USMCC Operations

SAR Controllers Workshop 2024

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Overview

- USMCC 24/7 Monitoring
- Beacon Testing
- MCC Processing
- Ground Station Types
- Basic Alert Distribution Rules
  - Unlocated Alerts
  - NOCRs
  - SSAS Alerts
  - Uncorroborated Alerts
  - Located Alerts
  - Position Confirmation
- Alert Site Closure
- GEOSORT

Data Driven Support

Operations Team
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Analysts/Engineers
Eric Foster
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Controllers
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- Detection & Location Data Processed (5 year span)
  - 6.9M distress alert solutions processed from LUTs world-wide (including U.S.)
    - 2.6M messages distributed to US RCCs/SAR Points of Contact & International MCCs
    - Distributing ~3.9% of alerts received to SAR forces
    - Yearly average of 11M alert solutions processed, 412K distributed
- Over 700,000 lines of code
- Interference monitoring/ reporting
- False alert reporting

USMCC 24/7 Monitoring

- **There is one controller on shift at a time**

- Controllers work 12-hour shifts (@7 AM/7 PM ET)

- The USMCC Controller's primary responsibility is to ensure that data flows smoothly and continuously:

  – Input from LUTs and MCCs

  – Output to the RCCs, MCCs, and SPOCs

- **The USMCC Controller can assist the RCC Controller by:**

  – Closing sites so an IHDB record will be created

  – Changing com paths when requested

  – Relaying messages to appropriate USMCC personnel

  – Answering alert message questions from RCCs

  – Resetting IHDB passwords

  – **Sending US beacon registrations or narrative messages to MCCs**

USMCC 24/7 Monitoring (Cont'd)

- **Assisting in retrieving registration information for foreign beacons**
  - Sending requests to other MCCs
  - Assisting with IBRD access
- Changing Search and Rescue Regions (SRRs) for sites
- Siting queries (O-plots) by geographic location
- **Suppressing alerts by site ID (email required)**
- Sending test messages to confirm good communications

- The USMCC Controller cannot:
  - Advise the RCC Controller about their SAR activities (e.g., such as whether or where to launch assets for an alert)
  - Assure that alerts were sent to RCCs outside of the US service area
  - Assure that a foreign RCC is actively prosecuting an alert for a US-coded beacon

MCC Processing

- The USMCC is a data stream processing system. Each input message from a ground station (LUT) is evaluated, validated, matched, and merged based on the beacon ID.
- The current operational system includes LEOSAR/GEOSAR/MEOSAR data (LGM systems)
  - LGM early operations began December 2016
  - 6 nodal MCCs: USA, France, Spain, Japan, Russia, and Australia
  - 11 non-nodal MCCs: Norway, United Kingdom, Qatar, Chile, Greece, Italy, Turkey, Algeria, Singapore, Chinese Taipei, and Cyprus
- LEOSAR/GEOSAR only (L/G) MCCs do <u>not</u> distribute MEOSAR data <u>automatically</u>
  - L/G MCCs must send MEOSAR data to their associated RCCs and SPOCs <u>manually</u>
- 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

Ground Station Types

- MEOLUTs
  - Send a single Difference of Arrival (DOA) position computed using multiple MEOSAR satellites
  - The DOA position is computed using differences in Time of Arrival (TOA) and/or Frequency of Arrival (FOA) data from different MEOSAR satellites
  - No inherent ambiguity
  - Encoded position may be sent in beacon message
- LEOLUTs (Primary LEOLUT, MEO antennas when not scheduled for LEO)
  - Send two positions known as Doppler A/B positions using one LEOSAR satellite
  - 1 real position and 1 image position
  - Inherent ambiguity
  - Encoded position may be sent in beacon message
- GEOLUTs
  - Send beacon detections for one 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 Registration (NOCR) messages are distributed based on country code
    - Sent when the alert is located outside the SRR of country of registration
- Ship Security Alert System (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
      - **RGDB SRR assignments for non-US areas are available in Annex 13 of the RCC Messages Manual**
    - 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 International Telecommunications Union (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 <u>non-USA-coded</u> beacon within the US 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

NOCR Distribution

- Per C/S, alert messages are sent based on country code and beacon location 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. **These countries are listed in Annex 14 of the RCC Messages Manual**
  - 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

SSAS Beacons and
Alerts for Unreliable Beacon IDs

- Alerts for USA-coded 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
- 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 (Cont'd)

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) <u>and</u>
  - At least 2 NM (3.7 km) less than lowest previously sent DOA expected error <u>and</u>
  - 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); <u>or</u>
  - 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

- <u>IHDB record created waiting for RCC or SPOC input</u>
  - RCC updates IHDB directly
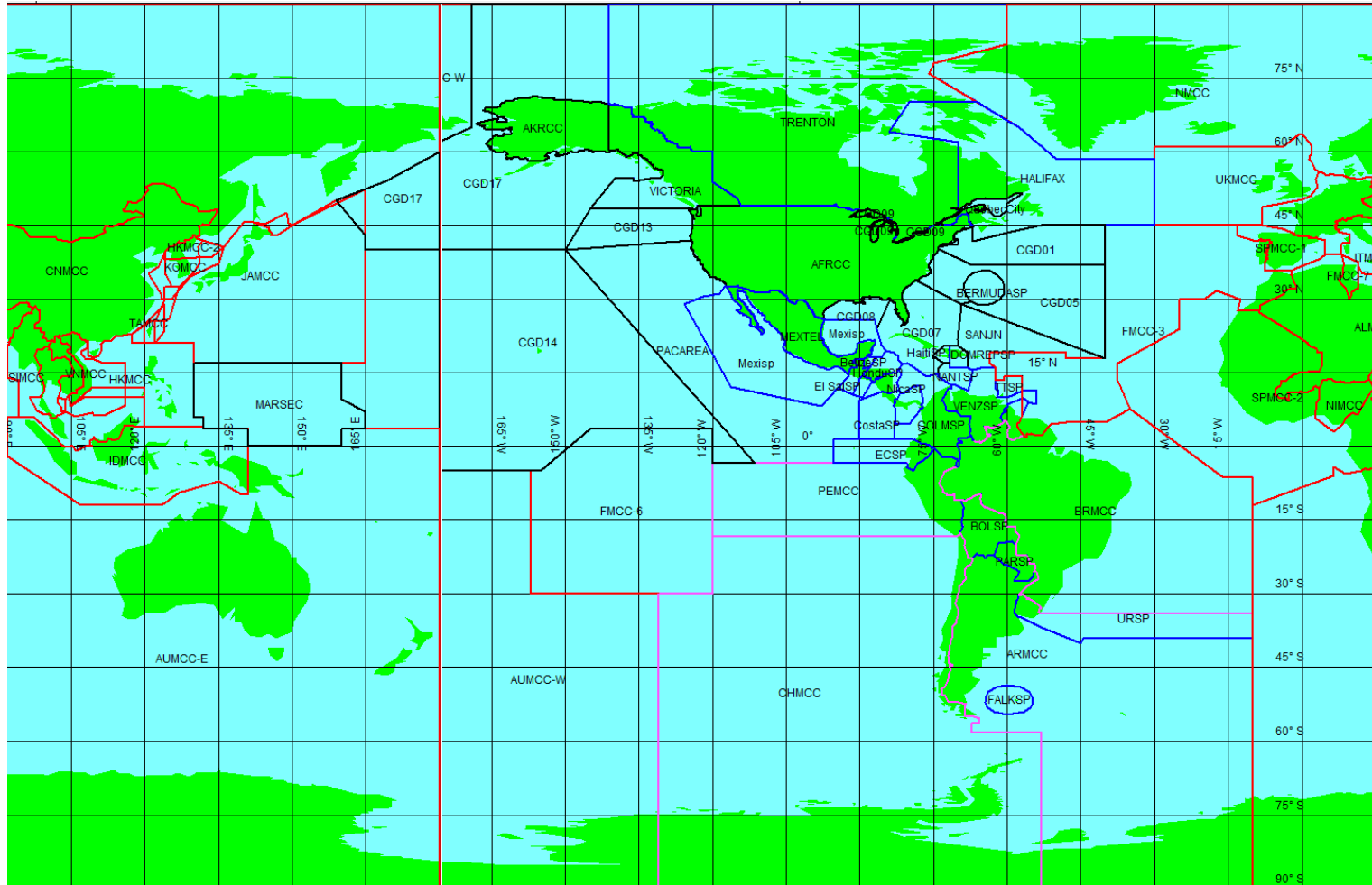 - SPOC provides Incident Feedback from USMCC site closure message to USMCC for entry by USMCC personnel

USMCC GEOSORT
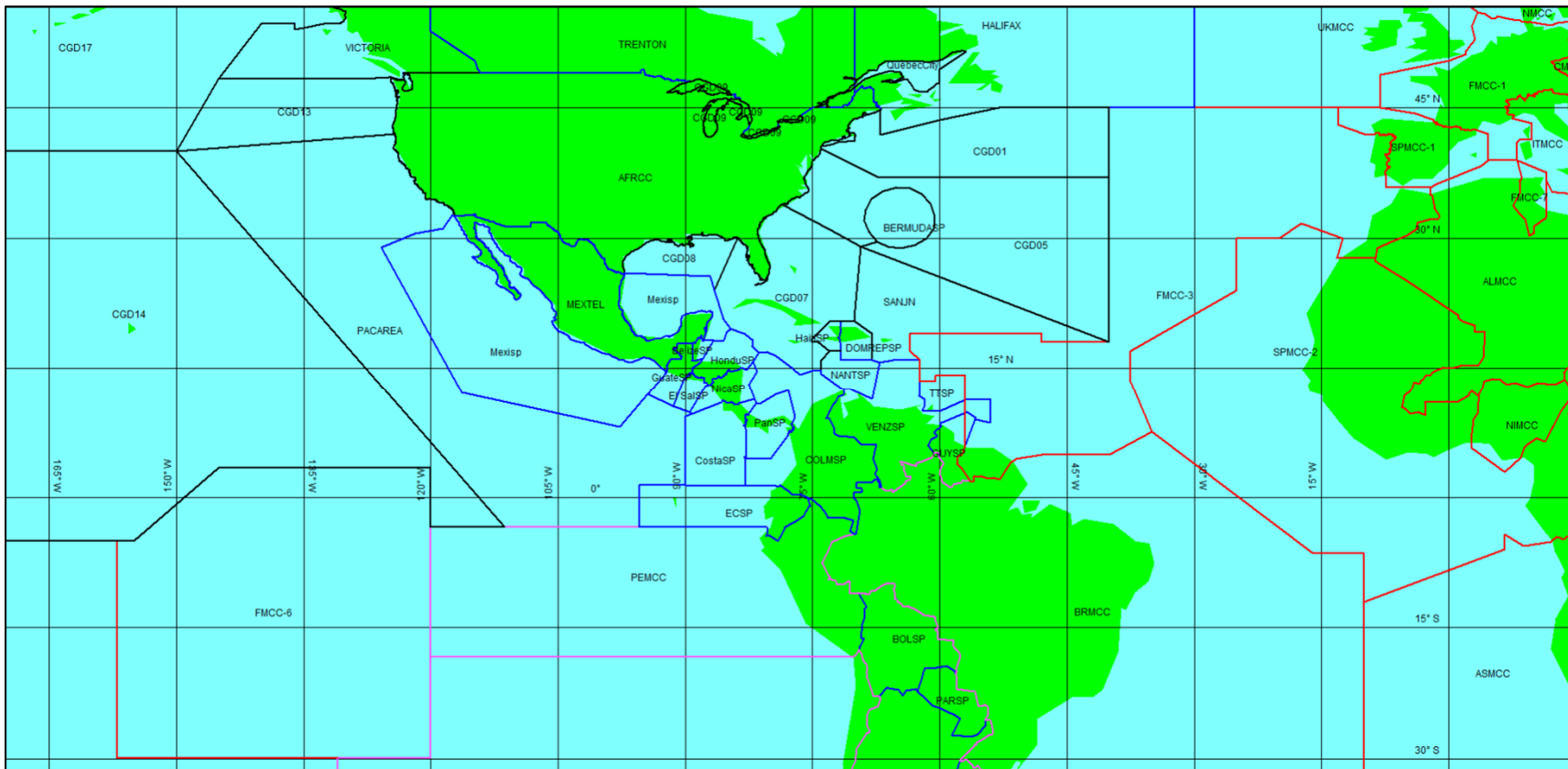
USMCC GEOSORT

Questions & Contact Info

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