USMCC Data Distribution

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MCC Processing

• The current operational system includes LEOSAR/GEOSAR/MEOSAR data (LGM system)
  – LGM early operations began December 2016
• These MCCs automatically deliver MEOSAR data and follow C/S data distribution rules for LGM MCCs as of 01 March 2020
  – 4 nodal MCCs: USA, France, Spain and Australia (Japan coming soon)
  – 4 non-nodal MCCs: Norway, United Kingdom, Qatar and Cyprus
• LEOSAR/GEOSAR only (L/G) MCCs do not distribute MEOSAR data automatically
  – L/G MCCs must send MEOSAR data to their associated RCCs and SPOCs manually.
• International Data distribution procedures are described in C/S A.001, the COSPAS-SARSAT Data Distribution Plan (DDP)
  – In addition, the USMCC follows national data distribution procedures
MCC to MCC Data Distribution  
Nodal Distribution Network

• The USMCC is nodal for the Western Data Distribution Region
• Messages are sent between MCCs via a nodal system
• There are 6 nodal MCCs in the C/S System
  – The nodal MCC distributes messages to all MCCs in its DDR and to all other nodal MCCs
  – Non-nodal MCCs only distribute messages to the nodal MCC in its DDR
• Advantages of the nodal system:
  – 32 MCCs in C/S system as of February 2020
  – MCCs are not required to establish and maintain communication links with all MCCs
  – Enables nodal MCCs to perform monitoring for all MCCs in its DDR
  – MCC backups are simpler to implement (e.g., when the CMCC is down, only the USMCC needs to change its data distribution)
MCC to MCC Data Distribution
Nodal Distribution Network

- Nodal MCC
  - CNMCC
  - HKMCC
  - KOMCC
  - TAMCC
  - VNMCC

- AUMCC
  - ASMCC
  - IDMCC
  - SIMCC
  - THMCC

- JAMCC
  - ARMCC
  - BRMCC
  - CHMCC

- USMCC
  - CMC
  - CMCC
  - PEMCC

- FMCC
  - SPMCC
  - CYMCC
  - GRMCC
  - ITMCC
  - NMCC
  - UKMCC
  - TRMCC

- AEMCC
  - ALMCC
  - SAMCC
  - NIMCC**
  - QAMCC
  - AEMCC

*Under development
** Commissioned not operational
Overview: Ground Station Satellite Data

• MEOLUTs send 1 position using multiple MEOSAR satellites
  – A single Difference of Arrival (DOA) position computed by MEOLUT
  – DOA position computed using differences in Time of Arrival (TOA) and/or Frequency of Arrival (FOA) data from multiple MEOSAR satellites
  – No inherent ambiguity
  – Encoded position may be sent in beacon message

• LEOLUTs send 2 positions using 1 LEOSAR satellite
  – Doppler A/B positions
  – 1 real position and 1 image position
  – Inherent ambiguity
  – Encoded position may be sent in beacon message

• GEOLUTs send beacon detections for 1 GEOSAR satellite
  – No independent position
  – Encoded position may be sent in beacon message
Basic Alert Distribution Rules

• Each beacon event (detect time/satellite/beacon) is only sent once (redundant data is filtered)

• **Unlocated** alerts are distributed
  – Internationally based on beacon country code
  – Nationally based on beacon registration data (if available)

• Notification of Country of Registry (NOCR) messages are distributed based on country code
  – Sent when the alert is located outside the SRR of country of registration

• Ship security (SSAS) alerts are distributed to the SSAS competent authority based solely on country code
  – For USA country codes, alerts are sent to LANTAREA and PACAREA

• Located alerts are usually distributed based on location (C/S GEOSORT for world, USMCC GEOSORT for USMCC service area)
Unlocated Alerts

• Per C/S MCCs, distribute based on country code of beacon
• For beacon IDs with a US country code (303, 338, 358, 366, 367, 368, 369, 379, 536, or 559)
  – If the beacon is registered in the US 406 MHz RGDB
    • Alert is distributed based on SRR in registration
    • SRR in registration is based on
      – State or country of homeport, or
      – State or country of owner’s mailing address
    • If no SRR is assigned (and vessel or aircraft ID is encoded in the beacon ID), alert is distributed based on beacon type
      – EPIRB alerts to PACAREA
      – ELT alerts to AFRCC
      – PLB alerts to AFRCC
Unlocated Alerts – Alternate Registry

- **Craft ID** decoded from the 406 MHz beacon message (15-hex ID) and provided on the RCC alert message can be used to access other registration databases:
  - EPIRBs: Radio Call Sign, Ship Station ID, etc.
    - RCC must look up using ITU or other source
    - Unlocated EPIRB alerts sent to PACAREA
  - ELTs: 24-bit address, aircraft operator designator, etc.
    - RCC must look up using tail number database
    - Unlocated ELT alerts sent to AFRCC
- If no vessel or aircraft ID (i.e., no link to another registry) in beacon message, the unlocated alert is not distributed to a US RCC or SPOC
Unlocated Alerts – Non-USA-Coded Beacons

- Unlocated alerts for a non-USA-coded beacon within the US Search and Rescue Region (SRR) are distributed based on country code:
  - To the country’s SPOC if the USMCC communicates directly with the SPOC
    - Example: Colombian beacon goes to Colombia
  - Otherwise, to the US RCC in whose SRR the country is included
    - Example: Cuban beacon goes to CGD07
# Unlocated Alerts – SRRs for US Registered RGDB SRR Assignments – Non-US Areas

<table>
<thead>
<tr>
<th>State Abbreviation</th>
<th>State Name</th>
<th>EPIRB SRR 01</th>
<th>EPIRB SRR 02</th>
<th>ELT SRR</th>
<th>PLB SRR 01</th>
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NOCR Distribution

• Per C/S, alert message sent based on country code and beacon location
  – Sent when the alert is located outside the SRR of country of registration

• The USMCC distributes an NOCR to a US RCC when it first receives a located alert for the alert site, and
  – The alert is for a US-coded beacon but not in a US SRR, or
  – The alert is for a non-US-coded beacon for a country supported by a US RCC (e.g., Bahamas), but not in that country’s SRR
  – Allows US RCC to ensure that there is a SAR response for (US) beacon

• Caution: If NOCR from a MEO alert and the beacon location is serviced by a LEOSAR/GEOSAR only MCC, the alert may not be sent to the responsible RCC!

• The USMCC:
  – Continues to send alerts to NOCR destinations until position is confirmed
  – Sends an NOCR indicating that position is confirmed, if position is confirmed on the first located alert
  – Will not send an NOCR if it previously sent an alert message with location to a RCC for the site
## Unlocated and NOCR Distribution – Non-USA Country Codes

<table>
<thead>
<tr>
<th>Country Code</th>
<th>Associated RCC/SPOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>MID: 307 ARUBA</td>
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<tr>
<td>MID: 308/309/311 BAHAMAS</td>
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<td>MID: 314 BARBADOS</td>
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<td>MID: 310 BERMUDA</td>
<td>BERMUDASP</td>
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<td>MID: 378 GB VIRGIN ISLANDS</td>
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<td>MID: 319 CAYMAN ISLANDS</td>
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<td>MID: 730 COLOMBIA</td>
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<td>MID: 323 CUBA</td>
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<td>MID: 327 DOMINICAN REPUBLIC</td>
<td>DOMREPS</td>
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<td>MID: 330 GRENAADA</td>
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<td>MID: 336 HAITI</td>
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<td>MID: 538 MARSHALL ISLANDS</td>
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<td>MID: 510 MICRONESIA</td>
<td>MARSEC (CG Sector Guam)</td>
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<td>MID: 306 NETHERLANDS ANTILLES</td>
<td>NANTSP</td>
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<td>MID: 511 PALAU</td>
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<td>MID: 362 TRINIDAD AND TOBAGO</td>
<td>TTSP</td>
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<td>MID: 364 TURKS AND CAICOS ISLANDS</td>
<td>CGD7</td>
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<tr>
<td>MID: 775 VENEZUELA</td>
<td>VZMCC</td>
</tr>
</tbody>
</table>
SSAS Beacons and Alerts for Unreliable Beacon IDs

• Alerts for USA-coded Ship Security Alert System (SSAS) beacons
  – Distributed to LANTAREA and PACAREA
  – After a SSAS beacon is detected, LANTAREA/PACAREA may request alerts be sent to other RCC(s)

• Alerts for unreliable beacon IDs:
  – 406 MHz beacon message failed validation checks due to
    • Malfunctioning beacon or miscoded beacon
    • LUT or satellite processing
  – When 406 MHz beacon message fails validation checks:
    • All encoded data is considered unreliable, therefore unlocated alerts are not distributed because unlocated alerts are distributed based on the country code in the beacon message
    • Alerts are only distributed based on DOA or Doppler location
    • If in US SRR, also sent to USCG LANTAREA and PACAREA (may be SSAS)
MEOSAR Uncorroborated Alerts

MEOSAR uncorroborated alerts are alerts based on a single beacon burst detected by one satellite, with no other detection for beacon

• Uncorroborated alerts may later be corroborated by another detection for the beacon (LEO, GEO, or MEO)
• Uncorroborated alerts never corroborated by another beacon detection have been used in SARSAT rescues (3 cases in 2017)
• Per C/S requirements, uncorroborated MEOSAR alerts are:
  – Distributed to LGM MCCs
  – Not distributed to LEOSAR/GEOSAR (L/G) only MCCs
  – Distributed to national RCCs as determined nationally
  – Distributed to SPOCs if the beacon is known to be registered or the source LUT is commissioned for low processing anomaly rate
Located Alerts/Detection Updates

Located alerts are usually distributed based on location (C/S GEOSORT for world, USMCC GEOSORT for USMCC service area)

• Detection update sent when 30 minutes has passed since the previous alert for beacon or MEOSAR uncorroborated alert is corroborated (USMCC rule only)

• A new MEOSAR alert is expected (per C/S rules):
  – Within 5 minutes before position confirmation*
  – Within 15 minutes after position confirmation*

*Based on latest data time of new vs. most recent data time of sent DOA alerts
Located Alerts

The USMCC

• Distributes alerts to US RCCs within 50 km buffer zone
• Distributes alerts to US RCCs within 348 km buffer zone for some US SPOCs, based on the 200 nautical mile US Exclusive Economic Zone (EEZ)
• Sends same pass update, prior to position confirmation, if the “A” side probability increases by at least 15%
• Sends located and unlocated alerts for US special program beacons specially (i.e., in append or replace mode)
Located Alerts

New alert with DOA or Doppler location distributed when:

• DOA or Doppler location first received
• Subsequent DOA location has improved Expected Horizontal Error (EE):
  – Less than 150 NM (277.8 km) and
  – At least 2 NM (3.7 km) less than lowest previously sent DOA expected error and
  – At least 50% less than lowest previously sent DOA expected error
• Before position confirmation, DOA position update every 5 minutes*
• Before position confirmation, position conflict occurs (20 km threshold)
• Position confirmation is achieved; for 2 DOA positions this requires:
  – Each DOA alert to include data from one satellite not included on the other alert and
time separation of at least 2 seconds in some portion of the periods for the two alerts
  (i.e., separate bursts); or
  – At least 30-minute time separation for the two DOA alerts
  – Position can also be confirmed by DOA, with Doppler or encoded position
• After position confirmation, DOA position update every 15 minutes*
• After position confirmation, DOA position conflict as often as every 10 minutes*

*Based on latest data time of new vs. most recent data time of sent DOA alerts
Position Confirmation

• Position confirmation requires independent positions that match within 20 km
• Matching positions can come from:
  – Independent Doppler positions
  – Independent DOA positions
  – A Doppler and DOA position
  – A Doppler and encoded position
  – A DOA and encoded position
• Position confirmation alert sent to all previous alert recipients for beacon activation
• By default, messages are sent after position confirmation to the destination associated with the real position (MCC per C/S rules; US RCC or SPOC if location within USMCC service area)
Alert Site Closure

• Sites close automatically
  – 2 hours without a detection, if the beacon was detected by a USA MEOLUT with DOA position or a USA GEOLUT, or
  – 6 hours without a detection; otherwise,
  – 72 hours since alert site opened (regardless of time since last detection)

• Sites close manually
  – USMCC Controller closes site at RCC request

• IHDB record created waiting for RCC or SPOC input
  – RCC updates IHDB directly
  – SPOC provides Incident Feedback from USMCC site closure message to USMCC for entry by USMCC personnel
Conclusion

Questions?