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FROM TRAGEDY TO TRIUMPH

HOW ACCIDENT INVESTIGATIONS SHAPE CERTIFICATION REQUIREMENTS AND ENHANCE ENGINEERING RELIABILITY

Alvimar de Lucena Costa Junior
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The Boeing Company

We will never be done improving

BOEING Contents Introduction Approach & Governance People Products & Services Operations Communities Appendix

Aerospace Safety

Safety is a fundamental value and our top priority. We take seriously the responsibility to ensure those who fly on and service our products are safe.

Everyone at Boeing will never forget the lives lost and where the company fell short in the tragic 737 MAX accidents. Based on the lessons learned, we implemented a series of meaningful changes to strengthen our safety practices and culture and bring lasting improvements to aerospace safety.

These changes include uniting critical teams and functions under the leadership of Mike Delaney, our first-ever Chief Aerospace Safety Officer. Aligning these groups into a consolidated team helps drive safety across every aspect of our operations and help enable end-to-end accountability through the safety ecosystem.

“Everyone at Boeing will never forget the lives lost and where the company fell short in the tragic 737 MAX accidents. Based on key lessons learned, we implemented a series of meaningful changes to strengthen our safety practices and culture and bring lasting improvements to aerospace safety.”

IN A RAPIDLY CHANGING WORLD

In a rapidly changing environment with a wide range of global competitors, we must remain our best competitive advantage. We invest in them by providing resources and training. Advanced Quality Planning (AQP) is a structured approach to product and process development that spans Product Engineering, Design Engineering, Quality, Supply Chain and Manufacturing to ensure that quality is built into the product and controlled every step — from concept to production. The AQP framework ensures products are delivered on time while meeting performance targets, by identifying quality issues early in the product — even before the first prototype is built — instead of reacting and addressing problems in the field.

“From information gathered through risk assessment processes to the issues and ideas employees bring forward, our Safety Management System relies on data. We’re taking an eyes-wide-open approach to how we use that data to continuously learn and improve — always with our sights set on safety.”

Mike Delaney, Chief Aerospace Safety Officer and Senior Vice President, Global Aerospace Safety

Boeing is building first-time quality into everything we do. Pictured here is Christal Nosby and colleagues from P-8 First Assembly working to take quality to the finish line.

2021 SUSTAINABILITY REPORT PRODUCTS & SERVICES 34

Commitment to Global Aerospace Safety



Boeing Enterprise SMS



New Airplane Delivery Support



Enhance Pilot and Maintainer Competency



Deployment of Flight Operations Representatives to Operator Sites



Global Safety and Regulatory Engagement



Operational Aspects of Design

Global Safety & Regulatory Affairs Presence – 2024 Global Coverage



Organizational Structure

Global Safety and Regulatory Affairs



Michael Delaney
CASO – Chief Aerospace Safety Officer



Lacey Pittman
VP SMS, Global Aerospace Safety, Safety Experience



Todd Sigler
Global Safety & Regulatory Affairs

Accident / Incident Investigations

Flight Operations



Benjamin Ivers
Autonomous Systems
Seattle



Mildred Troegeler
Global Regulatory Strategy
Montreal



David Zwegers
Global Safety Strategy
Seattle



Victoria Wilks
International Strategy
Seattle



Stella Weidner
Product Safety & Air Safety Investigation



Rich Lee
Deputy Chief Pilot
Safety & Tech Pilots



Mike Farrell
Air Crew Operations
Americas

Latin America & Caribbean Sao Jose dos Campos

FOR Leads – Americas Capt. Susan MacNamara Capt. Gregorio Delgado Soto



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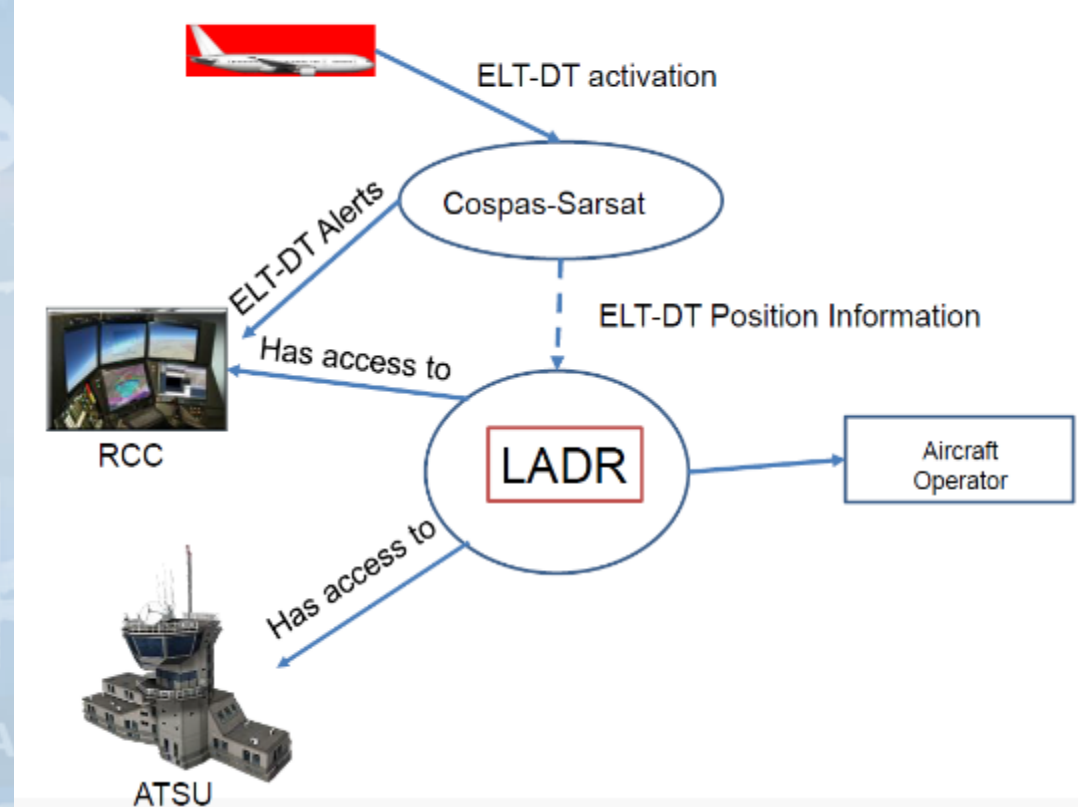
One timeline from tragedy to triumph GADSS-ADT

What is it?

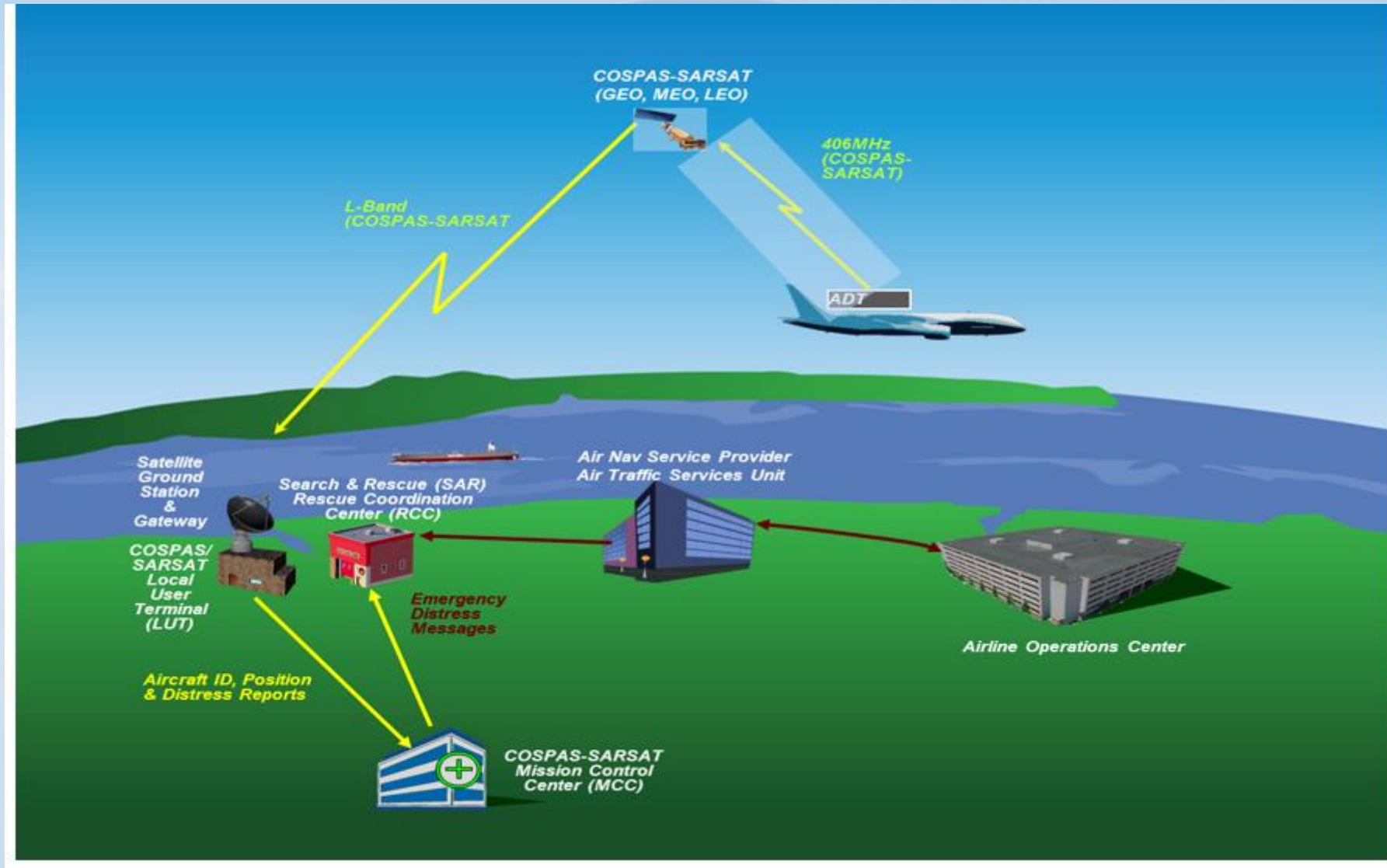
GADSS ADT is a system of systems

- Airplane Equipage
 - Emergency Locator Transmitter (ELT) with automatic activation when an aircraft is in distress
- Service Provider: COSPAS SARSAT
 - Constellation of satellites managed by COSPAS SARSAT
- ICAO Location of Aircraft in Distress Repository (LADR)
- Air Traffic Service Units and Rescue Coordination Centers
 - Need training and procedures for new types of alerts and LADR connectivity/training
- Operators
 - Airlines policy/training for ADT use including LADR connectivity/training
 - Requirements in ICAO PANS-OP

LADR-ELT-DT



GADSS-ADT Infrastructure Requirements



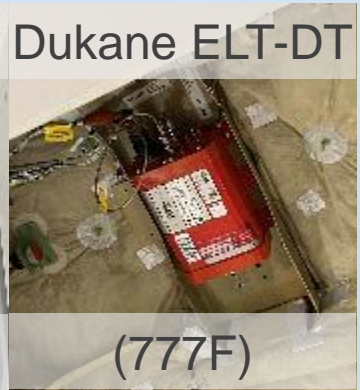
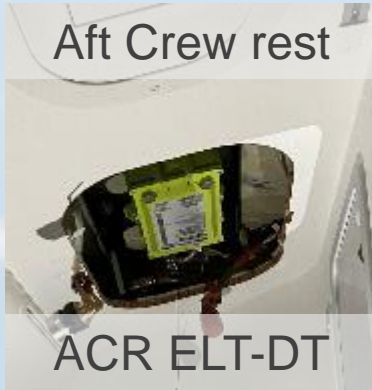
GADSS-ADT Walk-Around (787 as example)



Similar Installation:
 ELT-DT Antenna
 ELT-DT
 Cockpit Control Panel

New Installation:
 ATU
 Remote Function Panel Interface

Provisions:
 Wiring
 RFP Interface
 ATU ARINC Tray in E12 rack



ELT-DT Unit (Crown)

RFP Interface (E12 Rack inside Aft Cargo Door)

ATU (E12 Rack)



Boeing Proprietary

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Background of GADSS-NT and GADSS-ADT

- AF447 and MH370 showed the industry the need for improved airplane location data, particularly for oceanic routes.



Aircraft Tracking Normal Operations

11/2018

RFIT & FFIT.

- Met with existing aircraft options and service (2018-ACB-0006 Released April 2019)

Autonomous Distress Tracking (ADT)

01/2025

FFIT

- CoA on/after 1 Jan 2024, applicable 1 Jan 2025
- New capabilities driven by autonomy/resilience and in-air distress based activation requirements

Timely Recovery of Flight Data

01/2021

New Type Certification applied for on/after this date

- New capabilities
- FDR and CVR data



ICAO Standard

Annex 6 — Operation of Aircraft Part I, International Commercial Air Transport — Aeroplanes

6.18 LOCATION OF AN AEROPLANE IN DISTRESS

6.18.1 As of 1 January 2025, all aeroplanes of a maximum certificated take-off mass of over 27 000 kg for which the individual certificate of airworthiness is first issued on or after 1 January 2024, shall autonomously transmit information from which a position can be determined by the operator at least once every minute, when in distress, in accordance with Appendix 9.

6.18.2 **Recommendation.**— *All aeroplanes of a maximum certificated take-off mass of over 5 700 kg for which the individual certificate of airworthiness is first issued on or after 1 January 2023, should autonomously transmit information from which a position can be determined at least once every minute, when in distress, in accordance with Appendix 9.*

6.18.3 The operator shall make position information of a flight in distress available to the appropriate organizations, as established by the State of the Operator.

Note 1.— Refer to 4.2.1.3.1 for operator responsibilities when using third parties.

Note 2.— Operational procedures for monitoring and making position information of a flight in distress available to the appropriate organizations in a timely manner are contained in PANS-OPS, Volume III, Section 10.

Safety Experience at Boeing

**Motivate everyone to own their
safety responsibility to advance
Boeing's safety culture**

Accident Reports

- Report Completion Data
- Regional Aviation Safety Group – Pan America (RASG-PA)
- Working Paper



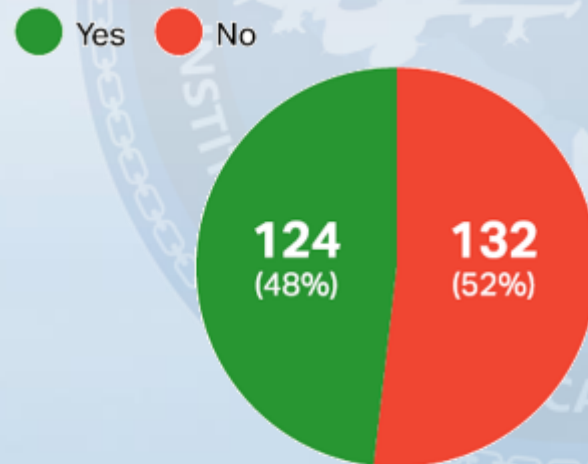
Status of Accident Investigation Reports

As of 1-Feb-24, IATA data shows that from 2018-2023 (5 yrs):

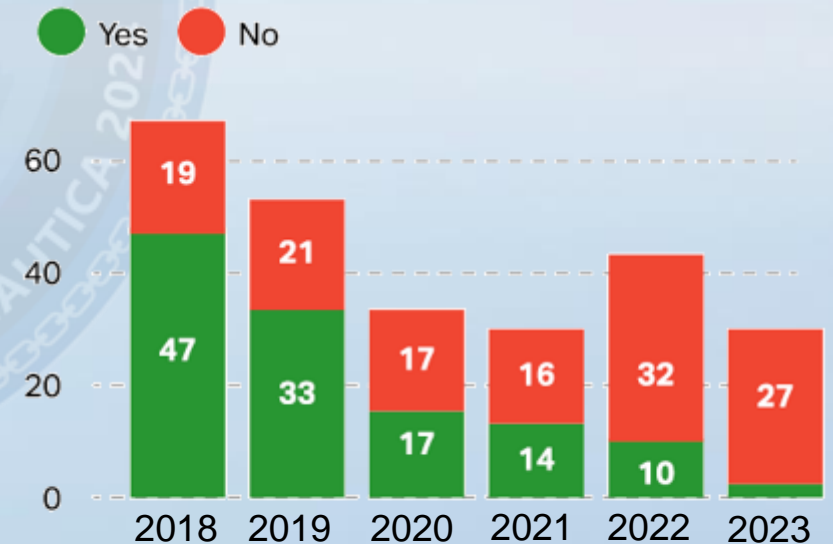
- 256 accidents happened globally

52% of accidents since 2018 lack a final published report

Accidents by Final Report Status * Data source IATA



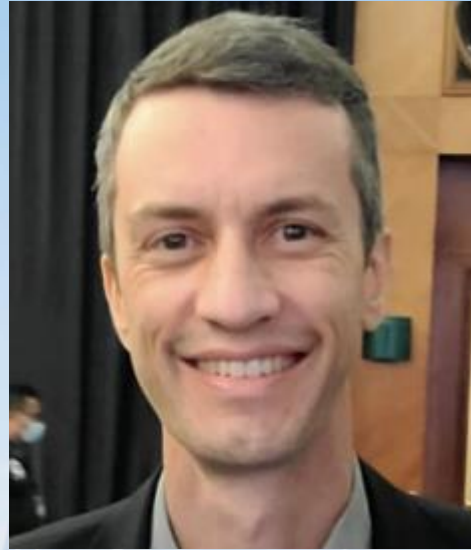
Final Report Status by Year * Data source IATA



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