



Electronic Bag Tag (EBT) Implementation Guide

Issue 1.1



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1. Introduction

1.1 Background

This Implementation Guide has been produced by the EBT sub-working group members. It is a living document that will be modified/edited as new requirements and needs are identified.

All the sections have been written by IATA Member Airlines and have been supported by the EBT sub-working group representatives, by commenting and discussing the different subjects addressed in the guide.

One of the questions that persists for the passenger journey is “why do airlines impose actions on the passengers to complete their own processes”. The Electronic Baggage Tag (EBT) is one technique that can overcome the need for a passenger to queue and get a paper tag and receipt that allows the airline to move the bag through its journey. A bag drop is still needed, and this can also be a much-improved process without the queue time associated with traditional check-in and bag drop.

The EBT is however a complex technology – there are many factors to consider. Fortunately, the EBT sub-working group in IATA has reduced this complexity to a manageable subject, and the information needed to implement EBT in an airline is contained in this guide. The key decisions that remain for an airline are to decide which tags they will accept for carriage on their aircraft and what passenger proposition will be made, a detailed discussion of these topics is beyond the scope of this guide.

1.1.1 Objective of the Implementation Guide

This implementation guide provides a roadmap for airlines that wish to implement Electronic Baggage Tags. It is not a step by step plan for implementation, however it presents the basic components of an EBT tag and their functionality as well as key activities that an airline should consider for their implementation plans in terms of the user interface.

With this guide, an airline should be able to rapidly implement an Electronic Baggage Tag design in their airline, and be able to focus on the additional steps needed to set up the required agreements to allow interlining of these electronic baggage tags between partners.

1.1.2 Scope of the Implementation Guide

This guide provides a detailed description of the core functionality of the Electronic Baggage Tag. It is important to realize that these components may be implemented in very different ways according to the decisions made by the implementer.

The core functions should be offered by any tag that is commercially available and wishes to be used for interline airline operations, although not all are required. It is possible to develop a tag without Bluetooth and still have a tag that has a display and is programmable. Such tags will even be usable in an interline environment, subject to each airline agreeing to carry the tags. The fallback process would involve re-tagging the bag, which is always the ultimate fallback process. Tags that use interfaces other than Bluetooth LE or without an RFID tag for GUID identification are outside the scope of this implementation guide.

1.2 Industry Business Needs

1.2.1 Why would airlines want to work with Electronic Baggage Tags?

Baggage faces several challenges that are generated by the very process of taking a bag from a passenger and returning it to them at the end of their journey. Most bags are dropped off at a baggage desk where a label is attached to the bag and then a receipt given to the passenger. The bag then moves into the airline ecosystem until it is returned to the passenger later, and if it is not then the passenger makes a claim using the receipt given at drop off to start the tracing process.

In this process, the passenger is forced to undertake several steps that have no value to the passenger, but necessary to enable the airline to complete its obligations for the journey. These include:

- Having to obtain a baggage tag
- Having to attach the tag to the bag
- Having to give the bag to the airline
- Having the airline confirm the journey details (if not in parallel to the above)
- Having to receive, and keep safe, a receipt for the bag

These processes take some time and introduce uncertainty to the passenger process as people simply do not know how long queues at the airport might be.

Airlines that are customer centric are aware of these process steps and the fact that an airline overcoming these steps will have a competitive advantage, and hence have developed electronic baggage tags.

1.2.2 Expected Benefits for the Industry

In addition to the passenger process savings, there are other benefits to the industry that can assist in the business case development by an airline. This section is not about building that business case for an airline, as each business is a totally separate entity with unique challenges and needs. The below drivers can be accommodated into an airline-built business case.

- **Improvements in passenger services:** Passengers can pre-program their bag tag whilst checking in, which can be many hours before the passenger might decide to go to the airport. The electronic baggage tag then displays the details for the journey, which can be a source of reassurance for the passenger if they know their routing.
- **Improvements in the speed of baggage acceptance:** In general, passenger arriving with bags that are pre-tagged for their journey are processed much faster than passengers who require a bag tag to be issued. This increase in processing speed can be translated into improved passenger experience or reduced check-in desk occupancy, but not both.
- **Simplification of baggage drop process:** When a passenger arrives with their baggage ready to be accepted, the baggage drop process can be simplified to:
 - Rule Validation: Checking baggage allowances and visa details
 - Identity Validation: Matching the presented identity to the passenger presenting the identity
 - Baggage validation: Checking that the baggage tag is for the same journey as the passenger is on.
 - Baggage acceptance: Moving the bag into the baggage system.

When a passenger is using an EBT then these steps can be simplified to:

- Identity validation
- Baggage identification
- Baggage acceptance

This is possible because the rule validation can be achieved during the check-in process.

- **Improved perception of the airline:** An airline that introduces new technologies, especially in the passenger space, is perceived as being progressive and focused on the passenger, which can benefit the airline.
- **Increased baggage recovery opportunity:** The EBT has a unique identifier associated with it that allows the bag's owner to be known uniquely and permanently. This means that there cannot be a "tag-off" – a situation where the baggage tag becomes separated from the bag and the bag is effectively lost. Even if an EBT tag screen is destroyed the tag GUID is accessible and the bag can be repatriated.

- **More efficient baggage recovery processes:** This benefit should be carefully considered by the airline, as depending upon how the processes are implemented could be less efficient than existing processes. This is because the activation of EBTs via the hardware switch will take time, and may vary between EBT models, resulting in a search time for the operator. The alternative to making physical changes to the tag can be achieved by indexing baggage messages through the GUID of the tag, and then providing staff with the ability to read the bag tag information on a device rather than from the EBT screen. This would allow faster processing of bags using EBTs with RFID inlays that transmit the GUID of the bag tag.

1.3 EBT Journey Details

This section describes the key elements of an Electronic Baggage Tag project that are non-technical, but essential to a successful implementation.

1.3.1 Approval

Before any electronic device can be carried on an aircraft in the baggage hold the device must be certified by the airline as being safe for carriage. This is an airline function, however as airlines decide to accept tags for carriage IATA requests to be informed, so that an up to date list of tags accepted by carriers may be made available to the airlines. Please contact baggage@iata.org.

Airline engineering departments are responsible for certifying any device and will be familiar with the requirements in [Appendix I - Smart Baggage with integrated lithium batteries and/or electronics](#). These have been recently produced as a consolidated document by IATA as a cohesive document and are based upon the guidance from agencies such as the FAA.

1.3.2 Key Project Steps

There are several key steps that are likely to be needed in any implementation project. These will be:

Departure Control System

The Departure Control System (DCS) is responsible for handling the issuing of the baggage tag, i.e. determining that the tag is an appropriate one and for carriage by the airline and sending the appropriate data to the tag via the airline application.

One of the key capabilities of the DCS is the ability to receive data from the airline application that contains the .M element to identify the tag. This is essential as the .M can then be included in the subsequent messaging to identify the tag by its GUID. This is a great mechanism to facilitate RFID baggage tracking¹, which has advantages over the traditional barcode mechanism.

Additionally the DCS should be able to recognize, process and forward the .E/EBT element in baggage messages to further identify EBTs.

The DCS also needs to be updated to allow it to work with baggage independent from the passenger, as the EBT does not depend upon a passenger record to be programmed, and generally always belongs to the same person.

¹ IATA Resolution 753
EBT Implementation Guide | Issue 1.1

Airline Mobile Application

The airline mobile application is now a key component of the airlines tools in service delivery and recovery. This tool is the primary mechanism that allows passengers to program their EBT for a journey, as well as a crucial validator of the journey.

The airline application should support the user case flows described in the Use Cases in this document and enable the communication with the tag over the Bluetooth interface.

Handler Familiarization

Failure to familiarize the handlers with EBT technology will result in bags being left behind. It is essential that the handlers understand the fundamental concepts of the EBT:

- Permanence – that an EBT is related to a passenger and can be reassociated to them.
- Location – where the EBT is on the baggage and the form that it takes.
- Display – the format of the display so that they understand how to read the tag.
- Transmission – that the bag is not transmitting a signal unless activated.

When EBTs are introduced, an initial training course should be used to inform the handling community about the devices, and then each time a new EBT is authorized by the airline for use then the community should be sent a notice for the new tag type.

Government / Customs Approval

It will be necessary to have government approval for the use of EBTs in some regions. This is due to regulations created to ensure that baggage labels were controlled documents, much like passenger boarding passes used to be. The baggage tag is the boarding pass for the bag, and there may be concerns about tagging the bag away from the airport.

Customs may also have an interest in the tag. This is especially the case in Europe, where the green stripe on the traditional tag indicates that the bag has originated inside the European Free Trade Area. This can be facilitated on an EBT, as the display can support green bars, however there are then concerns over how easily the baggage tag can be changed or swapped for an alternative one.

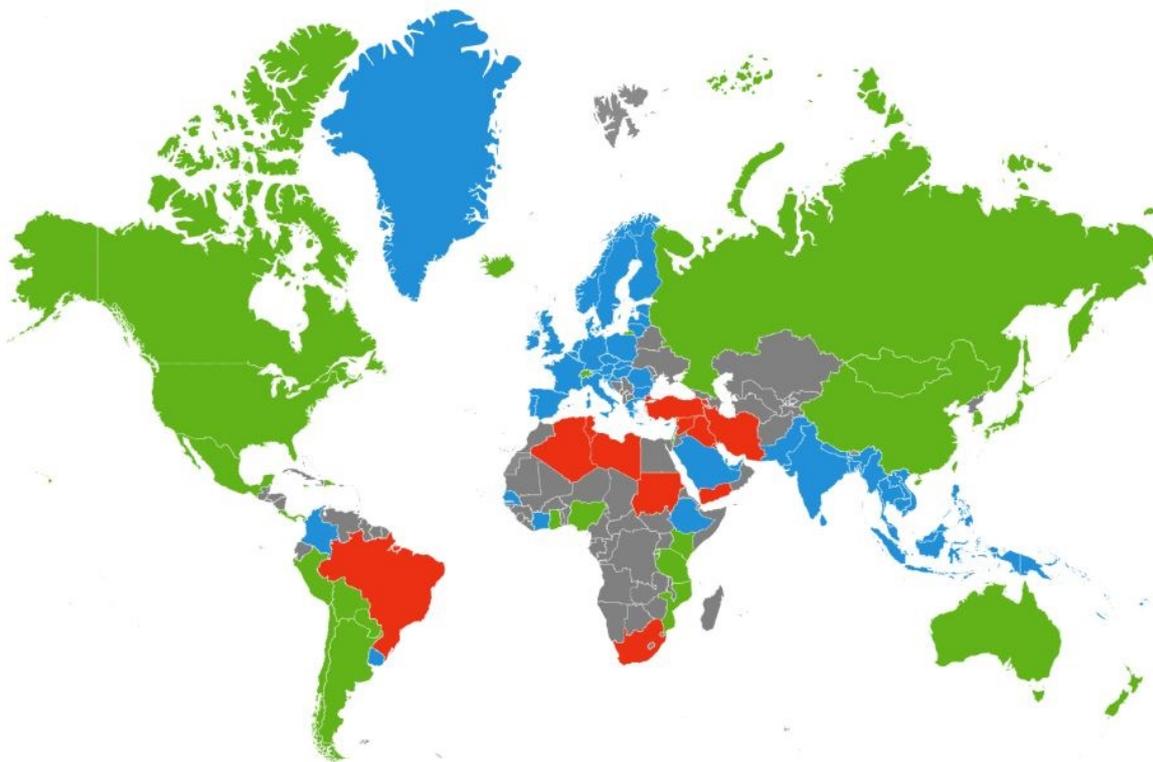
Other customs agencies outside of Europe may have similar concerns, so it is important to demonstrate how an EBT is more secure than a paper tag.

The improved areas are:

- Link to the passenger through the GUID – this is more robust than the 10-digit license plate which may refer to more than 1 journey
- Security for changing the display – as described in this document, only an airline can change the EBT display.

In relation to the regulatory status for EBTs, IATA Fast Travel program together with IATA Global Baggage Operations and IATA Regions work together to move the adoption globally.

The map below shows the current regulatory status of EBTs across the globe. The map is updated in a regular basis. To have the most up to date information, please visit the [IATA Fast Travel Map](#).



Permitted **Conditional** **In Progress** **Not Permitted** **No Active Requests**

Other Stakeholders

There may be other stakeholders who will need to be involved in the EBT project use (such as the passenger, the crew, customer service staff). These groups will require their own communication plan that describes the benefits of an EBT to them and how they will be impacted by the introduction of EBTs into the airline.

Roll-Out

The EBT will be approved for use by the airline and then be introduced for several routes. The roll out of the EBT therefore needs some consideration.

Is the EBT airline distributed or not?

EBTs can enter the airline via an airline distribution program or via the passenger independently procuring the devices.

When a passenger procures an EBT the airline application will validate if the EBT can be used. If not, then the passenger should be directed to use the on-airport facilities to get a traditional baggage tag.

When the airline distributes baggage tags then it will be responsible for some logistics management of that distribution and customer service. These all need to be considered prior to launching the EBT service.

1.3.3 Agreements with carriers

EBTs will need to interline between carriers, and whilst the fundamental use of the tag is entirely passive once programmed and compatible with interline, the actual carriage of the device will need to be approved by all the airlines involved in the journey.

The carriage of the device is the responsibility of the operating carrier, however there should be an agreement between the carriers for the carriage of approved EBTs.

1.4 List of related IATA Resolutions and Recommended Practices

The following tables show the IATA Resolutions and Recommended Practices (RP) related to EBT:

Number	Title
Resolution 740	Form of Interline Baggage Tag
Resolution 751	Use of the 10 Digit License Plate
Resolution 752	Electronic Baggage Claim Receipt
Resolution 753	Baggage Tracking
Resolution 780	Form of Interline Traffic Agreement–Passenger

Number	Title
RP 1740c	Radio Frequency Identification (RFID) Specifications for Interline Baggage
RP 1745	Baggage Information Messages
RP 1754	Electronic Baggage Tag
RP 1800	Automated Baggage Handling Based on the IATA License Plate Concept

For additional IATA Resolutions and RPs related to baggage see the “Baggage Standards” section under www.iata.org/baggage.

2. Technology

2.1 Rationale

There are mandatory and optional components of an EBT as described in the IATA RP 1754 and these have been selected to support different technologies accessible to airlines, airports and passengers. Concurrently there exist regulations that must also be observed in order to be compliant with operational and security requirements.

Under FAA regulations, UHF RFID, for instance, is considered flight safe in that it does not transmit or radiate energy during flight and has no need for an onboard power source. It is also supported by several airlines and airports already using agreed data formats described within the IATA RP 1740c.

Passengers on the other hand currently have no commonly available interface to this technology and therefore there needs to be defined a different access channel using commonly available consumer technology – for this purpose Bluetooth Low Energy (BLE) is the chosen medium. Most modern smart phones available to consumers support BLE. Additionally, other means of communicating with or verifying an EBT include (optional) Near-Field Communications (NFC) or scanning of the QR code printed on the EBT.

Recently a hybrid communications chip has become available, that combines three of the channels mentioned: UHF, BLE and NFC.

2.2 UHF RFID

The use of UHF RFID for baggage identification is defined already by the IATA RP 1740c. This RP defined a subclass of EPC global GEN2 UHF RFID and has been adopted by several airports, reader/writer manufacturers and UHF RFID baggage tag providers.

The basic advantages of UHF RFID over legacy paper baggage tags with printed barcode only, are better readability without “line of sight” required to optically scan a barcode, less damage potential, and the ability to optionally store data on the tag itself. There are also disadvantages, including associating a tag read with exactly to which physical bag the tag is attached.

Because an UHF RFID baggage tag has no built-in power source, it will remain passive and will not transmit unless activated by a reader unit energizing the tag. This is advantageous for use in an EBT as it will remain entirely silent and passive and will not transmit any signal in most situations, while still maintaining the ability for the UHF RFID data to be read or written on the tag. Care should be taken, however, to synchronize any UHF RFID data written to the tag with the EBT memory at any time the EBT is powered such that its display reflects the correct data stored on the device.

Every UHF RFID tag has its own, unique identification – the TID – that is written to the chip at the time the tag is manufactured and cannot be altered afterwards. With the introduction of the EBT, this unique identifier becomes very useful - the TID gives the ability to identify a UHF RFID tag even if all data stored on it has been lost.

The RP 1754 defines a unique identifier (or “GUID”, Globally Unique ID), based on the TID the UHF RFID tag provides. The unique identifier can be communicated with standard Baggage Information Messages² in the .M element. This unique identifier allows a system to unambiguously identify itinerary data and history for a particular baggage tag, as it is not constrained by the time limit imposed on, and the reuse of, a 10-digit Licence Plate tag number³.

² IATA RP 1745

³ IATA R751

The 128-bit GUID is constructed from the 96-bit TID as follows:

- Take the TID as 24 hexadecimal characters
XXXXXXXXXXXXXXXXXXXXXXXXXXXX
427EEC2DE0BC869B153C357D
- From the left, split it into 12-, 3- and 9-character sections
XXXXXXXXXXXX XXX XXXXXXXXXXX
427EEC2DE0BC 869 B153C357D
- Insert a “4” and an “A” at the split points and append the sequence “454254” to the end of the result:
XXXXXXXXXXXX 4 XXX A XXXXXXXXXXX 454254
427EEC2DE0BC 4 869 A B153C357D 454254
- This results in a standard version 4 GUID: XXXXXXXX-XXXX-4XXX-AXXX-XXXXXX454254
427EEC2D-E0BC-4869-AB15-3C357D454254

2.3 Bluetooth Low Energy (BLE)

Most modern smart phones available to consumers support the Bluetooth Low Energy (BLE) protocol, applications are widespread, and passengers generally are used to it already. The basic interface between an airline app on a passenger’s smart phone and any EBT shall use BLE. The basic interactions necessary to read or write EBT data are defined in a BLE standard’s extension that has been defined by IATA.

Any airline or handling app that conforms to this protocol will be able to interact with any standard EBT. This method enables the interoperability of EBTs between different airlines, airports and handlers, and is very important to the successful usage of an EBT.

EBT providers are free to implement other functions on top of the standard protocol, and these may enhance the capabilities of their EBTs, but these will not necessarily be available to every passenger, airline or airport. These must be implemented in such a way that basic operation of the EBT is not hindered or obstructed and that any airline or airport that does not use those functions can still handle the EBT and perform updates in the course of normal business, including irregular operations.

2.4 Screen

Most of the infrastructure currently in the field of baggage processing is based on optically scanned interleaved 2 of 5 barcodes. Thousands of laser scanners are integrated into baggage handling systems along with handheld devices used to scan bag tag barcodes to read the 10-digit Licence Plate Number of a bag in to retrieve baggage data and perform handling actions. Additionally, there are airports where there is no scanning of barcodes and identification of baggage is by human only.

Any EBT needs to be handled at airports, or by handlers, where only optical scanning technology is available, or where there is no technological solution at all. This situation is expected to continue at least for some years after the introduction of the EBT, so any EBT must maintain backward compatibility by displaying human readable information along with an interleaved 2 of 5 barcode containing the 10-digit Licence Plate Number⁴.

The screen at all times must reflect the data that is stored in the EBT. As soon as possible after any data is written to the device, the display should be synchronized with the data, whether it was modified via UHF RFID, BLE or NFC.

⁴ IATA R740

The current preferred solution for display type is electronic ink (“eInk”) because it requires no power to maintain its content only using power when the content is changed. These displays are sharp enough, and with enough contrast, to be reliably scanned at good read rates using existing optical and laser barcode readers, and it is flexible enough to serve other display purposes as well.

Over time, other suitable technologies may develop and may become preferred so long as they offer all of the same benefits.

2.5 NFC

A growing share of smartphones now have built-in NFC readers. With this capability, an EBT may be identified and read just by tapping it against the phone. The NFC shall deliver a URL, which points to a commonly accessible web server and contains both GUID and LPN, if available, to identify the tag (see [URL in QR code and NFC](#) below for a more detailed description of the URL).

2.6 QR code

2.6.1 Specification of the QR Code

On the outside of any EBT, a QR code must be permanently printed, which includes encoded with it a URL (as described below) containing particularly the GUID of the EBT. It is provided as a fallback, if all other channels to find out the tag’s identity have failed due to failed display, broken electronics, lack of proper reading devices, etc.

The identification shall be shown in a human readable form close to the QR code.

The QR code should be located and printed in such a way as to be protected from damage during baggage handling processes.

See [Annex III](#) in this Implementation Guide for the Specifications of the QR code.

2.6.2 Data to be included (TID / GUID)

A QR code shall contain a unique reference to the tag. Please refer to section [URL in QR code and NFC](#) for the definition of the QR content as well as [Annex III – QR Code symbology requirements](#).

2.6.3 Use of data

Read the QR code in the airline application and use as needed.

2.6.4 QR Code Requirements

Please go to [Annex III](#) for the QR Code Requirements.

2.7 URL in QR code and NFC

The URL found in both the QR code (printed permanently on the outside of the EBT) and the NFC chip shall allow a reading application to either call the web server directly to get information on the respective EBT or to provide the data necessary for an application to identify the tag.

- Web server address (<http://<some server>/<some address>>)
This could be the issuing airline's server, a central baggage information broker service or other server that is able to retrieve the tag data.
- &GUID=<the tag's GUID>
This is the most essential part of the URL; an application may choose to disregard all other pieces of data in the URL, but the GUID is vital to identify the tag
- &LPN=<10-digit license plate number>
If known, this part gives the LPN that currently is assigned to the tag. It most probably will not be contained in the QR code URL on the EBT, but a potential EBT with a fixed LPN may include it.
- &MAK=<manufacturer>
&VER=<tag version>
These two data elements will identify the manufacturer and type of the EBT. These data may be used to apply different protocols, identify what extra functions the tag will provide or reject tags of a certain provider or version.
- &ORG=<original issuer>
Here the issuer of an EBT can be specified. The same MAK/VER combination of tags may be used for different issuers (like different airlines or vendors) but treated differently based on the ORG value.

Example of a fixed URL, encoded in the QR code printed permanently on the outside of an EBT:

<https://bags.iata.org/request?GUID=9223DF3CD42441D9A230934460454254&MAK=BlueTagsLLC&VER=2.13&ORG=IATA>

Example of a dynamically generated URL available via NFC:

<http://mytravely.com:8021/guide.php?LPN=8634117853&GUID=41E110E079A8452DAF7DEA6246454254&MAK=SPC&VER=1>

2.8 Authentication QR code

A QR code may optionally be used to provide an authentication for the tag. This QR code is displayed dynamically on the EBT and provides a mechanism that allows the EBT display to be verified against the passenger record in the airline DCS. The QR code may be read by any QR code scanner and returns a dynamic web page that shows the presumed contents of the EBT display.

See [Annex III](#) for details on QR code.

3. Bluetooth Interface

The purpose of this section is to describe the EBT BLE interface.

3.1 Definitions

Advertising:	Sending a data packet over BLE for an external BLE app to receive	
Application (App)	External application that makes a BLE connection to EBT device and transfers data via BLE	
BLE:	Bluetooth Low Energy	
EBT:	Electronic Bag Tag device	
Data:	Passenger Data	Normal luggage tag information like passenger name, destination city, etc ⁵ .
Identifiers:	GAP Address	BLE Generic Access Profile (GAP) address – a 6 byte (48-bit) address used when a BLE device advertises. This address is preprogrammed into the EBT device’s BLE chip by the chip manufacturer.
	BLE UUID	Unique ID for a BLE Service or the services writable data fields also called characteristics. UUIDs are 16 bytes long (128 bits). Shorter 16-bit Versions are also used and are bytes 3-4 of the 16 byte UUID.
	GUID	16 byte (128-bit) Global Universal ID. Currently not used. Maybe either a RFC 4122 UUID, GUID generated from TID, or TID (per EBT Sub-Working Group Minutes 7/12/16).
	TID	A Tag ID written in an UHF RFID chip located on the EBT hardware. The chip used in EBT (UHF RFID) hardware should contains a 12 byte (96-bit) number.
UHF RFID:	Radio Frequency Identification – EBT hardware should contain an UHF RFID chip.	
Screen (alias display or tag):	Each EBT has at least one Electronic Paper Display (EPD) screen used to display information that retains its contents even when the device is powered off. The screen sizes may vary.	

3.2 Advertising Information

3.2.1 Advertising Rate and Duration

The BLE advertising rate and duration may vary but should fall within BLE specifications. The push of a physical button is required to wake up the device.

⁵ IATA R740 Form of Interline Baggage Tag, 5.2 Information Area
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Advertising Data Format

Bytes	Description of Proposed	Value	Notes
1	Length of This Item in Bytes	0x02	
2	This Item is 'Flags'	0x01	
3	Flag Value	0x06	Bit 1: LE General Discoverable Mode Bit 2: BR/EDT Not Supported.
4	Length of This Item in Bytes	0x11	Decimal 17
5	Complete List of Services	0x02	
6-21	128-bit Service UUID (16 bytes)	0x434Exxxx21474C848208264AB774F5CA	UUID of All BagTag services
22	Length of This Item in Bytes	0x09	
23	This Item is 'Manufacturer Specific Data'	0xFF	
24	APP_COMPANY_IDENTIFIER (LSB)	0x??	Company ID of Manufacturer
25	APP_COMPANY_IDENTIFIER (MSB)	0x??	
26-31	6-byte BLE GAP address	0x????????????	Unique address in each BLE chip

3.3 Scan Response Information

The device does not need to provide any Scan Response data. It is not required to be able to connect to the device.

3.4 Connection Information

If Phone Application connects to the device and does Service Discovery it will see that there are the normal BLE GAP (0x1800) and GATT (0x1801) services plus the *BagTag Service* in the EBT device.

This custom service has several *BagTag Characteristics* in the table below.

After the Application is finished writing/reading to these characteristics it should disconnect.

3.5 BagTag Service UUIDs

3.5.1 128-bit Base UUID

128-bit Base UUID in hex: 0x434Exxxx21474C848208264AB774F5CA (xxxx is populated with 16-bit UUIDs listed below)

The previous number in the Implementation Guide Issue 1, was 0x0000432000001000800000805f9b34fb

3.5.2 16-bit BagTag Service UUID

BagTag Service UUID: 0x4320

3.5.3 16-Bit BagTag Characteristic UUIDs

The device interrogates the EBT and the EBT responds with a directory of supported characteristics.

Characteristic	16-Bit UUID	Permissions	Format	Example data	Optional/Mandatory
Passenger data message type	0x4321	Read	20 unsigned bytes	TBD	Mandatory
Passenger data payload length	0x4322	Read	Integer	TBD	Mandatory
Passenger data	0x4323	Write	ASCII string	(See example payload)	Mandatory
Device GUID	0x4324	Read	128-bit GUID		Mandatory
Battery level	0x4325	Read	TBD	TBD	Optional
Blank display	0x4326	Write	Integer	1=blank	Optional
Restore data	0x4327	Write	Integer	1=restore	Optional
Model number	0x4328	Read	Integer	212	Optional
Firmware level MSB	0x4329	Read	byte	0x0A	Optional
Firmware level LSB	0x432A	Read	byte	0x12	Optional
Request token	0x432B	Read	16-byte binary		Optional
Access token	0x432C	Write	16-byte binary		Optional

3.6 BagTag Service Characteristic Field Type/Size Information

Field Type	Length	Example	Note
Passenger name	20	SMITHJOHNDR	A(20)
Record locator	12	G0PLC5	X(12)
Class of travel	16	BUSINESS	X(16) eg BUSINESS/PREM ECONOMY/etc
Priority	4	PRIO	X(4) eg PRIO/(blank)
Destination flight number	8	BA0048	CC[C][N]NNN[S]
Destination date	5	10OCT	DDMMM
Destination airport	3	LHR	AAA
Destination city	20	LONDON HEATHROW	A(20)
First transfer flight number	8	NZ0006	CC[C][N]NNN[S]
First transfer date	5	10OCT	DDMMM
First transfer airport	3	LAX	AAA
Second transfer flight number	8	AS551	CC[C][N]NNN[S]

Second transfer date	5	10OCT	DDMMM
Second transfer airport	3	SEA	AAA
Departure airport	3	AKL	AAA
Green strip	1	0	1=display, 0=do not display
Barcode/license plate	10	0086012345	N(10)
Bag tag human readable	15	0086 NZ 012345	X(15) any format preferred by airline up to 15 characters

3.7 Example passenger data payload based on 50-byte lengths

```
[0x01][0x01]SMITH-----BUSINESS-PRIOTORONTO-----YYZAC
[0x02][0x01]1234-OCT06SANFRANCISCO---SFOUA9876-OCT06LOSANGEL
[0x03][0x01]ES----LAXNZ0002-OCT06AKL00086123456
```

3.8 App Steps for Transferring Data/Commands to EBT

3.8.1 Initial Connection and Transfer Steps

1. The smartphone or tablet app should determine the GUID of the device it seeks to connect to. This could be done by reading the QR code on the EBT or recalling the GUID of a previously connected EBT.
2. Listen for BLE advertising from EBT devices. App may receive advertising packets from one or more devices.
3. Make a BLE connection to each EBT device that is advertising, do Service Discovery, and then read the *GUID* characteristic until find the correct device. If connected to the wrong device, disconnect and reconnect to another EBT that is advertising.
4. Once connected to the correct EBT, read the *passenger data version* characteristic to determine the data format to use to transfer the passenger data.
5. Read the *passenger data payload length* characteristic to determine the length of each segment of passenger data.
6. Optionally read the Manufacturer, Model and Firmware MSB/LSB characteristics to determine the security protocol to be applied in case.
7. If a security protocol is required, read the Request token characteristic and get the secure access token for it in the way the protocol prescribes. Write the received Access Token characteristic to be able to execute the following step.
8. Write the passenger data in segments to the *passenger data* characteristic until the passenger data is transferred, then disconnect from the device to allow it to write the new Tag data to persistent memory and to update the display. If the device disconnects, retry.
9. Optionally read the battery power level from the *battery level* characteristic.
10. Optionally write the command to clear the display using the *blank display* characteristic.
11. Optionally write the command to restore the most recent passenger data with the *restore data* characteristic.

4. Handling Issues

4.1 EBT Handling Issues

The specifications that are outlined in RP 1754 provide the necessary detail to ensure that a compliant EBT will function in the same manner as a paper tag under most conditions. However, there are some conditions that each airline should consider and adapt to if choosing to accept/allow EBT's for transport. This section describes known handling situations that may require modification to current procedures.

4.2 Securing the EBT to a bag

4.2.1 Attachable EBT

Some EBT designs require that the customer attach the tag to the handle of the bag. The most important consideration when applying or accepting these tags is that the display with the 1D barcode and human-readable itinerary is facing outward and cannot be turned around during the handling process. This can be accomplished by ensuring that the tag is properly and firmly attached to the handle with the display facing outward.

4.2.2 Integrated EBT

An EBT may be built into the passenger's bag. These tags should not require any customer intervention to securely attach to the bag. Upon acceptance, an airline representative should ensure that there is no obstruction covering any of the information on the tag, for example: stickers/hand-written markings, etc.

4.3 Scanning an EBT

4.3.1 Supplier certification of read rates

When accepting an EBT brand for use, the airline should ask the manufacturer to:

- Provide certification that the barcode display complies with IATA standards⁶
- Provide documentation that the barcode has machine read rates that achieve or exceed the standards outlined in RP 1754.

4.3.2 Internal testing prior to acceptance of EBT brand

It is recommended that an airline that chooses to accept/allow EBT brand(s) for travel perform internal tests on each brand. Testing could include:

- Automated scanning arrays
 - Using test bags, perform several hundred scans from multiple angles.
 - Tests should be performed on more than one conveyor.
 - Tests should be performed on more than one airport sortation system.
 - Read rates should achieve or exceed the standards outlined in RP1754 or reasonably match the performance of traditional auto-generated bag tags at the facility where the tests are completed.

⁶ Resolution 740, Form of Interline Baggage Tag
EBT Implementation Guide | Issue 1.1

4.4 Durability

An airline should consider the durability of each EBT brand that it allows/accepts. While RP1754 does not identify a standard, there are certain standard measurements that should be considered:

- Ingress Protection (IP) Rating: IEC 60529⁷ defines the level to which an enclosure protects equipment from the ingress of particles. An IP Rating consists of two numbers.
 - The first, ranging from 0 to 6, indicates the level of protection from a solid object such as dust.
 - The second, ranging from 0 to 8, indicates the level of protection from water.
- IATA recommends a rating of at least IP44 to manufacturers. This protects the tag against:
 - A solid object 1 mm or greater
 - Water splashing from any direction

The following documents outline technical processes to perform and measure shock fragility of products through drop testing.

- Military Standard, Environmental Test Methods and Engineering Guidelines (MIL-STD-810E)
- Standard Test Methods for Mechanical-Shock Fragility of Products, Using Shock Machines (ASTM – D3332-88)

IATA does not have a recommendation. However, manufacturers could consider performing these types of tests as a means to differentiate their product.

4.5 Exceptions

4.5.1 Rush Tags

Rush tags are used when the bag has been separated from the passenger. An airline has two options when facing this situation with an EBT:

- Apply a RUSH tag per current procedures. Remove the EBT and place it in the passenger's bag (for attachable EBT) or blank the display on the EBT (for both, attachable or integrated EBT).
- Update the EBT using an airline application that will display the new itinerary and identify the RUSH status of the bag. Use of black or red hashing along the side of the display is preferred. Alternatively, the airline may program their application to update the special handling area of the EBT with "RUSH".

Note: Do not write on the display screen of the EBT for any reason.

4.5.2 Reroute

In case of reroute:

- Apply a reroute tag per current procedures. Remove the EBT (for attachable EBT) and place it in the passenger's bag or blank the display on the EBT (for both, attachable or integrated EBT).
- Update the EBT using an airline application with the new itinerary. While not necessary, the airline may program their application to update the special handling area of the EBT with "RRTE" indicating that the bag has been rerouted.

Note: Do no write on the display screen of the EBT for any reason.

⁷ International Electrotechnical Commission 60529
EBT Implementation Guide | Issue 1.1

4.5.3 Tag off

Follow current Tag off procedures.

4.6 Other Considerations

4.6.1 EBT Management - Compliance with regulations

Airlines that allow/accept EBT brand(s) for carriage should require suppliers to provide documentation that proves their EBT complies with regulatory standards. These include, but may not be limited to:

- EU Green Stripe requirement for intra-EU travel.
- Active transmission compliance with FAA Advisory Circular 91-21-1B on the use of electronic devices onboard aircraft.
- FAA Advisory Circular 19.21-1C section 8 addresses airline responsibility for EBT use in the cargo hold, including but not limited to:
 - Redundancy to turn off cellular and/or mobile functions when airport
 - Rechargeable and non-rechargeable battery limits
 - Lithium metal limits of not more than 0.3 grams per cell or 2.7 watt-hours per lithium ion cell.
- EBT Recycling Plan: An airline choosing to sell EBTs should consider local and national recycling regulations for electronics in each of the States (Countries) where EBT are permitted.

Important note: This guidance is not meant to be all inclusive. Airlines that are considering allowing/accepting EBT on their aircraft should review these documents in their entirety.

4.7 Interlining

It is a best practice to partner with another airline if a carrier wants to begin interlining baggage using EBT. No airline should check a bag with an EBT on an itinerary that includes another airline without prior approval from the connecting airline. Airlines are required by regulation to approve any Personal Electronic Device (PED), including EBTs before allowing carriage in the cargo hold.

Failure to partner with the receiving airline may compromise the integrity of the receiving airline's operating certificate.

4.8 Responsibility when damaged EBT

The responsibility when damaged EBT falls under each airline's policy and it is out of the scope of IATA EBT sub-working group.

5. EBT Compliance

Important note: the required standard definitions for a secure communication between airline DCSs, airline apps and EBTs are currently under development and will be added in a coming release of this Implementation Guide.

5.1 Generic definitions and meaning for EBT compliance

Safety: A tag accepted by the operating airline because it complies with the operating airline's requirements.

Compliance/authority/privacy: Ensuring that only authorized parties can make changes to the data, and that data is held in an appropriate manner for purpose.

Note: the IATA EBT sub-working group had several proposals for the word being defined and agreed on the above.

EBT scope: includes EBT's validation and mechanisms to access the EBT (channels that can be used to talk to the tag).

EBT out of the scope: DCS related issues and vendor applications – it is assumed that the mechanisms used for host ↔ application communication is secured and appropriate.

EBT interlining: refers to the agreement of interlining and validating the tag between airline A and airline B.

Whilst airlines should ensure that the tag being used is appropriate for the journey being undertaken (i.e. accepted by all interline parties) the responsibility for checking that a tag is certified for carriage by the airline remains the responsibility of the carrying party.

5.2 Security Model

The security principles of the traditional baggage tag are continued into the EBT. There are several components that facilitate the security of the EBT. These are both physical and data related.

5.2.1 Physical Security

The EBT can be interacted in primarily through the physical button on the EBT itself. The button activates the Bluetooth LE interface on the baggage tag for a maximum of 60 seconds. Once the EBT has been accepted by the airline this button can only be accessed by authorised staff, reducing the chance of the tag being updated with incorrect information.

5.2.2 Data Security and Protection

Data Security

The EBT presents human and machine-readable data. These data are programmed by the airline application on the passenger's mobile phone. The data is checked when the bag is dropped at the airport against the back-office baggage data for the passenger journey.

The tag human readable data can be verified in 3 ways: either using LPN, GUID or scan QR code. As the GUID is generally fixed and cannot be changed, the comparison between the LPN shown and the LPN referenced by the GUID in the baggage messaging will quickly determine if there has been any tampering with the tag.

It is also possible to further protect the data on the EBT. It is possible to have the Bluetooth interface restricted so that some data is write only and cannot be read from the tag. This would include the passenger name, route details, etc. Restricting the data in this way so that only the GUID can be easily read allows baggage operations to be undertaken by referring to the baggage data.

Data protection

Every airline must be able to work with each and every EBT to enable the update of the tag for operational reasons. This is facilitated by the physical button that activates the Bluetooth tag for a maximum of 60 seconds to allow the update to commence.

The data that is transmitted to the tag is held in the airline systems which are secured. The interaction from the airline application to the airline systems is also secured. The transmission from the airline application to the EBT is over the Bluetooth LE interface. This effectively means that whilst the last stage of the communication with the baggage tag could be overheard, the opportunities to cause disruption (especially as the bag will be verified by the airline on acceptance) are very limited.

5.2.3 Data Transaction

Transaction Airline-App

All transactions between the airline and their application are handled according to the design of their application. Given that this application is used to handle the processing of passengers and grant access to the aircraft via a boarding pass, it is assumed that the technologies use facilitate high standards of data security.

Whilst it is possible for interactions with a mobile device to be intercepted over open networks, the airline application is expected to provide a secure channel to prevent such interception being capable of interfering with the passenger transaction.

Transaction App-EBT

The transaction between the EBT and the app takes place over a Bluetooth LE link and uses an open SDK. It is possible for the transactions to be interfered with, or for a bad actor to produce their own application in order to change the human readable information on the tag.

This is no different to the situation today with traditional tags, home printed baggage tags or UHF RFID baggage tags.

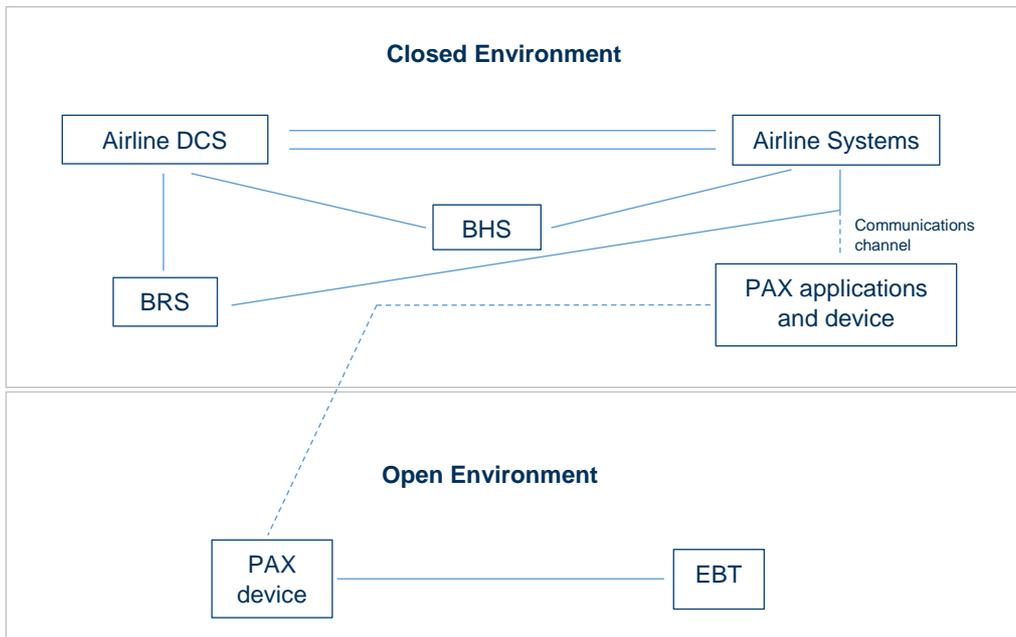
5.3 Data Integrity

It is possible for the data on the tag and the data in the DCS to become out of sync. This is because many systems can change the baggage information to result in a re-routing, re-flight, etc. When this happens, there is no real-time link to the baggage tag display, and the tag information is therefore out of date until it is updated.

Many systems will not need an update as the system will use the license plate read for the baggage tag to retrieve the baggage data and act on the most up to date information. However, handlers are often making decisions based on reading the tag information and then deciding what to do with the bag, without access to the most up to date information.

5.3.1 Critical Decision Points

For the reasons above it is essential that the back office information is checked sorting the bag to the aircraft and when loading the bag. Irrespective of this check, the safety of the bag to travel is assured by the security screening undertaken on the baggage. Any modifications to screening processes must also therefore be based upon the baggage messages provided.



5.4 Data Protection

5.4.1 EU regulation and other regulations for data protection

Each country has different regulations for data privacy. Baggage tags contain personal identification data items such as the name and journey details. The airline is responsible for ensuring that this data is used only for the purpose for which it has been given – i.e. the transport of the bag according to the passenger’s wishes. This includes returning the bag to the passenger should the bag be mishandled, which requires the sharing of this data with 3rd parties.

Airlines are recommended to ensure that the passenger has understood the data that they are giving to the airline and the uses that this data may have. Each airline is responsible for determining how to inform and get the authorization form the passenger in this regard.

It is also important that a bad actor cannot retrieve from the EBT the passenger identifying information. It is always possible for someone to look at the tag and copy the details, however this is not a specific issue for the EBT as it applies to all baggage tags. For the EBT, it is important that there is no transmission of passenger information to a reading device without the tag being activated by the hardware button. Airlines are recommended to make data that is personally identifiable (name, booking reference, frequent flyer status, etc.) write only to prevent the possibility of this data being transmitted.

6. User Stories

6.1 Passenger

#	As a	I want to	So that	Under the condition that
1	Passenger	prepare my bag with my airline app	I can drop it quickly at the airport	the tag is accepted/approved for use by all airlines in the interline journey
2	Passenger	track my EBT regardless of airlines and handlers involved	I always will know where it has been handled last	Provided the airline is happy to release the data to the passenger?? (Andrew)
3	Passenger	be the only one entitled to use my EBT*	no one can hijack my bag (EBT)	
4	Passenger	be able to sell or transfer my EBT to someone else	no trace of my previous data is to be found on the EBT	
5	Passenger	drop off my baggage at the Self Bag Drop	I don't have to be in the line	My bag has been checked in with my mobile APP and the UHF RFID reader in the SBD reads my tag ID and associates the ID with my DCS record.

6.2 Operating Airline

#	As a	I want to	So that	Under the condition that	questions / comments
6	Operating airline	put my baggage tag data on the EBT	my operations can use it accordingly	the customer fails to refresh the tag before the bag drop and the handling agent is authorized to do so	
7	Operating airline	have special handling advice (PRIORITY, HEAVY etc.) on the EBT	my operations can use it accordingly	the bag qualifies for special handling	per mandatory data requirements
8	Operating airline	get the EBT's GUID with any baggage message	I can safely track any single EBT across airlines and handlers involved		
9	operating airline	be able to interact with any EBT, regardless of who provided it	that I can deliver agreed baggage services to my customers and other airlines		
10	Operating airline	retrieve the EBT data via UHF RFID	my existing UHF RFID infrastructure can be used		

6.3 Issuing Airline

#	As a	I want to	So that	Under the condition that
11	Issuing airline	be able to determine the default information that is displayed on the EBT in idle state	I can make the tag useful	the EBT is not being used for travel
12	Issuing airline	"prime" an EBT issued by me	all data is deleted and the device is set to a defined initial state again	the device seems to be in an unrecoverable fault state or needs to be issued again

6.4 IROP Handler

#	As a	I want to	So that	Under the condition that
13	IROP handler	reroute an EBT and mark it as RUSH	it can be handled as expedite bag	the original itinerary is no longer valid

6.5 Handling Agent

#	As a	I want to	So that	Under the condition that
14	Handling agent	verify data on the EBT	I can see the data is valid for the journey	the handling agent is acting on behalf of the airline
15	Handling agent	refresh an EBT	the contents displayed are up to date	I have the authority to do so
16	Handling agent	blank an EBT	I can use legacy procedures	the EBT has invalid content and the agent cannot refresh the tag with accurate content
17	Handling agent	restore the previous display	I can revert a blanking action	the previous content is valid (again) or the blanking was erroneously
18	Handling agent	be able to deal with the EBT with the infrastructure already in place	I have no need to deploy expensive new technology	the cost and effort are too high to cope with

6.6 EBT

#	As a	I want to	So that	Under the condition that
19	EBT	have the optional ability to check the battery level	the EBT can warn a passenger to replace batteries or not use the EBT	the battery level is insufficient to update the display

6.7 Others

#	As a	I want to	So that	Under the condition that
20	Any customs officer	verify the customs state of any EBT (ex. EU green stripe requirement)	I will know when to inspect a bag	no one may have manipulated the state

#	As a	I want to	So that	Under the condition that	questions / comments
21	3rd party company	place advertisements on the EBT	these are visible on the display	no operative content is displayed	optional

7. Use Cases

The Use Cases are based on the User Stories from the previous section. The Use Cases have been developed taking the User Stories classified per actor, and then, developing the actual process that occurs, creating as a result, the process flow.

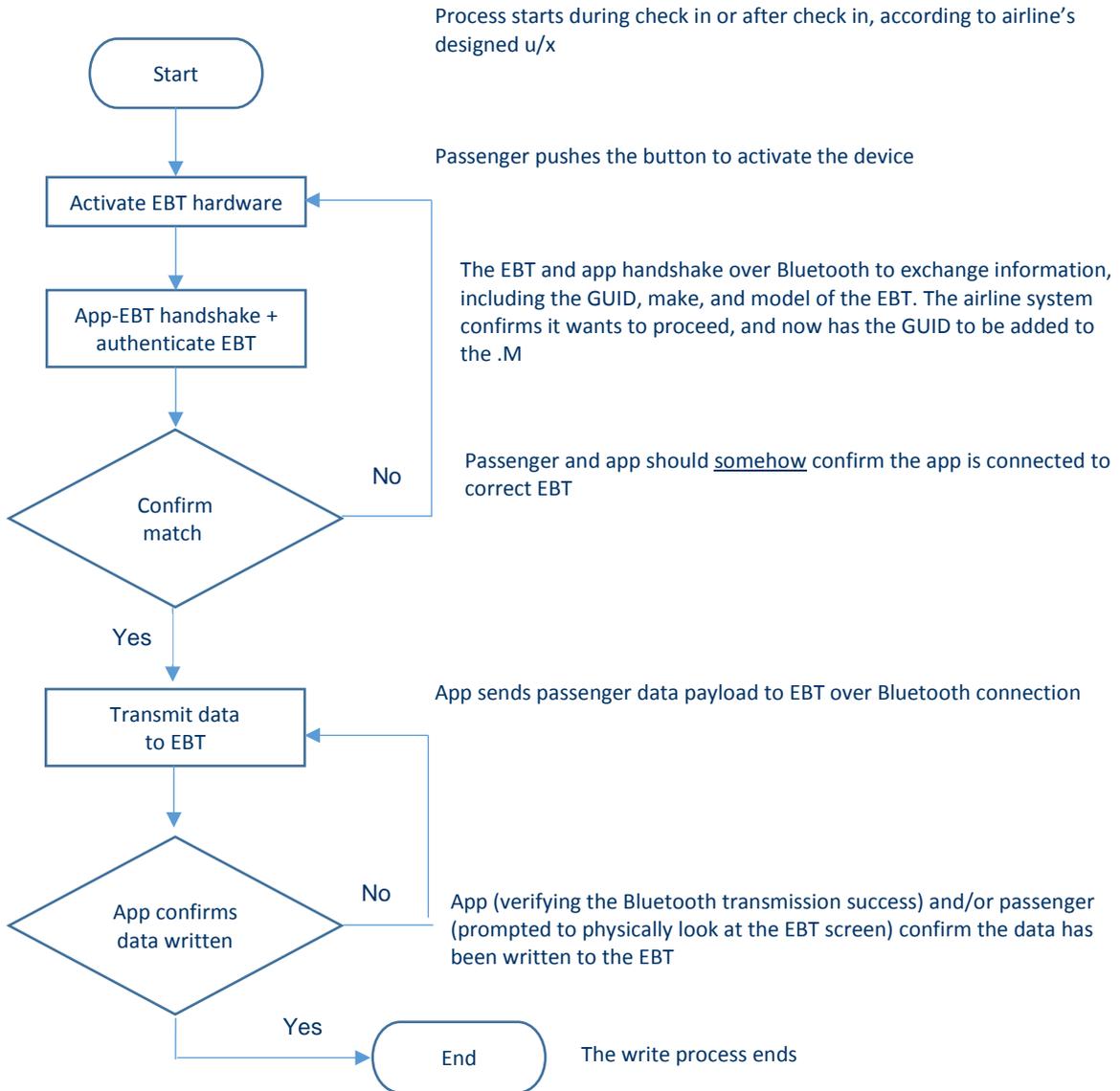
The table below shows the relation between the User Cases and the User Stories. Some User Stories do not require a User Case (indicated with “n/a”).

Use Case #	Use Case	User Story	User Story #
1	PAX uses EBT for journey using App	As a Passenger I want to prepare my bag with my airline app so that I can drop it quickly at the airport under the condition that the tag is accepted/approved for use by all airlines in the interline journey	1
2	Lockdown EBT to passenger	As a Passenger I want to track my EBT regardless of airlines and handlers involved so that I always will know where it has been handled last under the condition that provided the airline is happy to release the data to the passenger?? (Andrew)	2
	n/a	As a Passenger I want to be the only one entitled to use my EBT* so that no one can hijack my bag (EBT)	3
3	Transfer EBT to another person	As a Passenger I want to be able to sell or transfer my EBT to someone else so that no trace of my previous data is to be found on the EBT (# 11)	4
4	Bag drop process	As a Passenger I want to drop off my baggage at the Self Bag Drop so that I don't have to be in the line under the condition that my bag has been checked in with my mobile APP and the UHF RFID reader in the SBD reads my tag ID and associates the ID with my DCS record.	5
5	Airline uses EBT when passenger presents with no/incorrect data	As an Operating airline I want to put my baggage tag data on the EBT so that my operations can use it accordingly under the condition that the customer fails to refresh the tag before the bag drop and the handling agent is unauthorized to do sons / comments	6
6	Airline sets the Priority flag (or other data)	As an Operating airline I want to have special handling advice (PRIORITY, etc.) on the EBT so that my operations can use it accordingly under the condition that the bag qualifies for special handling per mandatory data requirements	7
	n/a	As an Operating airline I want to get the EBT's GUID with any baggage message so that I can safely track any single EBT across airlines and handlers involved	8
	n/a	As the operating airline and/or the agent I want to be able to interact (read, write) with any EBT, regardless of who provided it so that I can deliver agreed baggage services to my customers and other airlines (this is a requirement. It is not expected that the tag validates the eligibility of the tag or the data)	9
7	Getting data from RFID	As an Operating airline I want to retrieve the EBT data via UHF RFID so that my existing UHF RFID infrastructure can be used (to read all the information at once)	10

8	Put something on the tag when there is no journey taking place	As a Issuing airline I want to be able to determine the default information that is displayed on the EBT in idle state so that I can make the tag useful under the condition that the EBT is not being used for travel	11
9	Factory reset the tag	As a Issuing airline I want to "prime" an EBT issued by me so that all data is deleted and the device is set to a defined initial state again under the condition that the device seems to be in an unrecoverable fault state or needs to be issued again	12
10	Use an EBT in a RUSH process	As a IROP handler I want to reroute an EBT and mark it as RUSH so that it can be handled as expedite bag under the condition that the original itinerary is no longer valid	13
	n/a	As a Handling agent I want to verify data on the EBT so that I can see the data is valid for the journey under the condition that the handling agent is acting on behalf of the airline	14
	n/a	As a Handling agent I want to refresh an EBT so that the contents displayed are up to date under the condition that I have the authority to do so	15
11	Handling Agent needs to invalidate/blank the EBT display	As a Handling agent I want to blank an EBT so that I can use legacy procedures under the condition that the EBT has invalid content and the agent cannot refresh the tag with accurate content	16
12	Handling Agent wants to restore the EBT display	As a Handling agent I want to restore the previous display so that I can revert a blanking action under the condition that the previous content is valid (again) or the blanking was erroneously is this just refresh?	17
	n/a	As a Handling agent I want to be able to deal with the EBT with the infrastructure already in place so that I have no need to deploy expensive new technology under the condition that the cost and effort are too high to cope with	18
13	EBT warning about insufficient power remaining	As an EBT I want to have the optional ability to check the battery level so that the EBT can warn a passenger to replace batteries or not use the EBT under the condition that the battery level is insufficient to update the display	19
	n/a	As an Any customs officer I want to verify the customs state of any EBT (ex. EU green stripe requirement) so that I will know when to inspect a bag under the condition that no one may have manipulated the state	20
	n/a, covered in use case #8	As an airline I want to place advertisements on the EBT so that these are visible on the display under the condition that no operative content is displayed optional	21

1. PAX uses EBT for journey using App

As a passenger I want to prepare my bag with my airline app **so that** I can drop it quickly at the airport **under the condition that** the tag is accepted/approved for use by all airlines

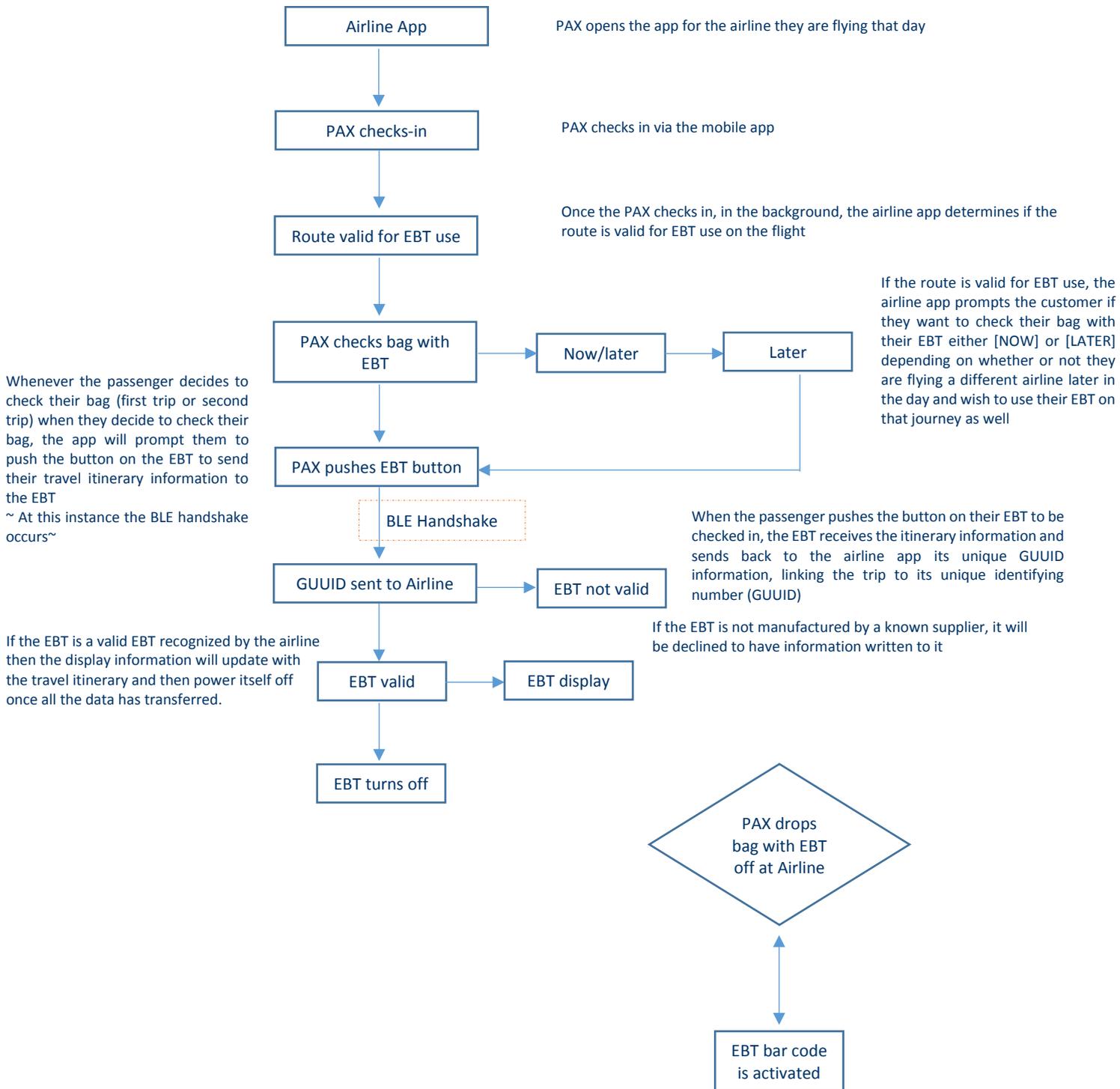


Comments:

Interlining: agreements should be done through alliances or relationships in case airlines are not part of an alliance or want to partner with an airline outside their alliance. The same concept of "prove" will be needed as part of the agreements.

2. Lockdown EBT to passenger

As a passenger I want to track my EBT regardless of airlines and handlers involved so that I always will know where it has been handled last.



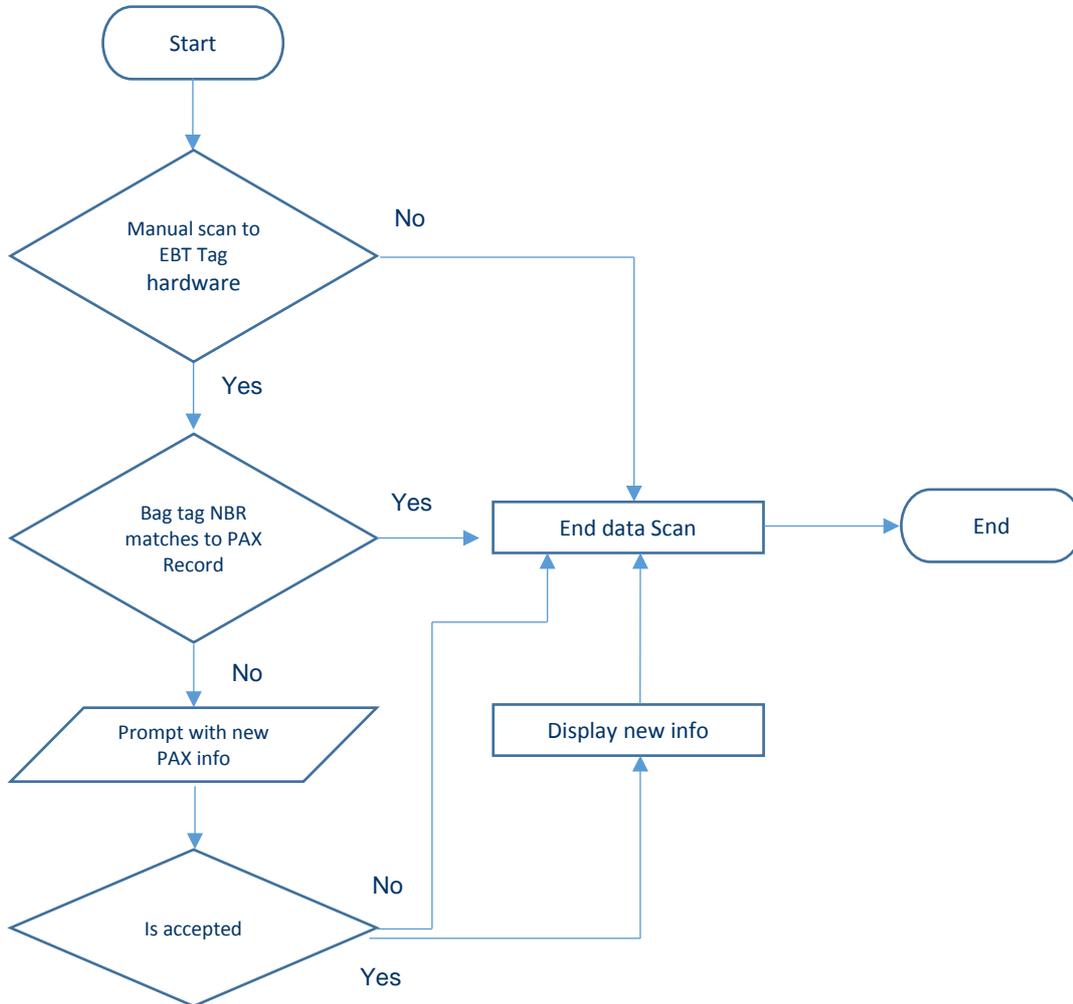
Comments:

There are two points of view for that process: the one with the Passenger as main actor (above), and the one when mass-update is needed (IROPS).

When taking into account the mass-update, the update validation through the button is not possible (as pressing 200 buttons would not be a feasible option).

3. Transfer EBT to another person

As a passenger I want to be able to sell or transfer my EBT to someone else so that no trace of my previous data is to be found on the EBT.



Comments:

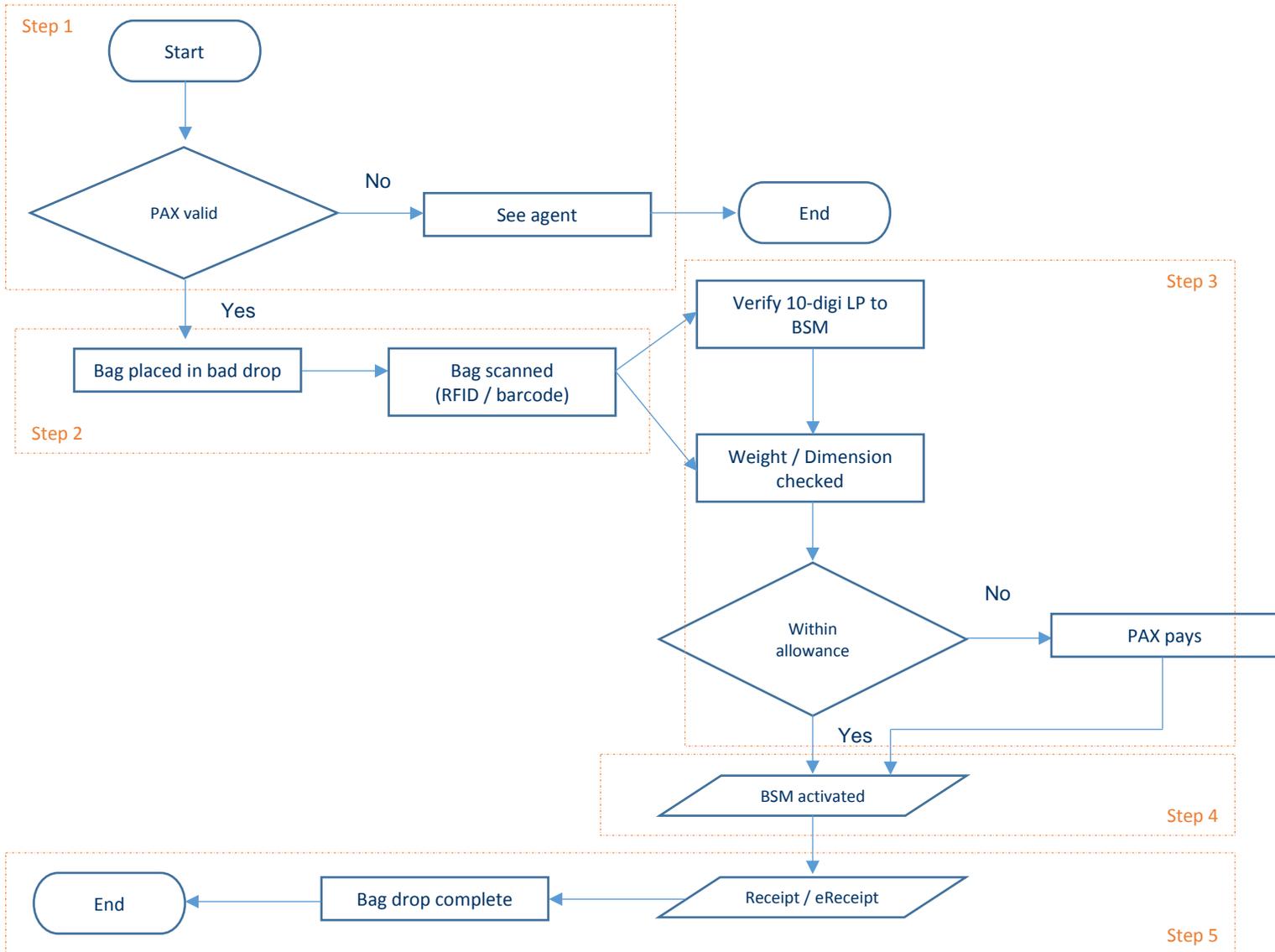
This process is also related to pooling. When a PAX have bag/s under his/her name that eventually does not travel, data on the backup should be updated on the EBT's display (2nd PAX PNR would be shown). Nevertheless, this procedure is closer to the Airline perspective than PAX perspective.

4. Bag drop process

As a Passenger I want to drop off my baggage at the Self Bag Drop **so that** I don't have to be in the line **under the condition that** my bag has been checked in with my mobile APP and the UHF RFID reader in the SBD reads my tag ID and associates the ID with my DCS record.

Conditions:

1. Bag has been checked with airline mobile application
2. Valid EBT has been activated
3. Valid EBT is attached to checked baggage



Comments:

The value of the EBT to the passenger is the convenience that it affords at baggage drop/airline acceptance. The EBT would eliminate the need for the passenger to visit a kiosk prior to baggage drop (dependent on airline process for document check). Ideally the process would be limited to minutes, if not seconds, before the passenger proceeds to the next step in the process, whether that be duty free shopping or visiting an airline premium lounge.

Step 1: The passenger and baggage would be directed to the "Bag Drop" location. Whether that is a fully automated Bag Drop solution, or to an agent. At the bag drop location, the customer would be required to produce valid identification (boarding pass may be necessary depending on the airline requirements). The passenger would be validated against the information contained within their PNR (facial recognition comparison with approved identification document).

Step 2: The validated customer would then be asked to tender their checked baggage. The baggage tag (EBT) would be scanned and validate that the tag is matching the inactive BSM generated at check-in.

Step 3: The validated baggage would then be subject to verification of weight and size limitations. If the bag is within limitations the baggage would proceed to the next step. If the baggage is oversized and/or overweight limits additional collections would be processed before proceeding to the next step.

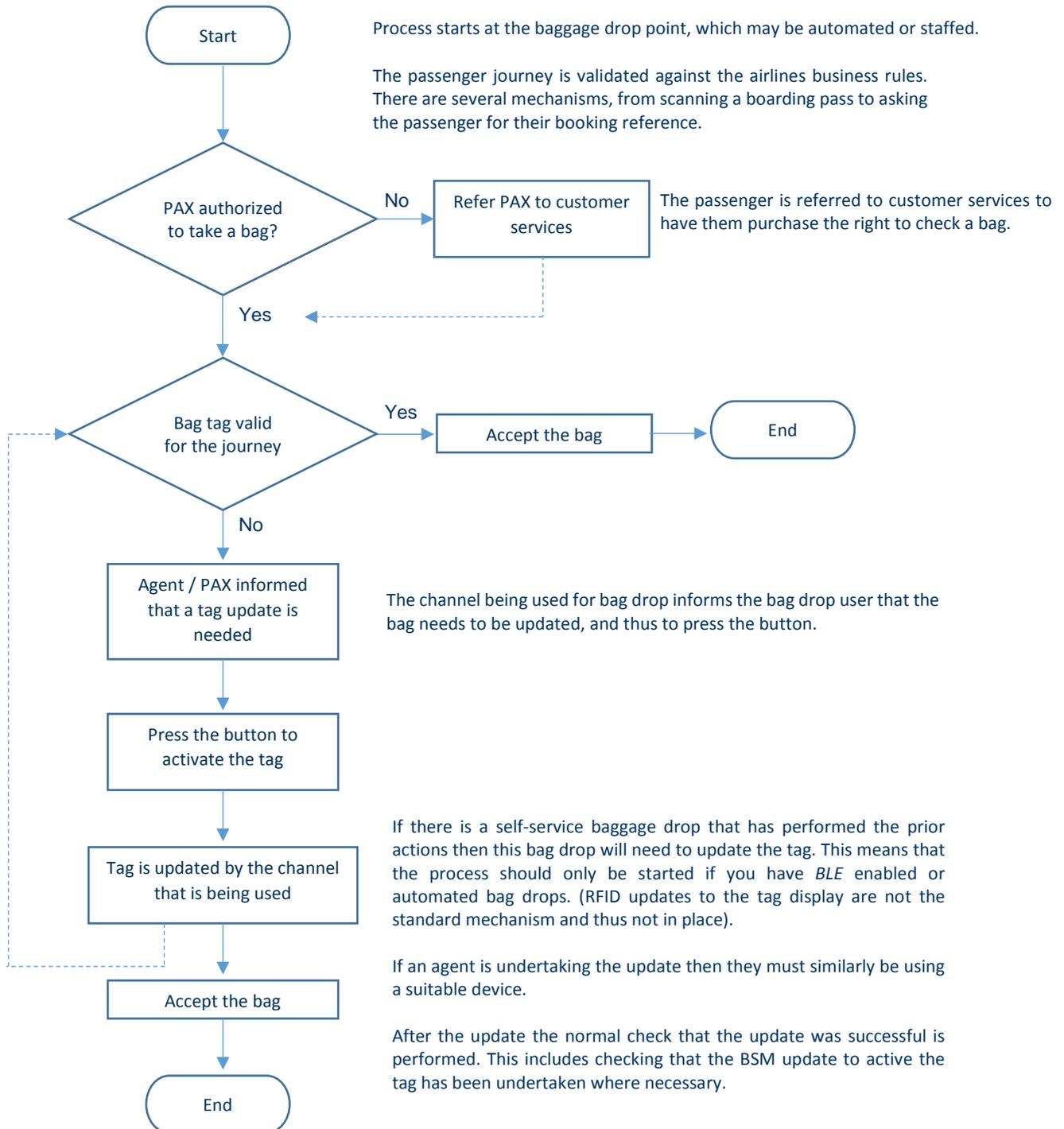
Step 4: After completing the previously required steps, the BSM would be activated, creating the initial acquisition tracking point, as required by Resolution 753.

Step 5: Dependent on airline/GDS process, a receipt (or E-Receipt) would be generated and provided to the passenger containing the Minimum Electronic Baggage Claim Receipt Data defined in the IATA Resolution 752:

Passenger Name
Destination and Flight Number Via and Flight Number
(additional via and flight number as needed)
Via and Flight Number Origin Flight Number Date
Number of Bags and baggage numbers PNR Reference

5. Airline uses EBT when passenger presents with no/incorrect data

As an Operating airline I want to put my baggage tag data on the EBT so that my operations can use it accordingly **under the condition that** the customer fails to refresh the tag before the bag drop and the handling agent is unauthorized to do so

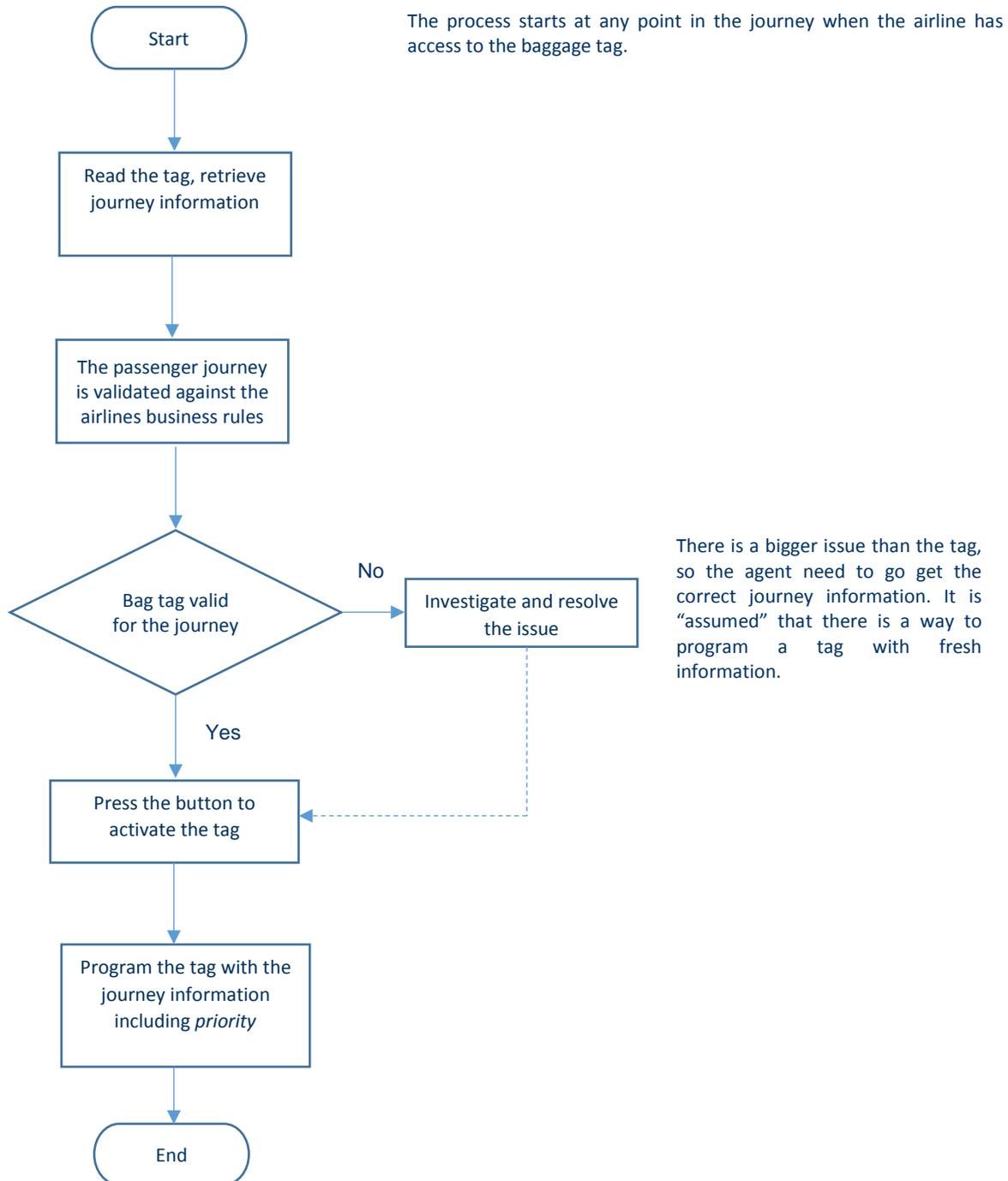


Comments:

This is basically the same as the passenger updating the tag, but the infrastructure used is airline provided as an agent device or bag drop. The person pressing the button may also be the agent or the passenger.

6. Airline sets the Priority flag (or other data)

As an Operating airline I want to have special handling advice (PRIORITY, etc.) on the EBT **so that** my operations can use it accordingly **under the condition that** the bag qualifies for special handling per mandatory data requirements.

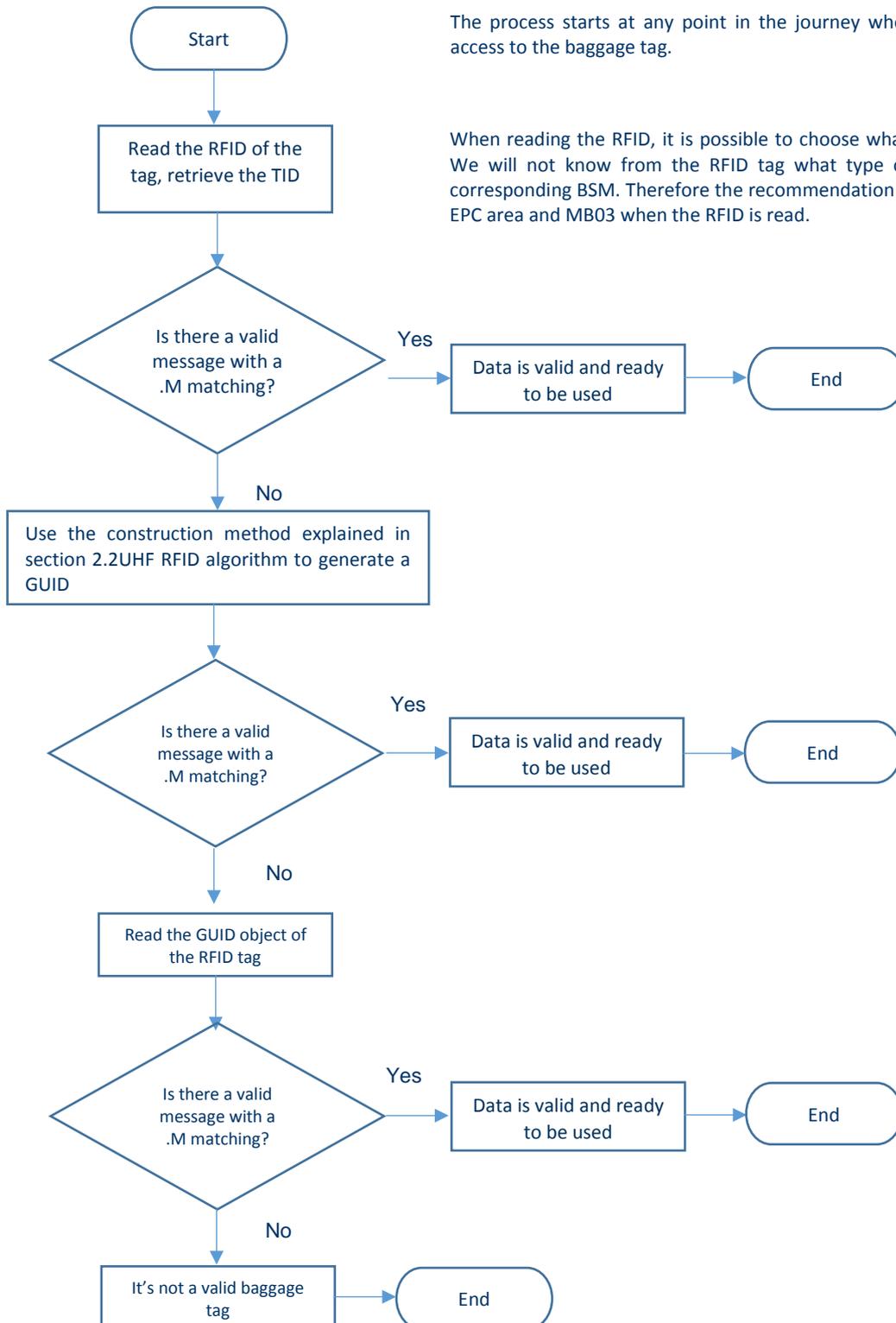


Comments:

Here we are basically reading the tag and then updating the tag with the same information plus any changes (like setting the priority). The idea is that the basic data is correct but you’ve changed something about the journey such as the priority.

7. Getting data from RFID

As an Operating airline I want to retrieve the EBT data via UHF RFID so that my existing UHF RFID infrastructure can be used.



The process starts at any point in the journey when the airline has access to the baggage tag.

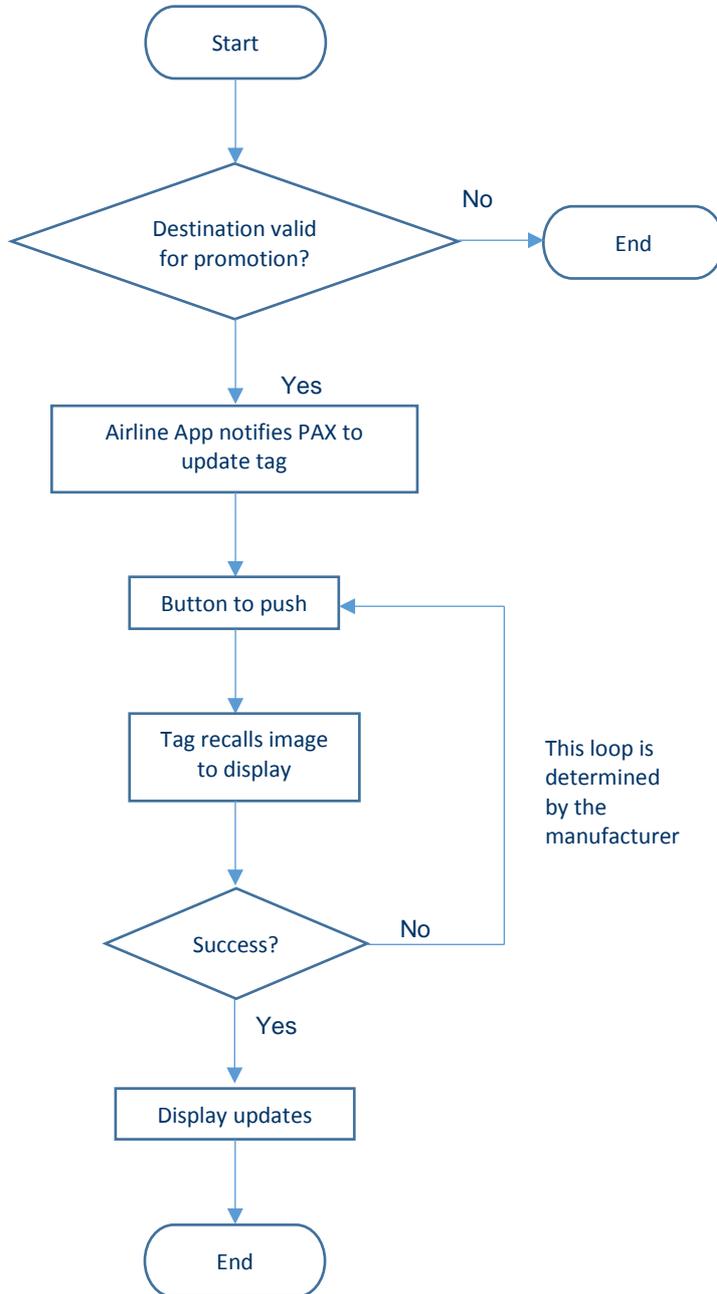
When reading the RFID, it is possible to choose what objects to read. We will not know from the RFID tag what type of GUID is in the corresponding BSM. Therefore the recommendation is to read the TID, EPC area and MB03 when the RFID is read.

Comments:
n/a

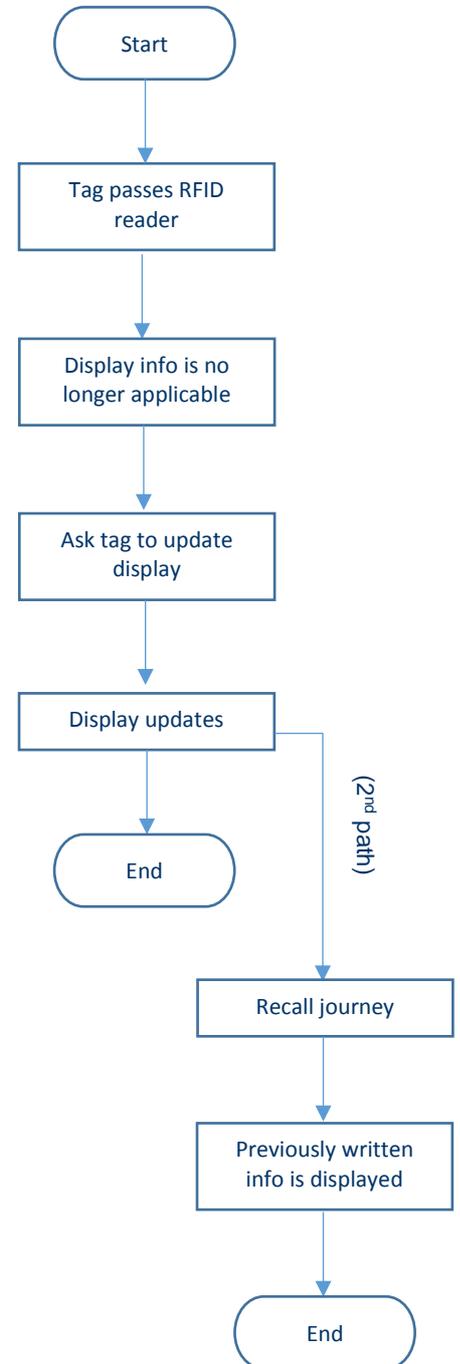
8. Put something on the tag when there is no journey taking place

As an Issuing airline I want to be able to determine the default information that is displayed on the EBT in idle state so that I can make the tag useful under the condition that the EBT is not being used for travel

Bluetooth



RFID



Comments:

It is assumed that the image information is transferred from the App during the “Transmit data to EBT” process.

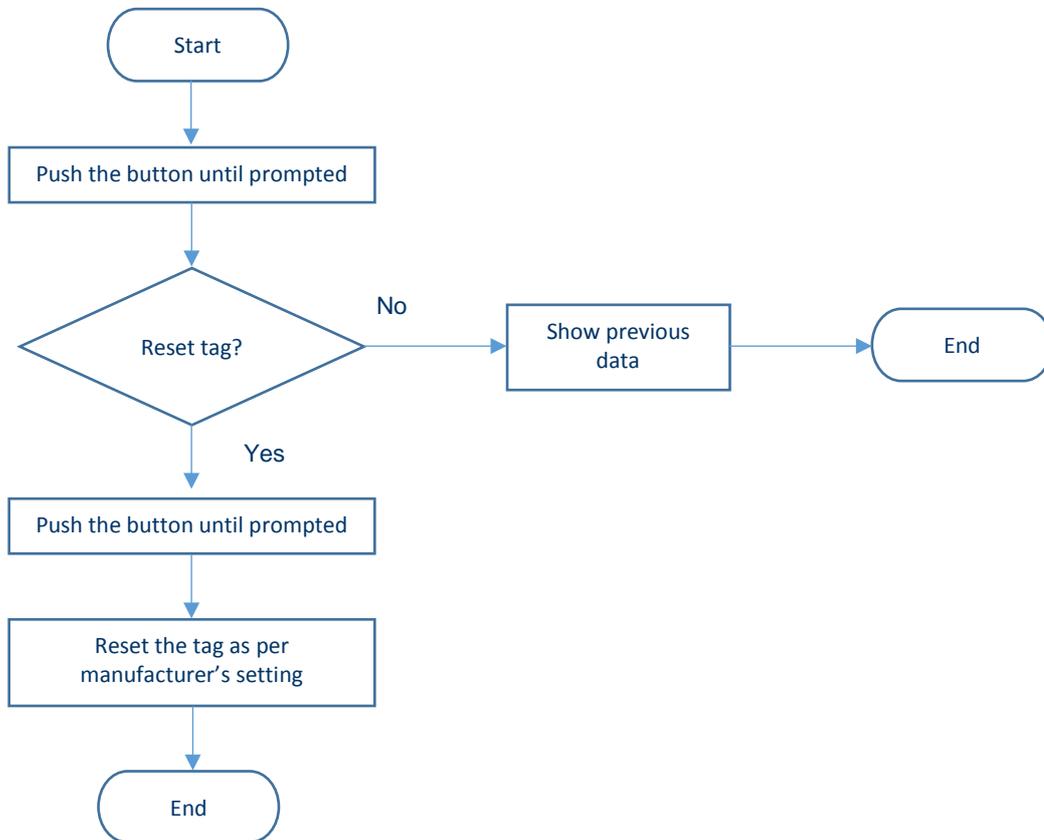
The reason the 2nd path exists in the RFID part is due to the fact that a bag might have been sitting on the baggage claim carousel and never claimed or is there due to being misrouted. So an airline staff member would need to claim that bag and walk it to either the baggage services office or onto another flight to be

reunited with its owner. This would require that the bag exit the baggage claim hall and pass in front of an RFID reader which would update the display with an advertisement (not something we would want in this scenario).

But since the bag is going back onto a plane or to the services office, the airline agent would need to recall the previous itinerary information to read the barcode and/or get the name of the passenger. Thus being able to recall the journey information is necessary in the event that the agent needs that information after the tag has automatically updated through RFID.

9. Factory reset the tag

As an Issuing airline I want to "prime" an EBT issued by me so that all data is deleted and the device is set to a defined initial state again under the condition that the device seems to be in an unrecoverable fault state or needs to be issued again.

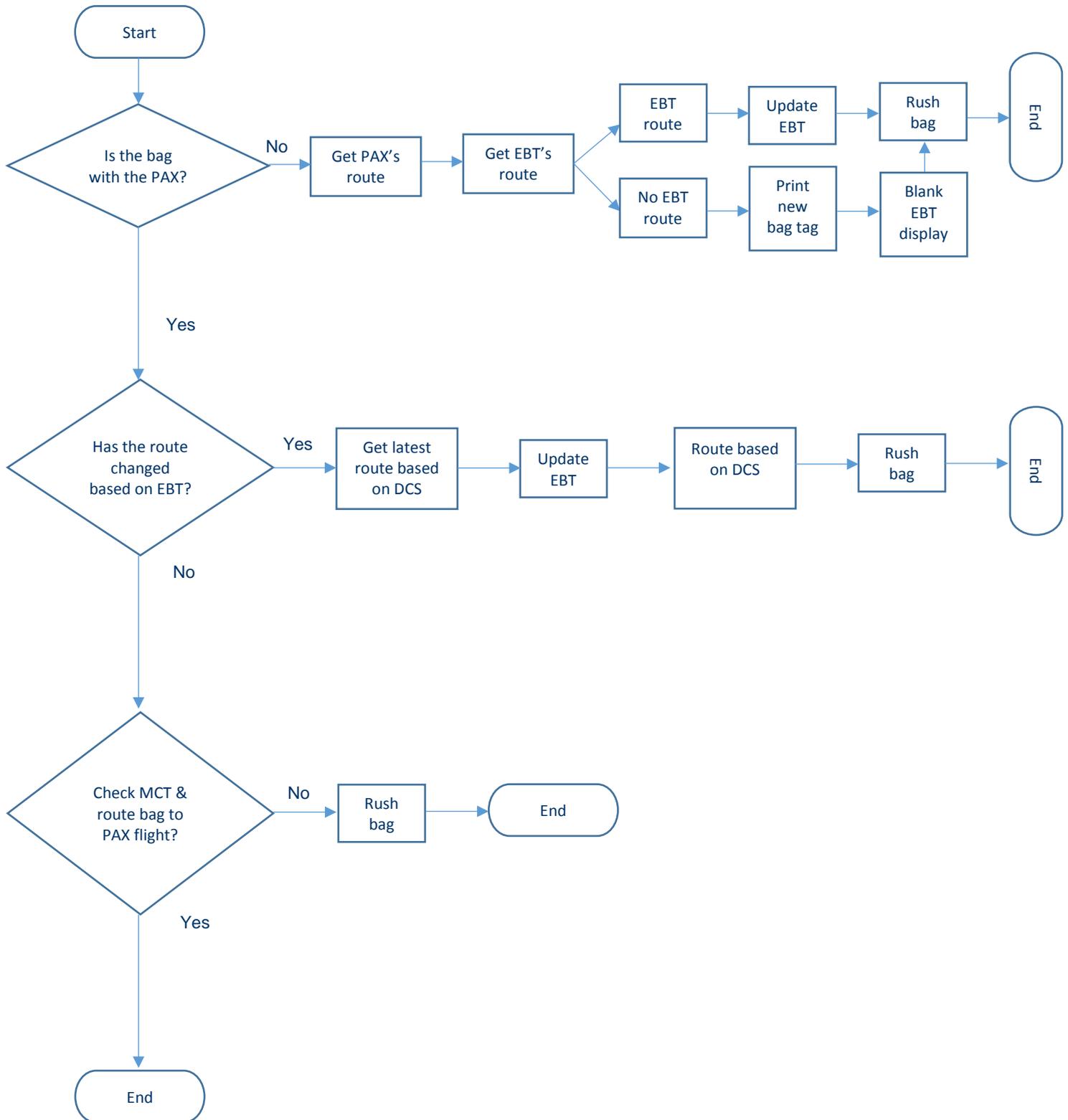


Comments:

The specifications of time and setting are not defined in the use case as it depends on each manufacturer. However, the process needs to assure that only intentional EBT tag rest can happen.

10. Use an EBT in a RUSH process

As an IROP handler I want to reroute an EBT and mark it as RUSH so that it can be handled as expedite bag under the condition that the original itinerary is no longer valid.

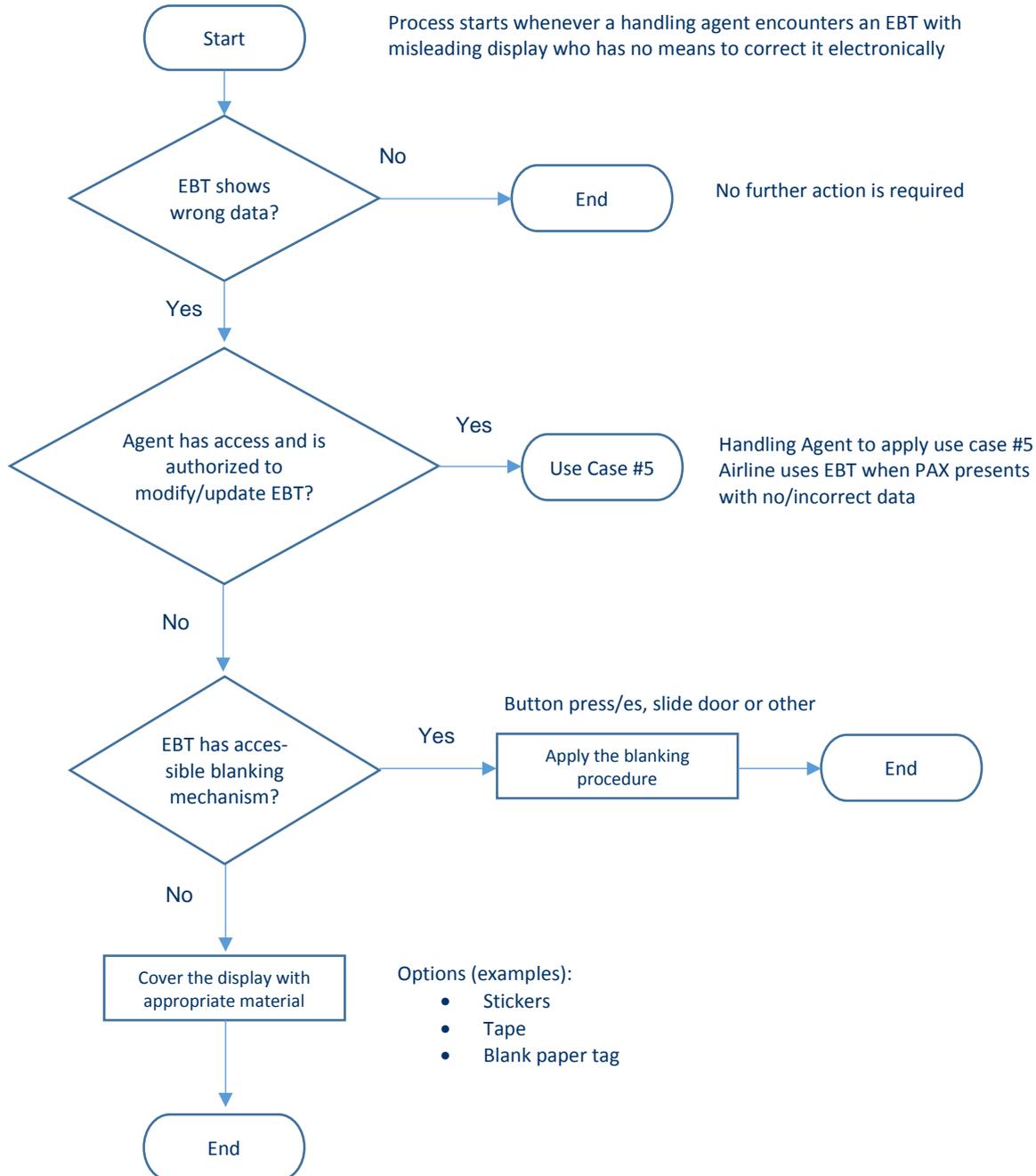


Comments:

n/a

11. Handling Agent needs to invalidate/blank the EBT display

As a Handling agent I want to blank an EBT so that I can use legacy procedures under the condition that the EBT has invalid content and the agent cannot refresh the tag with accurate content

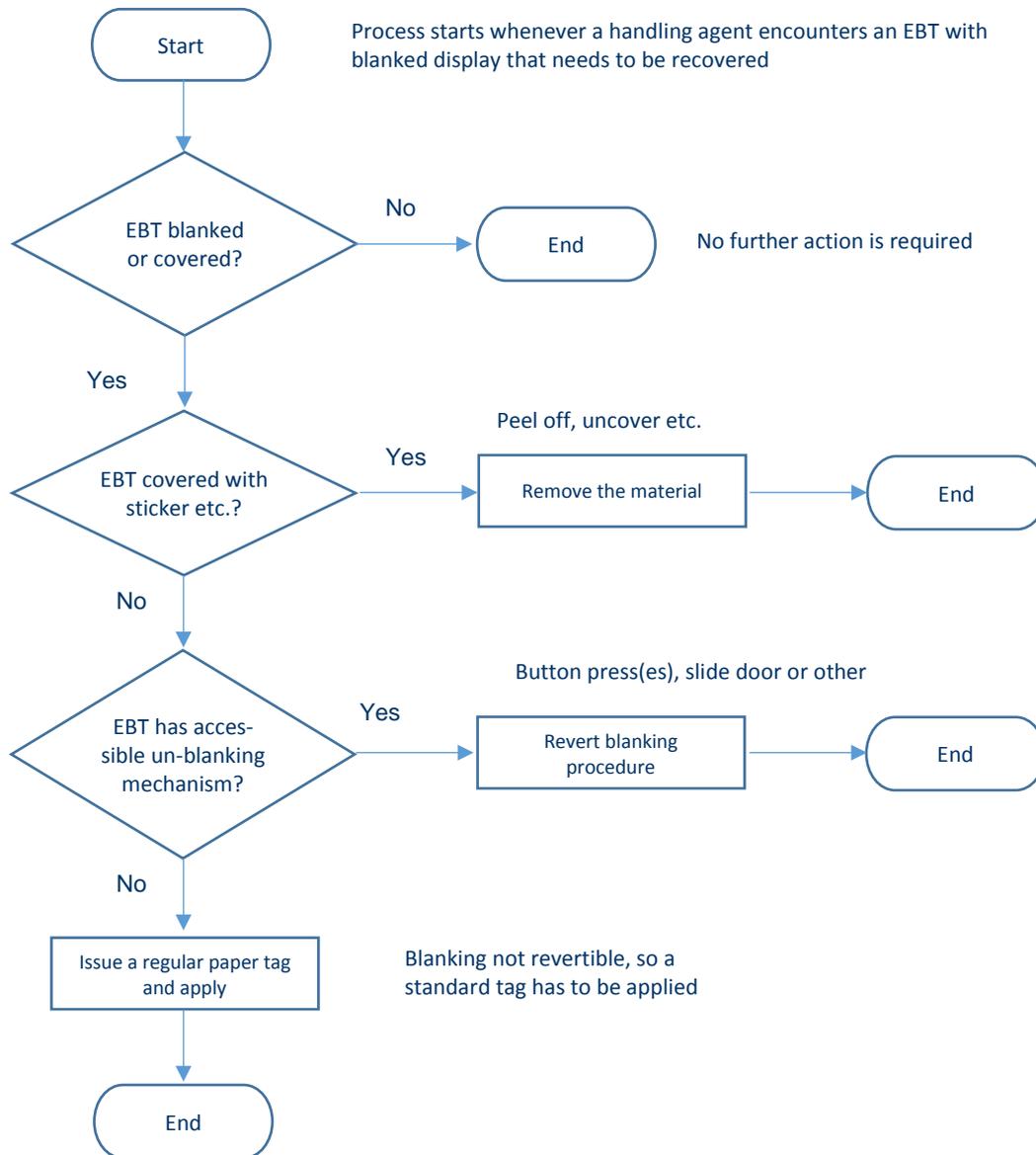


Comments:

The blanking mechanism should be obvious and accessible without opening the bag. The covering as a last resort should try to avoid any permanent damage to the EBT.

12. Handling Agent wants to restore the EBT display

As a Handling agent I want to restore the previous display so that I can revert a blanking action under the condition that the previous content is valid (again) or the blanking was erroneously is this just refresh?



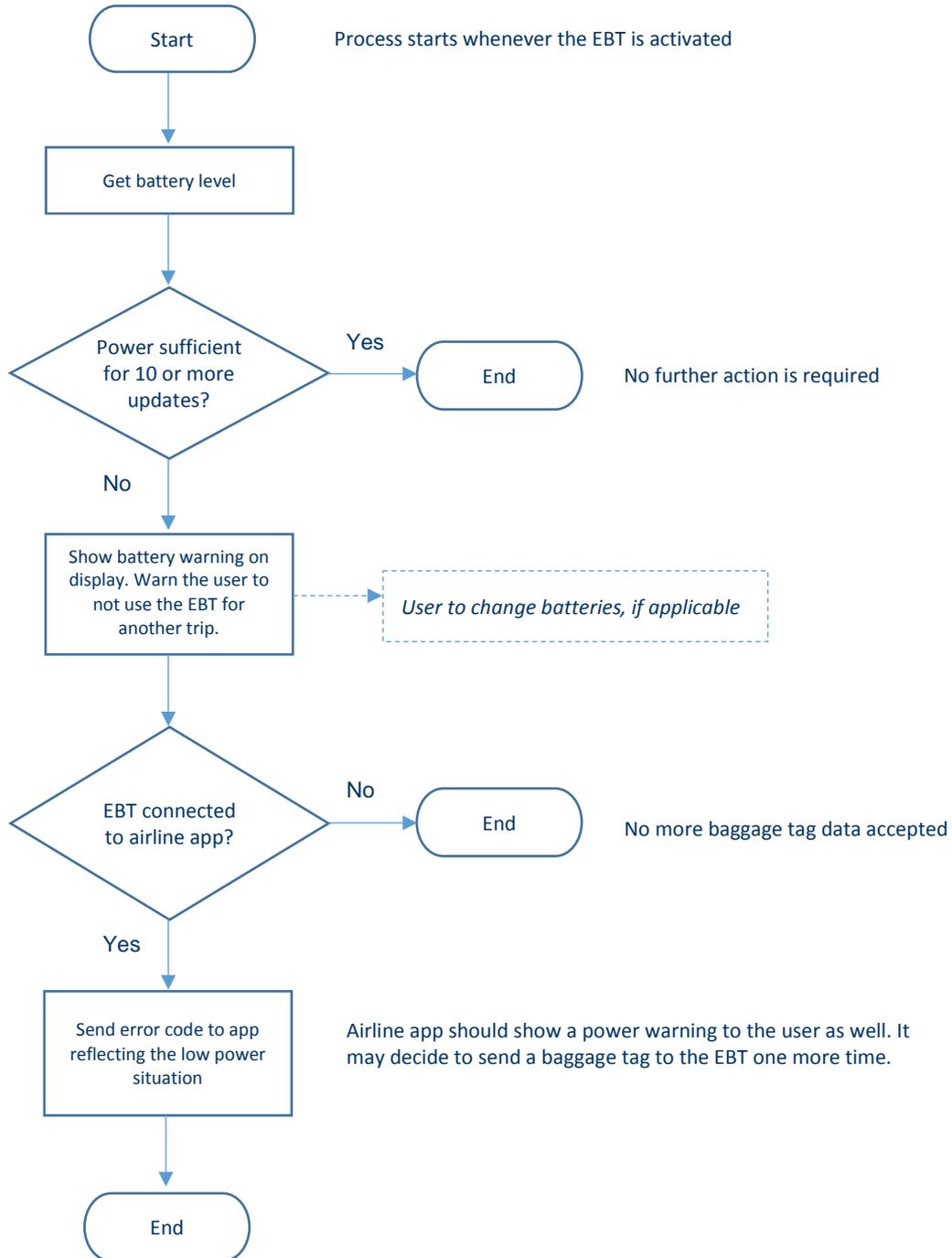
Comments:

The un-blanking mechanism should be obvious and accessible without opening the bag. Material covering the display should be removed with extreme caution so not to do any permanent damage to the EBT.

Should the EBT not has accessible un-blanking mechanism and a regular paper tag is issued, it is recommended to cover the display (sticker, etc) to prevent the unlikely but possible situation that during the bag journey the display un-blanks itself. This is to avoid having different tag information for the same bag.

13. EBT warning about insufficient power remaining

As an EBT I want to have the optional ability to check the battery level so that the EBT can warn a passenger to replace batteries or not use the EBT under the condition that the battery level is insufficient to update the display



Comments:

10 updates cycles should be sufficient for most single itineraries. EBTs may choose to issue a warning even earlier for increased safety.

8. Glossary

BLE	Bluetooth Low Energy
EBT	Electronic Bag Tag
EPD	Electronic Paper Display, screen used to display information that retains its contents even when the device is powered off
GUID	Global Unique Identifier
IP Rating	Ingress Protection (IP) Rating
MCT	Minimum Connection time (when bags transfer)
NFC	Near Field Communication
RFID	Radio Frequency Identification
RP1740c	Recommended Practice 1740c, Radio Frequency Identification (UHF RFID) Specifications for Interline Baggage
RP1745	Recommended Practice 1745, Baggage Information Messages
RP1754	Recommended Practice 1754, Form and Function of the Electronic Baggage Tag
TID	Unique identification written to the UHF RFID chip at the time the tag is manufactured and cannot be altered afterwards. No additional memory is required, it uses the UHF RFID TID bank memory
UHF RFID	Ultrahigh frequency RFID
UUID	Universal Unique Identifier

Annex

Annex I – RP1754

RECOMMENDED PRACTICE 1754

FORM and FUNCTION of the ELECTRONIC BAGGAGE TAG (EBT)

The following are the minimum specifications for an electronic baggage tag applicable for use in an interline environment by IATA members.

GENERAL EBT PRINCIPLES

1. Any party may manufacture electronic baggage tags. Airlines will not be the sole point of distribution for electronic baggage tags.
2. Electronic baggage tags are considered to be Personal Electronic Devices (PEDs) and should adhere to FAA Guidance 91-21-C or its subsequent versions.
3. All electronic baggage tag providers should submit their design details and samples to IATA.
4. Airlines retain the right to accept an electronic baggage tag for carriage or not.
5. All Electronic Baggage Tags shall have a GUID (Globally Unique Id).
6. A QR Code containing the GUID of the baggage tag shall be printed permanently on the EBT as a fall back option for broken screen.
7. EBTs shall include a physical switch that activates the tag into listening mode for an update. The listen mode shall be maintained for a limited period of time, and the tag shall cease to listen once the update is complete or in the absence of transmission for 60 seconds. Other techniques may be used to activate the listening mode of an EBT in addition to the physical switch. When such techniques are used, the EBT shall make use of additional security mechanisms to ensure an authorized party is updating the tag.
8. Simple validation of displayed data by checking the messages using LPN and .M (GUID). If different, could be a miss-labelled bag. Use .M as master.
9. The update of the EBT information via any available channel must refresh the display.
10. Ability to update EBT with PAX device plus Airline owned device.⁸

HARDWARE COMPONENTS OF THE ELECTRONIC BAGGAGE TAG

In order to ensure that there is a standard level of functionality across all electronic baggage tags there shall be a minimum set of functional components defined for an EBT.

COMPONENT	PURPOSE	OPTIONAL OR MANDATORY
Display	To display the human readable and 1D licence plate	Mandatory
QR Code containing a URL with the GUID	To allow identification of the tag through an optical means	Mandatory
RFID	To allow UHF RFID tracking of the bag	Mandatory
Bluetooth LE	To allow interaction with the EBT via a smartphone	Mandatory
NFC	To allow interaction with the EBT via a smartphone	Optional
GSM	To allow remote interaction with the device and global tracking	Optional

TRANSMISSION

EBTs making use of GSM or other active transmission technologies, including Bluetooth, must demonstrate compliance to FAA Advisory Circular 91-21-C, or other applicable regulations in other jurisdictions, this currently prohibits the transmission by EBTs during flight.

BATTERIES

EBTs using a battery must comply with the ICAO regulations Technical Instructions for the Safe Transport of Dangerous Goods by Air (Doc 9284).

DISPLAYS

⁸ Item proposed by the EBT sub-working group and submitted as voting item to the BWG38 – AMS June 2017

Handle attached EBTs must have either dual displays showing identical information, so that the tag can be read regardless of the tag orientation on the handle OR be affixed so that a single display EBT always presents a readable display to reading devices.

Displays must be of a size and resolution that allows a complete set of operational data to be shown in a legible manner. Typical display examples are shown in figure 1.



Figure 1 Sample EBT Display

Machine Readable Area

The Machine Readable Area is used to display the barcode representation of the baggage license plate. The barcode must be readable by both automatic and manual barcode readers without any degradation from the traditional tag read rates (i.e. 95% read rate on an automatic 360° read array).

Barcode displays must respect the need for quiet zones around the barcode to facilitate their reading.

Routing Area

The routing area shall be capable of displaying **up to 3** airport identifiers, arranged as follows:

FINAL DESTINATION
VIA ROUTING
VIA ROUTING

The lettering is a minimum of 4.1 mm as per Resolution 740 in the Arial Rounded MT Bold font or similar. Final destination is always shown at the top of the display, with the routings in order from first transfer point (lowest) to last transfer point (highest) below the final destination.

Alongside the airport codes the flight number and date must be shown, e.g.



Optionally, a short code for each sector can be included after the flight number and date, indicating an exceptional status for the bag.

For example:



Information Area

The information area displays the numeric representation of the barcode license plate, in its 10 digit form.

The information area also contains the passenger name in the format of lastname / firstnametitle (e.g. PRICE / ANDREWMR) and the Passenger Name Record locator.

Example:

4220123456 PRICE / ANDREWMR PNRADR

The information area font is 3 mm high (minimum).

EU BORDERS

When used in the EU, the EBT must adhere to the regulations in place regarding the display of green stripes to facilitate the identification of bags originating with the EU.

OTHER EBT CAPABILITIES

Electronic baggage tags may feature other capabilities such as NFC interfaces (to allow interacting with the tag by the passenger's phone), GSM (to allow remote programming and tracking), or other features. As these interfaces are developed, agreed and approved for use they will be included in the implementation guidance materials.

Annex II - Minimum requirements for EBT

This table shows the minimum requirements that an EBT should have to allow the common set of characteristics for an EBT to facilitate the interlining and the collaboration among all the agents taking part on the baggage journey.

Minimum Data Requirements for EBT		Displayed element
TID/GUID	To guarantee a unique id and key access to accept the tag/bag	No
Unique Manufacture ID	To identify the make and model of the tag so that airlines can decide if the tag is accepted or not for carriage on their airline.	No
Displayed Items		
Final Destination	Mandatory Displayed, 4.1mm Min	3 letter
Flight Number	Mandatory	2 letter 4 numeric
Flight Date	Mandatory	2 numeric 3 letter
Flight Time	Conditional	4 numeric
Via 1	Conditional 4.1mm	3 letter
Flight Number	Mandatory	2 letter 4 numeric
Flight Date	Mandatory	2 numeric 3 letter
Via 2	Conditional 4.1mm	3 letter
Flight Number	Mandatory	2 letter 4 numeric
Flight Date	Mandatory	2 numeric 3 letter
Final Destination in full text	Optional	Alpha
Passenger Name	Mandatory, 26 characters, displayed on a font readable size	Last Name / First Name Title
PNR	Mandatory	3 mm, 6 alpha, alpha-numeric
Barcode	Mandatory	As per display capabilities
QR code	Mandatory	
EU Indicator	Option to display, mandatory for capability to display	As per customs code
Journey Status	Conditional Priority / Rush / VIP / ...	8 Alpha max, 4mm
Origin	Conditional 3 letter code of the origin	3mm
Security Sequence Number	Conditional 3 character numeric	3mm

Mandatory: The airline application MUST send this data.

Conditional: If the element is provided by the airline application then this must be displayed.

EBTs will interpret the data stream presented to them and display the data that is provided in the best possible format for the make / model of the tag.

Annex III – QR Code symbology requirements

QR Code symbology requirements

GUID information shall be encoded in QR code symbols conforming to ISO/IEC 18004 (QR Code Model 2).

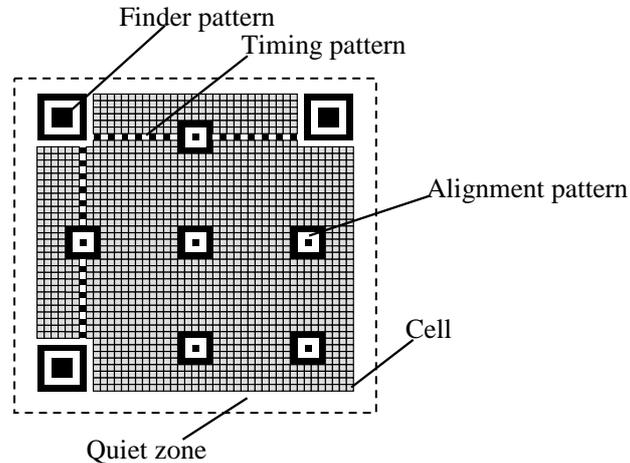


Figure1: Structure of QR Code Model 2 Symbol

“X” dimension

The appropriate “X” dimension for a symbol is determined by various factors including an available marking area, surface type, environments and reading device(s) used. The “X” dimension of a QR Code Model 2 symbol shall be equivalent to the cell size. It is recommended that the user implement a system using the largest “X” dimension that still enables the symbol to fit in the available area. The minimum open system “X” dimension shall be 0.25 mm. “X” dimensions of less than 0.25 mm are not recommended because such symbols may be difficult to scan in an open system environment (see Table 1).

Regardless of the element width, the symbol shall meet the symbol quality requirements in section *Symbol Quality* below.

Element height

The height of any individual cell of the QR Code Model 2 symbol should be equal to the “X” dimension.

Symbol size

In order to establish a known field of view for reading the label, the symbol size with Quiet Zone should not be smaller than 12.5mm by 12.5mm (see table 1 below).

The user should implement a system using the largest “X” dimension that will enable the symbol to fit in the available area. This will allow for the best possible scanner performance. The printed symbol size will depend on the amount of data, type of error correction level and “X” dimension selected. QR Code Model 2 Symbol size for alphanumeric 32 characters for each error collection level and “X” dimension are shown in the table 1. The alphanumeric Data capacity of 10mm x 10mm, 20mm x 20mm and 30mm x 30mm sizes QR Code model 2 for each error collection level and “X” dimension are shown in the table 2.

Table1: QR Code Model 2 Symbol size with minimum quiet zone for alphanumeric 32 character data

“ X ” dimension					
Data Size	Error Correction Level	0.25 mm (0.010 inch)	0.34 mm (0.013 inch)	0.42 mm (0.016 inch)	0.051 mm (0.020 inch)
32 char.	M	9.4mm	12.5mm	15.7mm	18.8mm
	Q	9.4mm	12.5mm	15.7mm	18.8mm
	H	10.4mm	13.9mm	17.4mm	20.8mm

Table2: QR Code Model 2 alphanumeric data capacity in the size of 10mm x 10mm, 20mm x 20mm and 30mm x 30mm

“ X ” dimension					
Symbol size (with minimum quiet zone)	Error Correction Level	0.25 mm (0.010 inch)	0.34 mm (0.013 inch)	0.42 mm (0.016 inch)	0.051 mm (0.020 inch)
10 mm x 10 mm	M	42	14	-	-
	Q	32	11	-	-
	H	24	7	-	-
20 mm x 20 mm	M	331	152	84	42
	Q	241	108	60	32
	H	177	84	44	24
30 mm x 30 mm	M	857	412	251	152
	Q	611	292	177	108
	H	461	220	137	84

Quiet zone

The QR Code Model 2 symbol shall have a minimum quiet zone of four (4) times the “X” dimension width on all four sides of the symbol. It is not the intent of this guideline to require additional quiet zone beyond the minimum required by ISO/IEC 18004.

Error correction level

The error correction level shall be either M (approximately 15%), Q (approximately 25%), or H (approximately 30%) as identified in ISO/IEC 18004. The error correction level is determined by many factors, including surface type, the environment, symbol quality, and reading device(s) used.

The error correction level L (approximately 7%) is not recommended for QR Code Model 2.

Symbol quality

QR Code symbol print quality shall be measured at the consignee’s point of scan, in accordance with ISO/IEC 18004 and ISO/IEC 15415 in the light range (e.g., 660 nm).

The minimally acceptable overall symbol grade of 2.0/10/660 applies to the final symbol on the item at the point of receipt. It is recommended that the overall symbol grade, at the point of printing the symbol, be equal to or exceed 2.5/10/660 to allow for process variations and possible degradation from storage, shipping, handling and use.

When printing on label stock, the methodology for measuring symbol quality shall be as specified in ISO/IEC 15415.

Encryption

Encryption shall not be used.

Character set

The character set shall be upper case alphabetic characters and numeric digits. It is recommended that the resultant data stream from scanning a QR Code Model 2 symbol follow the syntax described in ISO/IEC 18004.

Example

QR Code with GUID data, Alphanumeric 32 characters “9223DF3CD42441D9A230934460454254” is shown in the Figure 2. The symbol size with minimum quiet zone when “X” dimension 0.34mm is 12.5mm x 12.5mm,



QR Code model 2 Version 3

Error correction level: M (15%)

Number of Cell on one side: 29

Figure2: Example of QR Code with GUID Data

Annex IV – List of contributors

IATA would like to thank the following contributors to the first issue of this Implementation Guide:

Name	Company
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Appendix I - Smart Baggage with integrated lithium batteries and/or electronics

1. Background

Recent developments of innovative baggage with integrated lithium batteries, commonly known as “smart luggage” are being marketed and sold to the traveling public. These devices include integrated lithium batteries, motors, power banks, GPS, GSM, Bluetooth, RFID or Wi-Fi technology. The presence of the lithium batteries can contravene various regulatory requirements. These devices require careful attention – even if permitted by the applicable regulations.

Examples of “smart” luggage include features such as:

- Lithium ion battery and motor allowing it to be used as a personal transportation device, either as a stand-up scooter, or sit on vehicle. These devices do not meet the criteria of a mobility device.
- Lithium ion battery power bank that allows charging of other electronic devices such as mobile phones, tablets and laptops.
- GPS tracking devices with or without GSM capability.
- Bluetooth, RFID and Wi-Fi capability.
- Electronic baggage tags.
- Electronic lock/s.
- Lithium ion battery, motor and tracking device (GPS) allowing the bag to self-propel and ‘follow’ the owner.

2. Regulatory Requirements

2.1 Lithium Batteries – Passenger / Crew Provisions

All lithium batteries carried by passengers or crew are subject to the provisions of Part 8, Chapter 1 of the ICAO Technical Instructions. The provisions of the ICAO Technical Instructions are contained in Subsection 2.3 of the IATA Dangerous Goods Regulations (DGR).

The provisions set out in DGR 2.3 for lithium batteries provide for the following:

A. Operator approval not required:

- a) each installed or spare battery must not exceed:
 1. for lithium metal or lithium alloy batteries, a lithium content of not more than 2 g; or
 2. for lithium ion batteries, a watt-hour rating of not more than 100 Wh.
- b) batteries and cells must be of a type that meets the requirements of the UN Manual of Tests and Criteria, Part III, subsection 38.3;
- c) articles containing lithium metal or lithium ion cells or batteries, the primary purpose of which is to provide power to another device, e.g. power banks, and spare lithium batteries are permitted in carry-on baggage only.

Note: Specific security regulations may prevent the carriage of some peripherals, spare batteries and power banks in carry-on baggage.

B. Operator approval required:

- a) Each installed or spare battery must not exceed:
 1. for lithium metal or lithium alloy batteries, a lithium content exceeding 2 g, but not exceeding 8 g. Only permitted in portable medical electronic devices,
 2. for lithium ion batteries a watt-hour rating exceeding 100 Wh, but not exceeding 160 Wh;
- b) batteries must be of a type that meets the requirements of the UN Manual of Tests and Criteria, Part III, subsection 38.3;
- c) articles containing lithium metal or lithium ion cells or batteries, the primary purpose of which is to provide power to another device, e.g. power banks, and spare lithium batteries are permitted in carry-on baggage only with a limit of two spare lithium ion batteries per passenger.

Note: Specific security regulations may prevent the carriage of some peripherals, spare batteries and power banks in carry-on baggage.

2.2 Active Devices

All portable electronic devices (PED) carried on an aircraft are subject to specific requirements to ensure that they do not pose a hazard to aircraft systems due to electromagnetic radiation. These provisions are set out in applicable EASA and FAA regulations. The provisions in the regulations are the described in EASA AMC and GM to Part-CAT – Issue 2, Amendment 1 or subsequent versions of such guidance and FAA Advisory Circular AC 91.21-1C.

These documents require the following:

- a) for PED carried in the cabin by passengers or crew the passenger or crew member is responsible for ensuring that all transmitting functions are turned off at all times during flight.
- b) for devices carried in or as part of checked baggage there is a requirement that:
 1. The PED must have been demonstrated to meet specific electromagnetic radiation standards and the PED must be approved by the operator (airline).
 2. The PED must be designed with a minimum of two independent means to turn off completely, turn off cellular or mobile functions, or a combination of both when airborne. These independent methods must use different sources to identify flight. For example, a PED designed to sense rapid altitude changes and acceleration to turn off cellular transmissions is an acceptable design feature that meets the requirement. Redundant sources of the same information, such as two vertical accelerometers, would not be an acceptable design.

2.3 Quick reference

Lithium batteries*	<p>Any spare lithium battery, including power banks that are designed to charge other electronic devices, installed in a baggage item must be able to be removed from the bag so that the passenger can carry the spare lithium battery / power bank into the cabin. No lithium battery contained in a bag may be considered as “installed in equipment”.</p> <p>The lithium ion batteries must have a power rating of not more than 100 Wh unless the passenger has approval from the operator, in which case the lithium ion battery must not have a Watt-hour rating exceeding 160 Wh.</p>
Power banks*	<p>Where a lithium ion battery is installed in a bag for the primary purpose of charging other devices, it must be considered as a power bank and comply with existing requirements for carriage of such devices.</p>
Tracking systems	<p>Tracking devices must comply with FAA guidance 91-21-c or EASA AMC and GM to Part-CAT – Issue 2, Amendment 1 or subsequent versions of such guidance.</p> <p>Specifically under FAA guidance:</p> <ul style="list-style-type: none"> • The PED must be designed with a minimum of two independent means to turn off completely, turn off cellular or mobile functions, or a combination of both when airborne. • Tracking through passive RFID should comply with IATA RP1740C.
Electronic baggage tags	<p>Electronic Baggage Tags (EBT) have a screen, power source, passive RFID and a QR code as their major design components. The airline industry acceptable EBT is defined in IATA Recommended Practice 1754.</p> <p>These baggage tags have a Bluetooth LE interface that is activated for a short time through a hardware button on the baggage tag. During the active period the airline programs the bag tag with the passenger journey information. The tag then deactivates.</p>

**Note: Specific security regulations may prevent the carriage of power banks and spare lithium batteries in the cabin. Operators must ensure that they are aware of these restrictions and comply accordingly. Further information may be found in [IATA guidance document](#).*

3. Recommendations for Operators

Operators should ensure that airport check-in and passenger services staff and cabin crew are made aware of the potential for items of checked and carry-on baggage to contain lithium battery power banks and tracking devices such as GPS / GSM.

Check-in and passenger services staff and cabin crew should be made aware of the restrictions that apply to the carriage of this smart baggage. Specifically that:

- a) all lithium batteries must comply with the limits set out in the DGR for the watt-hour rating or lithium metal content, as applicable;

- b) Any PED equipped with a power bank offered as checked baggage must have the power bank removed prior to being checked-in. The power bank must then be carried in the passenger's carry-on baggage where permitted by security regulations;
- c) Where a bag intended to be carried in the cabin is surrendered at the boarding gate or on the aircraft to be loaded in the cargo compartment the passenger should be asked if the bag contains any spare lithium batteries, including power banks. Where it is identified that there are spare lithium batteries or power banks, the passenger must remove them from the bag before it can be loaded into the cargo compartment. The spare battery / power bank must then be carried in the cabin, where permitted by security regulations.

To alert passengers as to the requirements and limitations on the carriage of this smart baggage operators should include specific information on their booking and check-in websites, ticket purchase and check-in counters, baggage drop-off areas and boarding gates. Operators should also consider including information contained within in-flight magazines, or other tools used to communicate with passengers.

4. Cabin firefighting procedures

Firefighting procedures require that any lithium battery showing signs of overheating should be cooled as quickly as possible using water or non-flammable liquid.

The majority of PEDs powered by lithium batteries are held and/or used during flight. Passengers and cabin crew are therefore more able to identify an overheating device and take appropriate action to cool it before the point of ignition.

In the case of batteries installed within carry-on bags, these are more difficult to identify at an early stage, due to their stowage in the cabin. This should be considered in the safety risk assessment.

To effectively cool an overheating lithium battery either before or after ignition, the battery should be fully immersed in water or non-flammable liquid where possible. Where a battery is not able to be removed quickly or safely, the device in which it is contained should be immersed in water.

Where the overheated device is the size of a carry-on bag, it is unable to be fully immersed in water or placed in a fire containment device. This is a considerable hazard and should be carefully considered by the operator before determining a policy on acceptance for carriage.

5. Safety Risk Assessment

Operators should carry out their own safety risk assessment (SRA) regarding the carriage of these devices to determine whether they can be safely accepted for carriage and any mitigations which may be required. The following are examples which should be considered.

Hazards	Potential consequences
Ignition of a lithium battery which cannot be removed from bag.	Inability to cool battery effectively. Inability to isolate battery and prevent spreading.
Installation of power bank in bag not identified at check in.	Carried as checked baggage contrary to regulation.
Installation of tracking technology	Electromagnetic interference with aircraft systems.
Installation of connectivity systems e.g. Wi-Fi, Bluetooth, GSM, GPS	Electromagnetic interference with aircraft systems.
Bag intercepted and removed at departure gate and unable to be carried as checked bag due to installation of lithium ion power bank.	Passenger required to surrender bag and contents, or passenger offloaded.
Unacceptable devices checked in and not detected as inadmissible	Failure of battery pack and consequent fire in inaccessible hold