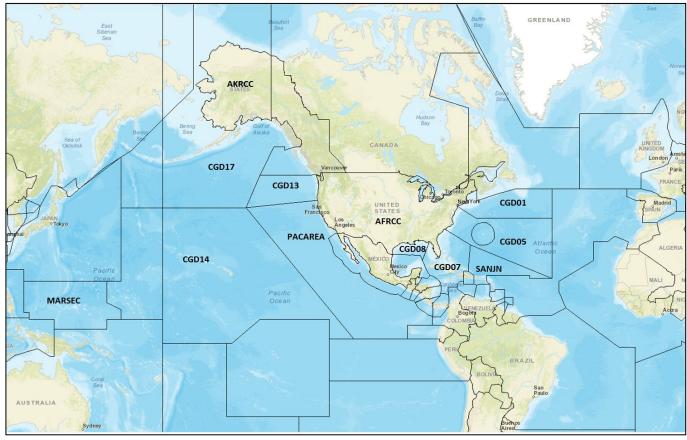## United States Mission Control Center (USMCC)

- Receives alerts from national LUTs and foreign MCCs

- Validates, matches, and merges alerts to improve location accuracy and determine the correct destination

- Correlates with NOAA registration database and append info to alert

Ground Segment

United States Mission Control Center (USMCC)
Geographically sort and then transmit alerts to appropriate
Rescue Coordination Centers (RCCs) and SAR Points of Contact (SPOC)

Ground Segment

United States Mission Control Center (USMCC)

- Filters redundant data

- Performs system support and monitoring functions

- Alert data received by the MCC is archived for access at a later time if required

- A record is created when sites close (beacon stops transmitting) in the Incident History Database (IHDB)

- The IHBD is populated by Search and Rescue Personnel and maintained by the USMCC to provide the history of why each SARSAT alert was received by USMCC

- The IHDB records tell the story of how each SARSAT alert case was handled, who handled it, and the accuracy of the information in the Registration Database

COSPAS-SARSAT Beacons

Activation:

- **Manual**

- **Automatic (Hydrostatic/G-Switch)**

Signal:

- **406 MHz (Digital)**

- **121.5 MHz (Analog) Homing**

Applications:

- **Aviation - Emergency Locator Transmitter (ELT)***

- **Maritime - Emergency Position-Indicating Radio Beacon (EPIRB)**

- **Personal/Land - Personal Locator Beacon (PLB)**

- **Security - Ship Security Alert System (SSAS)**

   *Most US general aviation ELTs are still 121.5 MHz, which are no longer monitored by Cospas-Sarsat

SARSAT Beacon Totals

- More than 607,432 U.S. beacons in the NOAA Registration Database as of 19 Feb 19:
  o 110,401 ELTs
  o 247,659 EPIRBs
  o 249,105 PLBs
  o 263 SSAS
- 134,607 DoD devices registered in JSETS
- Estimated worldwide beacon population: ~2,000,000

SARSAT Rescues

As of Dec 31, 2018

340 Rescues in the United States during Calendar Year 2018

Rescues at sea: 219 people rescued in 73 incidents
Aviation rescues: 32 people rescued in 15 incidents
Terrestrial rescues: 89 people rescued in 60 incidents

Number rescued world-wide since 1982: over *43,000*

Number rescued in United States since 1982: *8,689*

SARSAT Saves

Home Port – Wilmington, NC
On 26 November 2018 at 2314 UTC (1814 EST) an Emergency Position Indicating Radiobeacon (EPIRB) was detected at 33 31.0N 075 00.8W, 100 NM southeast of Cape Lookout, NC. It was activated when a sailing vessel, with 4 people on board, demasted. Coast Guard District 5 received the alert and launched a C-130 aircraft from Air Station Elizabeth City to locate the vessel, then diverted Coast Guard Cutter ESCANABA to the scene. The ESCANABA assisted the disabled vessel to shore with no report of injuries. **4 SARSAT RESCUES**

Importance of Registration
Register online at beaconregistration.noaa.gov

- **Digital data transmitted by beacon provides nationality and type of beacon and aids in tracking.**

- **Emergency contact information and home port are listed in registration**

- **Tail number and identifying information can be encoded into the beacon**

- **Registration can include information about the owner/operator, specifics on aircraft or vessel, capability of the beacon and/or medical concerns of the owner. This information allows for a more coordinated, timely and prepared search and rescue response by SAR authorities.**

- **Often, false alerts are resolved prior to dispatching limited search and rescue resources, protecting those valuable resources for actual cases, saving tax dollars, and protecting search and rescue crews.**

Importance of Registration

- **Digital data transmitted by beacon provides nationality and type of beacon**

- **Emergency contact information and home port are listed in registration**

- **Tail number or other identifying information can be encoded into the beacon**

- **Registration Database provides additional information about the owner/operator, and can include specifics on aircraft or vessel**

- **In most cases, false alerts are resolved prior to launching SAR resources, saving taxpayer $$**

Questions?

Contact Info

Mr. Allan Knox

Acting USMCC Operations Manager
SARSAT Program Analyst

NESDIS/OSPO/DSB/SARSAT

allan.knox@noaa.gov

301-817-4144 (Office)