



# USMCC Data Distribution

SAR Controllers Workshop 2019

5 - 7 March 2019

Beth Creamer

USMCC Chief

ERT, Inc.





# MCC Processing

---

- The current operational system includes LEOSAR/GEOSAR/MEOSAR data (LGM system)
  - LGM early operations began 13 December 2016
- Only 4 MCCs of 33 in C/S System deliver MEOSAR data and follow data distribution rules for LGM MCCs
  - USA
  - France
  - Norway
  - Spain
  - Australia coming soon
- Data Distribution Procedures are described in the Cospas-SARSAT Data Distribution Plan (DDP), A.001



# MCC to MCC Data Distribution

## Nodal Distribution Network

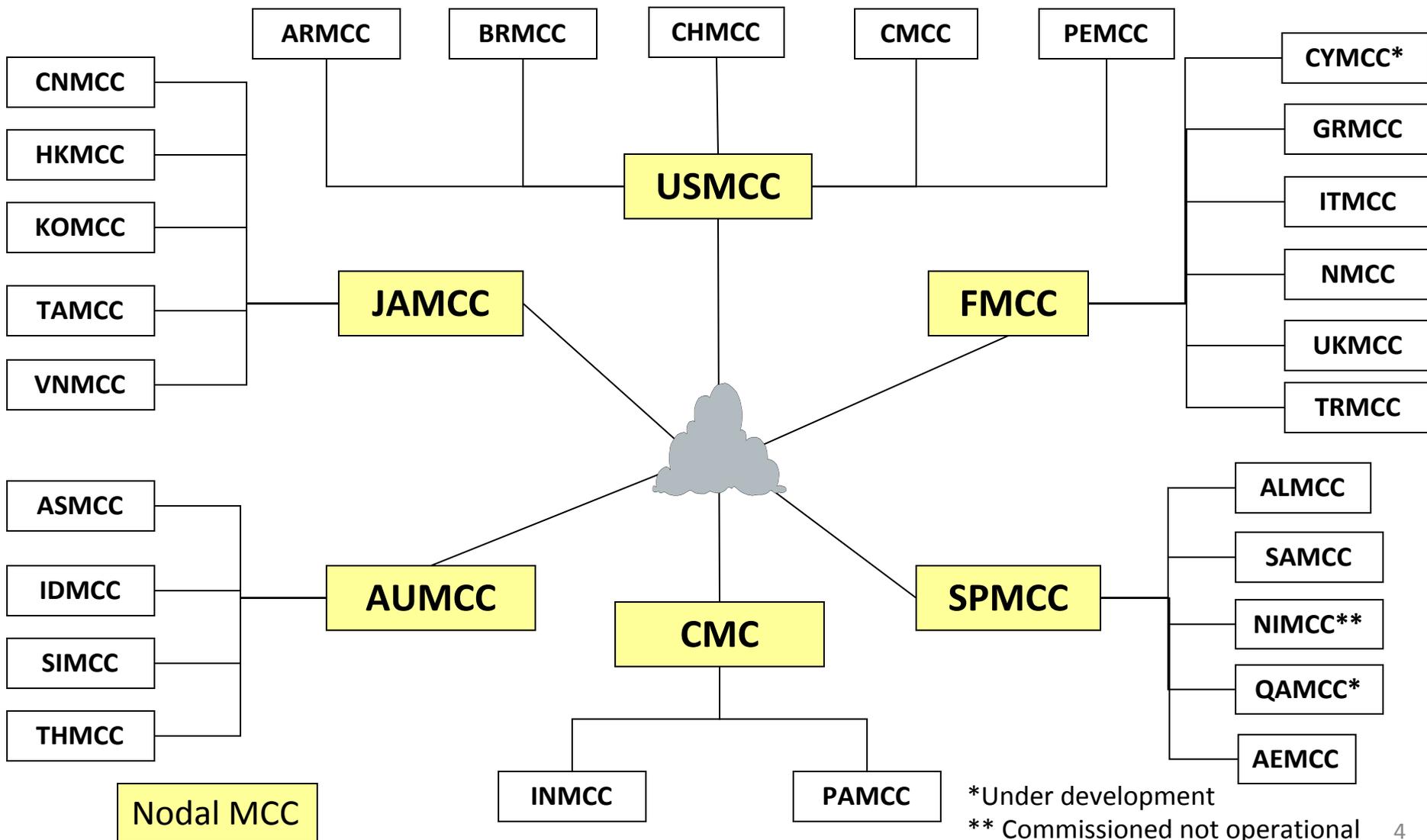
---

- The USMCC is nodal for the Western Data Distribution Region
- Messages are sent between MCCs via 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:
  - 30 MCCs in C/S system as of March 2018
  - 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





# 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
- LEOLUTs send 2 positions using 1 LEOSAR satellite
  - Doppler A/B positions
  - 1 real position and 1 image position
  - Inherent ambiguity
- GEOLUTs send beacon detections for 1 GEOSAR satellite
  - no independent position
  - Encoded position may be sent in Beacon ID



# Basic Distribution

---

- 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

---

- Per C/S MCCs distribute based on Country Code of Beacon
- For beacon IDs with U.S. country code (303, 338, 358, 366, 367, 368, 369, 379, 536 or 559)
  - If the beacon is registered in U.S. 406 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 owners 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 go to PACAREA
  - ELTs: 24-bit address, aircraft operator designator, etc.
    - RCC must look up using tail number database
    - Unlocated ELT alerts go to AFRCC

If no vessel or aircraft ID (i.e., no link to another registry) in beacon message, unlocated alert is not distributed



# Unlocated Alerts – Non-U.S. Beacons

---

- Unlocated alerts for a non-U.S. coded beacon within the U.S. 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 U.S. RCC in whose SRR the country is included
    - Example, Cuban beacon goes to CGD7



# Unlocated Alerts – SRRs for U.S. Registered

## RGDB SRR Assignments – non US areas

State Abbreviation	State Name	EPIRB SRR 01	EPIRB SRR 02	ELT SRR	PLB SRR 01
AN	Antigua	San Juan		AFRCC	AFRCC
BH	Bahamas	CGD7		AFRCC	AFRCC
BL	Belize	CGD7		AFRCC	AFRCC
BR	Bermuda	CGD5		AFRCC	AFRCC
CI	Cayman Islands	CGD7		AFRCC	AFRCC
CR	Costa Rica	PacArea		AFRCC	AFRCC
DR	Dominican Republic	San Juan		San Juan	San Juan
ES	El Salvador	PacArea		AFRCC	AFRCC
GT	Guatemala	PacArea		AFRCC	AFRCC
HN	Honduras	CGD7		AFRCC	AFRCC
JA	Jamaica	CGD7		AFRCC	AFRCC
MR	Marshall Islands	CGD14		CGD14	CGD14
NA	Netherlands Antilles	San Juan		San Juan	San Juan
NI	Nicaragua	CGD7		AFRCC	AFRCC
PR	Puerto Rico	San Juan		San Juan	San Juan
RP	Panama	CGD7		AFRCC	AFRCC
SV	Saint Vincent	San Juan		San Juan	San Juan
VI	Virgin Islands	San Juan		San Juan	San Juan



# NOCR Distribution

---

- Notification of Country of Registry (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 U.S. RCC when it first receives a located alert for the alert site, and
    - The alert is for a U.S. coded beacon but not in a US SRR, or
    - The alert is for a non U.S. coded beacon for a country supported by a US RCC (e.g., Bahamas) but not in that country's SRR.
  - 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

<u>Country Code</u>	<u>Associated RCC</u>
MID: 307 ARUBA	NANTSP
MID: 308/309/311 BAHAMAS	CGD7
MID: 314 BARBADOS	CG Sector San Juan
MID: 310 BERMUDA	BERMUDASP
MID: 378 GB VIRGIN ISLANDS	CG Sector San Juan
MID: 319 CAYMAN ISLANDS	CGD7
MID: 730 COLOMBIA	COLMSP
MID: 323 CUBA	CGD7
MID: 327 DOMINICAN REPUBLIC	DOMREPSP
MID: 330 GRENADA	CG Sector San Juan
MID: 750 GUYANA	GUYSP
MID: 336 HAITI	<del>CGD7</del> -HaitiSP
MID: 339 JAMAICA	CGD7
MID: 538 MARSHALL ISLANDS	CGD14
MID: 510 MICRONESIA	CG Sector Guam
MID: 306 NETHERLANDS ANTILLES	NANTSP
MID: 511 PALAU	CG Sector Guam
MID: 351/352/353/354/355/356 PANAMA	PanSP
MID: 357/370/371/372/373/374 PANAMA	PanSP
MID: 375/376/377 SAINT VINCENT & GRENADINES	CG Sector San Juan
MID: 362 TRINIDAD AND TOBAGO	TTSP
MID: 364 TURKS AND CAICOS ISLANDS	CGD7
MID: 775 VENEZUELA	VENSP



# SSAS Beacons and Alerts for Unreliable Beacon IDs

- Alerts for U.S. 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 Suspect Alerts

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

- Suspect alerts may later be corroborated by another detection for the beacon (LEO, GEO or MEO)
- Suspect alerts never corroborated by another beacon detection have been used in SARSAT rescues (3 cases in 2017)
- Per C/S requirements, suspect MEOSAR alerts are:
  - Distributed to LGM MCCs
  - Not distributed to LEOSAR/GEOSAR (L/G) only MCCs or SPOCs\*
  - Distributed to national RCCs as determined nationally

\* - Per new C/S rule, suspect MEO alerts will be distributed to SPOCs if the beacon is known to be registered or the source LUT is commissioned for low processing anomaly rate (will be implemented in USMCC in 2019).



# Located Alerts / Detection Updates

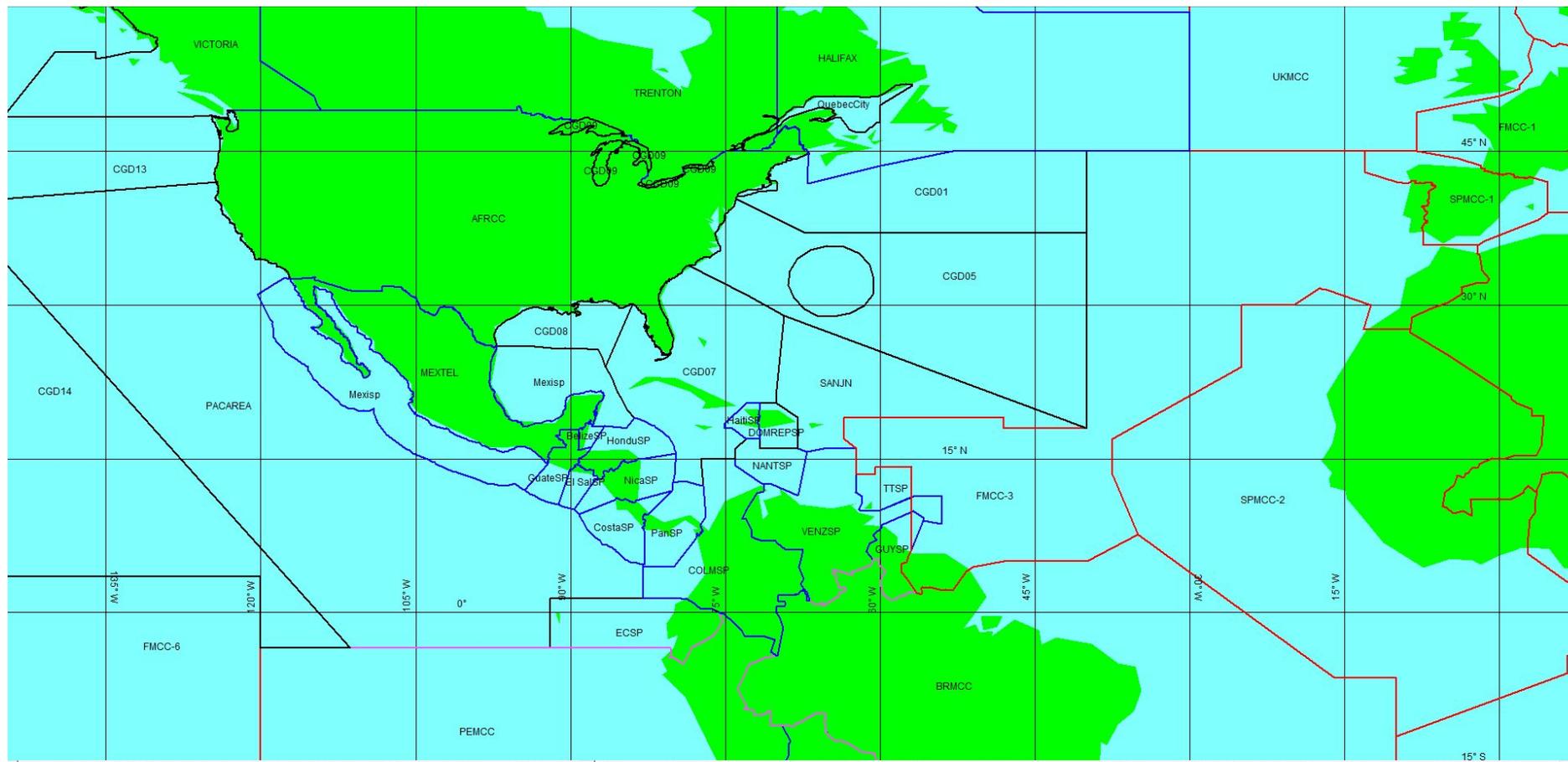
---

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 suspect MEO 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\*



# USMCC GEOSORT





# Located Alerts

---

## The USMCC

- Distributes alerts to U.S. RCCs within 50 km buffer zone
- Distributes alerts to U.S. 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 U.S. 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
- Positions can come from:
  - Independent Doppler positions
  - Independent DOA positions
  - A Doppler and DOA position
  - A Doppler and encoded position, or
  - A DOA and encoded position that match within 20 km
- 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, RCC or SPOC per USMCC rules)



# Alert Site Closure

---

- Sites close automatically
  - No detects for 2 hours after position confirmation
  - No detects for 6 hours if no location
- 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?