Module 10
Processing of an ELT(DT) Alert

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AUTONOMOUS DISTRESS TRACKING (ADT)

The ADT function is designed to identify the location of an aircraft in distress within a 6 NM radius of the accident site. The accuracy of position information shall, as a minimum, meet the position accuracy requirements established for Emergency Locator Transmitters (ELTs).

There are two high-level functional objectives for an ADT system. These are to:

a) Receive timely notice of an airplane in a distress condition to facilitate timely SAR operations; and

b) Locate an accident site with high probability after a crash based on last known position of the aircraft.

ELT(DT) Activation triggers

Activated when the plane is still flying via 4 main automatic triggers (manual activation available)

- (1) Unusual attitude - The conditions may include, but are not limited to, excessive values of roll, pitch and yaw and their corresponding rates of change.

- (2) Unusual speed - The conditions may include, but are not limited to, excessive vertical speed, stall condition, low airspeed, overspeed or other speed conditions.

- (3) Collision with terrain - The conditions may include, but are not limited to, high rate of closure to terrain or inappropriate altitude for the current position.

- (4) Total loss of thrust/propulsion on all engines - The parametric data used to define this condition may be engine performance parameters or other parameters that result from loss of thrust.

Expected to be very rapidly unfolding events – original crash studies showed average event timeline – 6 minutes from activation to crash.

ELT(DT) alert transmission schedule

- ELT(DT) transmissions primarily provide encoded (GNSS) locations – position data provided from onboard navigation system to beacon.
  - *Time of Encoded position update for Second Generation Beacons (SGB) provided with 1 second resolution*
  - *Time of Encoded position update provided for First Generation Beacons (FGB)s as either "0 - 2 SECONDS", "2 - 60 SECONDS", or "1 MINUTE TO 4 HOURS"*
  - *Locations computed by a Mid Earth Orbiting (MEO) Ground Stations will be used only if the MEO Ground Station is commissioned to provide locations for fast moving beacons*

- *Burst Transmission* Specification (C/S T.001/C/S T.018)
  - Every 5 seconds the first 2 minutes (24 messages)
  - Every 10 seconds 2-5 minutes (18 Messages)
    - 42 messages in first 5 minutes
  - Every 30 seconds after 5 minutes

- Updated *Alert Distribution* Specification resulting from JC-35 discussions
  - *Distribution of* ELT(DT) *alert data to SAR Points of Contacts (SPOC)/Rescue Coordination Centers (RCC) for each received* burst *will* be limited to the first 30 seconds (*up to* 6 bursts) after beacon activation
  - With an alert distributed *to SPOCs/RCCs* every 10 minutes thereafter. (Reduction from 42 *initial* messages to 6 messages, *and the **best** new alert distributed every 10 minutes rather than the **last** alert every 10 minutes*)

- Message distribution to the Location of an Aircraft in Distress Repository (LADR)
  - *At least one message for each received burst* will *be* uploaded to the LADR

ELT(DT) FGB SIT 185 Example

1. DISTRESS TRACKING COSPAS-SARSAT DOA POSITION CONFLICT ALERT

2. MSG NO 21013 CMCC REF 1D1200F03BBFDFF

3. DETECTED AT 04 AUG 20 1015 UTC BY MEOSAR

4. DETECTION FREQUENCY 406.0400 MHZ

5. COUNTRY OF BEACON REGISTRATION 232 / G BRITAIN

6. USER CLASS ELT DISTRESS TRACKING

   AIRCRAFT 24 BIT ADDRESS 01E077

   AIRCRAFT OPERATOR DESIGNATOR (3LD): MMB

7. EMERGENCY CODE NIL

8. POSITIONS

   DOA - 02 00.1 N 046 06.2 E

   ENCODED - 01 54.40 N 045 37.53 E

9. ENCODED POSITION PROVIDED BY EXTERNAL DEVICE

10. NEXT PASS/EXPECTED DATA TIMES NIL

11. HEX ID 1D1200F03BBFDFF

ELT(DT) FGB SIT 185 Example (cont)

12. ACTIVATION TYPE MANUAL

13. BEACON NUMBER ON AIRCRAFT OR VESSEL NIL

14. OTHER ENCODED INFORMATION

ENCODED POSITION UNCERTAINTY PLUS-MINUS 2 SECONDS OF

LATITUDE AND LONGITUDE

ALTITUDE OF ENCODED LOCATION: BETWEEN 1600 AND 2200 METRES

(BETWEEN 5200 AND 7200 FEET)

AIRCRAFT 24-BIT ADDRESS ASSIGNED TO G BRITAIN

15. OPERATIONAL INFORMATION

MEOSAR ALERT LAST DETECTED AT 03 MAY 19 0853 UTC

POSITION CONFLICT BASED ON DISTANCE SEPARATION OF AT LEAST 20

KM

ELT(DT) POSITION DOES NOT REFERENCE ANY PREVIOUS POSITION

16. REMARKS

THIS DISTRESS TRACKING MESSAGE IS BEING SENT TO APPROPRIATE

SAR AUTHORITIES

PROCESS THIS ALERT ACCORDING TO RELEVANT REQUIREMENTS

END OF MESSAGE

ELT (DT) SGB SIT -185 Example

1. DISTRESS TRACKING COSPAS-SARSAT DOA POSITION MATCH ALERT

2. MSG NO 00192 AUMCC REF B27400F81FD4710

3. DETECTED AT 03 MAY 19 085310 UTC BY MEOSAR

4. DETECTION FREQUENCY 406.0500 MHZ

5. COUNTRY OF BEACON REGISTRATION 403 / SAUDI

6. USER CLASS SGB – ELT DISTRESS TRACKING

   AIRCRAFT 24 BIT ADDRESS 7100CE

   TAC 62 SERIAL NO 509

7. EMERGENCY CODE NIL

8. POSITIONS

   CONFIRMED - NIL

   DOPPLER A - NIL

   DOPPLER B – NIL

   DOA - 02 25.1 N 046 06.2 E

   ENCODED - 02 24.40 N 046 04.11 E

9. ENCODED POSITION PROVIDED BY EXTERNAL DEVICE

ELT (DT) SGB SIT -185 Example – (cont)

10. NEXT PASS/EXPECTED DATA TIMES

    CONFIRMED - NIL

    DOPPLER A - NIL

    DOPPLER B – NIL

    DOA - NIL

    ENCODED - NIL

11. HEX ID B27400F81FD4 7100CE00000 HOMING SIGNAL NIL

12. ACTIVATION TYPE AUTOMATIC BY BEACON (G-SWITCH/PROBABLE CRASH)

13. BEACON NUMBER ON AIRCRAFT OR VESSEL NIL

14. OTHER ENCODED INFORMATION

    ENCODED POSITION UNCERTAINTY PLUS-MINUS 1.7 METRES

    TIME OF ENCODED POSITION UPDATE: 03 MAY 19 085308 UTC

    TIME SINCE ENCODED LOCATION GENERATED: 0 MINUTES

    ALTITUDE OF ENCODED LOCATION: 125 METRES (410 FEET)

    ELAPSED TIME SINCE ACTIVATION: 0 HOURS

    REMAINING BATTERY CAPACITY BETWEEN 75 AND 100 PERCENT

    AIRCRAFT 24-BIT ADDRESS ASSIGNED TO SAUDI

ELT (DT) SGB SIT -185 Example – (cont)

15. OPERATIONAL INFORMATION

   MEOSAR ALERT LAST DETECTED AT 03 MAY 19 085310 UTC

   ELT(DT) POSITION DOES NOT REFERENCE ANY PREVIOUS POSITION

   BEACON CHARACTERISTICS PER TAC DATABASE PROVIDED IN A SEPARATE

   MESSAGE

16. REMARKS

   THIS DISTRESS TRACKING MESSAGE IS BEING SENT TO APPROPRIATE SAR

   AUTHORITIES.

   PROCESS THIS ALERT ACCORDING TO RELEVANT REQUIREMENTS

END OF MESSAGE

Nodal MCC Populating the LADR*

- All C/S MCCs will send all ELT(DT) data to nodal MCCs, and those MCCs will populate the Location of an Aircraft in Distress Repository (LADR)

- The connection to the LADR:
  - Employs web services in compliance with SWIM T1-Yellow Profile requirements, specifically expected to use a REST API protocol over https (secure internet protocol)
  - Formats content to populate the LADR fields per a defined XML schema
  - Contains a subset of the alert data fields provided to RCCs, focused on but not limited to, items such as location and burst detection time

- Rules for data distribution to the LADR
  - At least one XML message for each received burst will be uploaded to the LADR
  - Should better/newer information for a previously sent burst become available (e.g., a computed MEOLUT location has now been received at the MCC) , an additional message will be uploaded to the LADR
  - Although not yet a fully agreed specification, indication that the distress situation has been cancelled (once confirmed) will also be uploaded to the LADR

*While these specifications exist, and to a degree are implemented, due to ICAO's recent negotiations with a potential host and the potential of resulting changes in the design, this is still considered a work in progress.

Questions