



To SAI Subcommittee
Global Aircraft Tracking (GAT)
Working Group

Date April 26, 2017

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Reference 17-999/SMA-008 lth

Subject Meeting Announcement
Global Aircraft Tracking (GAT) Working Group

Chairman Chuck Adler, Boeing (Charles.O.Adler@Boeing.com)

When June 15-16, 2017
Thursday from 0900 to 1700, Friday from 0900 to 1300
Note: The SAI Subcommittee meeting will be held June 13-14, 2017 at the same location.

Host Panasonic Avionics

Where Hilton Denver Inverness Hotel
200 Inverness Drive West
Englewood, Colorado 80112
tel: +1-303-799-5800
fax: +1-303-799-5874
Hilton Inverness Denver
<http://www3.hilton.com/en/hotels/colorado/hilton-denver-inverness-DENIRHH/index.html>

Hotel Panasonic has negotiated a discount rate of \$169.00. To reserve a room at the Hilton, follow this link:
https://www.regonline.com/sai_adt_meeting

Instructions Please notify the Industry Activities staff of your intention to attend by registering online at: <http://www.aviation-ia.com/events/>
The meeting is open to all interested parties. Individuals requesting time on the agenda should contact Chuck Adler or Paul Prisaznuk. The agenda will be finalized one week prior to the meeting.

Meeting Objectives

Global Aircraft Tracking in Denver

The Systems Architecture and Interfaces (SAI) Subcommittee has been discussing ICAO Global Aeronautical Distress and Safety System (GADSS) requirements in anticipation of AEEC Executive Committee action at the AEEC General Session in Milwaukee.

The SAI Subcommittee has looked at various technologies that contribute to positive aircraft tracking. This includes ground-based ADS-B, space-based ADS-B, datalink services, and others. The goal is to propose solutions that can positively identify and track an aircraft with minimal impact on aircraft production and retrofit.

ICAO Global Aeronautical Distress & Safety System (GADSS)

ICAO SARPS will require GADSS on certain production aircraft starting in 2021 (> 27,000 kg)

- Normal Tracking – all flight phases – 15-minute interval
- Abnormal Tracking – 1 Minute interval
- Autonomous Distress Tracking – high data rates

Technologies for consideration include Mode S, ADS-B, ADS-C, including space-based Datalink technologies, VHF, and satcom.

Boeing has prepared initial drafts of the APIMs that have been reviewed, updated, and widely supported by the SAI Subcommittee. The APIMs are as follows:

APIM 17-004 – Autonomous Distress Tracking (ADT)

APIM 17-005 – Timely Recovery of Flight Data (TRFD)

NOTE: APIMs are subject to AEEC Executive Committee approval.

APIM 17-004 – Autonomous Distress Tracking (ADT)

The goal is to define system requirements, equipment architectures and aircraft installation standards for equipment capable of meeting ICAO GADSS requirements potentially including:

- Satcom-based tracker
- Fixed Emergency Locator Transmitter – Distress Tracker (ELT-DT)
- Space-based Automatic Dependent Surveillance – Broadcast (ADS-B)

Airlines are expected to benefit by being able to meet the forthcoming worldwide Autonomous Distress Tracking mandates in the most effective manner (minimize overall cost, reduced risk, within schedule, etc.).

The goal is to reach consensus on a strawman requirements document.

APIM 17-005 – Timely Recovery of Flight Data (TRFD)

Future work on APIM 17-005 is anticipated as part of the overall work package. Following the ADT activity, the Global Aircraft Tracking Working Group is expected to define system requirements, equipment architectures and aircraft installation standards for equipment capable of meeting ICAO TRFD requirements potentially including:

- Automatic Deployable Flight Recorder (ADFR) – a combination flight recorder (Cockpit Voice Recorder (CVR)/Flight Data Recorder (FDR)) installed on the aircraft which is capable of automatically deploying from the aircraft
- Flight Data Streaming (FDS) – the ability to stream flight data from the airplane while in flight

Preliminary discussions will be held as a matter of planning. Airlines are expected to benefit by being able to meet the forthcoming worldwide TRFD mandates in the most effective manner (minimize overall cost, reduced risk, within schedule, etc.)

**Travel
Information**

The Hilton Denver Inverness Hotel is located 30 miles south of the Denver International Airport.

Exit the Airport via Pena Blvd. to the combined I-70 West/I-225 South exit. Follow I-25 South to the County Line Road (Exit 195) and turn left going east. Take the first left onto Inverness Drive West. The hotel will be on the right.

A rental car is recommended.

Attachments APIM 17-004 and APIM 17-005

Attachment 1

ARINC Project Initiation/Modification (APIM)

- 1.0 Name of Proposed Project** **APIM 17-004**
Autonomous Distress Tracking (ADT)
- 1.1 Name of Originator and/or Organization**
Boeing / Jessie Turner
- 2.0 Subcommittee Assignment and Project Support**
- 2.1 Suggested AEEC Group and Chairman**
Group: Global Aeronautical Distress and Safety System (GADSS) Working Group of the Systems Architecture and Interfaces (SAI) Subcommittee
Chairman: Charles Adler, Boeing
- 2.2 Support for the activity**
Airlines: American, Delta, FedEx, Southwest, TAP, United, UPS
Airframe Manufacturers: Airbus, Boeing, Embraer
Suppliers: L3T AP, Avionica, Cobham Satcom, FLYHT, Honeywell, Inmarsat, Iridium, Panasonic, Rockwell Collins, Teledyne, Thales, Universal Avionics, and TBD-others
Others: TBD
- 2.3 Commitment for Drafting and Meeting Participation**
Airlines: American, United
Airframe Manufacturers: Boeing, Airbus
Suppliers: L3T AP, FLYHT, Inmarsat, Iridium, Panasonic, Thales and TBD-others
Others: TBD
- 2.4 Recommended Coordination with other groups**
AEEC: Traffic Surveillance Subcommittee
EUROCAE: Working Group 98 (WG-98)
ICAO Surveillance Panel
- 3.0 Project Scope**
- 3.1 Description**
The difficulty in locating the crash sites of Air France Flight 447 in June 2009 and Egypt Air Flight 804 in May 2016, and the disappearance of Malaysia Airlines Flight 370 in March 2014, has prompted significant international effort to provide means for a global aircraft tracking capability. Since 2015, ICAO has worked to amend ICAO Annex 6 standards to include requirements for tracking commercial

Specify: To comply with forthcoming ADT mandates

Mandate/regulatory requirement yes no

Forthcoming global mandates for Autonomous Distress Tracking.

Is the activity defining/changing an infrastructure standard? yes no

Specify: TBD

When is the ARINC Standard required? Jan. 2019

What is driving this date? Expected Autonomous Distress Tracking mandates of Jan. 1, 2021 (for forward-fit aircraft).

Are 18 months (min) available for standardization work? yes no

Are Patent(s) involved? yes no

If YES please describe, identify patent holder: Boeing is aware that multiple patents from multiple companies (including Boeing) have been applied for in this area.

3.3 Issues to be worked

Phase 1

Tasks:

1. Document the end-to-end system requirements that are being levied by ICAO and individual Civil Aviation Authorities (CAAs) (both at the aircraft-level and on-ground systems).
2. Develop a System Functional Block Diagram, allocating the requirements (ICAO and CAAs) to each functional block.

Product: ARINC Report (under configuration control)

Duration: ~3 months

Phase 2

Tasks:

1. Develop candidate architectures (both at the aircraft-level and on-ground systems) that would meet these system-level requirements.
2. Choose an architecture (or architectures) in which to develop detailed equipment and aircraft installation requirements, as well as ground system requirements

Product: ARINC Report (under configuration control)

Duration: ~6 months

Phase 3

Task: Develop detailed equipment, interface, and aircraft installation requirements, as well as ground system requirements, for an architecture (or architectures).

Product: ARINC Characteristic(s) (new or revised)

Duration: ~10 months

There are a few potential aircraft tracking architectures that are expected to be evaluated, including (but not limited to) the following:

- A Satcom-based tracker
- A Fixed Emergency Locator Transmitter – Distress Tracker (ELT-DT)
- Space-based Automatic Dependent Surveillance – Broadcast (ADS-B)

In order to complete Phase 2, other AEEC subcommittees (e.g. the Traffic Surveillance Subcommittee for Space-based ADS-B) may be requested to assist the SAI subcommittee to develop candidate architectures. Also, depending on the chosen architecture(s), Phase 3 may be worked within the SAI subcommittee, or another AEEC subcommittee(s).

4.0 Benefits

4.1 Basic benefits

Operational enhancements? yes no

For equipment standards:

- a. Is this a hardware characteristic? yes no
- b. Is this a software characteristic? yes no
- c. Interchangeable interface definition? yes no
- d. Interchangeable function definition? yes no

If not fully interchangeable, please explain: Not applicable

Is this a software interface and protocol standard? yes no

Specify:

Product offered by more than one supplier yes no

Identify: Yes – Multiple suppliers depending on the chosen architecture(s).

4.2 Specific project benefits (Describe overall project benefits.)

4.2.1 Benefits for Airlines

Airlines are expected to benefit in being able to meet the forthcoming worldwide Autonomous Distress Tracking mandates in the most effective manner (minimize overall cost, reduced risk, within schedule, etc.).

4.2.2 Benefits for Airframe Manufacturers

Airframe manufacturers will benefit by being able to implement common installation(s)/solution(s) across all of their aircraft models with minimized changes to the aircraft.

4.2.3 Benefits for Avionics Equipment Suppliers

Avionics equipment suppliers will benefit by being able to provide equipment that can be installed on multiple aircraft platforms, across multiple aircraft OEMs.

5.0 Documents to be Produced and Date of Expected Result

ARINC Report, "Autonomous Distress Tracking (ADT) System-Level Requirements", in July 2017.

ARINC Report, "Autonomous Distress Tracking (ADT) Architectures Study", in Feb. 2018.

Modification of existing ARINC Characteristic(s), or introduction of a new "Autonomous Distress Tracking (ADT) System" Characteristic, in Jan. 2019 (dependent upon chosen architecture(s)).

5.1 Meetings and Expected Document Completion

The following table identifies the number of meetings and proposed meeting days needed to produce the documents described above.

Activity	Mtgs	Mtg-Days (Total)	Expected Start Date	Expected Completion Date
<i>Phase 1: Document the end-to-end system requirements</i>	One 2-day meeting plus teleconferences	2	May 2017*	July 2017
<i>Phase 2: Develop candidate architectures, and select architecture(s)</i>	Three 3-day meetings plus teleconferences	9	August 2017	Feb. 2018
<i>Phase 3: Develop detailed equipment, interface, and aircraft installation requirements, as well as ground system requirements</i>	Three 3 day meetings plus teleconferences	9	March 2018	Jan. 2019**

* The start date of Phase 1 (May 2017) is contingent on completion of the ICAO GADSS ConOps (and other associated documents).

** The completion date of Phase 3 (Jan. 2019) is driven by a Jan. 1, 2021 (individual Certificate of Airworthiness) forward-fit mandate (ref. ICAO Annex 6, Part I, §6.18.1). 24 months is considered the minimum time needed for system development.

6.0 **Comments**

6.1 **Expiration Date for the APIM**

February 2019

Attachment 2

ARINC Project Initiation/Modification (APIM)

1.0 Name of Proposed Project APIM 17-005

Timely Recovery of Flight Data (TRFD)

1.1 Name of Originator and/or Organization

Boeing / Jessie Turner

2.0 Subcommittee Assignment and Project Support

2.1 Suggested AEEC Group and Chairman

Group: Global Aeronautical Distress and Safety System (GADSS) Working Group of the Systems Architecture and Interfaces (SAI) Subcommittee

Chairman: Charles Adler, Boeing

2.2 Support for the activity

Airlines: American, Delta, FedEx, Lufthansa, Southwest, TAP, United, UPS

Airframe Manufacturers: Airbus, Boeing, Embraer

Suppliers: ACSS, Honeywell, Rockwell Collins, Teledyne, Thales

Others: Inmarsat

2.3 Commitment for Drafting and Meeting Participation

Airlines: American,

Airframe Manufacturers: Boeing, Airbus

Suppliers: TBD

Others: Inmarsat

2.4 Recommended Coordination with other groups

AEEC: Digital Flight Data Recorder (DFDR) Subcommittee

ICAO: Flight Operations Panel – Flight Recorder Working Group

ICAO: Frequency Management Panel

3.0 Project Scope

3.1 Description

The difficulty in timely recovery of flight data from aircraft crash sites has prompted accident investigation agencies to request ICAO to update Annex 6, Part 1 (Operation of Aircraft – International Commercial Air Transport – Aeroplanes) standards. ICAO has recently updated §6.3 *Flight Recorders* standards to add a new sub-section “6.3.5 Flight recorder data recovery”. This new sub-section 6.3.5 states the following:

6.3.5.1 All aeroplanes of a maximum certificated take-off mass of over 27 000 kg and authorized to carry more than nineteen passengers for which the application for type certification is submitted to a Contracting State on or after 1 January 2021, shall be equipped with a means approved by the State of the Operator, to recover flight recorder data and make it available in a timely manner.

6.3.5.2 In approving the means to make flight recorder data available in a timely manner, the State of the Operator shall take into account the following:

- a) the capabilities of the operator;
- b) overall capability of the aeroplane and its systems as certified by State of Design;
- c) the reliability of the means to recover the appropriate CVR channels and appropriate FDR data; and
- d) specific mitigation measures.

Note.— Guidance on approving the means to make flight recorder data available in a timely manner is contained in the *Manual on Location of Aircraft in Distress and Flight Recorder Data Recovery (Doc 10054)*.

Note: At the time of writing of this APIM, ICAO Doc 10054 has not been published (nor drafted). A draft Doc 10054 is expected by the end of 2017.

The ICAO Annex 6 update also added a definition for an *Automatic deployable flight recorder (ADFR)* – A combination flight recorder installed on the aircraft which is capable of automatically deploying from the aircraft, and includes an APPENDIX 8 which provides a list of requirements that an ADFR must meet.

However, there is no specific ICAO Annex 6 requirement that an ADFR must be installed. Besides ADFRs, timely recovery of flight data could also be provided by Flight Data Streaming from the aircraft.

In order to address a potential Civil Aviation Authority (CAA) mandate for Timely Recovery of Flight Data in the most effective way (accounting for system complexity, cost, schedule, risk, etc.), the aviation industry needs to:

1. Document the end-to-end system requirements that will be levied by ICAO and individual Civil Aviation Authorities (CAAs), including documenting certification and operational requirements, and Acceptable Means of Compliance.
2. Develop candidate architectures (both at the aircraft-level and on-ground systems) that would meet these system-level requirements
3. Choose an architecture(s) in which to develop detailed equipment and aircraft installation requirements, as well as ground system requirements, so that:
 - Equipment suppliers can proceed with development of equipment that can be installed on multiple platforms
 - Airlines and OEMs can plan/proceed with aircraft installation changes.
 - Airlines can make any necessary changes (as required) within their Airline Operations Centers (AOCs)

3.2 **Planned usage of the envisioned specification**

New aircraft developments planned to use this specification yes no

Specify: To comply with potential TRFD mandates

Modification/retrofit requirement yes no

Specify: Only if required by potential TRFD mandates, or to support owner/operator fleet commonality goals

Needed for airframe manufacturer or airline project yes no

Specify: To comply with potential TRFD mandates

Mandate/regulatory requirement yes no

Potential forthcoming mandates for TRFD.

Is the activity defining/changing an infrastructure standard? yes no

Specify: TBD

When is the ARINC Standard required? Jan. 2021

What is driving this date? Expected TRFD mandates of Jan. 1, 2021 (for new type certification applications).

Are 18 months (min) available for standardization work? yes no

Are Patent(s) involved? yes no

If YES please describe, identify patent holder: Boeing is aware that multiple patents from multiple companies (including Boeing) have been applied for (or obtained) in this area.

3.3 **Issues to be worked**

Phase 1

Tasks:

1. Document the end-to-end system requirements that are being levied by ICAO and individual Civil Aviation Authorities (CAAs) (both at the aircraft-level and on-ground systems).
2. Document data security and privacy requirements.
3. Develop a System Functional Block Diagram, allocating the requirements (ICAO and CAAs) to each functional block.

Product: ARINC Report (under configuration control)

Duration: ~3 months

Phase 2

Tasks:

1. Develop candidate architectures (both at the aircraft-level and on-ground systems) that would meet these system-level requirements.
2. Choose an architecture (or architectures) in which to develop detailed

equipment and aircraft installation requirements, as well as ground system requirements

Product: ARINC Report (under configuration control)

Duration: ~12 months

Phase 3

Task: Develop detailed equipment, interface, and aircraft installation requirements, as well as ground system requirements, for an architecture (or architectures).

Product: ARINC Characteristic(s) (new or revised)

Duration: ~13 months

There are two potential TRFD architectures that are expected to be evaluated, including (but not limited to) the following:

- Automatic Deployable Flight Recorder (ADFR) - a combination flight recorder (Cockpit Voice Recorder (CVR)/Flight Data Recorder (FDR)) installed on the aircraft which is capable of automatically deploying from the aircraft
- Flight Data Streaming (FDS) – the ability to stream flight data from the airplane while in flight

In order to complete Phase 2, other AEEC subcommittees (e.g. the Digital Flight Data Recorder (DFDR) Subcommittee) may be requested to assist the GADSS Working Group to develop candidate architectures. Also, depending on the chosen architecture(s), Phase 3 may be worked within the SAI subcommittee, or another AEEC subcommittee(s).

4.0 Benefits

4.1 Basic benefits

Operational enhancements? yes no

Dependent on the chosen solution

For equipment standards:

a. Is this a hardware characteristic? TBD yes no

b. Is this a software characteristic? TBD yes no

c. Interchangeable interface definition? yes no

d. Interchangeable function definition? yes no

If not fully interchangeable, please explain: Not applicable

Is this a software interface and protocol standard? yes no

Specify:

Product offered by more than one supplier yes no

Identify: Yes – Multiple suppliers depending on the chosen

architecture(s).

4.2 Specific project benefits (Describe overall project benefits.)

4.2.1 Benefits for Airlines

Airlines are expected to benefit in being able to meet any forthcoming worldwide TRFD mandates in the most effective manner (minimize overall cost, reduced risk, within schedule, etc.).

4.2.2 Benefits for Airframe Manufacturers

Airframe manufacturers will benefit by being able to implement common installation(s)/solution(s) across aircraft models with minimized changes to the aircraft.

4.2.3 Benefits for Avionics Equipment Suppliers

Avionics equipment suppliers will benefit by being able to provide equipment that can be installed on multiple aircraft platforms, across multiple aircraft OEMs.

5.0 Documents to be Produced and Date of Expected Result

ARINC Report, "Timely Recovery of Flight Data (TRFD) System-Level Requirements", in Dec. 2018.

ARINC Report, "Timely Recovery of Flight Data (TRFD) Architectures Study", in Dec. 2019.

ARINC Characteristic(s), "Timely Recovery of Flight Data (TRFD) System", in Sept. 2020.*

* ARINC Characteristic(s) are dependent upon chosen architecture(s) and may be new ARINC characteristic(s), or modification of existing ARINC characteristic(s).

5.1 Meetings and Expected Document Completion

The following table identifies the number of meetings and proposed meeting days needed to produce the documents described above.

Activity	Mtgs	Mtg-Days (Total)	Expected Start Date	Expected Completion Date
<i>Phase 1: Document the end-to-end system requirements</i>	One 2-day meeting plus teleconferences	2	June 2018*	Dec. 2018
<i>Phase 2: Develop candidate architectures, and select architecture(s)</i>	Three 3-day meetings plus teleconferences	9	Jan. 2019***	Dec. 2019
<i>Phase 3: Develop detailed equipment, interface, and aircraft installation requirements, as well as ground system requirements</i>	Three 3 day meetings plus teleconferences	9	Jan. 2020	Sept 2020**

* The start date of Phase 1 is contingent on completion of ICAO Document(s).

** The completion date of Phase 3 is driven by a Jan. 1, 2021 application for type certification date for new aircraft type designs (ref. ICAO Annex 6, Part I, §6.3.5.1).

*** The start date of Phase 2 is to allow resources/budget to be allocated to the Autonomous Distress Tracking (ADT) development effort which has an earlier potential mandate date.

6.0 Comments

6.1 Expiration Date for the APIM

October 2020