



Baggage Tracking RFID Solutions

Challenges in the Aviation industry

Today's airlines face a number of challenges that threaten customer retention levels and profitability — from sharp increases in competition to escalating operating costs. Competition is on the rise as new low cost airlines impact market segments. Low ticket prices are attracting many customers who were previously loyal to a specific airline, enabling low cost providers to gain extraordinary market share in a short time. The new low cost fares also cause unrelenting pressure on ticket prices, threatening already razor-thin profit margins. Operating costs are also on the rise. Fuel costs have increased more than 250 percent between 2003 and 2006, accounting for 26 percent of all operating costs in 2006.¹

In addition, more staff is required to handle the increase in the number of checked bags driven by new safety regulations and an increase in passenger volume, estimated at an approximate 5 percent per year.²

To combat rising costs and fare reductions, airlines are seeking to improve the efficiency of business processes. RFID is one technology that is increasingly being utilized to deliver dramatic efficiency improvements in one of the most critical areas of operations: baggage handling.

The high cost of mishandled baggage

The increasing growth in the number of air passengers and the resulting increase in checked baggage are straining the world's baggage handling infrastructure, as evidenced by major increases in reports of mishandled baggage across the globe. In Europe, the Association of European Airlines (AEA) reported that the incidence of mishandled bags has increased 14.6 percent — representing an additional 1.2 million bags reported missing on arrival. In the United States, baggage complaints have been on the rise since 2002. The US Department of Transportation has reported an increase from 3.84 mishandled bags per thousand enplaned passengers in 2002 to 6.73 in 2006 — an effective 75 percent increase over a four year period, representing an additional 2.3 million mishandled bags each year.³ And the opportunities for mishandled baggage are increasing, driven by a number of factors.

RFID bags big benefits

Motorola has conducted a number of pilots as well as four major implementations of RFID-based baggage tracking applications at some of the world's major airports. These deployments verify the many benefits of RFID in baggage handling:

- Over 20% improvement in increased throughput (compared to bar-code based systems)
- Virtual elimination of errors — over 99 percent accuracy (compared to 80 percent for a typical bar code-based system)
- Better on-time flight performance by reducing baggage-related delays
- Improved departure time management because of timely deposit and withdrawal of bags to and from planes
- Increased security
- Cost-effective compliance with security regulations — such as positive bag matching and screening proof
- Reduced labor costs
- Improved passenger satisfaction and retention



Leading airports all over the world are utilizing RFID tags to streamline baggage handling operations and improve customer service and loyalty.



RFID helps airlines ensure that the right bags are placed on the right plane at the right time by enabling positive identification of each and every bag prior to placing it on the conveyor for loading — without requiring any action at all from baggage handlers out on the tarmac. A mobile RFID reader, such as Motorola's RD5000, can be placed on the end of the conveyor, and baggage handlers armed with a mobile handheld computer can receive an instant alert if a bag destined for another flight is identified. In addition, if a passenger must de-plane or fails to board, news laws require the removal of the associated passenger bags. With handheld mobile RFID readers, baggage handlers can identify those bags in seconds, ensuring compliance with government regulations designed to protect passenger safety — and keeping the plane on schedule.

New cabin restrictions for carry-on baggage affect allowable bag size and bag contents (such as liquids and gels), forcing more travelers to check their baggage — and forcing airlines to add resources to handle the increase in bag volume. The effect of these new laws is documented in the 2007 North America Airports Satisfaction Study, which reported that 77 percent of passengers in the US now check bags, compared with 66 percent the prior year — an increase of 11 percent in just one year. Another factor is tighter turn-around and connection times. The reduction in the time between connecting flights increases the opportunity for error and mishandling, as the window for properly identifying and loading baggage onto connecting flights is decreased.

The cost of mishandled baggage is staggering. In 2006, approximately 34.3 million bags were mishandled globally, costing the airline industry US \$3.8B.³ And the problem is expected to grow. In 2006, the airline industry carried 2.2 billion passengers.⁴ Passenger volume is projected to increase to more than four billion by 2019,⁵ and at the current mishandled bag rate, will result in nearly

70 million mishandled bags per year. Since the cost of a mishandled bag is approximately \$130,¹⁰ airports can significantly reduce operational expenses by reducing the number of mishandled bags.

In addition to the hard costs associated with physically managing the mishandled baggage, a mishandled bag also causes customer frustration and delay, eroding customer satisfaction and loyalty — which can be associated with a specific airline as well as a specific airport.

The answer: streamline baggage management with RFID

RFID increases automation in baggage handling processes, significantly reducing the number of mishandled bags — and the associated costs. RFID provides real-time visibility into the whereabouts of passenger luggage, complete with invaluable cross-checks at every step of the bag's travels — all without any human intervention. And with RFID, everyone benefits — the airlines and passengers as well as airports (see Figure 1).

Figure 1

Airline benefits

RFID can provide:

- Faster connection times as a result of reduced mishandling errors.
- An increase in baggage processing productivity — the same staff can process more baggage more accurately.
- A reduction in operating costs due to more efficient use of employee time and a possible reduction in end-to-end flight times (which include the time the plane departs from the gate to the time the plane arrives at the gate). The more rapid loading of baggage could potentially allow planes to push back from the gate earlier. According to the International Air Transport Association (IATA), if airlines can save one minute per flight through better design, procedures or management, operating costs could potentially be reduced by as much as \$1 billion USD annually.⁶
- A significant improvement in customer satisfaction through the substantial reduction in baggage-handling errors. The error-proofing capabilities of RFID can enable airlines to potentially achieve 100 percent accuracy in baggage handling — allowing more bags to arrive at the right airport at the right time. And in the event of an exception, the track and trace capabilities inherent in RFID solutions provide the real-time location information needed to rapidly locate bags.
- A comprehensive audit trail to enable continuous improvement in baggage handling procedures, increasing security and reducing the opportunity for baggage theft.
- Cost-effective automated compliance with new safety regulations.

Airport benefits

With RFID, airports can:

- Improve brand positioning: The airport is more attractive to airlines, and public perception is improved through operational efficiency and increased security levels.
- Reduce operation costs: The volume of manual activities is reduced, improving worker productivity.
- Position the airport infrastructure to easily and cost-effectively accommodate future growth in passenger and checked baggage volumes because of higher throughput feasibility due to improved efficiency.
- Reduce minimum connection times (MCT) for transfer passengers at hub airports (if transfer baggage is handled with RFID)
- Improve theft protection: RFID can record the movement of each bag from the moment it is tagged at the curb or the ticket counter, providing additional protection against theft.
- Ensure compliance with new government safety regulations: RFID can automatically collect the data required to allow airports to easily monitor and ensure compliance with government regulations.
- Take advantage of an infrastructure capable of handling the increased baggage volumes today, as well as the significant increase anticipated in the near future.

Passenger benefits

With RFID, passengers enjoy better service:

- Bags arrive on time: The reduction in mishandled bags ensures that more passengers are reunited with their bags as expected, improving customer satisfaction and helping increase customer retention rates.
- More on-time departures: RFID can increase the number of timely departures by enabling more efficient loading of baggage onto the plane, as well as the rapid location and removal of any bags for passengers who are on the passenger manifest but not on the plane.
- Shorter connection times as a result of reduced mishandling errors.
- Improved safety: Compliance with government safety regulations improves the level of passenger safety by ensuring that bags associated with missing passengers are always removed prior to takeoff.
- Theft reduction: RFID can provide a real-time history of movement for any given piece of luggage, reducing the opportunities for theft.



The increase in passengers, checked baggage and new baggage-related government regulations are leading to a substantial increase in the number of bags that are mishandled each year, costing airlines billions of dollars — and lost customers. With RFID, airlines can address the six key issues that lead to mishandled baggage by enabling the automatic identification of bags at every step of their journey — from check-in to the luggage carousel at the passenger's destination — delivering benefits to both passengers and airlines. Passengers experience better service — bags consistently arrive in the right place at the right time, and in the event a passenger does not board or must de-plane, the ability to quickly locate and remove the baggage keeps the plane on schedule. And airlines enjoy greater profitability in the face of razor thin margins: the improvement in service leads to more loyal customers, improving sales; and RFID's automation leaves baggage handlers free to handle more luggage, improving staff utilization.

RFID streamlines every step of the baggage handling process

The logistical characteristics of the baggage handling process are very well suited to RFID, which can streamline the entire baggage handling process — from curb to curb:

Check-in: Curbside or airline ticket counter

Regardless of whether passengers utilize the curb-side check-in areas or the airline ticket counter inside the terminal, RFID printers enable the instant encoding of an information-rich RFID tag right on the spot — including required information, such as license plate number (LPN) containing flight information and any specific sortation directions. As the bags are placed on the conveyor to enter the baggage handling process, an RFID reader captures the tag information, documenting the start of the bag's journey.

Sortation

As bags move to conveyor belts, RFID readers interrogate and capture the available information

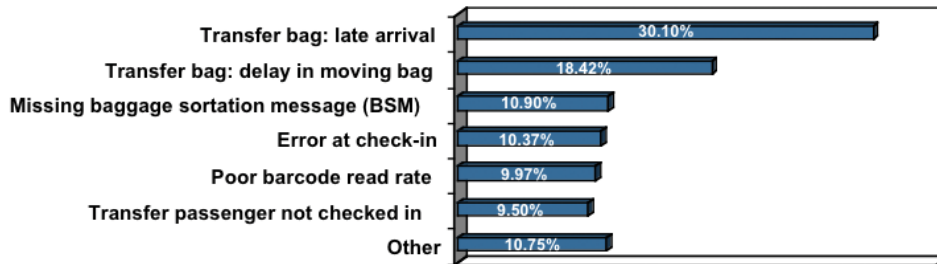
on the tag, providing the information needed to ensure delivery of the right bags to the right airline, the right flight and the right gate. This information is used to automatically direct the bags through proper sortation, reducing manual labor — as well as the errors and associated costs inherent in manual sortation procedures. In addition, RFID provides a valuable automated double check in the staging area: alarms or alerts are triggered if a bag is accidentally staged for loading on the wrong plane.

Routing

Throughout the routing process, RFID readers capture the location of bags at key checkpoints. The resulting real-time baggage location database helps identify luggage that needs priority treatment to ensure timely delivery to aircraft — for example, bags belonging to a passenger who arrived at the airport late, or when a late flight arrival leaves minimal transfer time for a connecting flight.

The six key issues that lead to baggage mishandling

Figure 2



Source: RFID Business Case for Baggage Tagging; International Air Transport Association (IATA); 2007

Delivery to planes

Out on the tarmac, RFID is still at work. Hardened cargo tags ensure that Unit Load Devices (ULDs) — the assets used to load luggage, freight and mail onto planes — are loaded onto the right trolley for delivery to the right plane. And a mobile RFID reader on a trolley can automatically and instantly reconcile the baggage in just seconds. Bags that might be incorrectly placed on the trolley are easily identified before the trolley leaves — eliminating the time and cost associated with returning the bag to the sortation center for proper routing — or returning a bag to its rightful owner in the event the bag did not reach the right plane prior to takeoff.

Exception management/positive bag matching

When a passenger has failed to board or must de-plane, new laws require their baggage to be removed from the plane before the plane can be cleared for takeoff. Handheld RFID readers allow workers to quickly and easily locate and remove the right bags, without the need to manually handle and scan the bar code on each individual bag.

Effectively address three of the six issues that lead to mishandled bags

According to an IATA survey, there are six key issues that lead to baggage mishandling (See Figure 2). RFID can help address three of these top six issues:

Transfer bag: late arrivals and the delay in moving bags

RFID can help airlines reduce the volume of bags that miss a connecting flight, due either to the late arrival of a flight or a delay in moving the bag to the connecting flight. When a flight arrives late, RFID can instantly identify any bags that require transfer to another flight. If the transfer flight has not yet left the ground, the bags can be marked for priority handling, helping to reduce the number of passengers who

The RFID-enabled Airport: Beyond Baggage Handling

The value of RFID in the aviation industry reaches well beyond baggage handling to deliver safety, customer service and efficiency improvements throughout operations. Additional uses for RFID in Aviation include:

Commercial cargo tracking: Enables granular real-time end-to-end tracking for all commercial cargo.

Asset and inventory management: RFID can provides real-time tracking of all assets for improved utilization, including trolleys and ULDs. Real-time visibility into inventory also helps ensure that spares are in stock and in hand when needed.

Authorization and Role-based Access: Tarmacs and other airport facilities have very specific access rules for personnel, equipment, assets and tools. Knowing exactly where mechanics and other resources are located at any point in time enables more efficient access enforcement, task management and staff utilization.

Maintenance, Repair & Overhaul (MRO): Real-time visibility of assets (spare parts, tools, etc.) passing through an MRO shop exposes issues and helps reduce costs and delays, and increases throughput, schedule adherence and security compliance.

arrive before their baggage. If the transfer flight has already left the ground, the automatic identification of the next appropriate flight helps minimize the delay between when passengers arrive and when they are reunited with their bags. And since RFID data is available in real time, the moment a passenger discovers that their baggage is missing, baggage management personnel can provide customers with the exact location of the bag, flight number and status as well as the estimated arrival time. And anytime the customer phones to check on the bag, workers can provide a real-time update at the press of a few keystrokes on a mobile or desktop computer.

Missing baggage sortation message (BSM)

In a typical non-RFID baggage handling process, a bar code on the luggage tag is associated with a record in the airline’s computer system that contains the baggage sortation message (BSM), which enables the proper routing of the bag. The BSM contains the flight information, and can also include the location of the sortation pier for that specific flight. A scan of the bar code tag allows the look up of the record to determine the proper sort for a given bag. With RFID, that same information can be included directly on the RFID tag — routing information is always available, eliminating the mishandling associated with missing BSMs. And the ability to include additional data on the RFID tag,

Case Study

The Costs of Mishandled Baggage

The following scenario illustrates the costs of mishandled baggage in a large international airport:

Number of bags per day	100,000
Number of mishandled bags	7 bags per thousand
Number of bags mishandled per day	100,000 bags x .007 bags lost = 700
Cost of a mishandled bag	\$100*
Cost of mishandled bags per day	700 bags mishandled per day x \$100 = \$70,000/day
Annual cost of mishandled bags	\$70,000/day x 365 days/yr = \$25.5+ million/year

* This is a more conservative figure than the industry average of \$130

While the above calculations illustrate the heavy financial impact of mishandled baggage, they do not factor in the cost of a dissatisfied customer — which can lead to a lost customer, lost revenues and negative word-of-mouth that can further erode the customer base and revenues.

In an industry already operating on thin margins and struggling to maintain profitability, RFID can have a significant impact. The ability to significantly reduce these losses improves overall profitability and your competitive edge.

such as passenger name and contact information, paves the way for new applications and improved customer services. For example, airlines could enable passengers to enroll in a real-time baggage alert program, enabling an automated text message to be sent to a customer's cell phone in the event a bag misses a connection — complete with flight number and arrival time. Customer service is improved — in the event of a mishandled bag, the airlines can notify the customer instantly, complete with real time updates, effectively reducing the volume of inquiries at the baggage claim help desk.

Poor bar code read rates

Poor bar code read rates can result from a variety of issues. Since bar code labels are image-based, they can be easily damaged and rendered unreadable due to scuffing, ink-bleeding, spills and more as the bags move through the baggage handling process. In addition, in an automated setting where bar code readers are capturing bar code information and the bags move down a conveyor, the bag may not be in a position where the bar code label is visible to the reader, or the bar code may not be presented at the proper angle to ensure an accurate read — both situations that require manual intervention in order to capture the bar code data.

Since RFID is a proximity technology (rather than an image-based, orientation sensitive technology), line of sight and label presentation angle are irrelevant. When RFID tags are within range of an RFID reader, the information embedded on the tag is instantly captured — the position of the tag is irrelevant. And since the data is on a computer chip, it is nearly impervious to the environmental damages that often prevent an accurate read on paper-based bar code labels. And the proof is in the results.

McCarran International Airport in Las Vegas, Nevada, was experiencing a 15 to 30 percent error rate in the scanning of bar coded luggage tags — primarily due to issues with the orientation of the bar code to the scanner. RFID has virtually eliminated the errors, delivering a 99.5 percent read rate.⁷ And Hong Kong International Airport, which moves over 47 million passengers⁸ and 110,000 pieces of baggage through its doors each day, achieves read rates of 97 percent with RFID, versus the 80 percent previously achieved with bar codes.⁹

Summary

When RFID is deployed in baggage handling operations, everyone benefits: airlines, passengers and airports. Airlines are better positioned to address increasing costs and competition by shaving errors and inefficiencies out of business processes and by improving customer service and customer loyalty. Customers enjoy more predictable arrival of baggage when and where it is expected, as well as more timely flight departures. And airports can better attract and retain airlines; enable airlines to globally track and trace baggage; improve public perceptions through improved passenger safety; and accommodate substantial increases in passenger and baggage volumes.

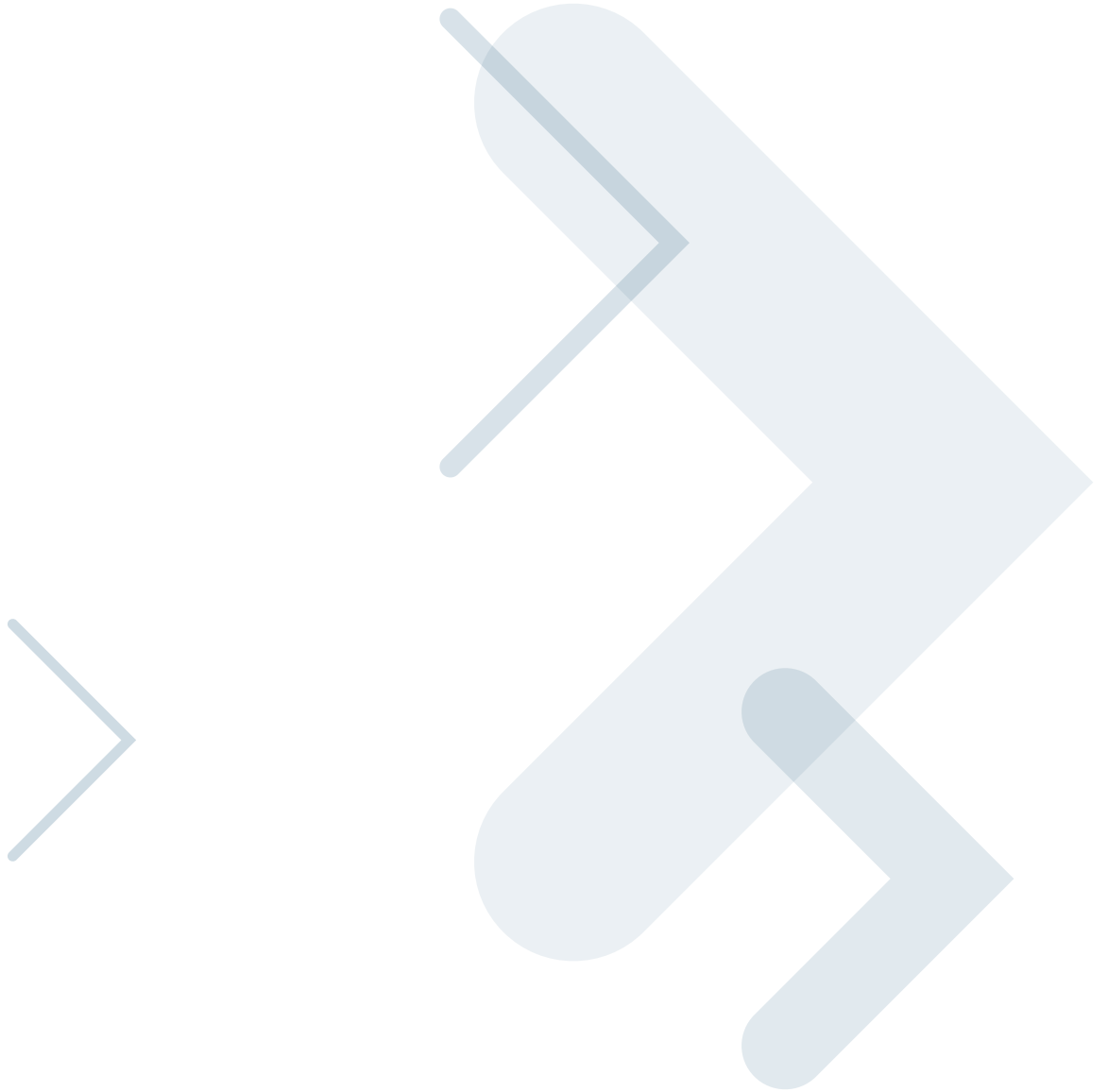
For more information on how RFID can make a difference in the your baggage handling operations, please visit us on the web at www.motorola.com/rfid or access our global directory at www.motorola.com/enterprisemobility/contactus

FOOTNOTES

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INDUSTRY BRIEF

BAGGAGE TRACKING RFID SOLUTIONS



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