ICAO’s Global Aeronautical Distress and Safety System (GADSS)

Beacon Manufacturers Workshop
2016
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SAR Systems Specialist
Origin of the Global Aeronautical Distress and Safety System (GADSS)

- Malaysia Airlines flight 370
- Air France flight 447

International Civil Aviation Organization (ICAO) review & analysis of recent tragic aviation events highlighted vulnerabilities in the current air navigation system with respect to:

- timely identification
- localization of aircraft in distress
- notification of/coordination with search & rescue services
The Need

ICAO’s review identified a capability gap:

• effective, globally consistent approach to alerting search and rescue services

• effectiveness of current alerting and then notification of search and rescue services
  – address key improvement areas
  – develop and implement a globally integrated system
Phases of An Aviation Event

ICAO Ad-hoc Working Group on Flight Tracking

– formed in 2014 to develop Concept of Operation (CONOP)

– identified following event phases:
  • detection of an abnormal situation (uncertainty phase)
  • alert phase
  • distress phase
  • search and rescue activities

– GADSS CONOP draft released in July 2015, updated in December 2015
GADSS Concept of Operations

Four stages of escalation:
- Normal Operation
- Abnormal Operation
- Distress Tracking
- Response & Recovery

Aircraft Tracking
Normal Operations
- Possible Subset of ATS Surveillance
- Used for Airline Operational Functions
- Controllable by Flight Crew
- Multiple solutions

Abnormal Operations
- Triggered by abnormal events
- Provides flight location data at least once per minute
- Controllable by flight crew
- Multiple solutions

Autonomous Distress Tracking (ADT)
- A Distress Signal
- Auto triggered by very specific events
- May be manually activated
- Can not be isolated

Flight Data Recovery
- ADFR
  - Automatically deployed
  - Floatable
  - Contains ELT to aid location
- Alternate Solution
  - Performance Based
  - Provides a minimum CVR and FDR dataset
  - Operation Approval Required

Airline
ATS/RCC
SWIM
Concurrently in May 2014, IATA established the Aircraft Tracking Task Force to address near term and voluntary aircraft tracking solutions.

Close collaboration between IATA and ICAO has ensured that the IATA solutions fit within the GADSS Concept of Operations (ConOps).
GADSS Tracking Concept
GADSS Objectives

• Global perspective
• Evaluate existing procedures
• Improve coordination and information sharing
• Enhance training of personnel
• Evolutionary implementation
  – Short term activities
  – Medium term activities
  – Long term activities
GADSS Requirements

• Enhance the ability to rescue survivors
• Provide immediate notification of abnormal event
• Locate an accident site with a degree of accuracy in a timeframe & level of confidence
• Function worldwide
• Specified using performance based standards
• Independent of any one prescriptive technology
• Flexible to accommodate diverse regional needs
• Not degrade baseline SAR services
• Seamless across Air Traffic Service (ATS) unit boundaries
Current Systems

• Emergency Locator Transmitters (ELTs)
  – ELTs can be tracked in order to aid in the detection and localization of aircraft in distress
  – uniquely identified almost instantly (if registered)
  – ICAO mandated 406 MHz ELTs from 1 JAN 2005.

• Flight Recorders
  – underwater locator beacons (ULB)
  – in 2012, duration of ULB transmission increased from 30 days to 90 days
GADSS Improvements

Aircraft Systems

Emergency Locator Transmitter (ELT)
- Timely activation
- Carriage of 406 MHz
- Registration

Communication and Position Data

Improve capability to transmit 4D posn
Ground/Space based Infrastructure
Reduce sole HF reliance

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GADSS Elements

Aircraft Systems
- Most lead time
- Forms baseline for future development

Air Traffic Services
- Leverage existing ATS framework
- Coordination with SAR units
- Global coverage

Search & Rescue Systems
- SAR Regions align with Flight Info Regions
- Coordination with ATS
- Global coverage

Information Management
- IRM Framework
- Interoperable
- Info sharing
Future GADSS Components

• Aircraft Tracking
  – aircraft’s position reported at least every 15 min
  – accuracy within 1 NM

• Autonomous Distress Tracking (ADT)
  – 4D position (Lat, Long, altitude, time)
  – autonomous transmission at least every minute
  – localize accident site to within 6 NM radius
  – immediate or no later than five seconds latency
Future GADSS Components

- **Flight Data Recovery**
  - equipped with a means to recover flight recorder data in a timely manner
  - alternatives for flight data recovery
    - Automatically Deployable Flight Recorder (ADFR)
    - Transmission of flight data
      - Data streaming
      - Near real-time data-link
Future GADSS Components

Supported by:

• System Wide Information Management
  – standards, infrastructure and governance enabling management & exchange of ATS information between qualified parties via interoperable services

• Information repository service
  – supports correlating Aircraft position information with ATS unit and RCC areas of responsibility
  – available 24/7
  – accurate and complete to the maximum extent possible and practical

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GADSS Implementation Timelines

• Aircraft Tracking
  – Normal tracking; existing equipment with 15 minute reporting interval
  – Develop & implement basic provisions, November 2016
  – Implement revised provisions, November 2018
  – Applicability to other aircraft operations, November 2022

• Autonomous Distress Tracking (ADT) System
  – Specification for new generation ELT, March 2018
  – Performance specifications for ADT, March 2018
  – First implementations, January 2021
GADSS Implementation Timelines

• Flight Data Recovery
  – Performance specifications, March 2016
  – Guidance for compliance, March 2018

• System Wide Information Management
  – Develop GADSS Information Management framework, March 2018
  – Develop GADSS Communications framework, March 2018
  – Identify information elements, March 2020

• Information repository service
  – Set-up GADSS repository, September 2016
Impacts & Outcomes

• Covered aircraft will require modifications
• States may need to invest more in the implementation of SAR responsibilities
• Enhanced Aircraft Tracking may provide additional benefits in Air Traffic Service and airline operations
• Enhanced awareness and information sharing across operators, ATS and RCCs
Questions?

Thank you for your attention!
Backup Slides
GADSS Definitions

• **Abnormal event.** Event during flight which may trigger an emergency phase.

• **Aircraft Tracking.** A ground based process, established by the operator, that maintains and updates, at standardized intervals, a ground-based record of the four dimensional position of individual aircraft in flight.

• **Alerting service.** A service provided to notify appropriate organizations regarding aircraft in need of search and rescue aid, and assist such organizations as required.

• **Autonomous Distress Tracking (ADT).** The aircraft capability to broadcast for distress situations, independent of aircraft power or systems, aircraft tracking information.
GADSS Definitions

• **Emergency phase.** A generic term meaning, as the case may be, uncertainty phase, alert phase or distress phase.
  – Uncertainty phase. A situation wherein uncertainty exists as to the safety of an aircraft and its occupants.
  – Alert phase. A situation wherein apprehension exists as to the safety of an aircraft and its occupants.
  – Distress phase. A situation wherein there is reasonable certainty that an aircraft and its occupants are threatened by grave and imminent danger or require immediate assistance.

• **Rescue Coordination Centre (RCC).** A unit responsible for promoting efficient organization of search and rescue services and for coordinating the conduct of search and rescue operations within a search and rescue region.
Chicago Convention Annex References

- **Annex 2** provides provisions for flight plans, distress and urgency signals.

- **Annex 6** Part I provides provisions for aircraft operators. Some specific examples include requirements for ELTs and flight recorders, in-flight fuel management, and communication and navigation equipment.

- **Annex 8** provides provision for the design, production and maintenance of aircraft including the requirement for safety and survival equipment.
Chicago Convention Annex References

• **Annex 11** Chapter 5 details the provisions for an Alerting Service.

• **Annex 12** details the operating procedures for Search and Rescue.

• **Annex 13** provides the provisions for accident investigation, including the availability and protection of information related to an incident or accident.
# GADSS Implementation Plan

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<thead>
<tr>
<th>Task</th>
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<th>Status</th>
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5/25/2016
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<th>Flight Data Recovery</th>
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<td>SWIM.01 - Develop GADSS Information Management framework including data formats taking account of information ownership, security and confidentiality.</td>
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<td>SWIM.03 - Identify FF-ICE information elements in support of GADSS (e.g. to associate ADT messages to the aircraft operator).</td>
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GADSS Concept of Operations

Aircraft Tracking
- Provides automatic A/C position at least once every 15 minutes
- ATS Surveillance may be utilised
- Can be isolated by Flight Crew
- Multiple solutions
- May have airline defined triggers for abnormal operations with higher reporting rate

Autonomous Distress Tracking (ADT)
- Provides automatic A/C position at least once every minute
- Must be active prior to accident event
- Operates autonomously of aircraft power
- Results in a Distress Signal to appropriate SAR FIR
- May be manually activated
- Can not be isolated

Flight Data Recovery
- Performance Based Solution
- Ensures a minimum dataset of CVR and FDR information
- Operation Approval Required
- ADFR
  - Automatically deployed
  - Floatable
  - Contains an ELT to aid location

Airline
ATS/RCC
SWIM