



# MEOSAR Overview

SAR Controllers Training 2013  
19 – 21 March 2013

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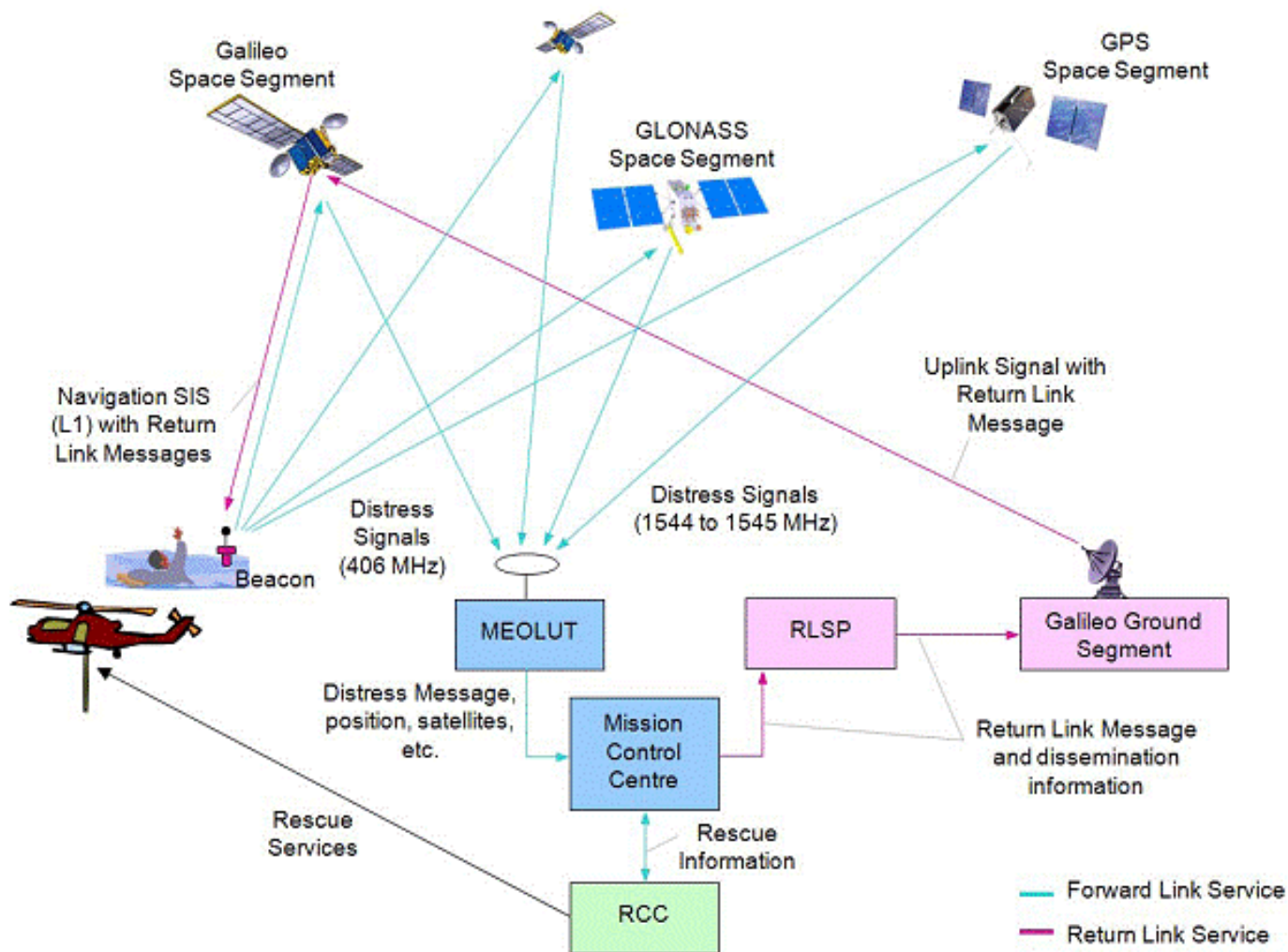
# Agenda

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- MEOSAR/DASS Overview
- Space Segment
- Ground Segment
- DASS POC
- MEOSAR Timeline
- Demonstration and Evaluation
- 2<sup>nd</sup> Generation Beacons



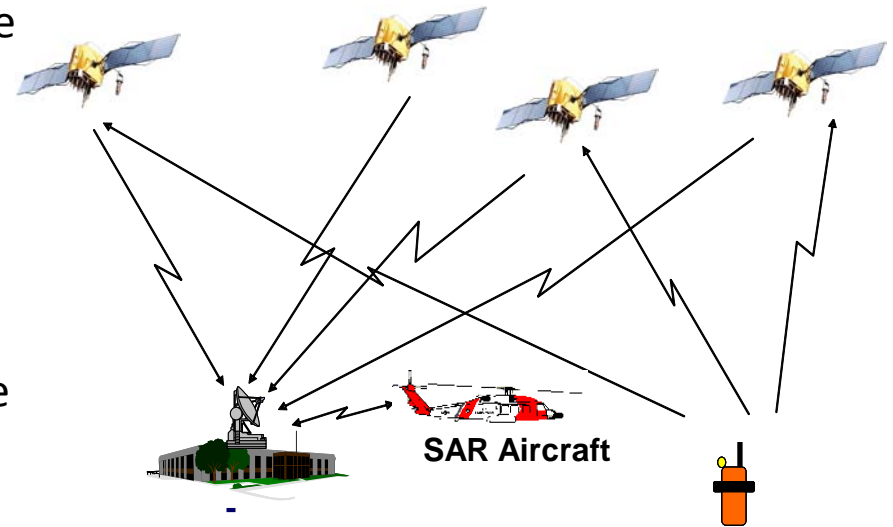
# MEOSAR/DASS Overview



# MEOSAR/DASS Overview

- MEOSAR/DASS Concept

- Utilize multiple satellites with SAR repeaters, or “bent pipe”
- Multiple antennas are used to receive the same beacon burst
- The time difference of arrival (TDOA) and frequency difference of arrival (FDOA) is then used to determine location
- One burst, received through 3 unique satellites, is capable of producing a location
- Essentially, GPS location in reverse





# MEOSAR/DASS Overview

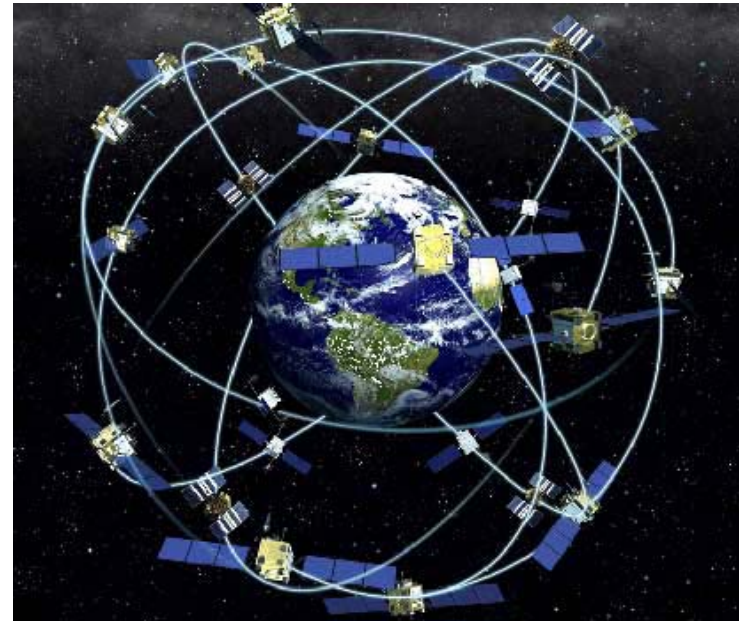
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- Medium Earth Orbit (MEO) SAR / Distress Alerting Satellite System (DASS)
  - Various studies determined that medium-earth orbiting (MEO) satellites provide a vastly improved space-based distress alerting and locating system.
  - NASA, with USAF Space and Air Combat Command, NOAA, and USCG are developing a capability on GPS satellites– Distress Alerting Satellite System (DASS)
- MEOSAR provides
  - A combination of the best assets of GEOSAR and LEOSAR
  - Near instantaneous notification and location of distress
  - Near 100% Availability
  - Better location accuracy
  - Global coverage
  - Full compatibility with current and future beacons



# Space Segment

- Repeaters will be flown on Medium Earth Orbit satellites (MEOSATs)
- Will utilize 3 Global Navigation Satellite System (GNSS) constellations
  - GPS (USA)
  - GLONASS (Russia)
  - Galileo (ESA)
- Current plan is to have 24 US MEOSAR instruments
- 72 MEOSAR instruments total





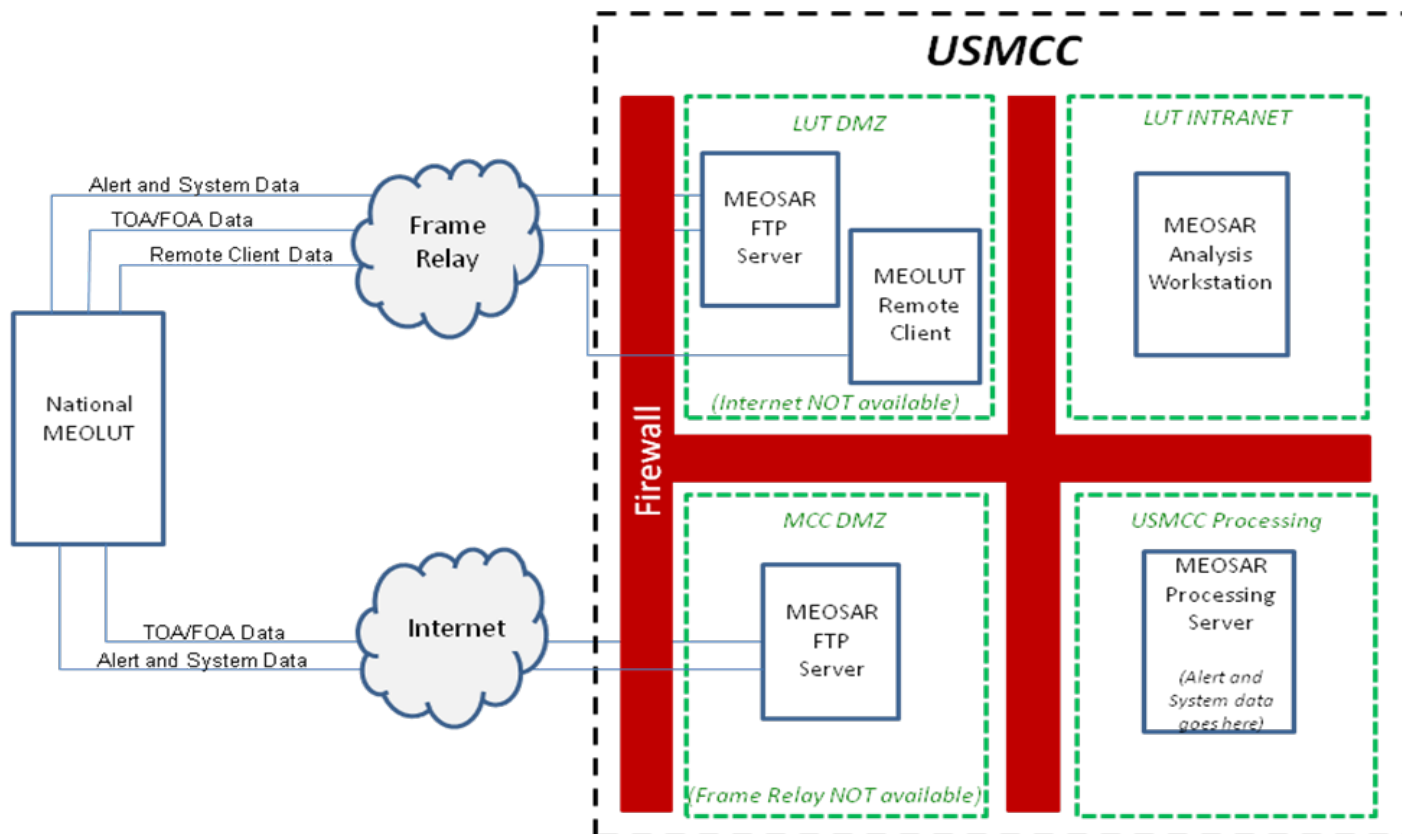


# MEO vs. LEO Coverage





# US MEOSAR Ground Segment Design







# Ground Segment

- Prototype ground station at NASA Goddard Space Flight Center
  - 4 antennas – capable of independently tracking 4 satellites
  - Completed in 2008
  - Successfully passed acceptance testing
  - May become future operational MEOLUT
  - Full participation in MEOSAR D&E testing



# Ground Segment

- Accepted MEOLUT Wahiawa, Hawaii
  - 6 antenna – capable of tracking 6 satellites either S-band or L-band
  - Constructed in September 2011 and passed acceptance testing
- Proposed MEOLUT in Miami, Florida
  - 6 antenna – capable of tracking 6 satellites either S-band or L-band
  - Procurement will be released by Sept 2012
  - Construction will begin Sept 2013, completed by Dec 2013





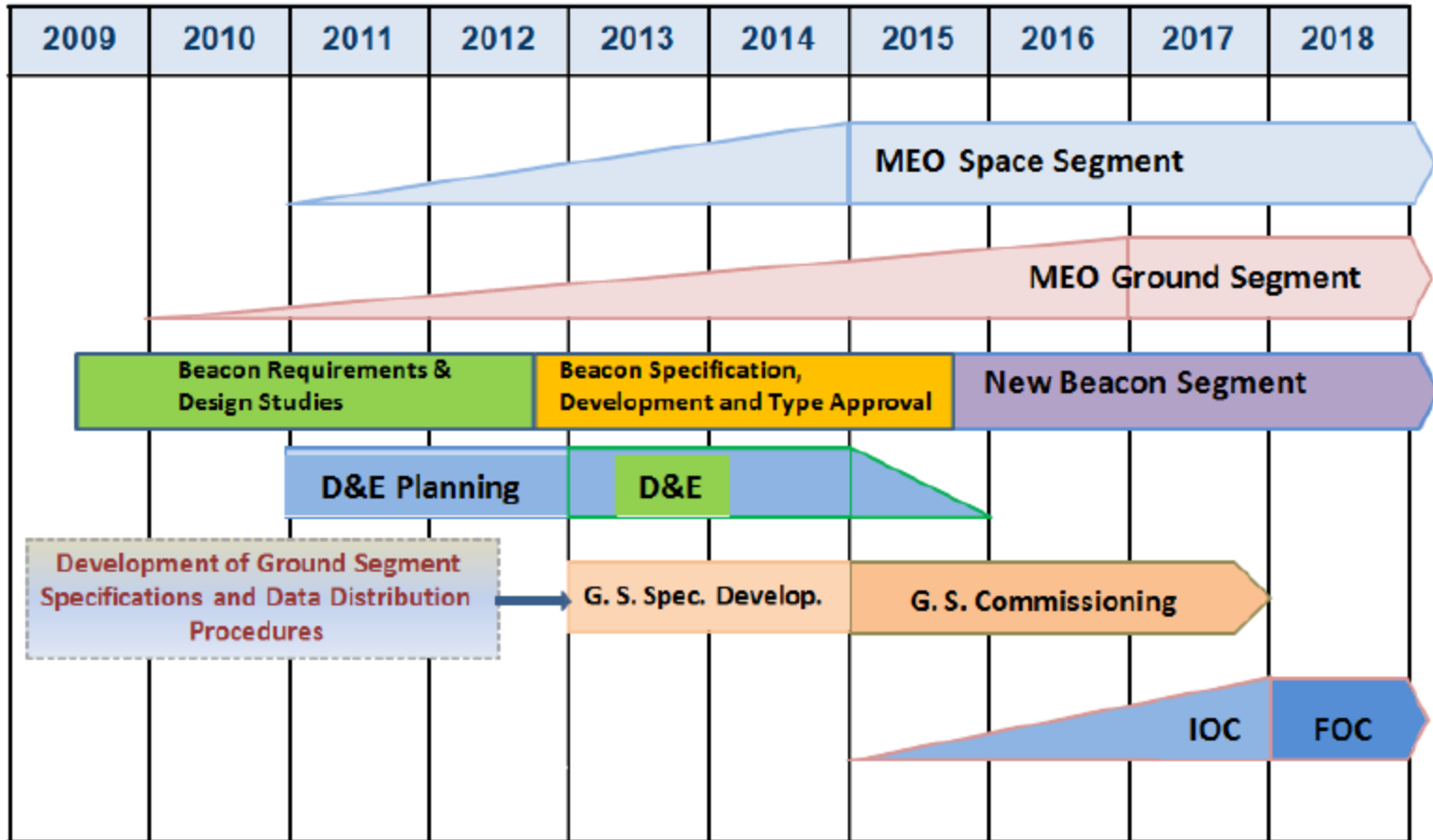
# DASS Proof-of-Concept

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- DASS Proof-of-Concept (POC) Space Segment
  - Ten current on-orbit GPS Block IIR and IIF satellites carry DASS repeaters
  - POC system uses existing GPS. Downlink at S-Band (Not ITU-allocated for SAR, but may possibly be used operationally)
- Proof-of-Concept results to date:
  - Demonstrated ability to locate beacons to greater than current Cospas-Sarsat accuracy using two or more satellites
  - System meets/exceeds theoretical capabilities
  - Tests are on-going



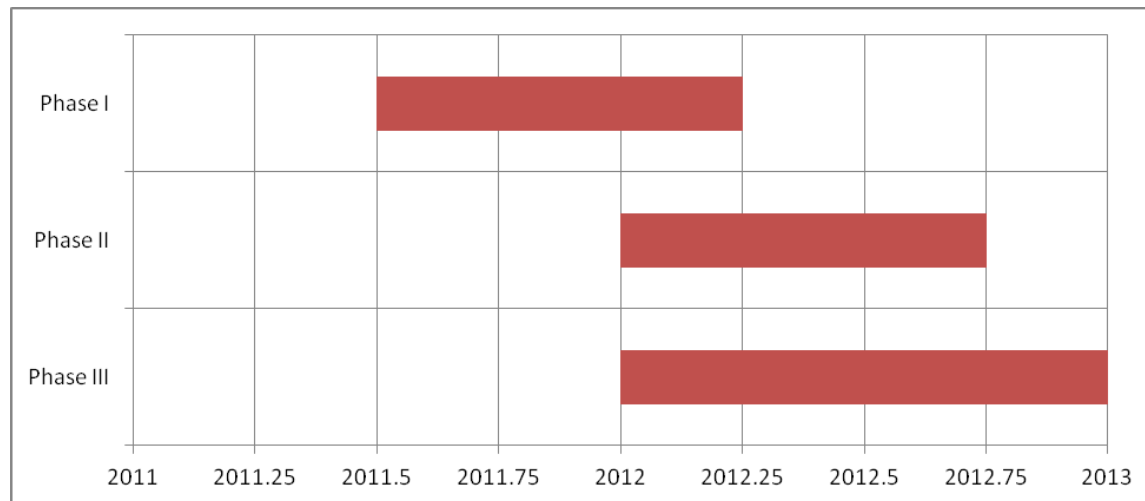
# MEOSAR Timeline





# US MEOSAR Timeline

- Phase I – Installation of Hawaii MEOLUT
- Phase II – Networking of Data
- Phase III – MEOSAR D&E



# MEOSAR Demonstration and Evaluation (D&E)

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- Goals
  - Characterize technical and operational performance
  - Evaluate operational effectiveness
  - **Provide basis for recommendations on the integration of MEOSAR system into C/S**
    - **Basis for commissioning criteria**

# MEOSAR Demonstration and Evaluation (D&E)

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- Technical tests
  - Processing threshold and system margin
  - Impact of interference
  - Valid and complete message acquisition
  - Location accuracy
  - System Capacity
  - Networked MEOLUT advantage
  - Combined MEO/GEO performance



# MEOSAR Demonstration and Evaluation (D&E)

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- Operational Tests
  - Time advantage
  - Unique detections
  - Volume of ground segment traffic
  - SAR/Galileo RLS
  - Direct and indirect benefits of MEOSAR system



# Second Generation Beacons

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- Compatible with Cospas-Sarsat System
- Minimum Requirement Improvements
  - Independent location accuracy
  - First burst transmission timeliness [3] seconds
  - Increased performance in first 30 seconds
  - Cancellation function
- Objective Requirement Improvements
  - Better encoded location
    - 30 m, 95% of the time within 5 minutes of activation
  - Return Link Service (RLS)
  - Additional data encoded in beacon message
  - Automatic ELT activation on indication of emergency