SARSAT Beacon Manufacturer’s Workshop
September 28, 2012

Next Generation SARSAT Space Segment
MEOSAR

Prepared by:
Chris O’Connors
NOAA/NESDIS
Agenda

• MEOSAR Overview
• Space Segment
• Ground Segment
• MEOSAR POC
• MEOSAR Timeline
• Demonstration and Evaluation
• IOC and FOC Look Ahead
MEOSAR Overview
MEOSAR Overview

• MEOSAR 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 Overview

• **Medium Earth Orbit (MEO) SAR / GPS**
  - 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—SAR/GPS

• **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 (MEO) satellites
- 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

Components at NSOF

D&E National MEOLUTs

D&E International MEOLUTs

Frame Relay

Internet

MccMeeFtp Server

TOA/FOA Data

Alert and System Data

TOA/FOA Data

MCC DMZ

Firewall
Ground Segment

- Prototype ground station at NASA Goddard Space Flight Center
  - 4 antennas – capable of independently tracking 4 satellites
  - Proof of Concept testing successfully completed in 2008
  - 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

• Future MEOLUT in Miami, Florida
  – 6 antenna – capable of tracking 6 satellites either S-band or L-band
  – Award by end of Sept 2012
  – Construction will begin Sept 2013, completed by Dec 2013
Distress Alerting Satellite System (DASS) Proof-of-Concept only

- **DASS Proof-of-Concept (POC) Space Segment**
  - Ten current on-orbit GPS Block IIR and IIF satellites carry DASS repeaters (Max of 20 satellites)
  - 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 three or more satellites
  - System meets/exceeds theoretical capabilities
  - Tests are on-going

![Figure 1: GPS IIF Launch Schedule](image-url)
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)

• 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)

• 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

* Multiple beacons needed, distributed globally, to successfully complete D&E testing
• Operational Tests
  – Time advantage
  – Unique detections
  – Volume of ground segment traffic
  – SAR/Galileo RLS
  – Direct and indirect benefits of MEOSAR system
MEOSAR Timeline
# MEOSAR Constellation

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* - Galileo launches based roughly on outside dates as provided in JC-26/Inf.17
† - GPS Block II satellites removed from totals after projected 12-year life

**Anticipated MEOSAR Space Segment**
Participating MEOLUTs D&E Phase I

Participating MEOLUTs D&E Phase I: 1 January 2013
(Minimum 4+ L/S Band Visibility 78.0%)
MEOLUTs at IOC: 1 January 2015
Anticipated Operational MEOLUTs at FOC

MEOLUTs at FOC: 1 January 2018
MEOSAR D&E Beacon Request

• T-5 Independent 2D Location Capability for Operational Beacons
  – Requesting from manufacturer operationally coded EPIRBS, ELTS, PLBS with 121.5 MHz disabled but GPS enabled
  – 2 of each type, prefer multiple manufacturers – total of [20] beacons
Contact Information

SARSAT Program Office
NOAA Satellite Ops Facility
Suitland, MD  20746

www.sarsat.noaa.gov

Christopher O’Connors
301-817-3846
Christopher.O’Connors@noaa.gov