Overview

- Cospas-Sarsat System
- GNSS-enabled Medium Earth Orbit SAR (MEOSAR)
- MEOSAR launch schedule
- SAR GPS payload
- MEOSAR ground coverage
- MEOSAR operational capability phases
- Current status
MEOSAR: CONCEPT OF OPERATIONS

SAR/GPS

Search and Rescue-Global Positioning Satellite System
MEOSAR: NEXT GENERATION OF SATELLITE-AIDED SAR

• For USA, based on the use of SAR Repeaters carried onboard GPS
• Benefits...
  – Multiple satellites in view of the beacon anywhere in the world at all times
  – Advanced location process using time and frequency measurements of beacon signal to triangulate its location
• Near instantaneous beacon detection and location, globally, at all times
• Mitigates terrain blockage because of multiple look angles from multiple moving satellites
• Simple space segment repeater allows for development of higher performance beacon signal
• SAR/Galileo: The first 30 Galileo satellites carrying a total of 28 SAR payloads deploying between 2012 and 2019

• SAR/Glonass-K: SAR payloads planned to be carried on the Russian GNSS Glonass-K1 and Glonass-K2 satellites

• SAR/GPS: launch-ready date is 2023. After first launch, a GPS constellation of 24 satellites with SAR payloads should be in place within 10 years

• SAR/GPS/DASS: currently 20 DASS payloads onboard GPS. Planned 8 more payloads (Block III)
GPS and SAR

• U.S. SAR Operational Space Segment
  – Repeater payload will be provided by Canadian government built to C-S specifications including interoperability with Galileo and GLONASS
  – Development underway with first operational payload planned to launch on board GPS III SV-11
    • SAR/GPS PDR – held November 20, 2013
    • Payload provider decided to not extend vendor contract and will post an RFP this summer
      – Mitigates GPS schedule moving to the right
    • NASA role is safety and mission assurance oversight for payload build and integration into GPS
MEOSAR Payload Description

• Cospas-Sarsat Program writing Payload Description document for current suite of GNSS payloads. Areas include:
  – Interoperability parameters: modulation of downlinks, downlink frequencies, downlink EIRPs and polarization, repeater bandwidth
  – Functional descriptions
  – Spectrum characteristics
  – Repeater coverage area
  – Repeater performance and transmitter parameters
Cospas-Sarsat Program analyzing multiple simulations to show ground footprints of MEOLUTs around the world to ensure full Earth coverage

- France, Russia, and USA producing independent computer models to compare against

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Criteria/Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space Segment</td>
<td>List of satellites with their payload properties.</td>
</tr>
<tr>
<td>Ground Segment</td>
<td>List of Antennas (and their properties) along with their associated MEOLUT.</td>
</tr>
<tr>
<td>Networking (yes/no)</td>
<td>Stand-Alone or as commissioned</td>
</tr>
<tr>
<td>MEOLUT Minimum Elevation Angle</td>
<td>5 degrees</td>
</tr>
<tr>
<td>Beacon Minimum Elevation Angle</td>
<td>5 degrees</td>
</tr>
<tr>
<td>Beacon Motion</td>
<td>Static beacons</td>
</tr>
<tr>
<td>Number of Bursts</td>
<td>13 transmitted bursts</td>
</tr>
<tr>
<td>Allowable Wait Time</td>
<td>10 minutes (after first burst transmission)</td>
</tr>
<tr>
<td>Start Time</td>
<td>A given day and time</td>
</tr>
<tr>
<td>Length of Simulation</td>
<td>At least 10 days</td>
</tr>
<tr>
<td>Simulation Step Size</td>
<td>Maximum 15 minutes</td>
</tr>
<tr>
<td>Grid Size</td>
<td>Range of the latitude, longitude, typically covering the whole Earth</td>
</tr>
<tr>
<td>Grid Resolution</td>
<td>220km x 220km, which corresponds to 2 degrees at the equator</td>
</tr>
<tr>
<td>Number of Satellites required to locate</td>
<td>at least 5</td>
</tr>
</tbody>
</table>
MEOSAR Operational Capability Phases

- Cospas-Sarsat Program transition to MEOSAR will occur in phases:
  - EOC: Early Operational Capability
    - Allow for distribution of MEOSAR alert data for operational use at a given MEOLUT once commissioned
    - USA has commissioned its first MEOLUT and will commission the second this month
  - IOC: Initial Operational Capability
    - Declaration by MEOSAR satellite providers and Cospas-Sarsat that, prior to full deployment, alert data from the MEOSAR system can be used operationally and shared with other Mission Control Centers (MCCs). The MEOSAR system need not necessarily provide global coverage
  - FOC: Full Operational Capability
    - Full Earth ground station coverage
    - Full complement of L-Band MEO spacecraft payloads
MEOSAR Current Status

– Once Hawaii MEOLUT commissioned this month, USA will be the first nation to use MEOSAR data operationally (distribute to the USA Rescue Coordination Centers for all detected alerts)
– France also working to commission their MEOLUTs
– Demonstration and Evaluation of the MEOSAR system continues to progress
  • Completed second of three testing phases
    – Phase II includes GPS/DASS and available L-Band payloads
    – Phase III will test system performance with only L-Band payloads