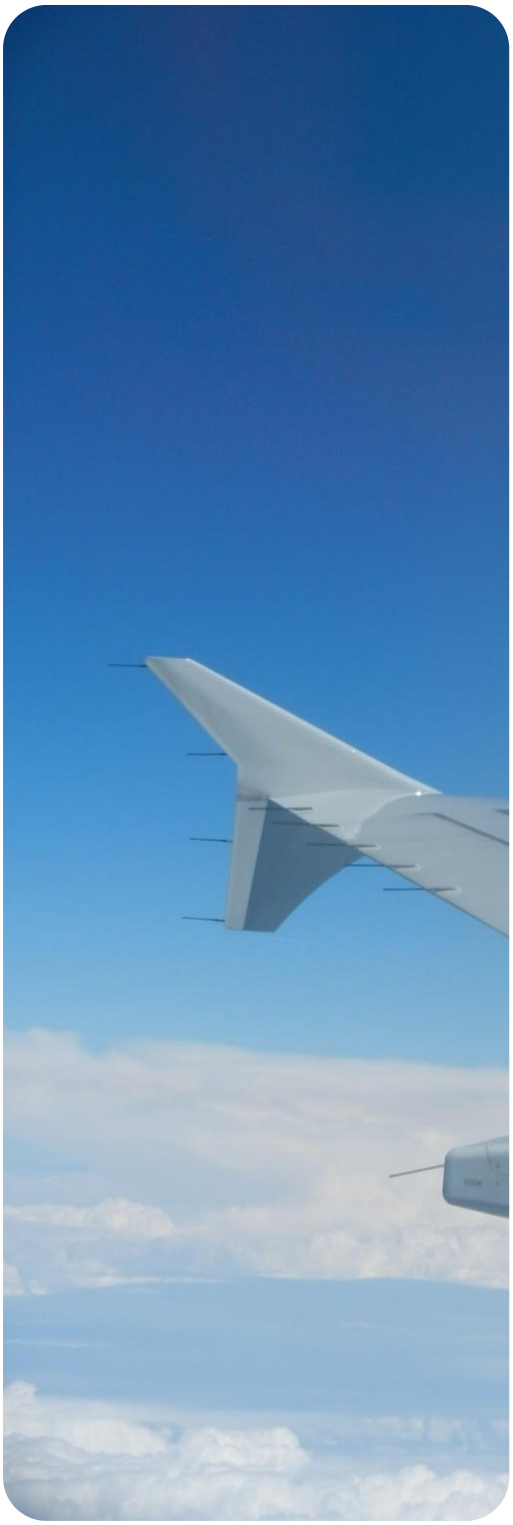


Functional Specification

Location of an Aircraft in Distress Repository (LADR)

Draft Version 3.1

Status of this document

The LADR functional Specification has been developed by the Autonomous Distress Tracking Repository Task Force (ADTR-TF) of ICAO. This document remains subject to further changes as the work progresses.

Version 2.0 incorporated the outcomes of the *DTR Functional Workshop* held at ICAO, Montreal, 9-11 April 2019. As part of the discussion at that workshop, a proposed change to the name of the repository was discussed. Subsequently this has been revised and the document re-titled to refer to the Location of an Aircraft in Distress Repository.

Version 3.0 was updated as a result of the DTR Technical Workshop held at Cospas-Sarsat, Montreal, 1-3 July 2019. Following this workshop the format of the functional spec was completely revised. Additional changes were made such as specific technical requirements, performance measures and other minor amendments.

Minor amendments resulted in version 3.1 which incorporates requirements for a basic web viewer to be included as part of the functionality.

EXECUTIVE SUMMARY

ICAO Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* requires that, as of 1 January 2021, all new production aeroplanes of a maximum certificated take-off mass of over 27 000 kg shall autonomously transmit information from which a position can be determined by the operator at least once every minute when an aircraft is in a state that, if the aircraft behaviour event is left uncorrected, it can result in an accident. Annex 6 also recommends that this requirement be applicable to all new aeroplanes after 1 Jan 2021 of a maximum certificated take-off mass of over 5 700 kg. The operator is responsible to make that 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.

The ICAO Global Aeronautical Distress and Safety System (GADSS) - Concept of Operations (CONOPS) identified a need to collect, store and provide access to Autonomous Distress Tracking (ADT) position information to aid appropriate stakeholders in locating an aircraft in distress, and enhance Search and Rescue (SAR) and recovery capabilities. When an operator detects a potential problem with an aircraft such as a missed position report or suspected distress situation, it will need to inform the appropriate ATSU and other stakeholders.

A centrally managed position data repository was considered the preferred means to provide access to the required distress tracking data. The concept of a repository was validated using a table top exercise involving operators, ATC, search and rescue personnel and tracking service providers. Additional provisions were also drafted to require the operators to monitor and react to any notifications from an on-board autonomous distress tracking (ADT) device and to require that information received from such a system would be stored in the repository for access by all stakeholders.

The repository, a secure web-based storage facility, will house position/location information of aircraft in distress or potentially in distress and will be the means to make the last known position of an aircraft in distress available to stakeholders in a timely manner.

TABLE OF CONTENTS

DEFINITIONS

All terms used in this document are consistent with the *GADSS – Concept of Operations*, Version 6.0.

REFERENCE DOCUMENTS

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

Annex 10 — *Aeronautical Telecommunications*

Annex 11 – *Air Traffic Services*

Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services (Doc 8585)

Location Indicators (Doc 7910)

Manual on System Wide Information Management (SWIM) Concept (Doc 10039)

Manual on Location of Aircraft in Distress and Flight Recorder Data Recovery (Doc 10054)

ICAO *Global Aeronautical Distress Safety System – Concept of Operations (GADSS - CONOPS)*, Version 6.0

1 BACKGROUND

1.0.1 On 2 March 2016, the ICAO Council adopted Amendment 40-A to Annex 6, Part I which included, among other elements, Standards and Recommended Practices (SARPs) related to the location of an aeroplane in distress (Chapter 6, 6.1.8, refers). These SARPs address the Global Aeronautical Distress Safety System (GADSS) Autonomous Distress Tracking (ADT) concept and became effective on 11 July 2016, with an applicability date of 1 January 2021. Amendment 40-A was issued in July 2016.

1.0.2 The SARPs are applicable to aeroplanes with take-off mass greater than 27 000 kg for which the certificate of airworthiness is first issued as of 1 January 2021, and establish the requirement to autonomously transmit information from which a position can be determined by the operator at least once every minute when in a distress condition. The same is recommended for new aeroplanes for which the certificate of airworthiness is first issued as of 1 January 2021with take-off mass greater than 5 700 kg. An aircraft is considered in distress when it is in a state that can, if the behaviour event is left uncorrected, result in an accident.

1.0.3 The SARPs state that autonomous transmission of position information needs to be active when an aircraft is in a distress condition. This will provide a high probability of locating an accident site to within a 6 NM radius. Annex 6, Part I, Appendix 9, also specifies that this transmission can be activated manually. Annex 6 is not technology-specific and will allow for various solutions, including triggered transmission systems. The autonomous transmission of position information needs to be capable of occurring in the event of aircraft electrical power loss, at least for the expected duration of the entire flight. For further details regarding the requirements for an ADT system, refer to the *Manual on Location of Aircraft in Distress and Flight Recorder Data Recovery* (Doc 10054).

1.0.4 The SARPs also establish the requirement for making this information available to authorities such as: Rescue Coordination Centres (RCCs); Air Traffic Services Units (ATSUs); and others as determined by the State of the Operator.

1.0.5 Performance-based standards for ADT systems allow industry to come up with different degrees of innovation. The challenge, however, is to make the ADT position information available in a standard format for the primary intended audience, the RCCs and ATSUs. To accomplish this, the GADSS CONOPS identified a need to store and provide access to ADT position information by means of a centrally managed repository, originally referred to as the Distress Tracking Data Repository and now referred to at the Location of an Aircraft in Distress Repository (LADR), and implemented in accordance with the guidelines provided in the *Manual on System Wide Information Management (SWIM) Concept* (Doc 10039).

1.0.6 Additional provisions have been drafted for PANS-OPS Vol. III which will require that the information related to the position of an aircraft in distress be provided to the centrally managed repository.

2 SCOPE

2.0.1 The scope of this document is to provide details on a solution to meet the requirement of making the last known position of an aircraft in distress situation available to stakeholders in a timely manner applying a global standard.

2.0.2 The proposed Location of an Aircraft in Distress Repository (LADR) is intended to serve as a central location for storing and accessing the last known position of an aircraft in distress. This position may be made available from a number of different proprietary systems which meet the requirements of the Standards in Annex 6. The LADR will provide a single point of access and standard format for this information. Additional functionality, for example the issuing of a notification to accredited users of the arrival of new data, may also be included but are not considered fundamental to the basic function of the LADR.

2.0.3 The LADR does not provide alerting of distress conditions, this will be done by operators and Air Traffic Service Units (ATSUs) using the existing provisions of Annex 6 and Annex 11. Annex 6 requires the operator to be notified when an aircraft is in distress. The operator should use this information to supplement their existing procedures and either validate the distress event, or establish contact with the crew confirm the safety of the aeroplane. In the event that a distress condition is confirmed or suspected the operator will contact the relevant Air Traffic Control centre who remain responsible for the activation of the alerting service and establishment of the relevant alert phase (INCERFA, ALERFA, DETRESFA)

2.0.4 In due course the LADR may host or serve as a SWIM-based conduit for additional information that may be of use to SAR. This specification identifies the minimum dataset required to make the location of an aircraft in a distress condition (aircraft identification details, latitude, longitude and time) available to ATSUs, RCCs and others as established by the State of the Operator. Additional elements which may optionally be provided by an ADT are also defined in order to ensure the information is received in a standard format.

2.0.5 The initial implementation of the LADR is limited to position data from an activated ADT device caused by the aircraft reporting a *distress condition*, or being manually activated by the flight crew.. This should not be confused with an aircraft being designated as in a *distress phase* by ATC, as described in Annex 11, Chapter 5 (Alerting Service).

3 OPERATIONAL FRAMEWORK FOR THE USE OF THE LADR

3.0.1 The LADR is a system that will allow accredited contributors, as defined in Section 6, to submit position information of an aircraft in distress or potentially in distress. The system will store information (i.e. data that meets the input format guidelines) and provide filters allowing users to access information based on their profile.

4 LADR STAKEHOLDERS

4.0.1 There will be three main categories of LADR stakeholders:

i. LADR Administrator;
ii. LADR Contributors (data providers to LADR) inclusive of *developmental submitters, see 6.2.2*; and
iii. LADR Data Users (data consumers to LADR)

4.0.2 An individual entity may fit into one or more of the above stakeholders (e.g. an airline may be a LADR Contributor and also a LADR Data User).

4.1 LADR administrator

4.1.1 The LADR administrator will be ICAO. Effective daily activities for accreditation, monitoring, maintenance and any other working aspects may be delegated to an organization authorized by ICAO which will "host" all above activities on the organization's behalf.

4.1.2 For administrative details such as the accreditation of a new user, the LADR administrator, or delegated responsible organization, will be contactable during regular working hours of the State in which they are located.

4.1.3 For technical issues related to access and use of the LADR, the LADR administrator, or delegated responsible organization, will be contactable 24/7 and be required to address issues related to availability of the repository and access by accredited users. Actual response times for issues and database unavailability will need to be defined in a service level agreement with the delegated responsible organization, once this has been decided.

4.1.4 The LADR administrator will establish criteria to approve contributors and determine the information available to each user profile.

4.2 LADR Contributors

4.2.1 Criteria for becoming a LADR contributor

4.2.1.1 LADR Contributors will be those organizations which:

a) have ADT solutions which have been approved for use by a Contracting State;
b) are able to provide data to the LADR in accordance with the requirements defined by the LADR administrator; and
c) have been properly accredited.

4.2.1.2 Potential LADR Contributors will be designated as *developmental submitters* until they can demonstrate that appropriate quality systems ensure verification of accuracy and integrity of provided data. Functional requirements related to the developmental area used for this purpose are described in 'General System Requirements'.

4.2.1.3 LADR Contributors will need to have policies and procedures to ensure that the data they submit is received and processed by the LADR. These include appropriate actions when notification of a "rejected", "incomplete" or "duplicate" message is received from the LADR. The policies and procedures will also include periodic verification that submitted information is being processed correctly by the LADR.

4.2.2 Contributor accreditation

4.2.2.1 A LADR Contributor will need to provide evidence that it supports an ADT system approved by a Contracting State and that it meets the LADR requirements. The accreditation process may follow the following sequence of events:

a) a Member State informs ICAO that it is in the approval process of an ADT system and wishes that the LADR establishes the organization as a developmental submitter;

b) the LADR administrator provides all necessary documentation to fully specify the required data, formats and procedures for ADT data submissions;

c) the LADR administrator runs a verification test to ensure that the contributor, in developmental submitter mode, meets the LADR requirements for data submissions;

d) once the verification tests are successfully completed, the LADR administrator will set the system up to allow the contributor to submit data and monitor data submissions; and

e) once all requirements are met to the satisfaction of the LADR administrator, it informs the respective Member State of the suitability of the ADT system. The LADR administrator will also issue an accreditation to the ADT provider as a contributor.

4.2.2.2 Contributors will automatically have User Status.

4.2.3 Contributor ongoing accreditation

4.2.3.1 Initial accreditation is granted based on meeting the requirements of the LADR and successful testing and verification. Subsequent changes to an ADT system that impact the connection to the LADR would need to be documented and submitted for re-accreditation, demonstrating the results of testing that has been conducted to ensure ongoing compatibility.

4.3 LADR Data Users

4.3.1 Criteria for becoming a LADR user

4.3.1.1 LADR Users are individuals that are associated with a LADR accredited entity. All user access to the LADR will be read-only. User access and available information will be subject to the entity type profile (see Table 3) and the privileges granted by the particular accredited entity.

Entity (user) type profile	Domain of data available to users
Air Operator	All ADT data for operators own aircraft, identified by the operators three letter designator
Air navigation services provider (ANSP)	All ADT data for aircraft within the flight information region (FIR) managed by the ANSP. Additionally, any event that starts, is active or terminates within the FIR should be fully visible to the ANSP responsible for the FIR (including the data points that are outside of the FIR)
RCC	All ADT data in the LADR
Others, as established by the State of the Operator	Partial or all ADT data for aircraft associated with air operators of the particular State of the Operator
Contributor	All ADT data submitted by the particular contributor

Table 1

4.3.1.2 An accredited entity will have one or more Super Users and as many users as deemed appropriate. Super Users will manage their own users and will be able to establish criteria, within the domain of the entity type profile, and options that their users can flag to get notifications (see section 6.5).

4.3.1.3 An accredited entity will need to have at least one Super User that will act as the focal point for the LADR administrator.

4.3.1.4 Users will be approved and registered in the LADR by the Super User. Users will be able to see the ADT data based on the corresponding entity type profile.

4.3.2 User (entity) accreditation

4.3.2.1 ICAO will accredit entities that will, in turn, accredit users. When an entity seeks ICAO accreditation to access the LADR, it will need to nominate at least one Super User that will serve as the LADR focal point.

4.3.2.2 The table 4 below contains the entities that are eligible for accreditation by the LADR administrator and the eligibility requirements for each entity.

Entity	Requirement
Air Operator	• Be listed in ICAO Doc 8585 - *Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services* • Maintain updated agency (operator) operational control contact information with ICAO
ANSP	• Manage at least one ATSU • Have ATSUs listed in ICAO Doc 7910 - *Location Indicators* • Maintain updated ATSU operational control contact information with ICAO
RCC	• Be listed in the Cospas-Sarsat RCC database • Maintain updated RCC operational control contact information with ICAO
Others, as determined by the State of the Operator	• Additional users which the State of the Operator requires to have access will need to be specifically identified by the State of the Operator

Table 2

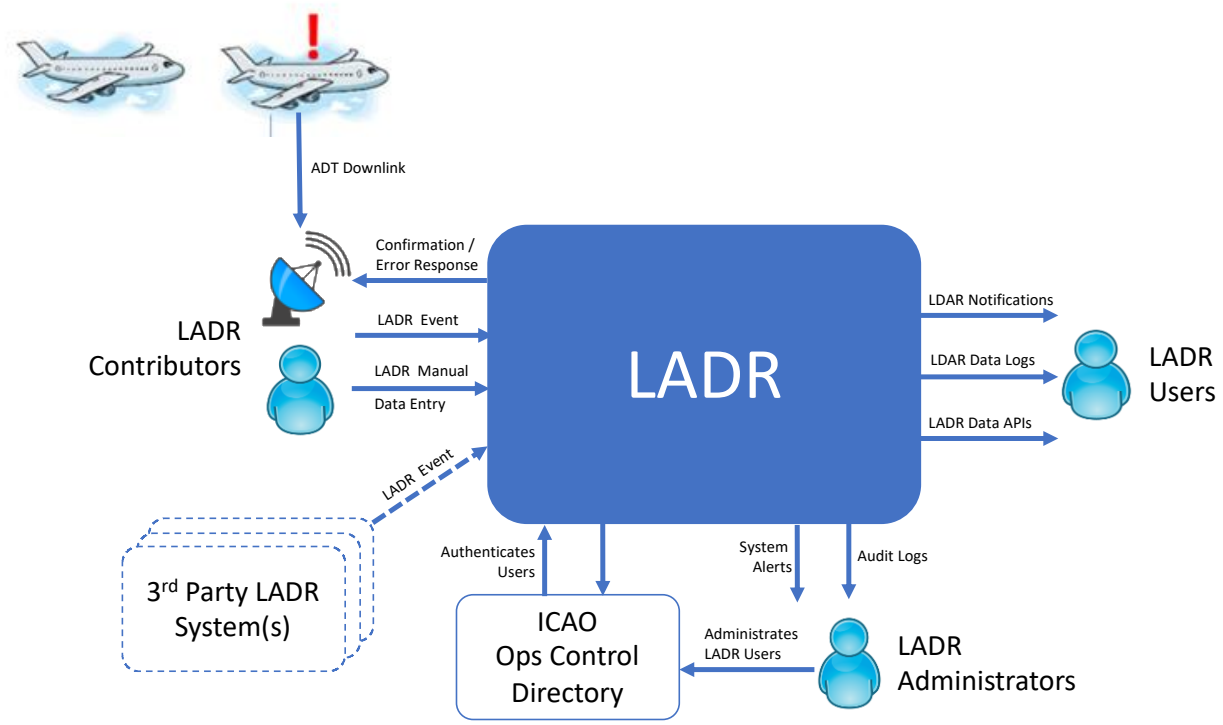
4.3.2.3 An entity, which meets the requirements in Table 4, seeking ICAO LADR accreditation, will need to submit an official request to the LADR administrator. The request will indicate the contact details of the Super User (focal point) and as applicable, assurance that the relevant ICAO operational contact database is up to date.

4.3.2.4 An entity and all users associated with that entity will retain accreditation for as long as the eligibility requirements in Table 4 remain valid.

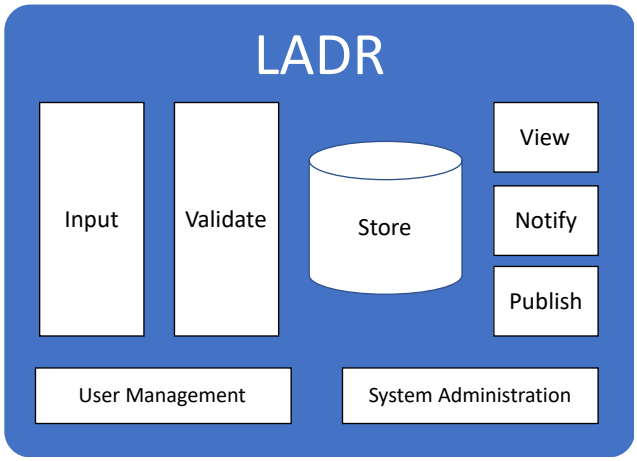
5 FUNCTIONAL OVERVIEW

This section outlines a high-level overview of the LADR, its functional blocks and the various actors that interact with the LADR. Detailed requirements can be found in the sections defining the Functional and Non-Functional Requirements.

5.1 System Scope



5.2 System Functional Blocks



6 FUNCTIONAL REQUIREMENTS

6.1 Data Input

DI-M-100 The system SHALL receive data from one or more authorised LADR Contributors in a suitable format capable of encoding the mandatory data elements specified in Appendix 1 and the optional data element in Appendix 2. FIXM 4.2 is the preferred format for data input.

DI-M-110 On receipt of data, the system SHALL respond to the LADR Contributor in an synchronous manner, acknowledging receipt as well as any validation errors (if any). For the avoidance of doubt this is not a LADR User notification

DI-M-120 On receipt of data, the system SHALL store all incoming data (valid or invalid) within a data audit log.

DI-M-130 The system SHALL monitor the connection to all LADR Contributors using a system-to-system heartbeat or similar concept

DI-M-140 The system SHALL notify the LADR Administrator if a LADR Contributor cannot be contacted.

DI-M-150 The system SHOULD allow for feedback of issues experienced to be sent to the administrator for review and action.

DI-M-160 The system SHALL have a means to manually add information to a record such as callsign, flight number, 24-bit address (as detailed in Appendix 2) to assist with positive disambiguation of events

6.2 Data Storage

DS-M-100 The system SHALL store the mandatory data elements specified in Appendix 1 and the optional data elements in Appendix 2 within a suitable persistent datastore

DS-M-110 The datastore SHALL be capable of performing spatial queries to facilitate geometric LADR User Filters e.g. filter by FIR polygon

DS-M-120 The datastore SHALL be capable of performing text based queries to facilitate text-based LADR User Filters e.g. filter by Operator code

DS-M-130 The system SHALL be capable of connecting to multiple ICAO authorized LADR systems which are geographically distinct. This facility does not need to be built but sufficient information regarding how to connect to the system to facilitate this must be described

6.3 Data Validation

DV-M-100 The system SHALL syntactically validate all messages originating from LADR Contributors in accordance to the format specified in Appendix 1 & Appendix 2 or any relevant industry standard (FIXM 4.2)

DV-M-110 The system SHALL fail validation if the syntax is incorrect;

DV-M-120 The system SHALL fail validation if the message is not complete;

DV-M-130 The system SHALL fail validation if the system is incapable of processing all submitted data in the message

DV-M-140 The system SHALL fail validation if the system suspects duplication of submitted data or messages.

DV-M-150 The system SHALL synchronously inform LADR Contributors of validation failures on submission of data into the system.

DV-M-160 The system SHALL store all validation failures in an validation audit log

DV-M-170 The system SHALL use an appropriate means (e.g. Email) to notify the LADR Administrator that data validation failures have occurred

6.4 Data Publication

DP-M-100 The system SHALL make the last known position of an aircraft in distress available to authorised LADR Users . The required information, per Annex 6, Part I, is the latitude and longitude with a time stamp.

DP-O-110 The system SHOULD make all information stored within the LADR available to authorised LADR Users, consistent with their user access privileges

DP-M-120 The system SHALL encode data in at least one suitable format to mitigate implementation expense and complexity for LADR User(s) to consume the data in existing GIS systems such as Geoserver / ESRI ArcGIS as well as browser-based mapping frameworks such as Open Layer. Example formats include but are not limited to: FIXM4.2, GML3.2 or GeoJSON

DP-M-130 The system SHALL provide valid data matching the filter associated to the LADR user profile via one or more web-service interface(s) in accordance to the SWIM-TI Yellow Profile e.g. Req/Res over TLS and/or Publish & Subscribe of AMQP 1.0. More information on the SWIM-TI Yellow Profile can be found in Annex 3. More information on SWIM can be found in ICAO Doc 10039.

DP-M-140 The system SHALL provide all invalid data recorded in the data audit log via a web-service interface in accordance to the SWIM-TI Yellow Profile User management

6.5 Notifications

UN-M-100 The system SHALL issue a notification to a LADR User when ADT data that meets a LADR Users ‘filter’, as defined in the LADR user profile, is met

UN-M-110 The system SHALL trigger a notification on the first entry from an activated ADT and should not subsequently send notifications for each position report received from the device.

UN-M-120 The system SHALL allow LADR Users to optionally subscribe to receiving notifications. LADR Users will be aware that incomplete messages may hinder the User Notification functionality.

UN-M-130 The system SHALL provide notifications to LDAR Users via Email

UN-M-140 The system SHALL provide a SWIM compliant notification to LDAR Users using a message queuing service such as AMQP 1.0. Note: There is no requirement at this moment for a push-pull message exchange pattern for LADR notifications (i.e. "pushing data"). However, based on comments from the ATS community, there may be a requirement in this regard in the near future.

UN-O-150 The system SHOULD provide notifications to LDAR Users via SMS

UN-O-160 The system SHOULD provide notifications to LDAR Users via ATS message over AFTN

UN-M-170 The system SHALL store and manage pre-determined filters which can be referenced by one or more LADR User profiles. Filters, will include:

a) ADT property e.g. Operator Aircraft

b) Geometric Polygon e.g. FIR

c) State of the Operator

UN-M-180 The system SHALL notify LDAR Users depending on the type of user account, according to the following table:

User Account Type	Notification options
Air Operator	Limited to operators own aircraft
Air Navigation Service Provider	Events which start are active or terminate within the FIR managed by the ANSP *Note – Data for an event which originated outside of the FIR but terminated within the FIR will still be accessible, according to 6.3.1.1*
RCC	No limitation
State of the Operator	Any events relating to aircraft associated with operators of the State of the Operator

UN-M-190 Where notifications are generated using a filter based on a geometric shape, the system SHALL apply an additional 80 NM buffer around the geometric shape in order to calculate which notifications are to be sent and to which LADR User. For example, the area for an FIR or a State will be considered from 80 NM outside of the published boundary.

UN-M-200 The system SHALL send notifications only once for an event. Successive transmissions of an event at one minute intervals shall not generate additional notifications.

UN-M-210 If an event transmission stops and subsequently re-starts, the system SHALL consider the restart as a separate event and send a new User Notification.

UN-M-220 The system SHALL provide a clear means to determine which stakeholders associated with an event have opted to receive notifications. This will allow other parties to know whether or not they are likely to be informed about the distress condition of the aircraft.

UN-M-230 The system SHALL allow LDAR Users to block notifications for a specific aircraft in order to stop erroneous notifications due to an intermittent /recurrent fault with the ADT

UN-M-240 The system SHALL have a means for a user to manage their own notification settings

6.6 Distress event validation

DV-O-100 The system SHOULD have a means for a user to indicate that they have confirmed that a genuine distress event is taking place

6.7 Web Viewer

WV-M-100 The system SHALL provide a secure browser-based Web Viewer that enables each LDAR user to view the events relevant to them (based on the ‘filters’ associated to the LADR user profile) on an interactive 2D map.

WV-M-110 The system SHALL only allow authorized LADR users to access the Web Viewer based on permissions of the ICAO OPS CTRL directory

WV-M-120 The Web Viewer SHALL display the geographic position of the event (including the latest event and all previous events) received on the map

WV-M-130 The Web Viewer SHALL enable the LDAR User to click on any geographic position of the event and display its associated properties in table form

WV-M-140 The Web Viewer SHALL enable the LADR User to zoom in and out and pan over the map and context layers

WV-M-150 The Web Viewer SHALL enable the LADR User to display the property (e.g. altitude) of the LADR Event as a label next to the geographic position of the event

WV-M-160 The Web Viewer SHALL enable the LADR User to turn on and off the labels of the event

WV-M-170 The Web Viewer SHALL enable the LADR User to display various backdrop map layers to provide additional context mapping to the event in order to provide additional context mapping to the event

WV-M-180 The Web Viewer SHALL enable the LADR User to turn on and off various backdrop map layers

WV-M-190 The Web Viewer SHOULD provide a map layer showing the all airports of the world based on the current AIRAC cycle

WV-M-200 The Web Viewer SHOULD provide a map layer showing the all FIRs of the world based on the current AIRAC cycle

WV-M-210 The Web Viewer SHOULD provide a map layer showing the all Country boundaries

WV-M-220 The Web Viewer SHALL allow the LADR User to print the current map screen being viewed

6.8 User Management

UM-M-100 The system SHALL integrate with the ICAO OSP CTRL Directory for user authentication and management

UM-M-110 The system SHALL be capable continuing to authenticate users and provide access even if the ICAO OPS CTRL Directory is offline.

UM-M-120 The system SHALL NOT export user data for any reason

6.9 System Administration

SA-M-100 The system SHALL allow the LADR Administrator to search all type of audit logs via a system administrator interface

SA-M-110 The system SHALL gather suitable system metrics in order to monitor the performance of the system against the agreed system services level agreement

6.10 General System Requirements

GN-M-110 The system SHALL provide a standalone production environment for access to live operational data by LADR Contributors and LADR Users

GN-M-120 The system SHALL provide a standalone pre-production environment for formal testing and accreditation of LADR Contributors and LADR Users who wish to connect to LADR or need to test updates to their existing systems.

GN-M-130 The system SHALL provide a standalone integration environment for early informal development and testing by LADR Contributors and LADR Users who wish to connect to LADR or need to test software updates to their existing systems.

GN-M-140 The system SHALL operate across two geographically independent sites to provide redundancy in case of natural disasters or other factors adversely impacting the operational readiness. The fact that the system operates across two geographically sites should be transparent to all LDAR Users and LDAR Contributors

7 NON-FUNCTIONAL REQUIREMENTS

NF-M-100 The system SHALL be developed, tested and deployed to a level of quality that ensures that when data is submitted, it is accurately processed

NF-M-105 The system SHALL be capable of scaling in a horizontal manner and without major disruption or change to the underlying architecture

NF-M-110 The system SHALL be capable of processing a peak load of 1000 events a minute based on an average ADT message size of 200 bytes, uncompressed;

NF-M-120 Based on the ATS data retention requirements in Annex 10 — Aeronautical Telecommunications, the system SHALL store all data (ADT Event and Audit Logs) for a period of at least thirty days from its submission.

NF-O-130 After 30 days from submission, the system SHOULD archive all data to offline file storage

NF-M-140 Excluding planned maintenance, the system SHALL be operated and supported on a 24/7 basis 365 days a year

NF-M-150 Excluding planned maintenance, the system SHALL be available at least 99.9% of the time per calendar month.

NF-M-160 The system SHALL have four planned maintenance periods during a calendar year and each period SHALL be no longer than 2 hours

NF-M-170 The system SHALL have a Recovery Point Objective 1 hour which will be measured from the point at which the decision to invoke the Disaster Recovery process is made.

NF-M-180 All webservice responses in the system SHALL have an average time-to-first-byte of no longer than 3 seconds.

NF-M-190 The time taken from when data is first received by the system to when it is made available to a LADR User (the “end-to-end latency”) SHALL be no longer than 30 seconds.

NF-M-200 The LADR will provide the appropriate level of security, and only allow approved contributors to submit information and approved users to access read-only information based on their profile. The security requirements will also keep contributor and user profiles secure.

NF-M-210 The system SHALL provide protection from malicious attempts to interfere with normal operation and authorized access (e.g. denial of service).

NF-M-220 The system SHALL virus scan all message entering the system

NF-M-230 The system SHALL encrypt network traffic in and out of the system using a suitable encryption transport technology such as TLS

NF-M-240 The system SHALL encrypt all Password information received, transmitted or stored in the system using standard Internet encryption technology.

NF-M-250 The system SHALL log all security events in an security audit log

NF-M-260 The system SHALL detect intrusions and attempt to terminate them where possible.

NF-M-270 The system SHALL report all intrusions in such a way that LADR Administrator is immediately alerted

NF-M-280 The system SHALL reports on attempted intrusions will be generated and made available to the originators of the data stored in the LADR.

8 Appendix 1 – Mandatory Data Elements

The table below defined the mandatory data elements to be provided by a LADR Data Contributor

Field	Format	LADR Functionality	Example
Latitude	N/S DD° MM.M’	Establish domain by geo referencing	N45°30.1'N
Longitude	E/W DDD° MM.M’	Establish domain by geo referencing	W073°33.9' W
Date/time of Transmission	DD/MM/YYYY/ HH:MM:SS	Sequencing of messages and data retention	07/12/2017
Date/time of Receipt	DD/MM/YYYY/ HH:MM:SS	Sequencing of messages and data retention (for corrupted/incomplete data)	07/12/2017
3LD	TTT	Establish State of the Operator domain	MXA
Aircraft Registration (with Nationality Mark)	TTTTTTT	Particular aircraft identification: (Completion of at least one field from the possible options to identify the aircraft is required)	XA-BJH
Aircraft 24-bit address	TTTTTT		AC82EC
Selcall	TTTTTT (TTTT)		ABCDEF (ABCD)
Flight callsign and flight #	TTTTTTT		Speedbird1234
Contributor Code	NNN	Establish contributor domain for data validation.	001
Data Source	TBD	Enable identification of the source of data (Manufacturer, type of ADT)	TBD

Table 3

9 Appendix 2 – Optional Data Elements

An ADT system may be configured to provide additional data which could be of use to SAR or post flight location and recovery. The following fields should be available for use in the LADR but remain optional. Where used, the format of the data supplied must match the indicated format to ensure consistency and usability of the data.

Field	Format	LADR Functionality	Example
Accuracy of position data		Optional if available from the ADT system	
Altitude (ft)	NNNNN	Optional field – either Altitude in m or ft (Recommended)	35000
Altitude (m)	NNNNN		10000
Altitude source	XXXX	Required if *Altitude* data supplied	BARO GNSS
Indicated Airspeed (kt)	NNN	Optional field	350
Indicated Airspeed (km/h)	NNN	Optional field	550
Heading	DDD°	Optional field	090
ELT Hex ID	HHHHHHHHHH HHHHH	Carried ELT devices (may be more than one per aircraft)	1234567890 ABCDE
ADT activation method	Text	Options would be manual/automatic	
ADT Cancellation message	TBD	Records cancellation signal from ADT (where provided) to distinguish between end transmission from end of flight	TBD
Validated distress event flag	True/False	Operator editable to indicate their process has determined the aircraft is in a genuine distress state	

10 Appendix 3 – SWIM TI-Yellow Profile binding requirements

The following table specifies WS-light interface binding mandatory requirements for the SWIM TI-Yellow Profile.

TLS	SWIM-TIYP-0008	The Service Interface Binding shall support the following versions of the Transport Layer Security Protocol (TLS): + IETF RFC 5246 (TLS v1.2)
HTTP	SWIM-TIYP-0009	The Service Interface Binding shall support HTTP/1.1.
HTTP over TLS	SWIM-TIYP-0010	The Service Interface Binding shall comply with IETF RFC 2818 (HTTP over TLS).
TLS Authentication	SWIM-TIYP-0042	The Service Interface Binding shall support one of the following authentication mechanisms for TLS: + Mutual authentication with X.509 certificates + Server authentication with X.509 and Client authentication with HTTP Basic or HTTP Digest.
HTTP Status Code Header	SWIM-TIYP-0043	The Service Interface Binding shall be able to use the HTTP Status-Code header.
HTTP Reason Phrase Header	SWIM-TIYP-0044	The Service Interface Binding shall be able to use the HTTP Reason-Phrase header.

More information can be found using the following link from the EUROCONTROL SWIM Service Registry: https://eur-registry.swim.aero/reference/ectl-swim-tiyp-v1-0/requirements