Beacon Manufacturers Workshop
May 20, 2016
Clearwater, Florida

MINUTES

NOTE: This document covers Workshop highlights. Presentations and other information are posted on the NOAA SARSAT website (www.sarsat.noaa.gov) under the 'SARSAT Meetings' tab.

1. Opening

The Chair, Mr. Mickey Fitzmaurice (NOAA/SARSAT), convened the Workshop. He thanked RTCM for hosting the meeting and Ms. Lisa Hessler (NOAA/ERT) for providing admin support.

The participants introduced themselves (enclosure (1) lists the participants).

The Chair advised that the Cospas-Sarsat Council had just decided to take a dual approach, i.e., to use both first and second generation beacon (FGB and SGB) technologies, to attempt to satisfy requirements of the International Civil Aviation Organization's Global Aviation Distress and Safety System (GADSS). Cospas-Sarsat had also asked that manufacturers not use the Cospas-Sarsat logo for other than type-approved beacons and would be sending letters to manufacturers to clarify this restriction.

On behalf of the U.S. SARSAT Agencies, the Chair presented a plaque of appreciation and gift to Mr. Robert Markle, RTCM outgoing President, for 14 years of strong support of the SARSAT Program, for assistance in developing beacon standards, and for annually hosting the Beacon Manufacturers Workshop. Mr. Markle spoke of the interesting work of the BMW and offered his best wishes for the Workshop and all of its participants.

2. Prior Action Items

The Workshop reviewed prior action items and closed one. Those that remained open are shown in enclosure (2).

3. Cospas-Sarsat

Mr. Eric Harpell (Cospas-Sarsat Secretariat) showed a list of the (38) Cospas-Sarsat Participants and reviewed the Cospas-Sarsat System components. The space segment had five LEO and six GEO payloads with more of each planned for launch within the next three years; there were also four in-orbit GEO payloads being tested. The ground segment had 54 LEOLUTs, 22 GEOLUTs, and 31 mission control centers (MCCs). At the end of 2015 there were nearly 1.8 million beacons and about 50 active beacon manufacturers. Mr. Harpell reviewed the System geographic coverage, the increasing beacon growth rate, and the 2014 search and rescue (SAR) statistics (2015 data was not yet available).

Cospas-Sarsat documents G.008 (406 MHz SGB requirements) and R.017 (SGB implementation plan (BIP)) were available to use. C/S T.018 (SGB specs) and C/S T.021

(SGB type approvals) were expected to be finished at the 30th and 31st sessions of the Joint Committee (JC-30 and JC-31), respectively. Issue B of the preliminary C/S T.018 was available but no version of C/S T.021 had been released.

The BIP timeline had not been updated to account for GADSS; this would be considered by JC-30 and the Council.

Mr. Harpell commented on parts of C/S T.018 that remained under development, on the possibility that a special autonomous distress tracking (ADT) beacon might be developed for GADSS (an ELT (DT)), and on SGB testing being conducted by NASA and others. He also mentioned four Cospas-Sarsat SGB correspondence working groups (CWGs) that were working on: homing and intelligent transmit scheduling; C/S T.018 and C/S T.021; the SGB proof of concept; and ELT (DT)s.

Cospas-Sarsat expected to have an operational return link service (RLS) by early 2018. C/S T.001 (FGB spec) and C/S T.007 (FGB type approval) had been updated to provide for RLS beacons.

The number of available L-band satellites was increasing. The MEOSAR space segment status can be reviewed at https://www.cospas-sarsat.int/en/system/meosar-system-status/status-of-cospas-sarsat-meosar-payload-instruments .

Cospas-Sarsat was completing the MEOSAR demonstration and evaluation (D&E) Phase II report. The final D&E Phase III would begin as soon as possible after the early operational capability (EOC) begins. A minimum of fourteen L-band satellites would be required before Phase III could be started.

EOC would allow: early operation use of MEOSAR data; MEOSAR to supplement the LEO/GEO system; and SAR personnel to become familiar with MEOSAR before it becomes fully operational. Full operational capability (FOC) would require global coverage but would not depend on availability of SGBs. GEOSAR and some LEOSAR capability would continue after FOC.

4. Global Aviation Distress and Safety System

Mr. Ed Thiedeman (USCG) briefed on GADSS, which ICAO was developing as a matter of priority consequential to major events involving downed aircraft that had been difficult to locate. GADSS would identify and track aircraft, provide reliable distress alerting, and help locate downed aircraft. The GADSS concept of operations (CONOPs) had been updated in December 2015; the CONOPs provided for tracking aircraft during normal and abnormal operations, distress tracking, and response and recovery.

GADSS was developed to:

- Enhance the ability to rescue survivors
- Provide immediate notification of abnormal event
- Locate an accident site with a degree of accuracy in a timeframe and level of confidence
- Function worldwide
- Use performance-based standards
- Be independent of any prescriptive technology
- Be flexible to accommodate diverse regional needs

- Not degrade baseline SAR services
- Be seamless across air traffic service (ATS) regions

GADSS would improve the ability of aircraft to transmit 4D (lat/long/altitude/time) positions via a space-ground system. It is intended to track an aircraft position within one nautical mile, every 15 minutes, provide ADT with transmissions every minute, and localize downed aircraft within six nautical miles. GADSS would also improve flight data recovery using automatically deployable flight recorders (ADFRs) or in-flight data streaming. As appropriate, data would be sent to aircraft operators, ATSs, and responsible SAR authorities.

Cospas-Sarsat was working on suitable new ELTs for the ADT requirement to be available in time to be installed on new aircraft by the GADSS January 2021, i.e., about two years before that date.

Some manufacturers expressed concerned about the tight schedule to produce ELT (DTs) and provide global Cospas-Sarsat coverage. The Chair emphasized that the U.S. saw a way forward to meet the ICAO beacon schedule and was working hard nationally and internationally to make that a reality. He also pointed out that encoded locations could be used to enable global detection and location for GADSS until Cospas-Sarsat can provide independent locations.

The Workshop noted that FGBs cannot meet the GADSS requirement to report altitude, and that GADSS provisions of ICAO's Annex 6 apparently did not require a 4D position.

Action: USCG (Ed Thiedeman) to obtain clarification from ICAO on the requirement and source document for 4D (lat/long/altitude/time) positions

One participant noted that the International Maritime Organization (IMO) had asked ICAO whether distress data transmitted via the Iridium satellite system would be delivered via the Cospas-Sarsat data distribution system; this had not yet been resolved by ICAO and Cospas-Sarsat.

5. RTCA

Mr. Tom Pack (Chair, RTCA SC-229/ACR Electronics) mentioned seven recent cases involving large missing aircraft that were incentives for improving the ability to locate downed aircraft. The FAA had asked RTCA to form a special committee to update its standard for 406 MHz ELTs (DO 204a); the update would be used as a basis to revise the FAA's Technical Standard Order (TSO) C126x for ELTs. RTCA was focused so far on FGBs; however, the FAA was allowing it to work on SGBs as well.

RTCA had established SC-229 and was working jointly with EUROCAE's Working Group – 98 so that DO – 204a and ED - 62a (minimum operational performance standards (MOPS) for 406 MHz ELTs) could be harmonized. SC-229 and WG-98 had met jointly seven times with the following working groups to support their work:

WG-1: Triggered Flight
WG-2: Crash Survivability
WG-3: 2nd Generation Homing
WG-5: GNSS, RLS, Power, Etc.
WG-5: DO-204 Standard Development

WG-1 had developed ED-237, a minimum aviation system performance specification (MASPS) for inflight event detection and triggering; triggering criteria would apply to GADSS abnormal tracking and ADT. The now-published EUROCAE MASPS provides guidance to regulatory authorities, designers, installers, manufacturers, service providers and users of systems intended for inflight activation.

WG-2 had studied crash safety data, conducted crash tests with three Cessna 172 airframes at NASA Langley, developed models and analyzed data to use as a basis for recommending text for DO-204A to improve ELT system survivability and reliability. The WG was also studying requirements for installations and to account for fire.

WG-3 was developing specifications for homing and intelligent transmission scheduling (covered by Mr. Thiedeman in a separate BMW presentation).

WG-4 had been coordinating its work with RTCA SC-159 (Global Positioning System) and SC-235 (Non-rechargeable Lithium Batteries).

WG-5 had been converging DO-204A and ED-62A into a single document; the document structure was being developed, updated or new requirements were being added, and test requirements were being collected into one place in the joint document (for ease of use).

Mr. Pack mentioned that Cospas-Sarsat had established a Triggered Flight CWG and was considering development of a new type of ELT to meet GADSS ADT requirements for in Annex 6 (Operation of Aircraft) of the ICAO Convention.

RTCA was working independently of ICAO and Cospas-Sarsat to finish DO-204a and ED-62A, but was closely following the work of these organizations and keeping the FAA briefed on their progress on GADSS and SGBs. RTCA expected to publish DO-204a by late 2017. RTCA was attempting to learn from the FAA whether it would consider certifying SGBs before MEOSAR FOC, and if so under what conditions. Mr. Pack would be requesting an extension of SC-229's deadline to finish its work so that it could deal with SGBs.

The Chair noted RTCA's frustration with the status of Cospas-Sarsat's work on MEOSAR and SGBs, and assured the meeting that Cospas-Sarsat was trying to accelerate its efforts and establish a workable timeline.

Mr. Chris Hoffman (Chair, RTCM SC-110/ACR Electronics) invited any manufacturer interested in working on specifications for an ELT (DT), or on updates to C/S T.001 and C/S T.018 to let him know, or Mr. Pack know, right away because the work was progressing quickly.

6. Second Generation Beacons

Dr. Sun Hur-Diaz (NASA) commented on NASA's SGB efforts. A published proof-of-concept (POC) plan included test procedures for SGB detection, location, capacity, 406 MHz homing, field testing, etc., and NASA had upgraded its MEOLUT and other equipment to generate and process SGB signals. Actual testing was scheduled for late May, but preliminary 24-hour tests at 37, 34 and 31 dBm transmit power through a monopole antenna had produced results fully or nearly compliant with C/S G.008 requirements. Dr. Hur-Diaz noted that using more than 15 bursts did not further improve location accuracy. NASA was using a signal consistent with C/S T.018 specs.

Cospas-Sarsat had updated C/S T.018 in areas such as PRN sequences, but frequency stability details and other areas still needed to be resolved. The POC was being used to help resolve the beacon transmit schedule and EIRP values and measurement. NASA expected C/S T.018 to be completed in 2016.

Cospas-Sarsat had made progress on the C/S T.021 compliance matrix, EIRP test configuration and measurement, and other sections, and expected to finish this standard in 2017.

Another SGB driver for NASA was the need to provide operational SGB PLBs, called Advanced Next Generation Emergency Locators (ANGELs), for the Orion crew to use with its splash-down capsule and life preserver units (LPUs) by late 2020. NASA had developed a prototype 406 MHz spread spectrum beacon with 121.5 MHz homing and planned to release a request for procurement (RFP) for 30 commercial units during the summer of 2016.

The Chair noted that NASA's excellent results would improve further with availability of more L-band satellites. Results based on single-burst throughput would be published during the summer.

7. Florida State Bill SB 746

LTJG Jason Wilson (NOAA/SARSAT) discussed a new Florida (SB 746) law that from July 1, 2016 would provide incentives to use EPIRBs and PLBs. The law resulted from efforts of parents of two boys who had been lost at sea during a sudden squall. SB 746 provides for discounts on annual boat registration fees of 12-23 percent (depending on boat size and category) for voluntary beacon carriage.

One participant proposed that SARSAT attempt to monitor the effectiveness of the Florida initiative. Florida has more beacon incidents than any other State and has the second largest number of beacons registered.

Action: NOAA to attempt to use the SARSAT registration database to quantify the impact of a new Florida law providing incentives to buy EPIRBs and PLBs

Australia had implemented mandatory beacon carriage for recreational vessels with good results.

CAPT Jack Fuecshel (USCG retired) commented that Hawaii also had a law that addressed carriage of beacons and other communications equipment, and that the Global Maritime Distress and Safety System (GMDSS) Task Force and the National Boating Safety Advisory Council had both advocated that the Coast Guard use its authority to promulgate requirements similar to those in Hawaii at the national level.

8. RTCM

Mr. Hoffman provided background on RTCM which develops and publishes numerous standards and contributes to developing Cospas-Sarsat beacon standards. He reviewed some history of RTCM's EPIRB and PLB standards. RTCM was developing standards for EPIRBs and PLBs that include automatic identification system (AIS) functions.

RTCM has Observer status with Cospas-Sarsat. It submits papers to and attends numerous Cospas-Sarsat meetings that work on C/S documents T.001, T.007, T.018, and T.021.

Once T.018 is finished, RTCM's Special Committee on EPIRBs and PLBs (SC-110) would begin work on a U.S. standard for EPIRB and PLB SGBs.

The RTCM EPIRB standard, 11000.4 published June 2015, addressed differences with the IEC standard such as internal GNSS, mounting, and thermal shock, and provided for AIS homing signals. The Federal Communications Commission (FCC) had issued an NPRM in 2014 to update Part 80 of its rules to adopt the updated RTCM EPIRB standard.

RTCM 11000.4 provides options for the following EPIRB variants:

- Group 1 EPIRBs that include a 121.5 MHz homing transmitter
- Group 2 EPIRBs that include an AIS transmitter
- Group 3 EPIRBs that include a 121.5 MHz and an AIS transmitter

Additionally, for these EPIRBs:

- 406 MHz signals take precedence over AIS signals in the event of a clash (i.e. can omit an individual AIS pulse if necessary)
- The EPIRB 15 hex ID is broadcast over AIS as a Message 14 Safety Related Broadcast Message to tie identities together
- AIS signals and 121.5 MHz signals are interleaved
- 406 MHz signals and AIS signals are interleaved
- AIS signals take precedence and can interrupt 121 MHz signals for up to 50 ms at a time to transmit a pulse if necessary
- The 121.5 MHz homing signal must have a minimum duty cycle of 33%, but can be up to 95% at the manufacturer's discretion

The current RTCM PLB Standard, 11010.2 published July 2008 includes amendments addressing internal navigation, altitude testing, wet self-test, and alignment with C/S T.001 GNSS timing and NOAA coding requirements. An update to Part 95 of the FCC's rules to adopt the new standard was being processed.

RTCM was working on a further update to permit PLBs to include an AIS transmitter. The Coast Guard and FCC were considering what options to permit for securing operation of the AIS portion of these PLBs when they are on land where use of AIS is not permitted; these could include manual and automatic means for securing AIS. The AIS signals would be interleaved with the 121.5 MHz homing signal in the maritime environment.

Mr. Hoffman advised that RTCM had developed a standard (12800.0) for satellite emergency notification devices (SENDs), last published with updates in June 2014. The standard includes message formats for distress alerts. An FCC NPRM proposes authorizing SENDs in Part 25 of its rules, but RTCM has requested that it be provided for in Part 95 instead.

RTCM's SC-119 handles RTCM Standard 11901.1 for maritime survivor locator devices (MSLDs), the last update of which was published in June 2014. The Standard provides for 'open loop' and 'closed loop' digital selective calling (DSC) devices that operate on channel 70, 121.5 MHz transmitters, VHF AIS transmitters, and active signaling. The FCC issued an NPRM to update Part 95 of its rules to add MSLD devices in 2015. A further update would be required to address new ITU-R M.493-14 provisions for DSC.

RTCM had not begun working on SGB ship security alerting system (SSAS) devices.

Mr. Hoffman remarked that the U.S. was working with the International Maritime Organization (IMO) on revising the IMO EPIRB standard to allow reduced duty cycle 121.5 MHz homing, which ICAO already allows.

9. MEOSAR

Mr. Jesse Reich (NOAA/SARSAT) provided an update on the D&E Phase II and on U.S. preparations for EOC.

Some Phase II tests were completed in July 2015, others in December 2015; the Cospas-Sarsat report for Phase II was expected to be completed for JC-30 and forwarded to the Council for approval. Phase II results for the U.S. MEOLUTs had been good; the tests demonstrated advantages in detection and location that MEOSAR had over the LEO/GEO system. Using mainly S-band satellites, single burst locations for 37 dBm signals were generally within 15 km accuracy and merged locations were generally within 10 km.

EOC use of the current MEOSAR system would help mitigate risks associated with the aging LEOSAR space segment.

NOAA had successfully completed EOC commissioning tests on May 10th using FGB reference beacons (simulators) in Florida and Maryland to run scripts, with S-band satellites and only one L-band satellite available. The relevant EOC criteria (relaxed initial operational capability (IOC) criteria pending availability of better satellites) that were met or exceeded are as follows:

- Single-burst probability of location of 75%, instead of 90%;
- Single-burst location accuracy of 70% within 5 km, instead of 90% within 5 km, and 90% within 10 km; and
- Multi-burst location performance measured over 20 minutes rather than 10 minutes, i.e., probability of location had to be 98% within 20 minutes and location accuracy had to be 95% < 5 km and 98% < 10 km, within 20 minutes after activation.

The U.S. planned to commission the Florida MEOLUT as a stand-alone MEOLUT by June 2016, and EOC testing for the Hawaii MEOLUT would begin in early June. The networked EOC commissioning test would follow. Both MEOLUTs would be commissioned by early July. Then the LEO/GEO/MEO MCC (LGM MCC) could be commissioned by early August dependent upon FMCC availability for the commissioning.

EOC would be using the S-band satellites and any available L-band satellites.

Actual beacons produce results comparable to the reference beacons; operational beacons around the U.S. had been performing well through MEOSAR. Operational tests using beacons deployed throughout the U.S. service area would be run in late May-early June.

The LGM MCC would provide composite solutions, including for drifting EPIRBs, to SAR authorities based on algorithms developed with them, and these algorithms would be further refined for merging and updating locations. With locations available for every beacon burst, available data was great. Encoded locations and ground truth locations were being used to check location accuracies. When additional L-band satellites became

available, the differential performance between using S- and L-band satellites would be able to be determined.

All nodal MCCs would receive EOC data, but the data would only be distributed to SAR entities that are ready for it.

10. Homing and Intelligent Transmit Scheduling

Mr. Ed Thiedeman (USCG) and Mr. Chris Hoffman (ACR) co-chair the Cospas-Sarsat Homing and Intelligent Transmit Scheduling (HITS) correspondence working group (CWG).

Mr. Thiedeman identified the CWG's tasks as follows:

- Identify homing signal characteristics to support SAR operational goals
- Develop draft homing and on-scene location specifications for C/S T.018
- Assess the impact of defined homing signal characteristics on existing direction finding (DF) equipment
- Define interleaving schema to facilitate multiple homing signals (i.e. 121.5 MHz, 406 MHz, and AIS-SART)
- Develop interleaved homing signal draft specs for document C/S T.018
- Assess transmit schedule to meet requirements in document C/S G.008
  - Consider alternative transmit schedules
- Assess the effects of requirements on the beacon battery
  - Allocation of battery capacity to functions
  - Trade-offs between performance, features, and capacity
  - Analysis of alternative schedule impacts on battery capacity
- Develop a draft transmit schedule for inclusion in draft document C/S T.018

The CWG had:

- Defined 406 MHz homing signal characteristics
- Developed an industry questionnaire to validate characteristics for an effective homing signal
- Presented a draft 406 MHz homing signal spec for comment
- Developed a plan to assess the impact of a reduced duty cycle on 121.5 MHz homing performance; four national administrations were engaged in test efforts
- Completed an initial assessment of transmit requirements presented in document C/SG.008

The CWG planned to:

- Conduct an industry survey to validate effective 406 MHz homing signal characteristics
- Complete the transmit schedule development
- Revise the draft 406 MHz homing signal spec for submission to JC-30
- Complete the performance assessment of reduced duty cycle 121.5 MHz homing
- Complete the battery capacity analysis (function/performance/battery trade-off)

The Coast Guard had engaged the Coast Guard Academy to investigate direction finding on spread spectrum signals. Ensign Ben Morseth commented on results of this work so far; he stated the goal as developing a POC architecture. Spread spectrum EPIRBs were

expected to provide direct sequence spread spectrum (DSSS) greater immunity to interference and jamming; potential for a greater quantity of beacons (using different spreading codes); and smaller less expensive beacons.

DF equipment needed to resolve direction within ± five degrees under realistic conditions. The POC equipment had succeeded in doing this using a four-element phased array antenna (would not need to use phased array), a software defined radio (only 10 dBm power), and difference in phase to locate the signals. The direction was determined based on Eigen vectors and values of a covariance matrix to decompose the data and estimate peak signal values. The results were successful, repeatable and reliable, and the approach could probably be applied to homing on weak (dying battery) 406 MHz alerting signals, cell phones and Wi-Fi signals.

Mr. Thiedeman hoped to continue this work in 2017 using SGBs and algorithms that NASA would develop. The Coast Guard was working with Rockwell-Collins about possibly upgrading Coast Guard DF aviation equipment to home on spread spectrum signals and hoped that other equipment could be developed for use on the ground as the technology becomes more affordable.

11. Beacon Use, Issues and 406 MHz Beacon Registration Database

Mr. Apurve Mathur (NOAA/ERT) pointed out that the U.S. registration database (RGDB) is supported by a staff of five at NOAA in Suitland, MD.

False alerts remained as an ongoing concern for SAR, particularly with ELTs that account for 18% of the beacon population but which were responsible for over 6,000 false alerts in 2015. There were half that many EPIRB false alerts. PLBs, 37% of the beacon population, had nearly 800. Many false alerts result from testing; owners and servicing personnel seem confused about testing 406 MHz beacons. The Federal Aviation Administration (FAA) had not updated its guidance for testing 406 MHz ELTs. Mr. Mathur said that suppliers should be encouraged to coach buyers and users on responsible use.

NOAA would like beacon suppliers to encourage their government customers to contact NOAA to discuss coding, alert distribution, proper use and testing, registration and battery replacement in disposal.

Mr. Mathur emphasized the great value for registration database integrity that voluntary use of checksums by a few manufacturers had been. NOAA contacts owners when checksum values provided by owners are incorrect. NOAA asked that all manufacturers generate checksum values for their new beacons, and expected this to become a mandatory CFR provision.

In addition, NOAA asked that manufacturers and service centers take steps to help improve info in the RGDB:

- Contact NOAA immediately when an issue arises that impacts beacon owners, such as:
  - Duplicate IDs encoded in beacons
  - Mislabeling of beacon IDs on forms or beacons
  - Recalls of beacons

    - Ensure that the UIN label is legible and affixed to the blank registration form, and consider using a font type where the zero and the number 8 stand out since owners often confuse zero with letter “O” and 8 with letter “B”
- Make manufacturer UINs stand out on the beacon and registration form
- Place barcodes on the beacon label and/or form since NOAA uses barcode readers to increase speed and accuracy
- Verify NOAA decal currency and remind the owner, if appropriate, to update the beacon’s registration, especially if a different beacon is returned to the owner
- Provide NOAA the UIN for a beacon received that will not be returned to the registered owner
- Inform retailers of the importance of placing correct registration forms back into the box for boxes opened at their site

Mr. Mathur commented on RGDB website improvements. The new website was implemented on May 9th and offers a more user friendly interface. It also offers real-time entry checks to validate data accuracy. The site will make it easier to register beacons that previously had different owners by allowing owners to submit the registration information via the interface. NOAA will confirm the sale with an internal process and once validated will accept the registration. This should increase and promote the registration of used beacons as they are sold from one owner to another. About 70% of beacon registrations are done online.

The number of beacon registrations increased 18% in 2015 over the prior year. The ELT and EPIRB populations were growing slightly, but PLBs account for most of the growth. As of April, 2016 there were about 486,000 beacons in the RGDB. Beacon registration statistics are available on the NOAA SARSAT website.

Mr. Mathur agreed to provide guidance on use of barcodes since various types of barcodes are not interchangeable.

12. Beacon Testing

Mr. Zoubair Ghazi (NOAA/ERT) discussed SARSAT Program policies on use of 406 MHz beacons and DF equipment for testing, SAR exercises, and training. He cautioned that any beacon message is treated like a distress message used to trigger a SAR response. Non-distress messages routed to SAR services not only waste valuable resources, but could put lives at risk and divert SAR resources needed for actual distress situations. Open air testing (other than self-tests) also affects satellite and the ground system processing capacities.

Since satellites do not process self-tests, self-tests do not need to be coordinated with NOAA. Similarly, use of test-coded beacons does not have to be coordinated. Any non-distress use of operationally coded beacons does have to be coordinated; this includes beacon tests and SAR training or exercise activities.

NOAA is the final approval authority for any use of beacons that requires coordination. Requests forms should be submitted to NOAA at least 48 hours before use of 1-3 beacons and 30 days before use of 4-6 beacons. Normally requests for more than six beacons would not be approved. Requests by the Coast Guard or Coast Guard Auxiliary are submitted to NOAA via the designated Coast Guard SAR Program contact. Requests from

military services, the Civil Air Patrol or the State Department are submitted to NOAA via the designated Air Force contact.

In response to questions, the Chair pointed out that there is no frequency dedicated for testing and training but that the matter could be raised and considered internationally, and he added that NOAA tries to be reasonable in considering requests for tests, e.g., tests that need to be run over multiple days.

13. Beacon Type Approval

Mr. Harpell stated that four test facilities were certified to conduct FGB type approval tests; these are in the U.S., Russia, Ukraine and the UK.

C/S T.008 (Cospas-Sarsat Acceptance of 406 MHz Beacon Type Approval Test Facilities) would need to be updated for SGBs and C/S T.021 would need to be completed. ICAO's introduction of GADSS had increased pressure for progress on SGBs, particularly ELT (DT)s.

While type approval of SGBs would normally await global system coverage, the Chair emphasized that the 'dual approach' that the Council seemed to be supporting and the option of providing global coverage for encoded locations only for ELT (DT)s, at least initially, might enable meeting ICAO's requirements. What might need to be defined is 'sufficient coverage' for type approvals.

Approval of SGBs designed for independent locations might need to wait until coverage becomes essentially global after the beacons are available. Requirements of certification of SGBs by national administrations might vary; approvals could be provided sooner subject to beacon use being allowed only after the system is ready. The FAA had not officially commented on this matter.

14. Cospas-Sarsat Manufacturers Survey

Mr. Harpell reported that 46 beacon manufacturers had responded to the 2016 Cospas-Sarsat survey (six manufacturers collectively representing a small number of beacons had not responded). Responding manufacturers were in Europe (44%), the U.S. and Canada (30%) and Asia and Australia (26%).

About 200,000 beacons had been produced in 2015, representing a 4.5% increase over the prior year. 70% of these were location protocol beacons. About half of them were EPIRBs (6.9% increase), 24,000 were ELTs (down 3%) and 75,000 were PLBs (up 4.1%). This brought the total global population to almost 1.7 million.

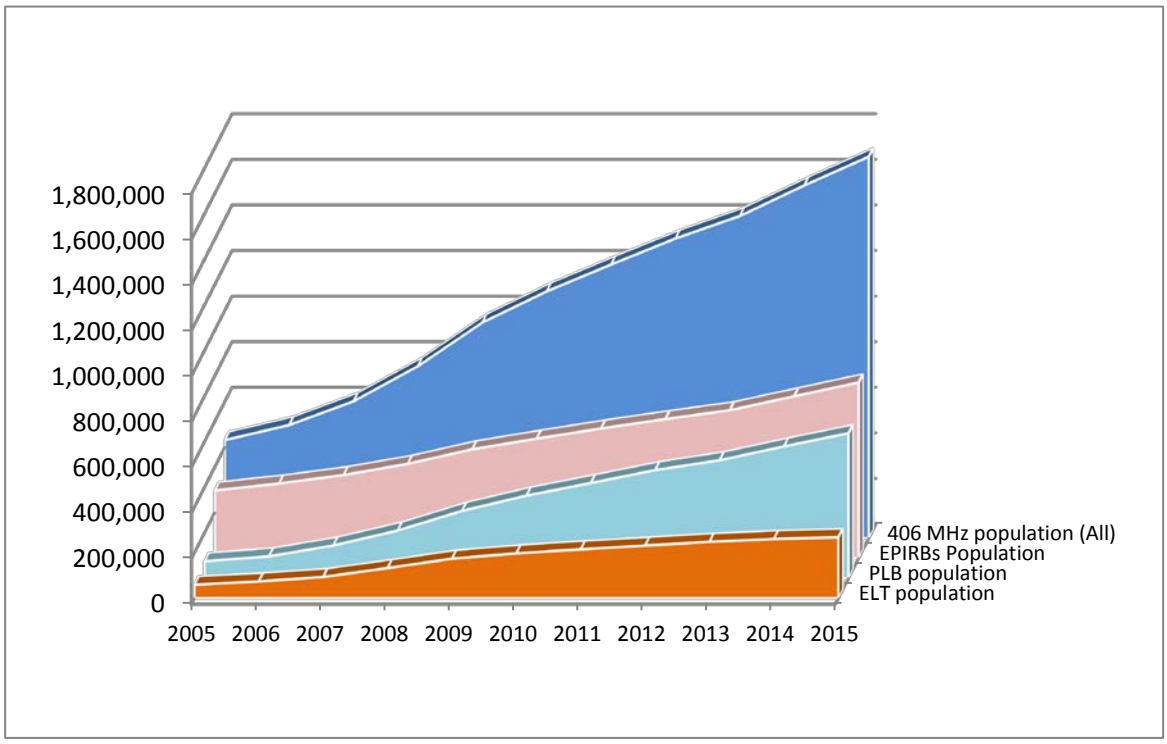
25 manufacturers had each produced more than 500 beacons. One participant asked that the survey determine how many had produced higher numbers of beacons, say 1,000 or 5,000.

For 2016, manufacturers collectively projected producing 106,000 EPIRBs, 26,000 ELTs and 88,000 PLBs, and expected to submit 20 applications for type approval for new beacon models.

Participants noted: that commercial owners tend to replace beacons rather than batteries, so beacon sales go up and battery sales drop; that availability of GPS beacons make new beacons more desirable; and that reduced beacon costs foster sales.

The survey had not addressed attrition rates.

ACTION: RTCM to ask manufacturers to study the attrition rates of beacon types and report results to the next BMW



15. Review of Action Items

Enclosure (2) is a list of action items that remain open from this and prior BMW meetings.

16. Closing Remarks

The Chair invited feedback on the meeting and indicated that the 2017 BMW would likely be in late April or early May.

The Chair expressed appreciation to all the presenters and participants for their interest and contributions, thanked RTCM for hosting the meeting, and gratefully acknowledged GME Standard Communications for sponsoring lunch.

The Workshop was adjourned.

Enclosures:

1. List of Participants
2. List of Open Action Items

Enclosure (1)

List of Participants

2016 Beacon Manufacturers Workshop
May 20, 2016
Clearwater, FL

	Name	Organization
1.	Aritake, Nobuo	Association of Radio Industries and Businesses (ARIB)
2.	Avidor, Dalia	Astronics DME
3.	Bastiani, Sergio	Astronics DME
4.	Beattie, Rich	Radio Holland USA Inc.
5.	Bece, Tibor	GME
6.	Christo, Jim	NASA/GSFC
7.	Duffy, Kate R.	RTCM
8.	Eggen, Øyvind	Jotron AS
9.	Fitzmaurice, Mickey	NOAA
10.	Forey, Peter	Sartech Engineering Ltd
11.	Foster, Eric	NOAA/ERT
12.	Fuechsel, CAPT Jack	GMDSS Task Force
13.	Ghazi, Zoubair	NOAA/ERT
14.	Greenway, Deborah	Rakon
15.	Harpell, Eric	Cospas-Sarsat International
16.	Hartnett, Dr. Richard	U.S. Coast Guard
17.	Hessler, Lisa	NOAA/ERT
18.	Hiner, Eric	Astronics DME LLC
19.	Hoffman, Christopher	ACR Electronics, Inc.
20.	Holmes, Kevin	WS Technologies, Inc.
21.	Hur-Diaz, Dr. Sun	Emergent Space Technologies, Inc.
22.	Igarashi, Dr. Kiyoshi	Association of Radio Industries and Businesses (ARIB)
23.	Jobey, Laurent	Syrlinks
24.	Jordan, Neil	Orolia Ltd
25.	Karan, George	GME
26.	Khalek, Ghassan	Federal Communications Commission
27.	Khorrami, Jeff	McMurdo, Inc.
28.	Lariviere, George	Whiffletree Corporation, Inc.
29.	Lemon, Dan	NOAA/ERT
30.	Markle, Robert	RTCM
31.	Mathur, Apurve	NOAA/ERT
32.	McCurry, Chris	Radiant Power Corp.
33.	McDonald, Mike	Colorado Search and Rescue Board
34.	Mirza, Saddique	Sartech Engineering Ltd
35.	Morseth, ENS Ben	U.S. Coast Guard
36.	Pack, Thomas	ACR Electronics, Inc.
37.	Pulgarin, Felipe	Rakon
38.	Reich, Jesse	NOAA
39.	Robinson, Michael	HR Smith Group
40.	Seals, CDR Kelly	U.S. Coast Guard

41.	Smith, Sharon	NOAA/ERT
42.	Street, Bill	WS Technologies, Inc.
43.	Takahashi, Masaaki	Icom America Inc.
44.	Taylor, Stuart	Techtest Ltd
45.	Taylor, Yvonne	NOAA/ERT
46.	Thiedeman, Edwin	U.S. Coast Guard
47.	Wilson, LTJG Jason	NOAA
48.	Wolf, CAPT Cody T.	Air Force Rescue Coordination Center
49.	Xu, Jiande	New Sunrise Co., Ltd.

Enclosure (2)

SARSAT Beacon Manufacturer's Workshop
Open Action Items from 2015 and Prior Meetings

Action Item #	Description	Status
BMW-2015-AI.1	NASA to distribute to BMW attendees the MEOSAR D&E Phase II T1 test data for various antennas and antenna setups (including elevations) using the Maryland MEOLUT	*Open*
BMW-2015-AI.2	USA SARSAT Agencies to evaluate implementation strategies for various homing and intelligent scheduling (HITS) with the objective of better standardization among beacon types	*Open*
BMW-2015-AI.3	USA SARSAT Program to review with the FAA whether its guidance for testing beacons could be improved to reduce false alerts occurring during maintenance	*Open. Beacon and antenna testing are not always done correctly. The FAA guidance should be updated. RTCA SC-229 had been reviewing antenna testing.*
BMW-2016-AI.1	USCG (Ed Thiedeman) to obtain clarification from ICAO on the requirement and source document for 4D (lat/long/altitude/time) positions	*Open*
BMW-2016-AI.2	NOAA to attempt to use the SARSAT registration database to quantify the impact of a new Florida law providing incentives to buy EPIRBs and PLBs	*Open*
BMW-2016-AI.3	RTCM to ask manufacturers to study the attrition rates of beacon types and report results to the next BMW	*Open*