



# AUTONOMOUS DISTRESS TRACKING (ADT)

## TIMELINE - TRAGIC EVENTS & OPPORTUNITIES FOR IMPROVEMENTS









# AIRFRANCE / FLIGHT 447



01:55:57am

Capt. Dubois goes on scheduled break, leaving two co-pilots in charge in the cockpit.

02:10:05am

Pitot tubes freeze. Air speed indicator goes haywire. Auto-pilot disconnects. Co-pilot Bonin now flying the plane.

02:10:07am

Co-pilot Bonin makes disastrous decision to pull the nose of the plane up. Plane starts to climb rapidly, which soon leads to aerodynamic stall.

02:10:11am

First stall warning. Nose is still up, vertical speed increasing.

02:11:22am

Top of the rollercoaster. The plane stalls, starts to fall out of the sky—dropping at 10,000 feet per minute.

02:11:43am

Capt. Dubois re-enters the cockpit. Says to Bonin, "What are you [expletive deleted] doing?" No one acknowledges the plane is in a stall.

02:12:30am

Co-pilot Bonin says: "Am I going down now?" Apparently so discombobulated he has no idea whether the plane is going up or down.

02:13:23am

Computer's synthetic voice announces "dual input" in the cockpit—the two copilots are putting contradictory inputs into their respective control sticks.

02:14:14am

Synthetic Voice: "Pull up!" But it is too late. Co-pilot Robert's last words: "We're going to crash. I can't believe it."


02:14:28 am

Air France 447 hits the water.

# Disappearance of Air France flight 447

Plane on route from Brazil to France with 228 people on board drops off radar screens at 0600 GMT





# GLOBAL AERONAUTICAL DISTRESS AND SAFETY SYSTEM (GADSS)

- ICAO developed GADSS Concept of Operations, released June 2017.
- Will enhance aviation safety for crew and passengers of commercial aircraft and SAR responders.
- Idea is to not lose anymore aircraft out at sea and able to locate the aircraft.
- The 2019 edition of the IAMSAR Manual contains general guidance regarding GADSS that applies to certain aircraft.

# GLOBAL AERONAUTICAL DISTRESS AND SAFETY SYSTEM (GADSS)


- The first phase, commenced 1 January 2018 with Underwater Locating device (ULD) on frequency 37.5 kHz attached to the aircraft flight recorder; and, a ULD on frequency 8.8 kHz attached to the aircraft frame.
- The second phase commenced 8 November 2018 for the aircraft tracking function of automated reporting of position at least every 15 minutes.
- The next phase commences 1 January 2021 for the autonomous distress tracking (ADT) function of reporting position updates at least once every minute.



# GLOBAL AERONAUTICAL DISTRESS AND SAFETY SYSTEM (GADSS)

- OBJECTIVES

- (1) Ensure timely detection of aircraft in distress (timely initiation of SAR actions).
- (2) Ensure tracking of aircraft in distress and timely accurate location of end of flight (accurate direction of SAR actions).
- (3) Enable efficient and effective SAR operations.
- (4) Ensure timely retrieval of flight recorder data.



# GLOBAL AERONAUTICAL DISTRESS AND SAFETY SYSTEM (GADSS)

- FUNCTIONS

- (1) Aircraft Tracking
- (2) Autonomous Distress Tracking (ADT)
- (3) Post flight localization and recovery



# AUTONOMOUS DISTRESS TRACKING (ADT)

- The ADT function would be used to identify the location of an aircraft in distress with the aim of establishing, to a reasonable extent, the location of an accident site within a 6 NM radius. 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.

# AUTONOMOUS DISTRESS TRACKING (ADT)

- 01 January 2021
- **Brand new** aircraft to be outfitted with ADT device after 2021
- Applies to certain passenger & cargo aircraft.
- All aircraft with take-off weight greater than 27,000KG/30TON maximum certificated take-off mass or seating capability over 19.
- Mandated to autonomously transmit information from which a position can be determined by the operator at least once per minute when the aircraft is in distress.
- A specific technology is not mandated. One type is Cospas-Sarsat ELT (Distress Tracking) ELT(DT)
- ELT(DT) expected duration of operation is 370minutes (6.2hrs)
  - **Note: Not 24 hours like an ELT**
- Distress can only be de-activated using the same mechanism that it was activated originally in case of recovery from distress
- Aircraft will be allowed to replace installed Automatic Fixed ELTs with ADT devices.
  - **Consequence – loss of homing and exact location**

## Global Aeronautical Distress Safety System

ADT

### • Autonomous Distress Tracking

Only protected aeronautical safety spectrum, or protected distress spectrum (e.g., 406.1 MHz), can be used

- Provides automatic A/C position at least once every minute
- Must be active prior to accident event
- Location of an accident site within 6 NM
- Operates autonomously of aircraft power
- Results in Distress signal to appropriate aircraft operator
- May be manually activated
- Cannot be isolated







# ELT (DT)

- COSPAS-SARSAT will start approving specialized ELTs for distress tracking (DT) in 2019
- Does not have the 121.5 MHz homing capability
  - May optionally equip 121.5 MHz homing
- Linked to new COSPAS-SARSAT system, alerts will be sent to RCCs
- Transmits position, aircraft ID and country of origin
- There will be a notification on the alert which will indicate whether if the ELT(DT) is in flight or has crashed
- For only 370minutes (6.2hrs)
- Every 5 seconds the first 2 minutes
- Every 10 seconds 2-5 minutes
- Every 30 seconds after 5 minutes
- There will be a part in the SIT report which states the age of the latest alert received. I.E "position 23-34.44N 070-33-.55W is less than 1 minute old"
- The only way to cancel the distress alert is by having the same reason it was activated solved

# ELT (DT)

- 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.**

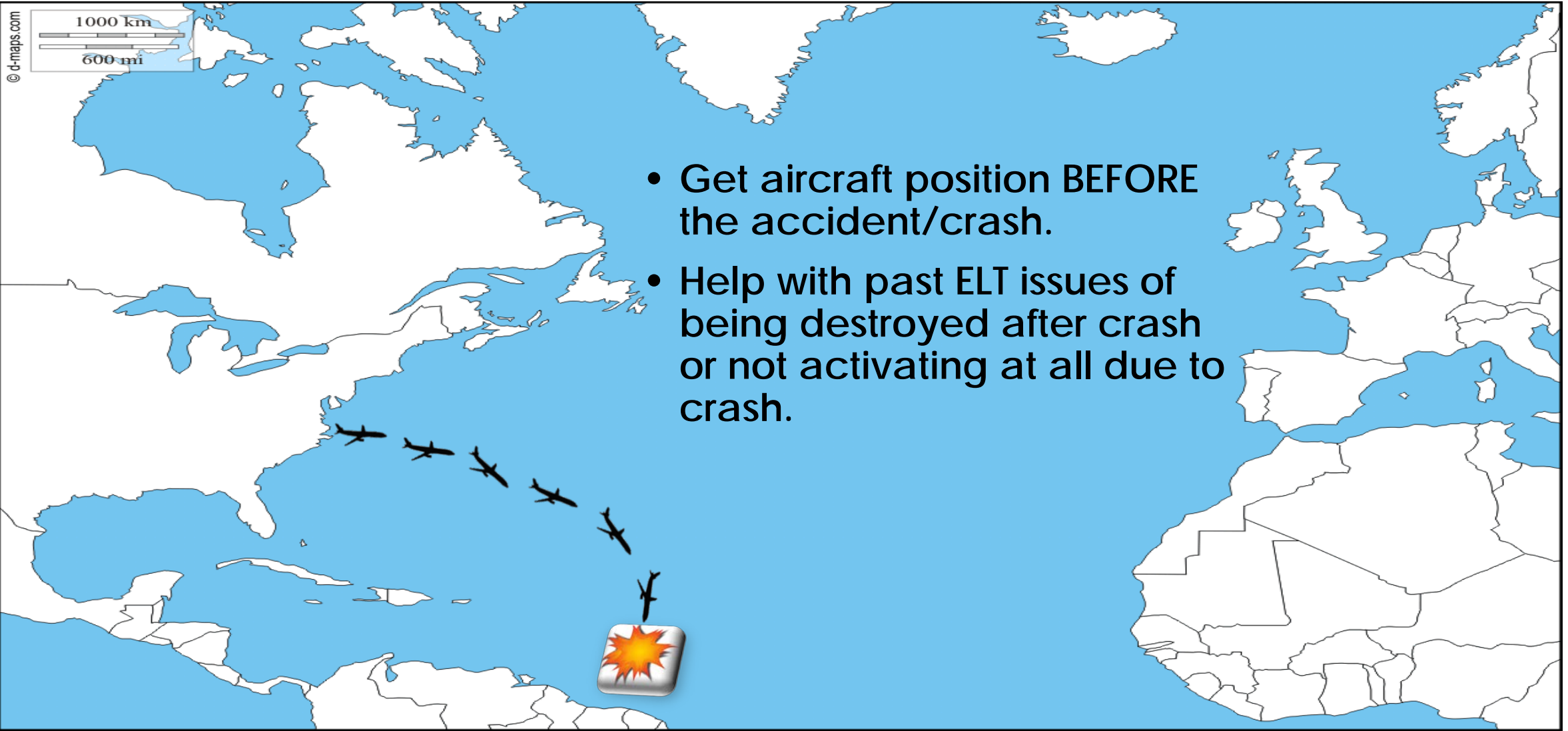
The conditions may include, but are not limited to, high rate of closure to terrain or inappropriate altitude for the current position.

(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.



# AUTONOMOUS DISTRESS TRACKER



- Get aircraft position BEFORE the accident/crash.
- Help with past ELT issues of being destroyed after crash or not activating at all due to crash.

# AUTONOMOUS DISTRESS TRACKER

**QUESTIONS?**



## **GADSS ADT Phase Basic Guidance**

### Purpose and Scope

1.1 This Guidance Material is intended to provide basic information on the Autonomous Distress Tracking (ADT) as part of the ICAO Global Aeronautical Distress and Safety System (GADSS).

1.2 The key stakeholders of this phase are:

- Air Navigation Service Providers (ANSPs);
- Aircraft Operators;
- ADT Service Providers; and
- Search and Rescue (SAR).

1.3 It should be noted that ADT Service Providers had not yet been determined. The providers of Automatic Dependent Surveillance-Broadcast (ADS-B) surveillance systems and Cospas-Sarsat were potential ADT providers, but the requirements for an autonomous power source for the airborne distress tracking component would need to be taken into account as current ADS-B systems may not meet this requirement.

### ICAO OPS Control Directory

2.1 An online OPS Control Directory portal had been established at <https://www4.icao.int/opsctrl> by ICAO, to assist the implementation of the Annex 6 Aircraft Tracking standard which became applicable on 8 November 2018. It is provided to facilitate communication and exchange of information between air operators and ANSPs. It also provides a link to a map depicting ANSP surveillance where position reports are received at less than 15 minute intervals to assist air operators with meeting Aircraft Tracking requirements.

### Autonomous Distress Tracking (ADT)

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

- a) receive timely notice of an aeroplane 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.

2.3 The ADT function would be used to identify the location of an aircraft in distress with the aim of establishing, to a reasonable extent, the location of an accident site within a 6 NM radius. The accuracy of position information shall, as a minimum, meet the position accuracy requirements established for Emergency Locator Transmitters (ELTs).

2.4 It is important to note that there was not expected to be many ADT-generated notifications at the beginning of operations. From 1 January 2021 the Standards and Recommended Practices (SARPs) of ICAO Annex 6 – *Operation of Aircraft, Part I – International Commercial Air Transport – Aeroplanes* (11<sup>th</sup> Edition, July 2018):

- a) mandated that newly manufactured aircraft over 27,000 kg maximum certificated take-off mass to autonomously transmit information from which a position can be determined by the operator at least once per minute when the aircraft is in distress;



- b) recommend the same requirement be applicable for defined aircraft over 5,700 kg maximum certificated take-off mass; and
- c) require the aircraft operator to make the position information of a flight in distress available to Air Traffic Services Units (ATSUs), Rescue Coordination Centres (RCCs) and any additional entity as established by the State of the Operator.

2.5 The ADT capability requires the automatic triggering and transmission of distress data when the aircraft enters a state which, if left uncorrected, is likely to result in the crash of the aircraft. Aircraft position information will be transmitted automatically at least once every minute when the aircraft is in a distress condition. The initial transmission shall commence immediately or no later than five seconds after the detection of the activation event. Pilots may also manually activate the ADT. The ADT will only be able to be deactivated by the same mechanism that activated it.

#### Distress Tracking Data Repository (DTR)

2.6 The GADSS Concept of Operations (CONOPS) identified the need to collect, store and provide access to ADT data to notify and assist appropriate stakeholders such as ATSUs and RCCs to locate an aircraft in distress and enhance SAR and recovery capabilities. A centrally managed data repository, the DTR, is considered the preferred means to enable this.

2.7 The DTR is planned by ICAO as a secure web-based storage facility where aircraft ADT data will be communicated and stored to enable the last known position of an aircraft in distress, or potential distress, to be available to authorized stakeholders in a timely manner.

2.8 DTR stakeholders will include DTR Administrators, Contributors and Users. Users will have read-only access. RCCs, as DTR Users, will need to subscribe as an authorized user to access ADT data in the DTR. Other Users will have access to available information according to their profile. For example, Air Operators will only have access to ADT data for their aircraft and ANSPs to ADT data within their Flight Information Region (FIR) and within a planned area 80 NM outside the FIR boundary.

2.9 Subscribers will receive a notification whenever new ADT information relevant to them arrives in the DTR. Subscribers will then need to look in the DTR to access the ADT data. Subscription will be voluntary.

2.10 States will determine who will have access to the DTR data as this is potentially sensitive. For example, an airline will only have access to its own aircraft, and ATSUs will only be able to access information within, or close to their area of responsibility.

#### End of Flight Localization

2.11 SAR experts had stressed the value of the 121.5 MHz homing signal from real SAR incident experience, as the ADT system had not yet determined whether the 121.5 MHz ELT homing feature would be retained.

#### Operational Considerations

2.12 Existing Annex 11 and Annex 12 SARPs between ATSUs and RCCs remain unchanged.

2.13 The ADT system was not intended as a distress alerting system like ELTs. It was intended as a means to identify and notify a distress, or potential distress, condition.

2.14 Upon the triggering of an ADT transmission, the aircraft operator was responsible for validation of the transmission and initial checks, if possible, including attempted contact with the aircraft to confirm the situation. The aircraft operator would then notify the relevant ATSU of the results including if a false activation. The ATSU will declare an emergency phase as appropriate and notify the relevant RCC per existing Annex 11, Chapter 5, *Alerting Service*.

2.15 DTR notifications would be sent to all affected DTR subscribers. Typically an initial ADT notification would go to the aircraft operator and the ATSU and RCC associated with the aircraft's position. This was one of the reasons why the establishment of clear areas of responsibility with non-overlapping or separated SRR boundaries was a priority.

2.16 Notwithstanding the responsibility of the aircraft operator, it was highly likely that the responsible ATSU and RCC could already be aware of an in-flight emergency for that aircraft by other alerting means and have already initiated a response. Aircraft operators, ATSUs and RCCs would need to ensure their staff understand each other's roles, responsibilities and processes to ensure clear communication and coordination to avoid, where possible, conflicting effort and unnecessarily increasing workload; hence special training and awareness programmes would be necessary.

*Note – States may consider this as part of meeting the expectations of Preferred SAR Capability Specification (PSCS) 7.4 (h) of the ICAO Asia/Pacific SAR Plan, which states that all States should facilitate a programme of regular liaison visits between relevant RCCs, ATC units and airline operating centres in order to understand those organizations, facilities and capabilities.*

2.17 More detailed information on GADSS and Global Tracking Initiatives is at the following ICAO HQ webpage: <https://www.icao.int/safety/globaltracking/Pages/Homepage.aspx>.

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