U.S. Search and Rescue Satellite-Aided Tracking (SARSAT) Overview

65th Civil GPS Service Interface Committee (CGISC)
April 21, 2026

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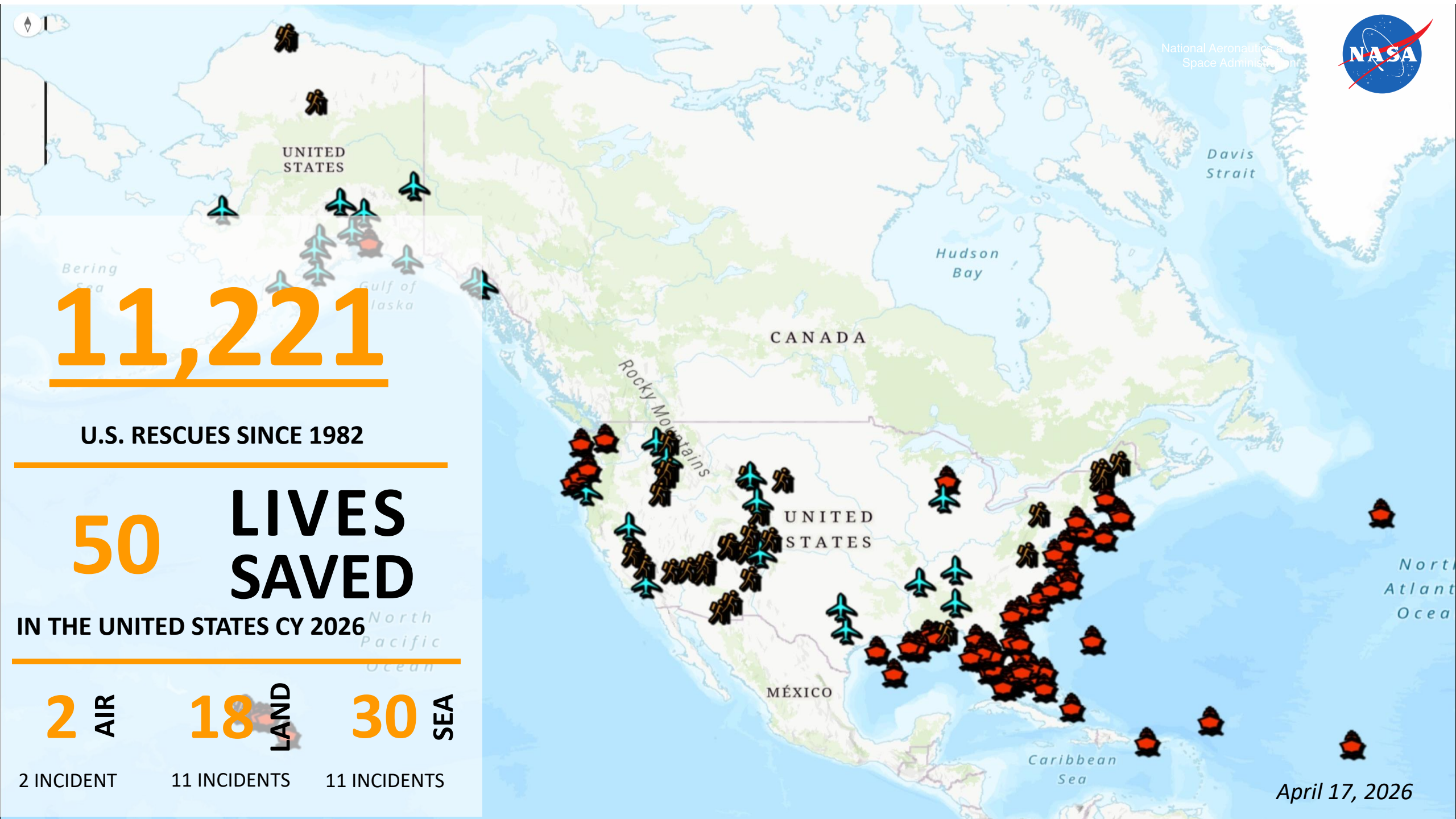
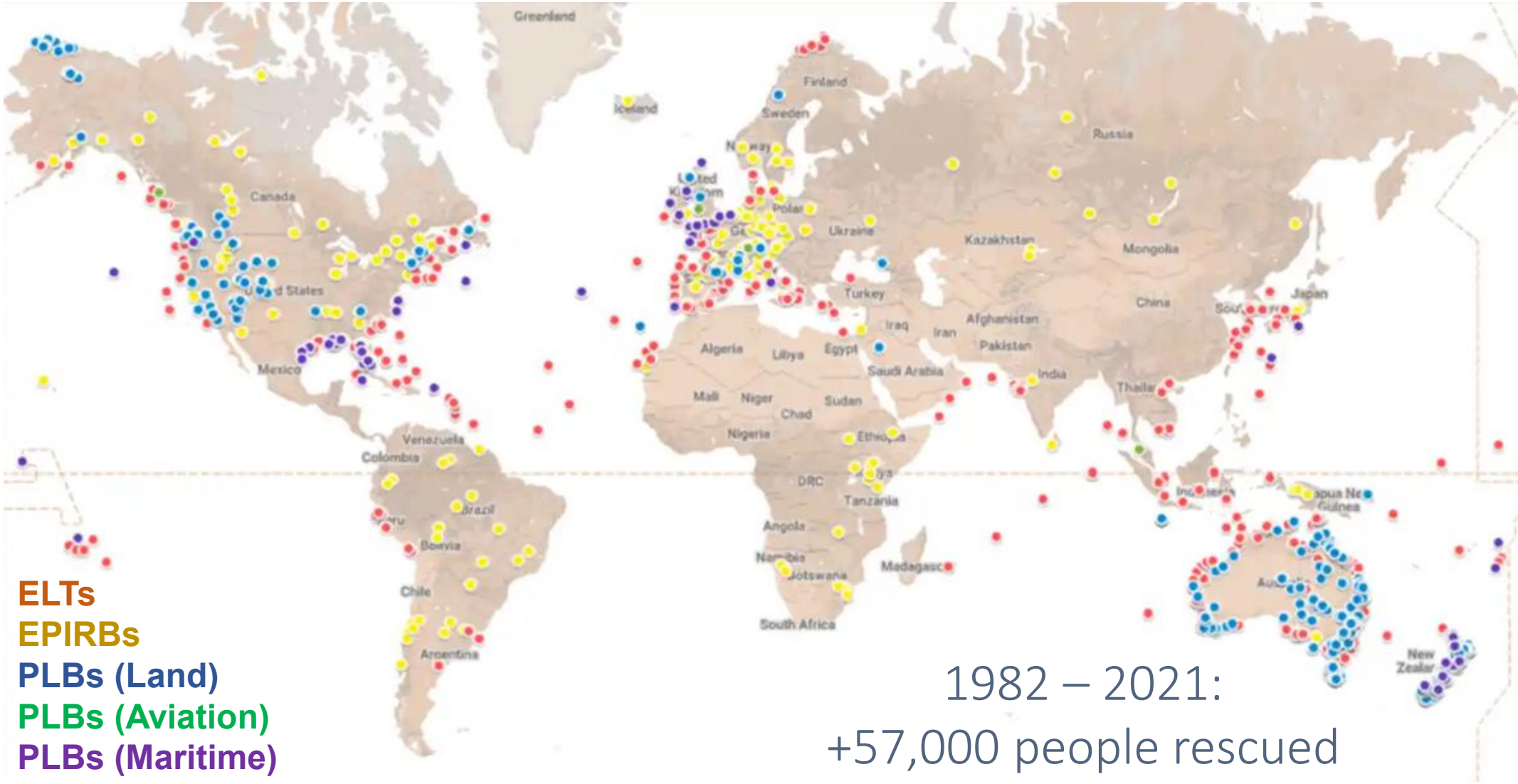

National Aeronautics and Space Administration
NASA
UNITED STATES
CANADA
Davis Strait
Hudson Bay
Bering Sea
Gulf of Alaska
Rocky Mountains
UNITED STATES
MÉXICO
North Pacific Ocean
Caribbean Sea
North Atlantic Ocean
11,221
U.S. RESCUES SINCE 1982
50
LIVES SAVED
IN THE UNITED STATES CY 2026
2 AIR
2 INCIDENT
18 LAND
11 INCIDENTS
30 SEA
11 INCIDENTS
April 17, 2026

Average 2,500+ Rescues Annually



ELTs
EPIRBs
PLBs (Land)
PLBs (Aviation)
PLBs (Maritime)

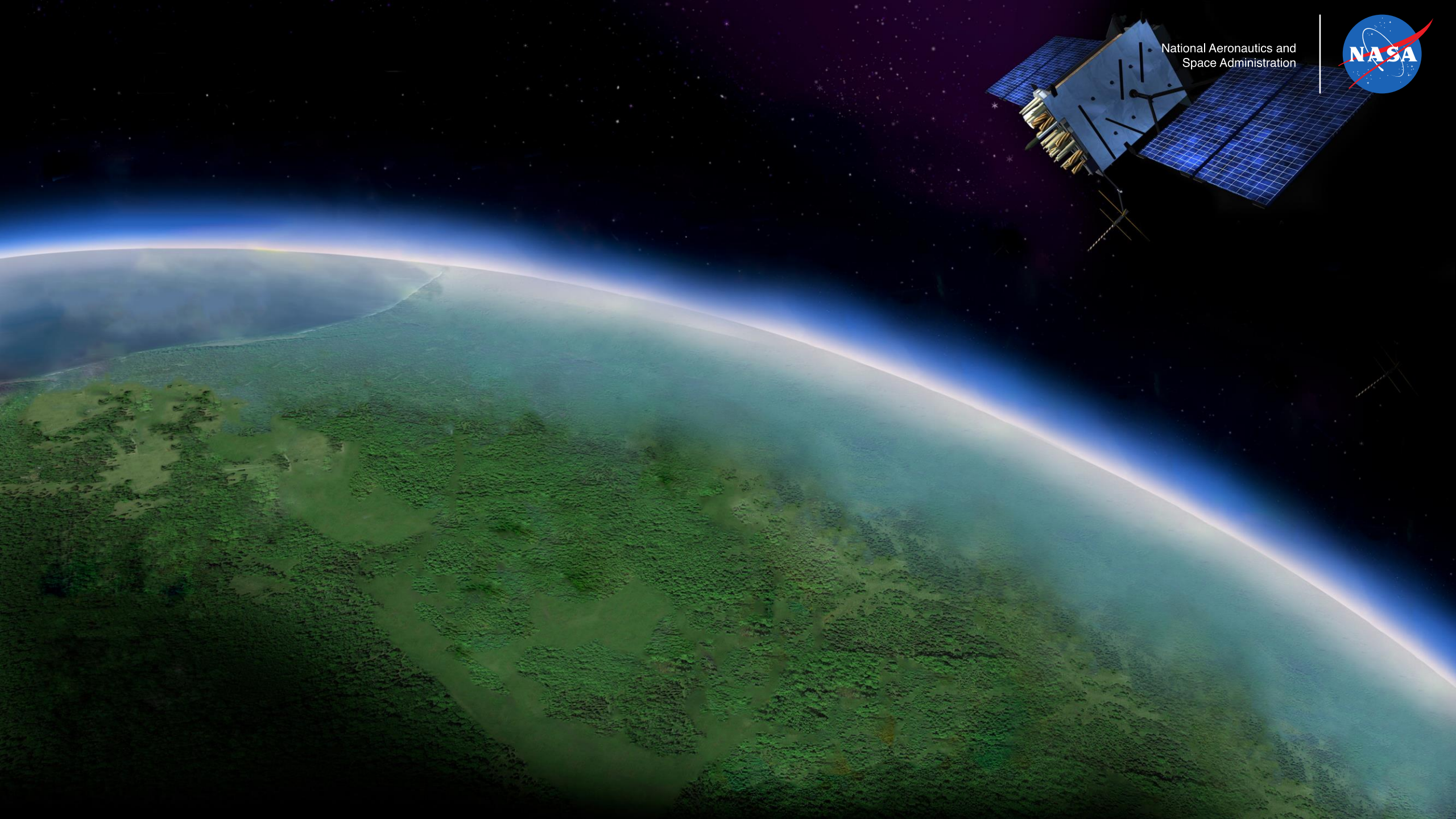
1982 – 2021:
+57,000 people rescued

COSPAS-SARSAT PROGRAM

National Aeronautics and Space Administration

Global Collaboration

COSPAS = Спутниковая система поиска и спасания (Space System for the Search of Vessels in Distress)
SARSAT = Search and Rescue Satellite-Aided Tracking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Space Administration
NASA

THE POWER OF MEOSAR
our new system

National Aeronautics and Space Administration

NASA

Near instantaneous beacon detection and gps-independent location, globally, at all times

Advanced location process using time and frequency measurements of beacon signal to triangulate its location

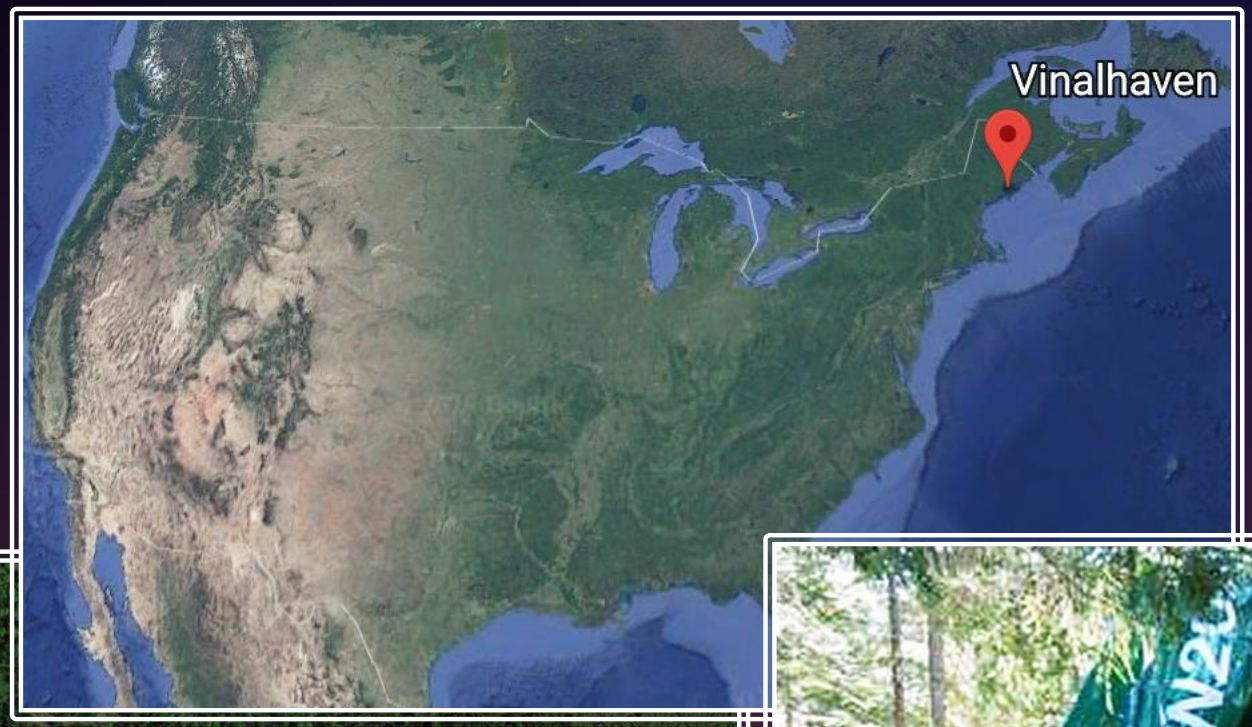
Mitigates terrain blockage due to multiple look angles from multiple moving satellites

Robust space segment, well maintained and highly redundant

Simple space segment repeater allows for development of higher performance beacon signal

THE POWER OF MEOSAR

Case studies



June 2017, Vinalhaven Airport, Maine

C/S MEOSAR ALERT (vs. LEO/GEO)	**First; received by USCG D1**
Detection Time	Near-instantaneous
Location Time	Composite Location 40 minutes before GEO and LEO
Location Accuracy	MEO initial alert within 0.78 Km; LEO within 3.1 Km

An ELT was activated when a single engine propeller plane crash landed on the end of the runway into trees

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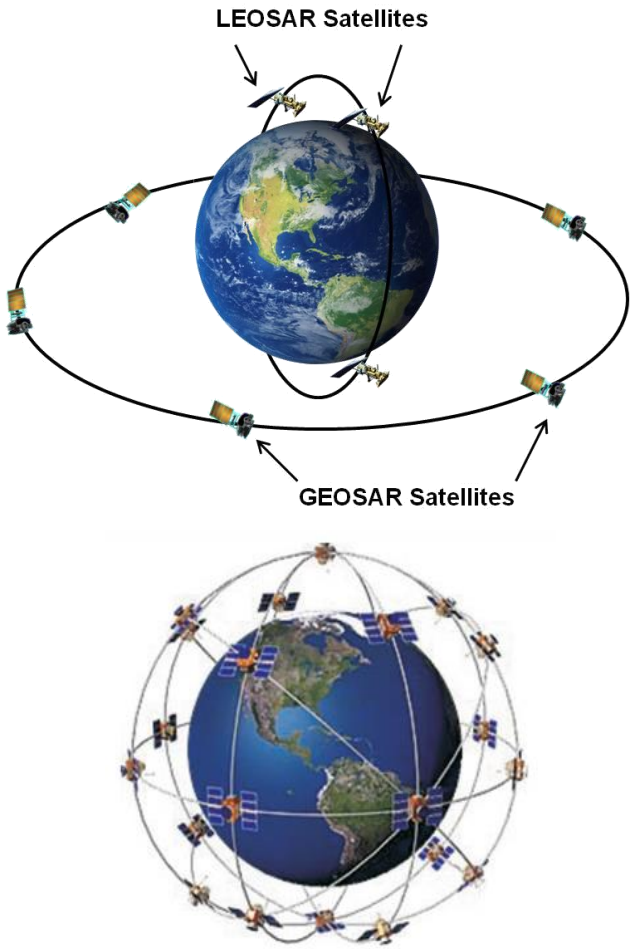
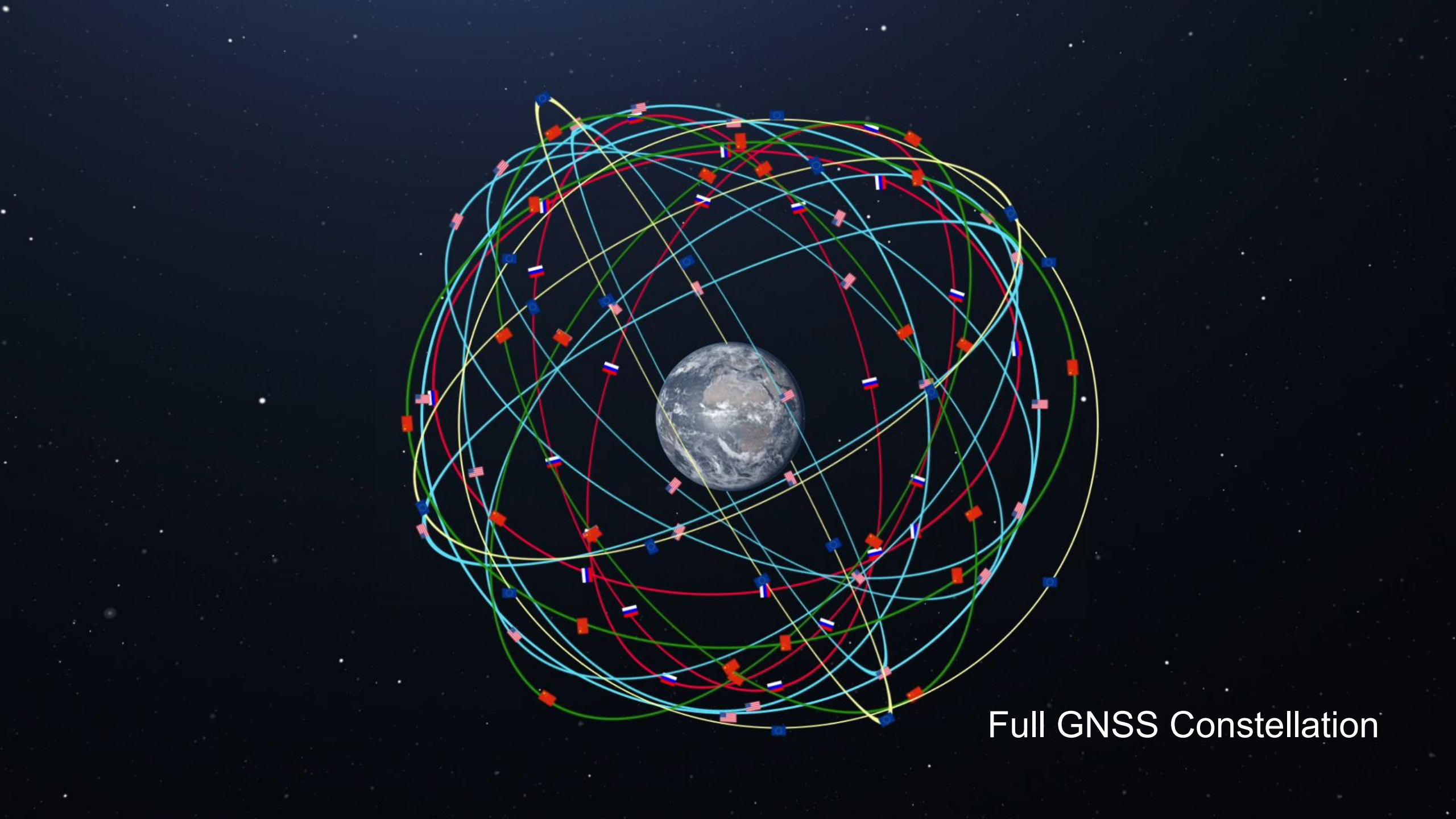
THE SPACE SEGMENT

Space Segment – 3 Types of Satellites

- LEOSAR - Low Earth Orbiting SAR Satellites (3)
- GEOSAR - Geostationary Orbiting SAR Satellites (13)
- MEOSAR - Medium Earth Orbit SAR Satellites (55)
  - US: *GPS-II/DASS (21)*
    - *S-band, with future GPS-III/L-band (SV-13, 2028)*
  - European Commission: Galileo (26)
  - *Russian Federation: Glonass (2)*
  - *China: Beidou (6)*




Full GNSS Constellation

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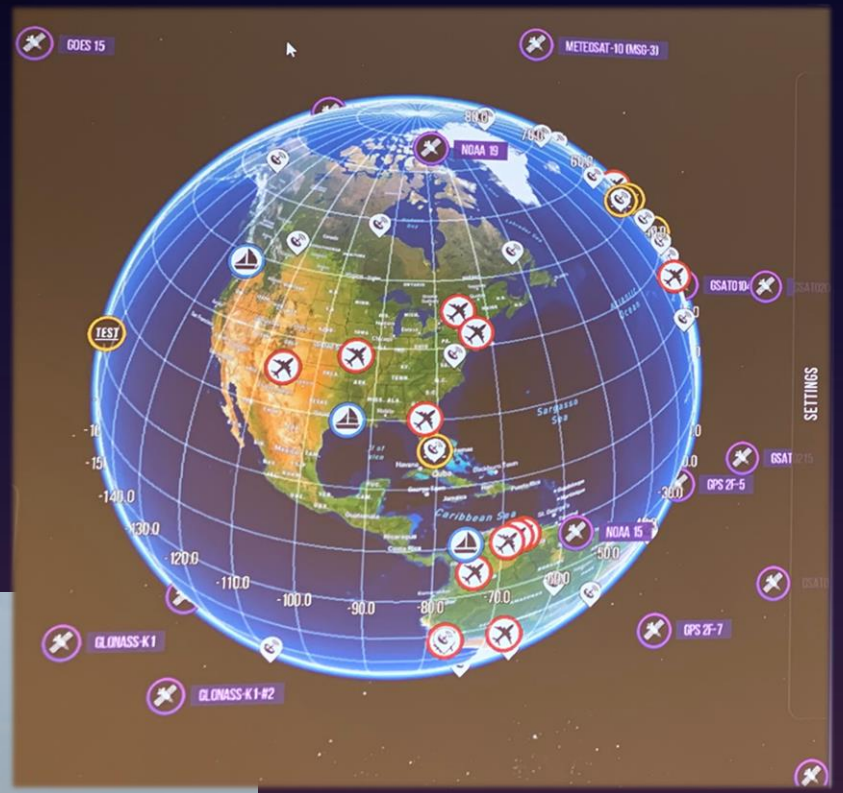
THE GROUND SEGMENT

NASA SAR Ground Station



NASA SAR Ground Station consists of LEO/GEO/MEO Local User Terminal (LUTs).

Provides location capability for first and second generation beacons.

Supports SARSAT R&D, tech development, system monitoring and anomaly resolution.

Dedicated support for NASA Human Space Flight Missions (Artemis, SpaceX, Soyuz, Starliner).

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THE BEACON SEGMENT

406 Distress Beacons vs. Commercial Satellite Devices

406 MHz Distress Beacons

- Global system
- Full attention of international SAR system
- One-time cost (beacon)
- Specs defined internationally
- One-way Communication (currently)

Satellite Emergency Notification Devices (SENDS)

- May not be global
- Full attention of a particular communications system
- Usually monthly fee
- Specs defined by manufacturer
- One & two-way Communications

SECOND GEN BEACONS

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Capitalize on MEOSAR space segment and improve system performance

- Independent detection probability, location accuracy and system capacity
- GPS-encoded location
- Single burst location capability
- Intelligent signal transmit scheduling
- Collaborate with manufacturers to obtain the most competitive end product
- Return Link Service: automatic acknowledgment, where return link message sent automatically when location of alert has been confirmed
- Cancellation function
- Two-way Communication (coming soon)

Mission ARTEMIS

Our Journey Back to the Moon

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NASA'S ANGEL BEACONS

Artemis II Mission Support

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- First-generation vehicle beacon system activates upon main chute deploy.
- Emergency egress of crew into life raft initiates manual activation of the ANGEL beacon (carried by each crewmember, attached to their personal flotation device).
- NASA SAR Office personnel supported from the NASA Ground Station and Goddard, Mission Control Center – Houston, and on board the recovery vessel, U.S.S. John P. Murtha in the South Pacific.

Credit: NASA/Bill Ingalls

Credit: NASA/James Blair

Credit: NASA


QUESTIONS?
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Space Administration
NASA

FOR FURTHER INFORMATION...

USCG SARSAT
https://www.navcen.uscg.gov/sarsat

SARSAT-NOAA
https://www.sarsat.noaa.gov/

COSPAS-SARSAT
https://www.cospas-sarsat.int/en/

NASA Search and Rescue Office
https://www.nasa.gov/goddard/esc/sar/

BACKUP

406 MHz Distress Beacons

EPIRB
Emergency Position Indicating Radio Beacons

ELTs
Emergency Locator Transmitter

ELT(DT)
Emergency Locator Transmitter
- Distress Tracker

PLB
Personal Locator Beacon

SSAS
Ship Security Alert System

406 MHz Distress Beacons

Global Users:

~500,000 ELTs

~1,050,000 EPIRBs

~950,000 PLBs

Required on:

- Aircraft on international flights (ELTs)
- Vessels 300 tons or greater (EPIRBs)

Ground Segment – Local User Terminals

LUTs

- Track Cospas and Sarsat satellites
- Recovers beacon signals
- Perform Doppler or Difference of Arrival (DOA) to determine position
- Sends distress alert to Mission Control Center

Mission Control Centers (MCCs)

30 MCCs Worldwide

- Receive alerts from LUTs and international MCCs
- Validate, match and merge distress alerts to improve location accuracy and determine the correct position
- Provides distress beacon registration info with distress alert
- Transmit alerts to Rescue Coordination Centers (RCCs) and SAR Points of Contact (SPOC) and filters redundant data

MCC functions handles automatically; no manual intervention

Mission Control Centers

Rescue Coordination Centers (RCCs)

Receive SARSAT distress alerts from MCCs

Coordinates SAR response