



Second Generation Beacon (SGB) Update

SARSAT Beacon Manufacturers Workshop 2022

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Agenda

- NASA's Role in SAR
- Second-Gen Beacon (SGB) Testing Status
 - EPG Status
 - International Test Facilities
 - SGB Testing Status
- Space Segment Involvement:
 - SAR/GPS Status
- Advanced Projects
 - Slow Moving Beacons
 - ELT(DT)s
 - Lunar Search & Rescue
 - Human Spaceflight Use of SARSAT Beacons



NASA's Role in Search and Rescue

- Innovate and develop new technologies to improve search and rescue hardware for national/international use in emergencies
 - Emergency beacons for use in distress
 - Ground stations that monitor and distribute data to rescue forces
 - Space payloads that detect the emergency signal and relay to Earth
- Work with US Coast Guard, Air Force, and National Oceanic and Atmospheric Administration (NOAA) to solve technical challenges within United States satellite-aided SAR Program (SARSAT)
- Agencies form a delegation and represent USA on international level
 - COSPAS-SARSAT Program
 - 42+ countries work together to obtain full Earth coverage of beacon detections and rescues



SGB Testing Status

Testing the Emerging Beacon Segment



EPG Status

– EPG Current Status:

- Interim Approval to test SGBs, excluding ELT(DT)s was granted by the Parties, until a recommendation can be provided from the Joint Committee to the Council to grant approval.
- EPG is testing a prototype SGB ELT(DT) and is in the process of providing ELT(DT) unique test data to the Extended Test Facilities (ETF) Panel to progress towards approvals to test ELT(DT)s
- Two SGB PLBs have completed type approval testing at EPG.
 - ANGEL for use by NASA (vendor – ACR)
 - DoD beacon program for US Army

Why Does This Matter – EPG approval allows for domestic approval of commercial SGBs at this time



International Test Facilities

TUV SUD:

- Interim Approval to test FGB ELT(DT)s at TUV was granted by the Parties, until a recommendation can be provided from the Joint Committee to the Council to grant approval.

No other labs have submitted applications to extend their capabilities to include testing SGBs or FGB ELT(DT)s.

Why Does This Matter – TUV approval allows for International approval of commercial FGB ELT(DT)s at this time



SGB Testing Status

- EPG granted Interim Approval to test SGBs
- SGB Capacity Test performed in late 2021, results under review
- Advanced Next Generation Emergency Locator (ANGEL) completed Type Approval Testing in early 2022. Currently, finalizing the Type Approval Request data package, to be submitted May 2022.
- The commissioning of SGB compatible ground system capabilities is underway
- Commercial vendors beginning development of SGBs and investigating Type Approval following EPG certification



SAR/GPS Status

Fielding the Future Space Segment



SAR/GPS

- Contracts were awarded in 2019:
 - USAF to LM for 22 GPS III F SVs
 - Canadian DND to MDA for the SAR repeater payload
- NASA is providing engineering expertise for mission assurance across all phases
- Design and engineering is underway
 - Repeater Engineering Qualification Model testing is currently ongoing.
 - Repeater Engineering Model delivery to Lockheed Martin is planned for the summer of 2022.
 - Critical Design Review (CDR) planned for the fall of 2022.
 - On track to fly on GPS III F SV11 in 2025/2026
- Launches are planned to start in 2026, replacing the existing DASS constellation

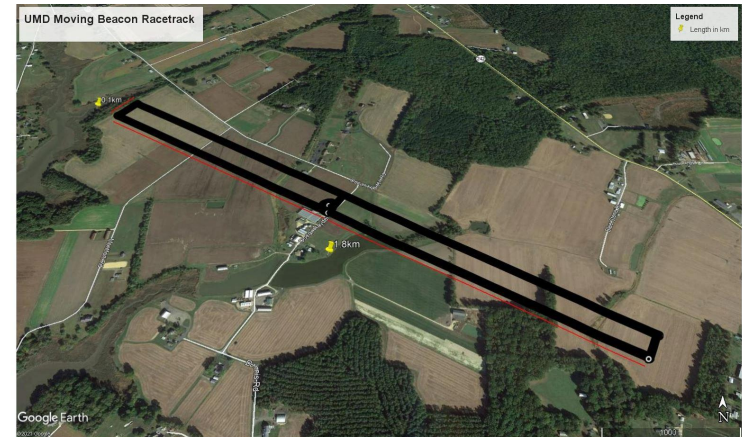




Advanced Projects / Development

Slow-Moving Beacons

- Testing performed with Univ. of Maryland (UMD) to implement testing procedures related to slow-moving beacons and MEOLUT commissioning
- Moving beacon testing performed using a beacon mounted to a DJI M600 sUAS Unmanned Aircraft System (UAS)
 - The advantage of this method is that the motion can be accurately controlled and, even more importantly, very accurately logged as a function of time during the flight
- Slow-moving beacon errors specific to FGBs, still a large element of the beacon market
- Drones provided beacon motion profiles consistent with MEOLUT commissioning standard, C/S T.020
- Drone testing executed for commissioning of Florida and Hawaii MEOLUTs.





ELT(DT) Development Support

- NASA Participated in C/S System Test that demonstrated the system's ability to process and distribute FGB and SGB ELT(DT)s.
- NASA Supported commissioning of ground segments (MEOLUTs and MCCs) for FGB and SGB ELT(DT)s
- EPG is in the process of using a SGB ELT(DT) being tested for type approval to provide data to the ETF Panel that was requested in order to approve EPG for SGB ELT(DT) testing capability.
- NASA Monitoring the LADR development by ICAO contractor Eurocontrol.



Lunar Search and Rescue (LunaSAR) R&D

- NASA developing concept for lunar search and rescue system for NASA's return to the moon, based off of the best practices seen today on Earth
- LunaSAR designed for the Artemis IV-V+ timeframe, when excursions begin occurring beyond immediate walk-back distances and risks increase for potential incapacitation, injury, or suit failure
- Reduced gravity (Moon or Mars) evacuation of incapacitated crewmember through level (or low-angle undulating) and/or rough terrain with obstacles not trafficable by rover requires the use of transport system for as few as one rescuer crewmember to move an incapacitated crew member to a rover (at which time, haul systems and ingress methods can be used)
- Need for external assistance among varied users drives:
 - Need for accurate survivor location data regardless of nav architecture
 - Need for assured communications with specific distress-related messaging
 - Need for a common bi-directional messaging architecture separate from a commercial-vendor specific RF link
- LunaSAR will leverage developments in rotating field implementation and novel waveforms to provide





Human Spaceflight Vehicle Beacons / Future

- All current NASA-partnered human spaceflight programs to low-earth orbit (LEO) utilize SARSAT PLB handsets as a vehicle location capability
- Govt-sponsored missions (i.e. SpaceX flights carrying NASA astronauts) operate under US SARSAT Letters of Compatibility for PLB Handset + Vehicle Antenna Pairings
- Fully-private missions not supporting US Government activities will need to fly fully type approved beacons
- Increasing cadence of public & private crewed missions leading NASA and National Search and Rescue Committee to form Space Working Group to recommend best practices to emerging commercial spaceflight market





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