The Global Aeronautical Distress and Safety System (GADSS)

Henk J. Hof
Chairman ICAO GADSS-Advisory Group

Henk.hof@eurocontrol.int
The Need

Vulnerability
Timely identification and location of aircraft in distress
Availability and sharing of valuable information
Effective and regularly trained procedures

❖ Know where aircraft fly
❖ Know when aircraft are in distress
❖ Enhance ability to rescue
❖ Enhance ability to recover
Global Aeronautical Distress and Safety System Overview

Global Aeronautical Distress Safety System

- Aircraft Tracking
- Autonomous Distress Tracking
- Post Flight Localisation & Recovery

Alerting System (ALERT)

SAR (Search and Rescue)

Accident Investigation

- RCC
- ATS
- Airline
- GADSS Information Management
High Level GADSS Objectives

- Ensure timely detection of aircraft in distress
  - To timely initiate SAR actions

- Ensure tracking of aircraft in distress and timely and accurate location of end of flight
  - To accurately direct SAR actions

- Enable efficient and effective SAR operations

- Ensure timely retrieval of Flight Recorder Data
“A process, established by the operator that maintains and 
updates at standardised intervals a ground based record of the 
four dimensional position of individual aircraft in flight (Annex 6)”

MTOW > 45.500 kg → Shall
MTOW > 27.000 kg → Should

> 19 seats

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Aircraft Tracking with ATS Surveillance

Normal

ATSU

AOC

Surveillance < 15min

Information Sharing & Procedures
Annex 11/12

Repository
AO PoC
ATSU PoC

Distress

RESCUE COORDINATION CENTER
Aircraft Tracking without ATS Surveillance

Normal

Tracking / 15 min.

Distress

Tracking / 1 min

Oceanic Area

ATSU

AOC

Com.

Record

4D position

Information Sharing & Procedures Annex 11/12

Repository AO PoC ATSU PoC

RESCUE COORDINATION CENTER
Aircraft Tracking - practical

- Aircraft Operators to assess their route network
  - https://www.icao.int/safety/globaltracking/Pages/Homepage.aspx
  - Oceanic airspace
  - Surveillance services
  - Update rate

- Provide (and have access to)
  - PoC information

- When necessary: implement tracking solution
  - 3rd party possible

- Implement processes
  - Detection of missing reports
  - Initiating contacts with ATSU’s
Missed position report process

Normal Aircraft Tracking Timeline

$T = 0$ mins

- Missed 4D/15 Position Report
  - Operator conducts checks/attempts to contact aircraft
    - Checks Successful?
      - Yes: Ops Normal
      - No: Second missed 4D/15 Position Report

$T + 15$ mins

- Second missed 4D/15 Position Report
  - Operator informs ATSU
  - ATSU Conducts checks/attempts to contact aircraft
    - Checks successful?
      - Yes: Appropriate Emergency Phase in accordance with Annex 11
      - No: Operator/ATSU notified of successful contact

Note 1: The operator should contact the relevant ATSU as soon as they have reason to believe there is concern regarding the aircraft. This should occur no later than the second missed 4D/15 report.
Autonomous Distress Tracking

- The capability using transmission of information from which a position of an aircraft in distress can be determined at least once every minute which is resilient to failures of the aircraft’s electrical power, navigation and communication systems.

- Resilient to human factors.

- Shall only be able to de-activate by the same mechanism that activated it.

- Objective: locating an accident site to within a 6 NM radius.
Information sharing

- Right information
- Right time
- Right place

- If ATSU detects a distress condition they will notify the RCC;
- If the operator detects a distress condition they will notify the ATSU who will in turn notify the RCC;
- If an ELT or ELT-DT is activated the RCC will be notified/alerted via the COSPAS/SARSAT system;
- The RCC may receive notification directly from outside sources.
  - Latitude
  - Longitude
  - Time stamp
  - Aircraft identification (i.e. registration)
  - 2Dt source (e.g. ELT, Iridium, INMARSAT)
Location of Aircraft in Distress Repository (LADR)

- RCC has access to LADR.
- LADR makes it available to Aircraft Operator.
- Position update rate < 1 min.
- Has access to Annex 11,12.

Annex 11,12

ATSU

Annex 11,12
LADR–ELT–DT

ELT-DT activation

Cospas-Sarsat

ELT-DT Alerts

Has access to

RCC

ELT-DT Position Information

Has access to

LADR

Has access to

ATSU

Aircraft Operator
Draft Functional Specification for the LADR
Developed by Operators, Regulators and Industry
Basis for system architecture design
Development of business model for sustainability
LADR OPERATIONAL FRAMEWORK

Accredited LADR Contributors

A
B
C
D
...

Data Exchange
(Published once, consumed by many)

Storage

Accredited LADR Users
(Subscribers)

AIR Operator

ANSP

RCC

Other

Contributor

SWIM Enabled
Tel.: +31 800 60 2000
Ref.: AD 15.1.1 E 16 — 18:53
Subject: Financial contributions for the development and implementation of the Location of an Aircraft or Object Reporting System (LAARS) to support Annex 6

14 August 2009

Action required: Discussions provided by
23 October 2009

Sir/Madam,

As of 1 January 2011, Standards in Annex 6 — Operations of Aircraft, Part I — International Commercial Air Transport — requires that all air operations necessitate the collection of detailed data from the aircraft in-flight conditions. It is left unresolved, if not in conflict, with the implementation of reporting systems that are intended to be made available to Air Traffic Services Units (ATSUs), Rescue Coordination Centers (RCCs), and any other entity as authorized by the state or the operator. The Standards address the Global Aeronautical Database (GAD) and its associated Data Tracking (ADT) concept, which was developed in response to recent recommendations following investigations of recent aviation accidents.

Air operators will be able to implement different solutions that meet the performance requirements. However, the Search and Rescue (SAR) community is concerned that allowing operators to have such a variety of options will make it difficult to determine where accurate information has been made available for them or the state of the data stored for search for survivors. As a result, the GAD/ADT concept of operations identifies a need to collect, store, and provide access to this position data to all appropriate stakeholders, as well as to include an aircraft or object reporting system. Consequently, it subscribes to a centrally managed position data repository as the optimal solution.

Sincerely yours,

[Signature]
6.18 LOCATION OF AN AIRCRAFT IN DISTRESS

- ICAO State Letter will be circulated before the end of the year
Global Aeronautical Distress and Safety System Status and Plans

Aircraft Tracking
- Surveillance coverage
- PoC repository
- LADR to be developed
- Doc 10054
- AEEC
- GADSS-AG

Autonomous Distress Tracking

Post Flight Localisation & Recovery
- In progress
- Issue on PFL

Operational

RCC
ATS
Airline
GADSS Information Management

SAR
Accident Investigation
General aviation Rescue capacity Improvement for the worldwide Adoption of a Safe Solution based on European GNSS
SAR statistics

- 840 rescue operations in Europe per year for a cost of 30 M€
- Figures below show some GA accidents’ statistics and the level of SAR equipment of GA aircrafts/pilots:
GA SAR Operation Management

- GA generates the majority of RCC workload
- Connection between RCC and other operators are mainly manual, lowly supported by automatized procedures and common tools

SAR Evolution

- New uses of Galileo Return-Link intensively discussed for PLB, EPIRB and ELT(DT) (remote activation)
- Organization of exchanges in aviation around SWIM concepts well advanced, but hardly dealing with SAR and only for CA
GRIMASSE overview

Project objective

GRIMASSE (H2020 project funded by GSA) proposes an answer to the need expressed by RCCs, AOPA and ICAO to improve General aviation safety by extending the GADSS concept to any aircraft and rotorcraft.

Main challenges

- **Beacon cost**, including integration into the aircraft, maintenance, minimal modification to the aircraft or rotorcraft structure and automatic triggering logic
- Development of SWIM-standard-based applications to improve the communication between elements of the SAR operational chain:
  - Software for RCCs to decrease the time of response of rescue teams -> MERCCURY
  - Automatic Beacon registration database for pilots and airplanes
GADGET
Automatic in-flight activation / location

GADGET
Post-flight activation / location
RESPONSE TIME of the RCCs will be significantly reduced thanks to MERCCURY (important for the 82% of survivors to a GA accident!!)

- Can receive a distress alert either from:
  - MCC (SIT 185) or
  - Distress Tracking Repository (DTR)
- Acoustic alert received
- Automatically decodes beacon ID
- Locates alert signal in a map
- Reads pilot’s information from the beacon registration database
- Downloads the flight plan from Eurocontrol database (ECTL B2B services)
- Generates a report at the end of the event
GRIMASSE flights

- MERCCURY and the 2nd generation beacon will be tested in Barcelona (Sabadell airport) from 18 to 20 September 2019
- Several scenarios will be simulated with real flights. Some examples:
  - Automatic trigger due to violent shock in the air
  - Abnormal descent rate due to, e.g. pilot faints
  - Remote activation of the beacon from ground (RLM)
  - 2 alerts received from 2 different emergencies received at the same time
  - ....
Global Aeronautical Distress and Safety System (GADSS)

- Know where aircraft fly
- Know when aircraft are in distress
- Enhance ability to rescue
- Enhance ability to recover

**Global Aeronautical Distress Safety System**

- **AT**
  - Aircraft Tracking

- **ADT**
  - Autonomous Distress Tracking

- **PFLR**
  - Post Flight Localization & Recovery

**Alert**

**SAR**

**Accident Investigation Authority**
Aviation is safe because it has the culture to react and take lessons out of rare events.