

RFID for Baggage Handling and Tracking

Whitepaper
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EXECUTIVE SUMMARY

With potential savings of 20 cents for every 10 cents⁴ spent on implementing RFID for baggage handling and tracking, now is the time to realize the benefits and close the gap in baggage performance. RFID technology is expected to reduce mishandling rates for baggage by 25%⁴, which means large savings for airlines, and just as importantly, a better passenger experience.

Barcode read rates on transfer bags are still found to be at 60-70%, so a large share of bags need to be handled twice and take up capacity. Due to the expected increase in doubling passenger numbers within the next 15 years¹, new technology is required to support the industry with their baggage handling solutions. RFID has proven read rates of 99.9% in baggage handling and is the most reliable and cost-effective technology to increase capacity and improve the baggage handling process.

Delta Airlines was the first airline to take the step into full RFID implementation for baggage handling in the airline industry, and it is no longer a matter of whether to go for RFID, but a matter of when. Airlines waiting too long will fall behind in the race to provide increased passenger services, better baggage handling, improved security and lower operational costs.

WHY RFID TECHNOLOGY FOR BAGGAGE HANDLING AND TRACKING?

TRACK MY BAG

With the rapid development of technologies such as mobile apps, customers now require more information from companies with which they have dealings. Courier and delivery companies have been tracking parcels and providing customers with real-time information for quite some time, so customers will, and do, expect airlines to provide similar baggage tracking information. New technologies are providing the airline industry with not only the ability to provide these enhanced customer services but also reduce mishandled baggage.

MISHANDLED BAGGAGE

Bags go awry, get lost, or are forgotten. Each year, over 23 million bags are mishandled, and 79% of those are delayed, resulting in both additional costs for the airline and inconvenience and dissatisfaction for customers. SITA estimate mishandled baggage costs the airline industry US\$ 2.3 billion in 2015¹, equivalent to the cost of nearly 50 Boeing 737-600s, and this figure is sure to rise with an increase in passenger numbers.

IATA RESOLUTION 753

Along with increased passenger requirements and operational challenges, airlines will soon need to comply with IATA Resolution 753³, due to come into force in June 2018. Resolution 753 is aimed at reducing the number of lost or delayed items of baggage to improve customer experience and reduce the cost and time of searching, retrieving and delivering missing or delayed items of baggage, as well as help eliminate baggage fraud.

IATA Resolution 753 means that from June 2018 IATA members must:

- Demonstrate delivery of baggage when custody changes
- Demonstrate acquisition of baggage when custody changes
- Provide an inventory of bags upon departure of a flight
- Be capable of exchanging these events with other airlines as needed



To do this, it is required to obtain tracking records for the following procedures:

- Acquisition of the bag from the passenger by the member or its agent
- Delivery of the bag onto the aircraft
- Delivery and acquisition of the bag between members or their agents when custody changes between carriers
- Delivery of the bag to the passenger

RFID is an easy and cost-effective way to obtain these tracking records automatically to become compliant to the new IATA Resolution 753.

WHY RFID TECHNOLOGY FOR BAGGAGE HANDLING AND TRACKING?

Baggage handling involves numerous steps from when a passenger checks in his or her bag, to when they retrieve it at the final destination. These include:

- Receive the bag from the passenger
- Move the bag through security
- Store the bag until the flight is ready for loading
- Sort the bag so it can be loaded onto the correct flight
- Load the bag onto the correct flight
- Ensure the bag and passenger are on the same flight
- Ensure the correct transfer of baggage if there is a connecting flight
- Ensure the swift unloading of baggage at the passenger's destination
- Ensure passengers get the bag delivered at the right reclaim carousel

With so many different stages in the baggage handling process, it is no surprise that things can and do go wrong. Various technologies can be deployed to address the tracking challenge, but we believe RFID has the most all round effectiveness as well as unique capabilities that support process improvement by enabling far greater visibility into baggage handling operations than ever before.

RFID is at the forefront of technologies, which offer the airline industry:

- Enhanced services for passengers such as real-time baggage tracking
- Reduced mishandling of baggage
- Improved operations – saving costs and making baggage handling more efficient with automatic scanning



Pier & Claim Reader

More effective tracking and control of baggage using technologies such as RFID is enabling airlines and airports to dramatically reduce the number of mishandled bags. The number of mishandled bags has fallen from 46.9 million in 2007, which had cost the industry US\$ 4.2 billion, to nearly half that number despite a rise in passenger numbers¹. As more airports and airlines adopt RFID technologies, this figure is expected to fall further, helping save the airline industry over \$US 3 billion in the next seven years, and the cost of implementation for airlines can be as little as US\$ 0.1 per passenger, yet accrue cost savings of US\$ 0.2 per passenger⁴.

DELTA AIRLINES RFID PIONEERS

When an airline like Delta Airlines chooses to rollout RFID in their network, it is obvious the technology has clear advantages. Delta Airlines, one of the United States' largest passenger carriers, handles over 120 million bags each year, is implementing RFID technology in its 344 stations around the globe. Delta has deployed 3,800 RFID bag tag printers, 600 pier and claim RFID readers and 1,500 belt loader readers, enabling hands free scanning of baggage throughout the handling process. The technology will provide Delta Airlines with greater data and more precise baggage information, and just as importantly, provide their customers with improved real-time tracking of their bags and giving Delta Airlines a great advantage over their competition.

WILL RFID REPLACE BARCODE?

Currently, the majority of airlines use simple barcodes for baggage handling. Barcodes are cheap, simple to use and a trusted technology. However, they also have distinct disadvantages. Not only do they require line-of-sight reading, often with a handheld scanner, but also where tested alongside RFID, barcode technologies provide read rates as low as 60 - 70%, while RFID read rates can be as high as 97 - 99.9%. Furthermore, when airports have adopted RFID over barcode systems, their weekly equipment maintenance requirements have typically dropped to just once a year.

Airports and airlines do not need to choose between RFID or barcode for baggage identification and tracking. More and more solutions utilizing both technologies are being introduced to the market. These hybrid solutions make airports capable of handling both barcode and RFID-tagged baggage. It is most likely that both technologies will be present, and by adapting hybrid solutions, airports can gain the benefits from both. A hybrid solution would typically have a higher read rate than by using the technologies separately. Partial implementation of RFID with hybrid solutions can be a first step towards a full implementation of RFID.

BENEFITS OF RFID ADOPTION

According to SITA and IATA the global adoption of RFID technology could save the airline industry up to US\$3 billion over the next seven years by improving baggage management and operations.

The main benefits for the airline industry in adopting RFID technology for baggage handling includes cost savings, improved operations and improved passenger service, which RFID achieves by its distinct advantages over other systems. Some of the benefits are listed below:

- Allows passengers to track baggage in real-time and creates passenger loyalty
- Lower the number of delayed and lost baggage, which have a potential saving at at least \$100 pr. bag
- Decrease need for manual processing, which helps you free up staff for other value adding tasks

- Full compliance of IATA 753 done in the most cost-effective way
- Shorter loading/off loading time with automatic on and off-load scannings, which results in a reduction of ground time and a higher average miles pr. seat.
- Better read rates on transfer bags, which increases capacity and enables growth without new infrastructure investments.

RFID has had significant impact on visibility and mishandled baggage in Delta Airlines US network, Hong Kong International Airport, Italy's Milano Malpensa Airport, Lisbon Airport, Las Vegas' McCarran Airport and Denmark's Aalborg International Airport.

Why is RFID superior to other technologies:

- Not requiring line-of-sight reading unlike barcodes
- Read points are relatively low cost
- Can be read from a distance
- RFID tag does not tear apart from handling
- Can read multiple tags simultaneously, unlike barcodes
- Can read bag tags more accurately and efficiently compared to barcodes
- Readers are easy and cost-effective to deploy

As with barcode baggage tags, RFID is globally interoperable, due to IATA RP 1740c (the standard for using RFID for baggage identification), so the same tag works as well in Hong Kong as it would hours later in Milan or Lisbon. RFID-enabled baggage tagging is already in place in a number of airports and has shown that even local or regional implementation of RFID on baggage can have significant benefits, resulting in improved service, substantial cost reductions or savings, and an increase in customer satisfaction.

CURRENT CHALLENGES TO ADOPTION

With such distinct advantages, it raises the question as to why hasn't there been an industry-wide adoption and implementation of RFID technology earlier?

The belief that benefits of RFID will not be realized until adoption is comprehensive (bags tracked along all segments of a journey) persists. This belief has led many airports, handlers and airlines to delay implementation until they see others implementing the technology, before they jump the wagon.

There have been concern in regards to the additional cost of RFID. With the major uptake of RFID within retail, the price points for RFID tags have dropped over the last years and are now at a level, where the business case is clear.

However, proactive airport management teams and airlines such as Delta Airlines, who have investigated their baggage handling process, have determined that performance improvements and savings resulting in a real return on investment are possible. And in an age where consumers face increasing fees (such as checked baggage charges), the ability to provide an improved service while reducing costs can go a long way toward enhancing an airline's reputation as well as building brand loyalty.

Some airlines wait for the next technology to be introduced and take over from RFID, while the proactive airlines and airports, who chose to take the step into RFID, just keeps widening the gap in operational performance and passengers services.



THE TECHNOLOGY

RFID technology has been around since the 1950's. This is a tried and tested technology. However, in recent years, thanks to mass adoption by other industries, particularly the retail industry, the technology has evolved substantially and, thanks to economies of scale, it is at a point where there is a highly positive return on investment.

When discussing RFID for baggage tracking, the RFID technology referred to is the passive GS1 UHF Gen2 protocol that ISO/IEC has standardized as 18000-63, also referred to as RAIN RFID. It is UHF frequency communicating at 860 – 960 MHz.



THE TAG

Disposable baggage tags

Disposable baggage tags are similar to the current paper baggage tags used today. They look the same and are printed in the airport in the same way as current paper baggage tags, the only difference is that they contain an RFID tag.

The RFID tag comprises an inlay consisting of an integrated circuit (tag chip) mounted on a substrate along with an antenna. The antenna inlay assembly is responsible for harvesting RF energy and communicating information. This RFID inlay is sandwiched between a label and its adhesive backing to create a printable label (or in case of the baggage handling application, a printable baggage tag). These bag tags are disposed of or replaced after each journey in the same way as current bag tags.



RFID Baggage Tag



Permanent Baggage Tag

Multiple use baggage tags

Today there are two types of multiple use baggage tags containing RFID: Electronic baggage tags and permanent baggage tags.

Electronic bag tags are active devices in that they can receive and send data, typically via Bluetooth, allowing travelers to keep track of their bag using a mobile phone app or other portal. Often these devices have a display, allowing the display of barcode and flight information. In addition, Electronic baggage tags can work in conjunction with airport RFID readers and be scanned in the same way as single use tags. RFID is according to IATA RP1754 (mandatory) in Electronic baggage tags to allow RFID tracking of the bag.

Permanent baggage tags do not typically have a screen. These are reusable baggage tags, perhaps in the form of a credit card, and issued to premier or frequent flyers or as part of a loyalty promotion. The RFID chip is incorporated in a permanent bag tag, which can be used multiple times. The passenger owns the tag and the airline updates it with new travel information each time they fly. The multiple use baggage tags are used for tracking and give data for operational optimization.

READ POINT

The read point provides visibility, tracking the position of the baggage on the bagdrop, conveyor, belt loader, tilt-tray or other. With traditional barcode readers, line of sight is often an issue and outdoor use is limited; if the barcode is not visible, the bag tag has to be manually adjusted so the barcode reader can scan it. However, with RFID bag tags, it doesn't matter if the bag tag is not facing the reader.

A read point comprises a high performance ISO 18000-6C compliant reader, multiple suitable fixed antennas, RFID integration SW, reader management middleware, communication options and based on the application multiple sensors. The reader must have the ability to provide propagation characteristics of the reflected data as well as the tag identification (TID) number, EPC memory containing License plate number and Julian Date.

At the heart of an RFID implementation, the intelligent SW on the read point must be able to process and filter tag data in real-time, as well as manage multiple readers. It needs to communicate with the back-end system (DCS, BRS, BHS etc.) in real-time. Communication can be via LAN, Wi-Fi, 3G/4G or other real-time communication options. The software also needs to monitor the conditions of the read points in real-time.

Being able to handle real-time data offers several advantages to airlines and is absolutely necessary to perform reconciliation and sortation. It also enables tracking information to be relayed to customers using an online portal or app, providing enhanced customer service and improving the flying experience for passengers.



EXAMPLES OF RFID RECORDING AND TRACKING POINTS

IDENTIFICATION AND TRACKING AT BAGDROP

A BagDrop Reader integrates effortlessly into a self-service bag drop station, enabling automatic scans of RFID tagged baggage. This eliminates the need for handheld scanners and allows passengers to move through the check-in process faster and more efficiently, experiencing a smooth start to their journey.

- It can be provided as stand-alone or hybrid solution (RFID and barcode)
- Enables faster more efficient self-service check-in of RFID tagged baggage
- Frees staff so they can focus on passengers in need of personal assistance

TRACKING AND SORTING AT BHS

A Sortation Reader is used for sortation of RFID-tagged bags. It reads and singulates RFID bag tags and provides real-time license plate data to the baggage handling system to enable sortation based on RFID.

- Stand-alone or hybrid solution (RFID and barcode)
- Improve productivity and baggage handling capacity/utilization
- Reduces mishandling of baggage and enhance passenger satisfaction
- Simple and cost-effective implementation and operation

TRACKING AND RECONCILIATION AT LOADING

A Belt Loader Reader is an innovative and intelligent RFID reader designed to fit on a belt loader. It provides departure and arrival scanning of bags, as they are loaded into the aircraft. It is used by the ramp agent to verify "Positive Passenger Bag Match" and enables the agent to detect any misrouted bags.



Belt Loader Reader



- Enhance passenger satisfaction
- Increased safety and easy compliance with IATA Resolution 753
- Speed up reconciliation and take away manual scanning at airside
- Increase operational efficiency and reduce costs

TRACKING AT PIER, TRANSFER AND CLAIM

The Pier and Claim Reader scans RFID tagged baggage at Pier, Transfer and Claim and provides enriched information about the location of baggage. This information can be utilized in passenger services like baggage tracking applications, which assures passengers that their baggage has arrived at the final arrival airport.

- Enhance passenger satisfaction with real-time baggage location information
- Improved baggage handling quality
- End-to-end overview of the baggage journey

CHOOSING YOUR PARTNERS

As with the implementation of all technology, careful selection of all the components along with application and installation of the technology is key to success. This means working with companies experienced in the field, including integrators, label suppliers, reader vendors and system integrators. Getting these partnerships right is critical for meeting cost and delivery targets.

There are few companies with expertise in this area, and fewer with real experience and off-the-shelf products. Lyngsoe Systems has product and installation experience already in operations throughout the world.



CONCLUSION

The business case for adopting RFID is fairly straightforward. The advantages far outweigh any concerns over short-term investment, and even local or partial implementations can bring clear ROI and operational improvements. Furthermore, with the imminent introduction of IATA Resolution 753, acting now makes more sense than ever.

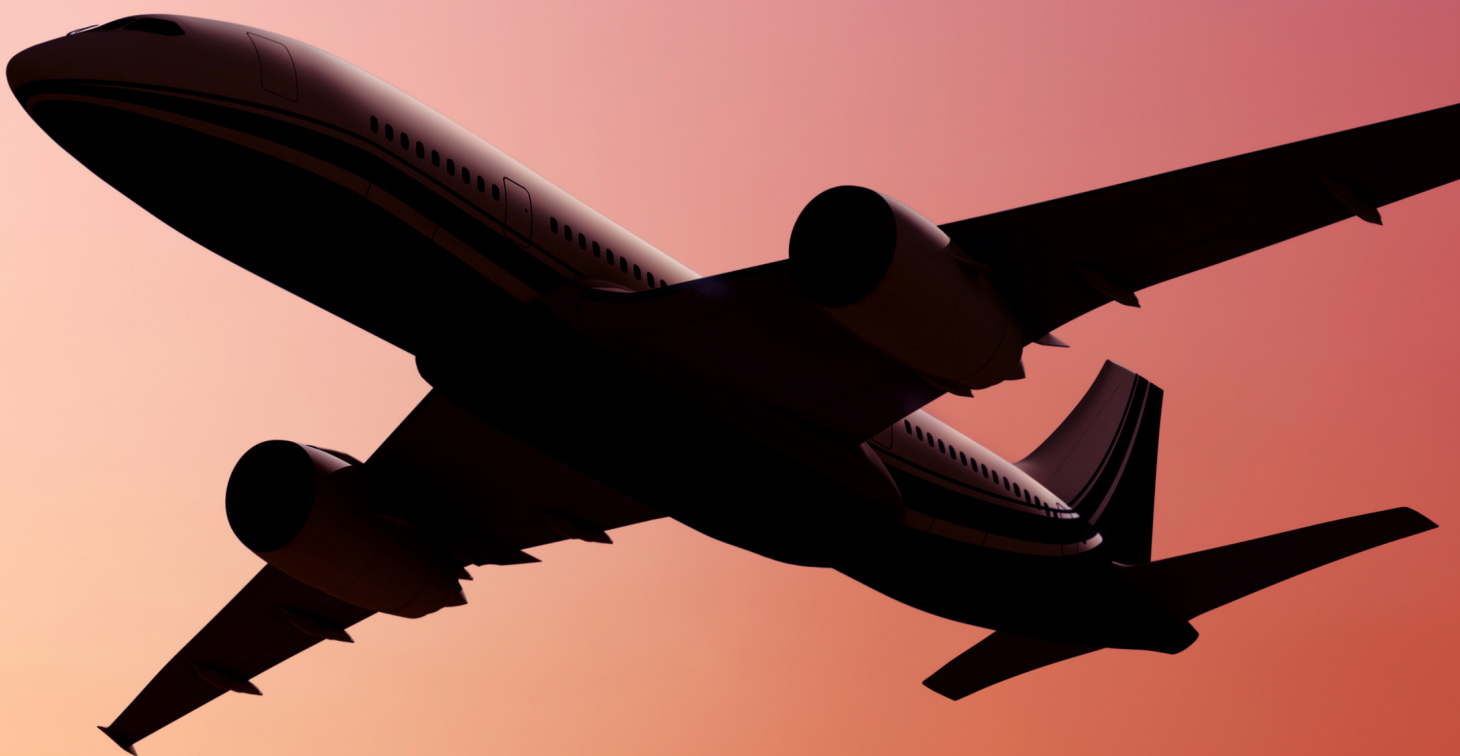
The goals of RFID implementation are to increase customer services, eliminate missorts, improve read rates and visibility, reduce maintenance costs and manual labor, reduce delivery delays to and from the aircraft, and perhaps most importantly, improve customer satisfaction. At a time when air travel has been hit economically and consumers only need to look on the internet for details about an airline or airport's performance, the need to improve customer service and build a brand known for that service is paramount to survival.

However, implementing RFID enabled tagging to track, trace, and control the travel of bags from ticket counter check-in to their final destination — even localized or partial implementation, does require careful planning, an in-depth understanding of baggage handling logic and controls, and a familiarity with the environment. Innovative improvement of the baggage handling process is a holistic task that requires a firm understanding of the business, organizational, technical, and political aspects of baggage handling. Communication between airport, handler, airline, and the leading providers of baggage handling systems is critical for process improvement success.

For more information about RFID-enabled baggage tracking, please contact Lyngsoe Systems.

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LYNGSOE SYSTEMS

Lyngsoe Systems is one of the world's leading software developers and systems integrators of logistics solutions for a wide range of complex logistics chain environments within the library, postal, supply chain and airport markets. We have been designing, installing and maintaining control and track-and-trace systems for more than 40 years and are leaders within the radio frequency identification (RFID) technology market.

With more than 3,700 installations worldwide in more than 60 countries, the Lyngsoe team demonstrates extensive customer process knowledge and advanced expertise within solution design, software development, integration, service and maintenance. In addition, we provide complete project management and consultancy services for our installations worldwide.

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