

RTCA UPDATE

ELT(DT) , LITHIUM BATTERIES, AAM

2023 NOAA Beacon Manufacturers Workshop

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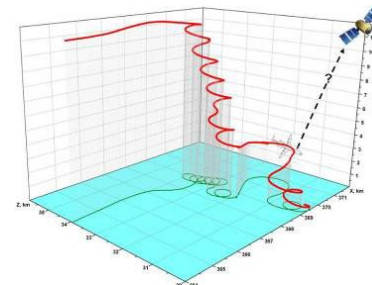
AGENDA

1. Decade Recap
2. RTCA SC-229 Update
3. RTCA SC-235 Update
4. Industry Challenges
5. AAM



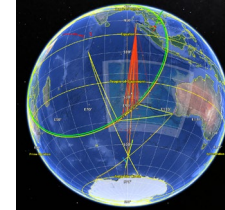
A RECAP OF THE LAST DECADE

- 2009 June 1st : AF 447 Crash
- 2011 April 29th : AF 447 FDR Recovered
- 2013 July 12th : Ethiopian 787 ELT Fire
 - Started Lithium Special Conditions
- 2013 Nov 27th : EUROCAE WG-98
 - Triggered in Flight ELT



A RECAP OF THE LAST DECADE

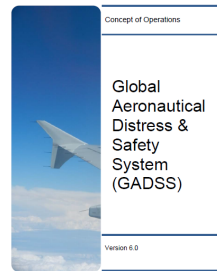
- 2014 March 8th: MH370 Missing



- 2014 March 10th : RTCA SC-229
 - Joint Committee with WG-98
 - ED-237 MASPS

- **ICAO GADSS**

- 2013 FLIRECP proposal
- 2015 Conops
- 2021 SARPS Mandate
- 2023 SARPS Mandate
- **2024/2025 SARPS Mandate**



- **EASA**

- Workshop Series
- **CAT.GEN.MPA.210**
- NPA 2020/2022



- **SAE ARINC**

- AEEC
- 680 GADSS Report
- 681 TRFD Report



RTCA SC-229 ELT COMMITTEE EUROCAE WG-98



- **RTCA DO-204B / EUROCAE ED-62B**
- MOPS FOR AIRCRAFT EMERGENCY LOCATOR TRANSMITTERS 406 MHz
- 2019 December = Published
 - Triggered in Flight ELT
 - Second Generation C/S
 - Crash Robustness
 - Harmonized with EUROCAE ED-62B
- 2020 June = DO-204B Change 1
- Committee back to Active Monitoring Status

- **EUROCAE ED-237**
- MASPS: CRITERIA TO DETECT IN-FLIGHT AIRCRAFT DISTRESS EVENTS TO TRIGGER TRANSMISSION OF FLIGHT INFORMATION
- 2016 February = Published

RTCA SC-235 NON RECHARGEABLE LITHIUM BATTERY COMMITTEE



- Update RTCA/DO-227 for Lithium battery to incorporate the latest understanding of lithium battery technology, including battery testing and installation considerations.

•**RTCA DO-227A** – MOPS FOR NON-RECHARGEABLE LITHIUM BATTERIES

- 2017 Sept = Published
- 2017 March = TSO-C142b Effectivity
- 2020 Comments Received from EASA
 - ETSO-C142a Deviations
 - Shock Vibe Thermal Runaway Sequencing
 - Modification of unit under test (TR)
 - Inconsistency of figures
 - Cell Discharge Tolerances

- 2021 March – Active Status

- Status:

- ToR = DO-227B by March 2022
 - 18 monthly meetings
 - Countless weekly subgroups

- 2022 Sept = FRAC #1

- 2023 May = Final Comment Review

- 2023 June = Entry Approval FRAC #2

- 2023 Dec = Possible Publication

- 2024 TSO-C142c to follow



FIRST TRIGGERED IN FLIGHT ELT ~2018

- **AIBN (Norway) Safety recommendation No. 2012/01T**

If the rescue parachute is deployed during the flight, the aircraft is in a serious emergency. The probability of the emergency and position being noticed by the alarm and rescue services increases if the emergency locator transmitter (ELT) is triggered automatically at the same time.

The AIBN recommends that Cirrus Aircraft develops an automatic system that ensures that the ELT is triggered when the Cirrus Aircraft Parachute System (CAPS) is engaged.

- **MOPS ED-62B**

6.3.3 AIRCRAFT WITH PARACHUTE SYSTEMS

6.3.3.1 Aircraft Parachutes

Some aircraft are equipped with an airframe parachute system, which when deployed will result in impact forces too weak for the crash sensor to activate the ELT. Such installations should be designed such that the ELT is automatically activated by the parachute deployment.

- **Cirrus SR22**

- *“The airplane is equipped with a self-contained **Artex ELT 1000** 406 MHz emergency locator transmitter that generates a signal to assist in search and rescue for missing aircraft.”*

- *“The transmitter is automatically activated upon sensing a change of velocity along its longitudinal axis exceeding 4 to 5 feet per second, or upon sensing deployment of the Cirrus Airframe Parachute System (CAPS).”*

- <https://www.cirruspilots.org/Safety/CAPS-Event-History>



INDUSTRY CHALLENGES

“It is not the critic who counts; not the man who points out how the strong man stumbles, or where the doer of deeds could have done them better. The credit belongs to the man who is actually in the arena, whose face is marred by dust and sweat and blood; who strives valiantly; ...” - Teddy Roosevelt

INDUSTRY CHALLENGES

- EASA NPA 2022 :

 - Class 1 Operation

 - DAL C: Nuisance Alert considered a Major 10E-5

 - Location of Crash Site

- ICAO Annex 6 Part 1

 - Does not define ELT(DT) as a Type of ELT.

- MOPS DO-204b

 - Does not define ELT(DT) as Automatic

 - TSO-C126c mentions DT automatic activation

 - Various Environmental inconsistencies with DO-160

 - Categories and Levels

 - DO-204b ≠ DO-160 Tests required by Customer (Safety of Flight)

- MASPS ED-237

 - Scenarios:

 - We only had the BEA database

 - OEMs would like to update with more realistic

 - “Manufacturers may include additional scenarios or combine scenarios”*

 - Compliance challenges

- ELT(DT) Does not comply with CFR 91.207

 - “...There is attached to the airplane an approved automatic type emergency locator transmitter ...”

Implication: ELT(DT) with Crash Survivability does not necessarily meet carriage requirements despite ELOS

- Interface Complexity

 - What industry envisioned:

 - ON / OFF

 - ARINC 680 : Labels 201, 202

 - What OEM customers needed:

 - ARINC Labels for : Data xfer, Status, Maintenance

 - Digital IO for: Air/Ground; ADT Health Status

 - CBIT / IBIT

 - Bypass Switch

 - Complex Logic

- Too much decision making inside of ELT(DT)!

- Aviation Requirements are the Gold Standard of Safety

 - Design Assurance ARP4754

 - SW DO-178c

 - Environmental DO-160g

 - MOPS / MASPS

- Cospas-Sarsat: Do we need to get back to Basics ???

 - Beacon signals are compatible with System receiving and processing equipment;

 - Beacons to be deployed do not degrade nominal System performance; and



 - Beacons encoded position data is correct.



ADVANCED AIR MOBILITY

CONVERGING DEFINITIONS

NO LACK OF ACRONYMS

- **AAM** broadly refers aircraft operations within three parameters:
 - 1. Operating at lower altitudes (<5,000) feet.
 - This includes known AAM and UAS operations.
 - 2. Highly automated control systems to distinguish from today's low-altitude aircraft.
 - 3. Provides Passenger or Cargo Service.
- **Operationally**
 - Urban Areas
 - Part 135 Operations – On Demand, Unscheduled  ELT Required
 - Part 121 Operations – Scheduled  ELT not Required
 - Passenger and Cargo
 - Uber business model
- **New aircraft design and system technologies.**
 - Elements traditional winged aircraft
 - Powered lift and Vertical Takeoff and Landing (VTOL, eVTOL)
 - Distributed Electric Propulsion (DEP)
 - Lots of lithium ion batteries – fast charge
 - Automated and autonomous operations.
 - Crewed and Uncrewed
 - Highly integrated avionics

BUSINESS CASES AND MISSIONS



US DOT INTER AGENCY WORKING GROUP

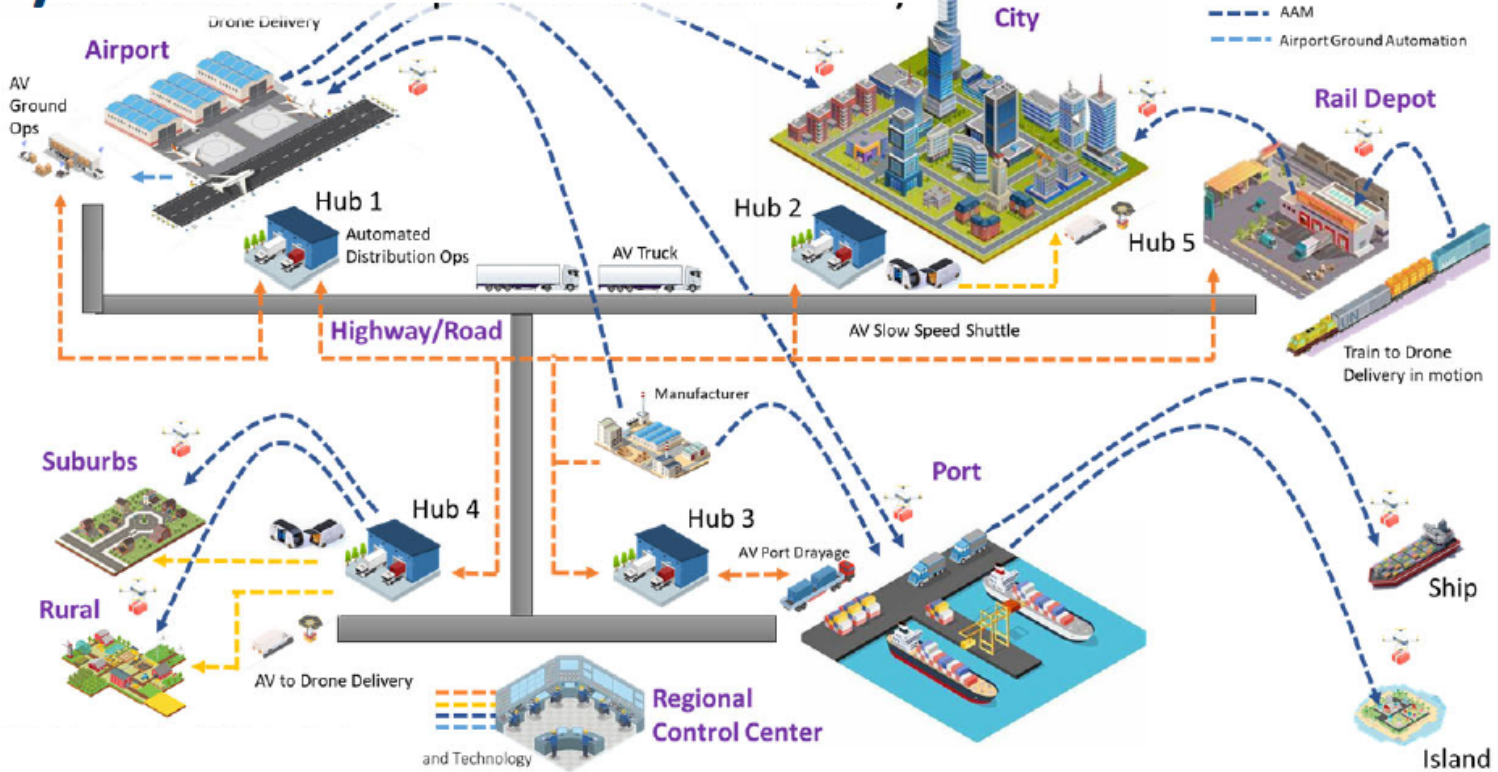
Creating the Transportation System of the Future

Seeing the Whole Picture



- Types of Communications
- GPS
 - 5.9 GHz (surface)
 - 4G/LTE
 - 5G

- Long Haul
- First Mile Last Mile
- AAM
- Airport Ground Automation

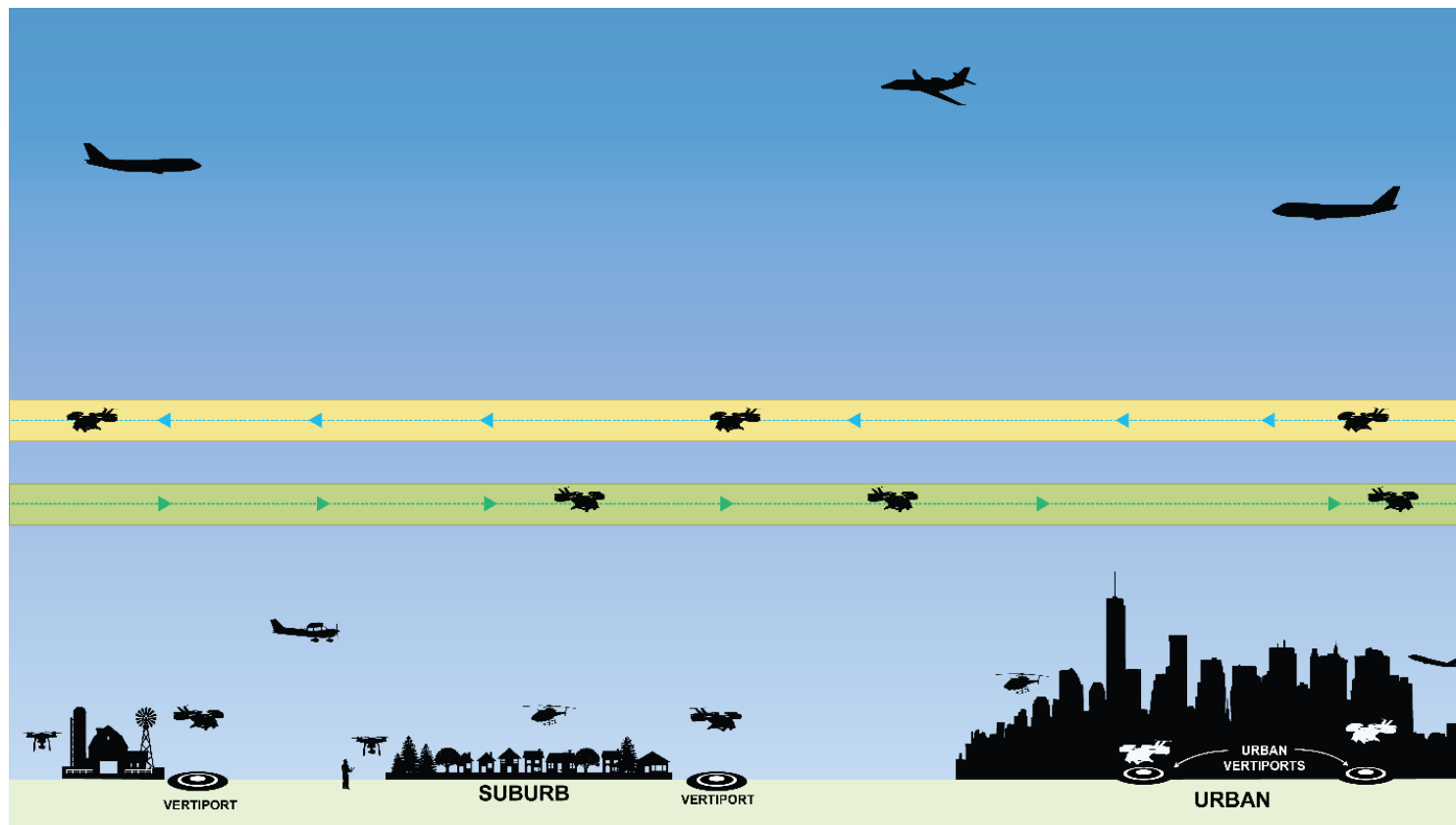


Working Across Agencies to make it all Happen



FAA CORRIDOR CONOPS

STAY IN YOUR SWIMLANE



CHALLENGES AND OPPORTUNITIES

Challenges to Tracking, Distress Tracking, Crash Location

- Size Weight and Power (SWaP)
- Rechargeable Batteries
- Time from Event to Crash : seconds and minutes.
- Highly integrated into vehicle
- Local communication : 5G, VHF
- ADS-B Communication
- Vehicle to Vehicle Communication (meshing)
- BVLOS Communication: Satcom
- Emergency Services

ELOS
Equivalent Level of Safety

We need to Rethink the ELT ...or someone else will.

- Would AAM Accidents constitute a SAR event... or just Rescue?
- What technology is needed?
- What role does Cospas-Sarsat play? If any?
- Multiple Communication Paths for Distress
- How to deal with rapidly evolving, integrated technology?
 - Special beacons and consultations will not work.



THANK YOU!