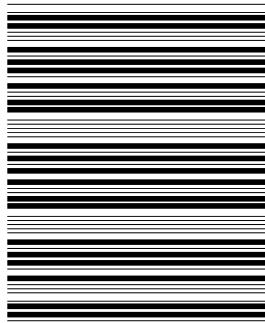
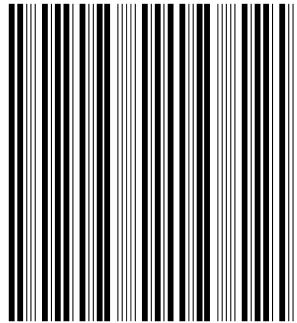


2017

AIR TRANSPORT INDUSTRY INSIGHTS
**THE BAGGAGE
REPORT**



In association with



FOREWORD

Air travel continues to transform our world – it will open up travel experiences, bring together families and friends and enable business for almost four billion people this year. The vast majority of these travelers will check in luggage. Ensuring that their bags arrive with them at their destination is a critical element of delivering excellent passenger experiences while keeping industry costs in check.

SITA WorldTracer® data shows that the number of mishandled bags and the rate of mishandled bags per thousand passengers reached a record low of 5.73 in 2016. However, the International Air Transport Association's Resolution 753 on bag tracking, which comes into effect in June 2018, promises to deliver major improvements in baggage services over and above the incremental improvement of recent years.

This digital transformation in baggage handling, supported by smart technology innovations, is under way. Airlines are gearing up to track every item of luggage, from start to finish, and to share that tracking information with all the partners who are involved in delivering those bags to and from the aircraft and back to passengers. SITA is working on several tracking innovations that will allow the air transport community to scale up their tracking capabilities without massive capital investments.

Successful technology transformation demands pan-industry cooperation and collaboration in order to positively impact the passenger experience. We all need to continually challenge ourselves to find new ways of working and sharing data to upgrade the experience for air travelers and to improve operations.

The air transport sector is highly competitive, yet it is united around the desire to radically improve the baggage experience. Airlines, airports, ground handlers and technology specialists, including SITA, are working together, with IATA, to support and ensure a new era of baggage handling.

Barbara Dalibard, CEO, SITA

**3.77
BILLION**
PASSENGERS
ENPLANED IN 2016

69.7%
CUT IN MISHANDLED
BAGS PER THOUSAND
PASSENGERS SINCE 2007

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TRACKING BAGS THROUGHOUT THE JOURNEY

Did you know...?

60%+

of airlines and airports implemented assisted bag-drop in 2016.

82%

of passengers surveyed in 2016 checked-in at least one bag for their last flight, the rest carried hand luggage.



BAGDROP

150+

airports worldwide have SITA BagManager installed.



BAGMESSAGE



BAGMANAGER

MAKE-UP

LOADING

SITA BagMessage distributed over

3.1bn

baggage service messages in 2016.



77%

of airlines expect IATA R753 will offer major benefits in improving customer satisfaction.

29%

of airlines plan to provide in-seat voice and SMS phone service by the end of 2019.

FLIGHT

UNLOADING



BAGJOURNEY

For as little as
US\$0.1
a RFID chip can be embedded
in a bag-tag and generate
savings of more than
US\$0.2 per passenger.



SCREENING



SORTING

Industry baggage
systems are expected
to handle over
4.5bn
bags in 2017.



SITA BagJourney
helps airlines comply
with IATA R753 by
providing a precise
picture of a bag's
current location.



SITA WorldTracer is
the number 1 global
baggage tracing service
in use at over
2,800
airports.



76%

of passengers are
interested in receiving
baggage location status
updates to their
smartphones.



WORLDTRACER



ARRIVALS

TRANSFERS

Bags return to screening area



of mishandled
bags occurred
during transfer
in 2016.



RFID can potentially
save the industry more than
US\$3bn

over the next seven years by
helping to reduce mishandling
during transfers.

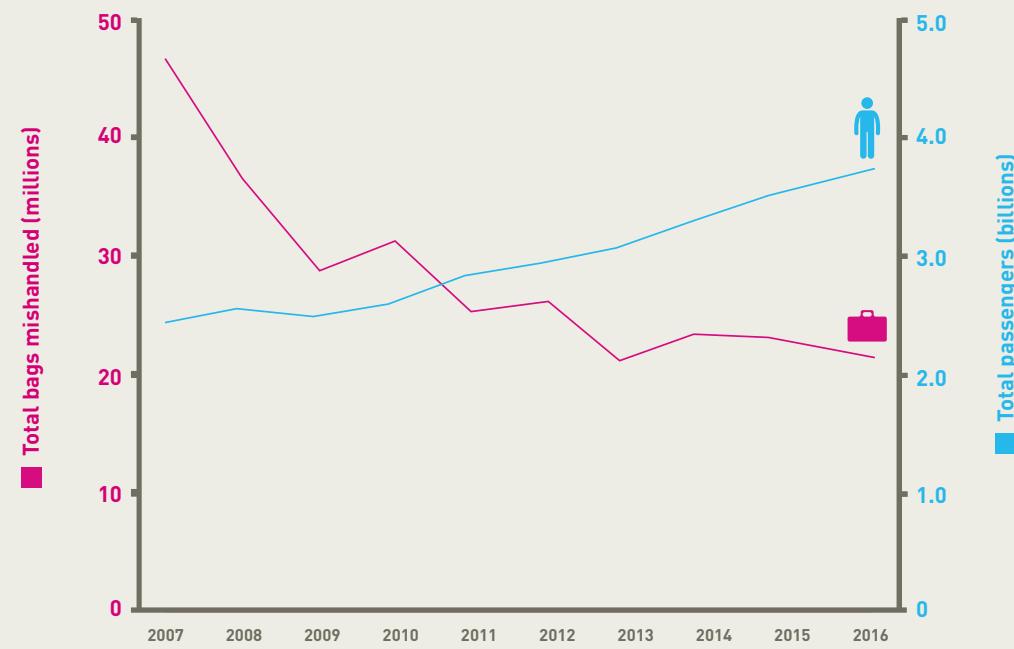
TRACKING BAGS THOUGHOUT THE JOURNEY

Preparations are under way across the air transport industry for a major step change in the way baggage is handled. Starting in June 2018 the International Air Transport Association (IATA) will require its member airlines, who represent 83% of total scheduled traffic, to keep track of every item of luggage, from start to finish. They will also be required to share that tracking information with all involved in delivering those bags back to passengers at their final destination. The intention is to improve customer service at a fundamental level and to drive down industry costs.

While the industry has made many improvements in bag handling in recent years, the number of passengers continues to rise rapidly. Almost four billion people are expected to fly this year, which suggests that the industry's baggage systems worldwide will handle more than 4.5 billion bags in 2017.¹ IATA's tracking requirement will do more than help the industry's regular incremental improvements in bag handling keep pace with that growth. It offers the potential to ensure that bags that are delayed or go missing will truly be a rarity.

As passengers progress from check-in, security and border control to gates and flights, their luggage undertakes an even more complex journey. Bags go through multiple changes in custody as they are transported to the aircraft. They are passed from check-in agents to the airport staff and their handling systems, security screeners, and ground handlers; a variety of partners who prepare flights and transport. Bags are loaded onto the aircraft for departure and then unloaded either for transfer to another flight or for delivery to the arrival belt. If that bag fails to arrive, the passenger's satisfaction with their flight experience is damaged. The cost to the industry to recover and reunite them with their bag is significant: the global bill was in the order of US\$2.1 billion in 2016.

+1.2BN PASSENGER GROWTH, WITH MISHANDLED BAGS RATE DECREASE



Source: SITA

GLOBAL PASSENGER LOAD FACTOR IN 2016:
80.5%





Under IATA's Resolution 753, airlines must demonstrate delivery or acquisition of baggage when custody changes; provide an inventory of bags upon departure of a flight; and be capable of exchanging this information with other airlines or their agents as needed.

There are four mandatory tracking points at which the bag, via its unique 10-digit bag-tag number, must be recorded: at check-in, when the passenger gives their bag to the airline; loading, when the bag is delivered onto the aircraft; transfer, when custody of the bag changes between carriers; and finally, at arrival, when the bag is delivered back to the passenger.

To prepare for Resolution 753, investment programs are under way across the industry: the 2016 Airline IT Trends Survey revealed that 74% of airlines were planning compliance projects as part of their IT&T investment programs.²

Among the airline baggage initiatives, the Star Alliance created a dedicated Alliance IT hub for baggage, which went into operation at the end of 2016. The aim is to help member airlines reduce the number of baggage issues. "While mishandling a bag is a relatively rare case in our Alliance, despite the fact that we carry almost 1.7 million passengers every day, when things do go wrong it is highly annoying to any customer affected," said Mark Schwab, Chief Executive Officer, Star Alliance. "We believe modern technology can be of tremendous assistance in significantly reducing the number of baggage issues and providing faster and more accurate information for our customer service agents. As ever, our ultimate goal is to provide the best possible service to our travelers."³

The airport community is also preparing to strengthen baggage IT. The majority plan to have business intelligence initiatives in place around their baggage operations by 2019 according to the Airport IT Trends Survey 2016.⁴ In addition, around half plan to implement Aviation Community Recommended Information Services (ACRIS) recommended practice for baggage. ACRIS provides a service-oriented architecture that enables airports, airlines, partners and suppliers to exchange and process data in a standardized way.⁵

RFID – THE TECH SOLUTION FOR THE WHOLE BAG JOURNEY?

Radio Frequency Identification (RFID) is not new – it is a proven technology that has been around for many years and is used everywhere from factory assembly lines to store labels. However, there is fresh interest in deploying RFID chips embedded in bag-tags as they can be used to accurately track passengers' bags in real-time across all the key points in the journey. RFID readers use radio waves to activate and capture the data stored on the RFID chip, so the license plate on the baggage tag can be read even when it is hidden under the bag, meaning bags do not need to be individually manipulated to be read. RFID readers can automate the process of capturing each tag in a pile of bags or in a container in a couple of seconds. This means that less bags are misread or not read at all and this results in fewer mishandled bags.

RFID TECHNOLOGY
COULD SAVE THE
INDUSTRY
US\$3bn
OVER SEVEN YEARS



By increasing the reading accuracy, RFID technology offers unparalleled improvements to track bags throughout their journey, in particular, on arrival and transfer. On the latter, RFID brings new ways to address mishandling during transfer from one flight to another, one of the key areas identified by SITA and IATA where technology could help improve baggage handling rates. This is because paper tags degrade during the journey through wear and tear, making them more difficult to read, whereas RFID chips do not.

SITA and IATA believe this technology has the potential to save the industry more than US\$3 billion over the next seven years by improving baggage management and operations. A sticking point has always been the cost of RFID tags, as these are based on volume and can be high for small-scale deployments. However, more widespread adoption will help drive down costs and the savings associated with RFID help to recover these costs quickly. In fact, SITA and IATA calculate that RFID capabilities can be deployed for as little as US\$0.1 per passenger on average, while generating expected savings of more than US\$0.2 per passenger.⁶

Delta Air Lines invested US\$50 million to deploy RFID at its 344 stations around the globe in 2016. The airline says that the initial deployments of RFID have ensured that bags are tracked at a 99.9 percent success rate. The end-to-end tracking data helps to ensure bags are properly routed and loaded onto the correct flights. Delta utilized RFID not only to track bags more effectively to meet Resolution 753, but also to improve the customer experience. It selected RFID technology to automate the data capture throughout the baggage processes because it is more accurate and more efficient.

Orlando International is the most recent airport to invest in RFID. Construction work is due to get under way later this year on the US\$1.8 billion South Terminal Complex Phase 1 Terminal C, which will feature a state-of-the-art baggage handling system that will offer 100 percent baggage tracking thanks to RFID. The airport says the system will have faster than conventional baggage conveyors; it will have a lower life-cycle cost; and its modularity will allow for future expansion.⁷

TRACKING INNOVATIONS

There are several technology innovations announced and in the pipeline that will support airlines and their partners fulfill the requirements of Resolution 753. One initiative in 2016 was the world's first image-based automatic tag reader that overcomes the limitations of laser-based baggage ID systems. The manufacturer, Cognex Corporation, which is a leader in machine vision, says its system has the ability to quickly and accurately read damaged tags, especially at transfer, when bag-tags frequently sustain damage from the airplane loading and unloading processes.⁸

SITA Lab and SITA product managers are working on several initiatives that will allow the air transport community to scale up their tracking capabilities without massive capital investments. On the data management side of things, these include the use of a central community repository platform to host all the individual bag tracking events in a shared environment. From this shared environment, tracking events collected in multiple airports from multiple stakeholders can be distributed to airlines' baggage systems or consumed over the platform web interface. They can obtain a list of bags on a flight (the bag manifest requested by IATA Resolution 753) or call up the tracking events for an individual bag investigation. SITA is also developing application program interfaces (APIs) to allow airlines to share tracking information with their passengers over their own mobile application.

To be fully Resolution 753 compliant, data capture is necessary and innovative solutions need to be considered to support it anytime and anywhere. SITA is working on making a mobile phone a portable bag-tag reader. A standard smart phone can be used as is, or inserted in a ruggedized case, and either its native camera, or an external scanner (Bluetooth) for better performance, scans the bag. The software will be a mobile app available from the iOS or Android app stores. All events tracked by this solution will be sent via 3G or WiFi network to the central community repository so that they can be accessed by all authorized stakeholders in the same way as existing baggage messages. This scanning solution will be autonomous and can be used during disruptions when bags may need to be stored and tracked outside of usual locations and, for smaller airlines and airports, used at transfer and arrivals.



88%
OF PASSENGERS ARE
HAPPY IF REUNITED
WITH THEIR LUGGAGE
WITHIN 10 MINUTES



GREATER CERTAINTY FOR BAG DELIVERY

Out of all the stages of the journey that are within the control of the air transport industry, bag collection is the one where passengers have the least positive emotions about their experiences⁹ and their emotions turn sour the longer they have to wait for their bags. According to the Passenger IT Trends Survey 2016, if passengers are reunited with their luggage within 10 minutes, 88% of them are happy.

Resolution 753's requirement for tracking bags at arrival will be a new element for many airlines and their airport partners – and an opportunity to improve the bag collection experience. The scanning arches that read bag-tag barcodes to route bags at high speed through the bag sortation system are over-engineered for an arrival belt. SITA is therefore working with industry partners on scanning arch technologies to be used at arrival that can read barcodes or RFID data, or to take pictures of bags that read the characters on the tags. These will provide the airport with performance metrics on when the first and last bags from a flight are loaded onto the arrival carousel.

One out-of-process circumstance is the delivery of mishandled bags, which must be returned to the passenger at their home or hotel. Airlines typically authorize a courier company to make these deliveries, but have little visibility about where the bag is during this process. SITA Lab is working on an API to fully integrate bag delivery services with the SITA WorldTracer® system (the only global tracing and matching baggage system). This will provide airlines with information on when the bag was picked up, scheduled for delivery and where the courier is on that delivery journey.

CONSUMER-FACING TRACKING SERVICES

While the industry prepares for Resolution 753, bag tracking services for passengers are increasingly in the spotlight. Luggage and communications specialists have been working on tracking beacons, smart tags and smart bag concepts over the past couple of years. Today though, few are capable of sending data to the airline. Even those solutions developed in partnership with an individual airline do not yet have the ability to share data with other airlines who may be involved in the passenger's and the bag's journey; or if the passenger travels with another airline other than the partner airline of the luggage company.

Meanwhile, airlines are moving the focus of their upcoming mobile notification services to baggage. Delta was first to offer bag tracking information via its mobile app back in 2011 and this service was upgraded in 2016 to provide customers at its 84 domestic airports with a map view of the journey undertaken by their bags. A few other airlines have followed, including American Airlines, which made changes to its web and mobile app in 2015 to allow customers to track their bags at key journey stages and is planning more bag alerts in 2017. However, by 2019, the majority of airlines plan to provide missing bag communications, real-time bag status information, and baggage location status updates to passengers' smartphones and tablets.¹⁰

"This transparency has become the customer expectation in the real-time world that we live in. I only see it growing from here to include even more information and an opportunity for our customers to interact with American Airlines in new ways," says Mark Matthews, Director, Customer Planning Operations, American Airlines.

As baggage tracking takes a higher profile within the industry and among passengers, it opens the door for IT disruptors and for aviation outsiders to come up with smart baggage solutions. Industrial Internet Consortium members GE Digital, M2Mi, and Oracle, supported by integration specialist InfoSys, are leading a new airline and passenger testbed: Smart Airline Baggage Management. This testbed aims to reduce the instances of delayed, damaged and lost bags. The project will also address the baggage requirements of Resolution 753.



The Smart Airline Baggage Management testbed, which is part of a broader aviation ecosystem vision, is also intended to increase the ability to report on baggage, including location information to prevent theft and loss; and to improve customer satisfaction through better communication, including new value-added services to frequent flyers.¹¹

Elsewhere, RFID tracking appears to have Uber considering the potential to provide travelers with reassurance, while freeing them from the need to wait at the carousel. APEX Experience magazine drew attention to a 2016 conference speech by Russell Dicker, Uber Head of Airport Experiences, in which he outlined a blueprint for Uber Luggage, a bag delivery service that would leverage the company's existing network of cars and drivers.¹²

BAGGAGE TRACKING PERSPECTIVES

THE AIRPORT: VÁCLAV HAVEL AIRPORT PRAGUE

"From our perspective, involving all our stakeholders is the most crucial aspect of implementing IATA Resolution 753. We are working in close cooperation with Prague Airport Operations Control and airlines to prepare a functional and solid solution.

"First, we plan to analyze the requirement of those airlines operating from Václav Havel Airport Prague. This will be crucial to understanding their needs and their approach to Resolution 753. Based on that, we can build a common-use solution together to cover all mandatory tracking points and provide data exchanges among all stakeholders.

"We use a baggage reconciliation system and an automated baggage handling system across the baggage handling process. Our baggage handling system supports multiple tracking points, but we have to check what data exchange is preferred by our airlines.

"We are closely monitoring all Resolution 753 mandatory tracking points. We are aware of, and analyze, the challenge of the arrival scanning and transfer bags tracking. In the past, we did some tests with manual arrival scanning, which brings some additional work for ground handlers.

"In 2015, we took part in the 'Hand-to-Hand RFID Baggage Tracking System' pilot organized by Longest Chance, and overseen by IATA. This jointly involved Aeroflot and its flights from Moscow Sheremetyevo Airport to Prague, Bologna, and Tallinn Airports. The goal was to demonstrate the capabilities of RFID baggage tracking to improve the quality and read-rates in the baggage handling operations.

"The benefits of RFID were proven, the read-rate was sufficient, but we do not see other airlines, apart from Delta Air Lines, adopting RFID. And it is obvious that the support of airlines is a crucial factor for success, as this activity has to be driven by airlines and not by airports.

"Currently, we are planning to test automatic bag-tag readers. We want to verify the read-rate of the devices on arrival and test the back-end solutions for the data exchange.

"The challenge is to ensure that the provided solution is suitable for all operating carriers in terms of their requirements and from the data exchange perspective. The opportunity is to continue with baggage data sharing across the aviation industry. This may lead to further benefits for all parties involved in the process, and improve their services to passengers during the travel journey."

**Stanislav Lukáš, Manager ICT Airport Operations Systems,
Václav Havel Airport Prague**



THE AIRLINE: AMERICAN AIRLINES

American Airlines began work on its own baggage reconciliation system in 2008 and since then has added in features and complimentary applications allowing it to track bags from check-in, including off-site, to customer delivery. Most of these applications are operated via handheld devices deployed to every airport where American Airlines operates worldwide.

"We are capturing more data around baggage than we ever have in our past and we are finding even more ways to use that data to become more efficient, and enhance the customer and the employee experience. The power of mobile computing, geo-locations and real-time data is enabling American Airlines to generate information that just a few years ago seemed like science fiction. Artificial Intelligence and machine learning are just beginning to find ways to take baggage handling to the next level.

"Regardless of who owns the airport infrastructure, we prioritize bag system data. When our customer passes through London or Tokyo, we need the ability to monitor the journey that their baggage takes to ensure that our employees can respond to the exceptions that occur. We use this information to provide real-time data to our teams not only in these airports, but to down-line airports that will eventually be handling these bags.

"The data that is captured from each scan is used to feed applications our employees are using for real-time baggage tracking. We have an application that uses the data to determine the most optimum route for a baggage transfer driver to deliver transfer baggage either to the tail or to the baggage handling system, on devices that are mounted in baggage tractors. They are not only using the data, but they are providing data as well; information such as which driver

has the bag, what route they are taking, where they are in the delivery process. Our Ramp Operations Center uses that information to make decisions about connecting baggage and when to request for a flight to be held for baggage or when additional resources may need to be assigned. We also have the opportunity to share that data with our customers so that they have a more real-time view of their bag's progress, including more dynamic, and personal, service recovery options when things do not go as planned.

"When we began scanning in the baggage make-up areas it really enabled us to move back the baggage timeline, so 30 minutes before departure we can see if a bag is in jeopardy of not making it on board and dispatch a rescue operation.

"The data and the applications that our teams have developed have enabled us to change the way we monitor baggage transiting a hub. Historically, we were focusing on arriving flights and making sure that adequate resources were assigned. We still do that, but now we are also tracking each individual bag to ensure that it is on track to get where it needs to go.

"In 2016, American Airlines had improvement across almost every "Reason for Loss" code. In September, October, and again in November of 2016, we set mishandled bag rate records for the New American (American Airlines merged with US Airways). We surpassed that record again in February of this year and we expect to continue to set records in 2017 as we continue to enhance our technology, our processes and provide even better tools for our employees."

**Mark Matthews, Director,
Customer Planning Operations,
American Airlines**



THE BUSINESS CASE FOR TRACKING

Over the decade 2007–2016, baggage mishandling cost the air transport industry over US\$27bn, which makes a compelling case for IATA Resolution 753 to deploy bag tracking throughout the journey. Every passenger wants to arrive at their destination without the stress of their luggage being delayed, which is a big customer satisfaction win for IATA's airline members. However, IATA has also identified other opportunities for the air transport sector to benefit from tracking, including reducing fraud, enabling proactive reporting, speeding up aircraft readiness for departure and facilitating the automation of baggage processes.

Most airlines believe that the greatest benefit from complying with the resolution will be improved satisfaction among their passengers and the ability to provide their customers with more accurate and timely information about their bags.¹³ They have the incentive that there is already a receptive audience waiting for new baggage services to be delivered to their smartphones and tablets. The majority of passengers say they would definitely use bag update notifications, report a mishandled bag via a mobile phone, and receive bag collection information if these services were available on their next trip.¹⁴

There is also broad consensus among airlines that Resolution 753 will deliver cost savings by reducing the number of mishandled bags; improve the baggage handling performance of all parties involved, improve efficiency for arrival bag handling, and improve mishandled bag rates.¹⁵

If these incentives are not enough, there is regulatory encouragement coming in one region. In the USA the Department of Transportation issued an Advance Notice of Proposed Rulemaking, in October 2016, which will ultimately result in a requirement that airlines refund consumers' baggage fees when their luggage is substantially delayed. In addition, airlines will have to provide the Department of Transportation with their total number of mishandled bags and total number of checked bags. Previously, they were only required to report the number of mishandled baggage reports, which were compared to the overall number of travelers. The aim is to ensure passengers are better informed about the likelihood that their bag will arrive with them.

However, the industry's journey to implementation of Resolution 753 will not be without challenges. Broadly, three out of five airlines foresee issues to be addressed in relation to lack of understanding of the potential investment and ongoing costs required; lack of collaboration with key airports to determine plans; and lack of awareness of airport readiness.¹⁶

BAGGAGE
MISHANDLING IN
2007-2016 COST THE
INDUSTRY

US\$27bn





BUSINESS CASE PERSPECTIVES

THE AIRPORT: FRANKFURT INTERNATIONAL

German airport operator Fraport has been tracking bags for 20 plus years and today uses a combination of laser scanners, imagery and RFID. Fraport is also testing Optical Character Recognition, with all readers linked into its baggage sortation, management and reconciliation systems. "If we handle a bag in our system environment and take responsibility for a bag, we scan it," says Markus Mueller, Senior Manager, Baggage Infrastructure.

"We meet all requirements for Resolution 753 within the baggage infrastructure and we have already started roll-out with some airlines. Just a few arrival carousels are currently still not equipped with integrated readers. We started roll-out on some arrival belts two years ago, but interrupted the roll-out to develop a new concept that will be smaller and provide a better read-rate. We will finalize the roll-out in 2018, the biggest challenge being the installation of additional readers within the existing arrivals infrastructure where there is not enough or no space. Until this has been solved, we may use our own hand scanners as an interim solution.

TRACKING DATA IS THE BASIS FOR ANALYZING MISHANDLING REASONS... AND ONLY ONCE YOU KNOW THE PROBLEM AND THE REASON, CAN YOU CHANGE IT.

"We have been sharing data with some of our partners for many years, not only for statistics, but also for operations, for example direct services for short connections. With Resolution 753 we hope to get more detailed information from airlines and origin stations that will help us to maintain and improve our common performance together with our customer.

"It is very important for us to provide an airport common-use infrastructure that fulfills the requirements of Resolution 753. The most unfavorable case for an airport like Frankfurt, or any ground handler, would be to use 20-50 or more different scanner devices from different airlines. That would be impossible to handle without deep impacts on performance and workload for our employees.

"As we already have many tracking points, we didn't start at zero. The investment for additional readers and IT enhancements are depreciable over several years. Our airline customers will get a great service and will save a lot of money rather than invest in their own scanners.

"On the IT side, we have to do some customer-specific changes in our Message Generator. We participate in the IATA Baggage Working Group to upgrade the RP1745 standard for Resolution 753. We will have to modify our Message Generator again, if the standard is completed. Also, we have to talk with each airline to assist their Resolution 753 rollout.

"Airports and ground handlers will become completely transparent. We are not afraid of that transparency, but we know that each airport, ground handler and airline is different. This diversity of airports and processes around the globe and the mass of data will lead inevitably to more misinterpretation and misunderstandings. That has to be avoided. It will be a lot of work to make that new transparency understandable and useful worldwide.

"Tracking data is the basis for analyzing mishandling reasons...and only once you know the problem and the reason, can you change it."

**Markus Mueller, Senior Manager,
Baggage Infrastructure, Fraport**

THE AIRLINE: DELTA AIR LINES

In 2016 Delta Air Lines replaced barcode hand scanning with RFID tracking technology, marking a historic shift for the carrier and the 120 million bags it handles annually. Delta deployed 4,600 scanners, installed 3,800 RFID bag-tag printers and integrated 600 pier and claim readers to enable hands-free scanning of baggage throughout the handling process. Throughout 84 of Delta's largest stations are 1,500 belt loaders with sensors that flash green when a bag is being loaded onto the correct aircraft or red when the bag requires additional handling. RFID chip bag-tags and tracking technology also enable Delta to provide its passengers with live push notifications from critical points along their bag's journey.

"Baggage tracking and real-time visibility to the status of your bag is core to the customer journey. We invested US\$50 million in RFID technology because we wanted to provide a consistent, accurate and reliable baggage tracking experience to our customers.

"Our Safetrac Baggage Reconciliation System provides us with a standard set of tracking events around the world. Mobile technology enables Delta to deploy our proprietary technology and processes which provide consistent bag tracking on all domestic and international routes. The global deployment of Safetrac and RFID has provided us with tracking events above and beyond the minimum set required by Resolution 753. The increase in tracking events and the reliability of the data has allowed us to create a fully transparent and interactive baggage tracking experience as well as provided efficiencies and helped to improve our handling performance.

"Prior to the RFID initiative we evaluated several technology solutions. RFID was the most effective and cost efficient platform to provide automated tracking throughout the baggage process. It provides additional capabilities above and beyond technologies that require line of sight to the baggage tag. RFID is highly accurate and the most efficient way to track bags throughout the end-to-end journey.

**RFID TECHNOLOGY
PROVIDES A
RELIABLE BAGGAGE
TRACKING
EXPERIENCE TO OUR
CUSTOMERS**



"Moving forward we will continue to expand and develop our Safetrac baggage tracking application and expand our RFID infrastructure to improve handling and the customer experience.

"The industry adoption of IATA Resolution 753 will drive investments by airlines and airports. At the industry level there is a tremendous opportunity to reduce costs and improve handling performance by leveraging RFID in a common-use terminal equipment (CUTE) environment to enable automated tracking of bags. The increased volume of tracking events and exchange of data between airlines and airports will only further improve the passenger experience."

David Hosford, General Manager – Below Wing Strategy and Technology, Delta Air Lines

INDUSTRY COLLABORATION



AIRPORTS ARE INVESTING TO SUPPORT AIRLINE PARTNERS

"Airports worldwide have invested in systems for baggage handling and central baggage reconciliation. These systems are designed to efficiently manage traceability routing and baggage flows through a set of WiFi mobile terminal equipment. Most airports are equipped with these systems and work closely with airlines to manage baggage. Through the Airports Council International (ACI) World Facilitation and Services Standing Committee, ACI is looking to implement solutions and processes that can facilitate the handling and tracking of baggage. ACI supports IATA's Resolution 753 on baggage tracking and the collaboration of airports and airlines in developments to reduce the number of mishandled baggage. While airports are not required to comply with the Resolution 753, ACI encourages its members to invest in baggage and network infrastructure to meet the requirements of this resolution."

Angela Gittens, Director General, Airports Council International World

IATA AND END-TO-END BAGGAGE

"In line with the Simplifying the Business aims of having freedom of transport for the airline and total visibility for the passenger, and continuing our commitments to more efficient and hassle-free baggage, the new End-to-End Baggage Capability (eBC) has been developed to build common capabilities in every member airline. The major areas of capability development are tracking and message modernization:

- **Tracking**

Resolution 753 – tracking of bags at four key journey points – becomes effective June 2018. IATA has developed regional workshops and a complete implementation guide for tracking to assist our members and is establishing an industry baseline against which progress may be measured from 2018. In addition, reviews of capability are being undertaken to speed airline readiness for tracking. Compliance with 753 enables the airline to provide visibility to the passenger for the baggage journey should the airline wish to offer this service.

- **Message Modernization**

The cost of baggage messaging is high, due to factors such as legacy system support. To address this, messaging is being modernized. The baggage area is integrated into the Aviation Industry Data Model (AIDM) and the Passenger and Airport Data Interchange Standards (PADIS) Board has approved the first release of the new messaging standard. Pilots are underway to test systems using baggage brokers and XML messaging, allowing modern, secure and low-cost messaging to be introduced. There will be a live operational trial during 2017."

Andrew Price, Head of Global Baggage Operations, IATA

COMPETITION AND BAG DATA COLLABORATION GO HAND-IN-HAND

"Competition in the airline industry has never been so intense: traditional flag carriers are having their market dominance eroded by newer airlines and by low cost carriers. Baggage is an important part of the offer for all airlines, whether they are competing for passengers by offering cheaper air fares with baggage for an additional fee; including baggage in the ticket price as a value-added service; or providing more baggage self-service from check-in to tracking. Airports too are competing heavily for airline customers and their passengers.

"Yet collaboration on baggage tracking data between these competing organizations is vital to create long-lasting improvements to industry operations and to ensure real benefits for passengers. Everyone wins if we share data about the location of passengers' bags more effectively. This is the spirit of the IATA Passenger Conferences Manual, Resolution 753.

"In February 2017 the Baggage Working Group, whose contributors span airline alliances, airports and multiple vendors, completed the Implementation Guide to Resolution 753. This offers support on how to work together to capture baggage tracking data; manage it effectively while not misusing it; and exchange where agreements exist for the benefit of all parties involved in the transportation of passengers' bags. This will reduce mishandling and ultimately improve the experience for all passengers."

Peter Drummond, Portfolio Director, Baggage, SITA



2016 BAG HANDLING PERFORMANCE IN DEPTH

THE GLOBAL PICTURE

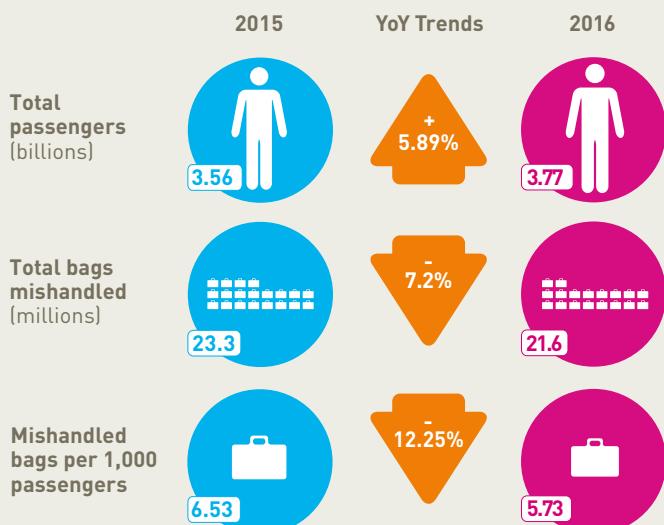
2016 proved to be one of the best years ever for air travel. IATA revealed that airlines carried a record 3.77 billion passengers during the year, buoyed up by 700 new routes and a US\$44 fall in average return fares.¹⁷

Furthermore, IATA expects the industry to achieve a profit of US\$35.6 billion in 2016, which it says will be the “highest absolute profit generated by the airline industry”. While IATA predicts that rising oil prices will make conditions a little more difficult in 2017, the outlook continues to be positive, with forecast earnings of US\$29.8 billion. “That’s a very soft landing and safely in profitable territory. These three years are the best performance in the industry’s history—irrespective of the many uncertainties we face,” said Alexandre de Juniac, IATA’s Director General and Chief Executive Officer.¹⁸

Against this backdrop of expansion and rising passenger numbers, SITA WorldTracer® data reveals that the total number of mishandled bags fell to 21.6 million in 2016. This represents a 7.2% decrease on 2015’s total of 23.3 million bags. The year saw a 12.25% improvement on the overall mishandling rate, which dropped to 5.73 mishandled bags per thousand passengers in 2016.

The overall cost of mishandled bags to the industry in 2016 was US\$ 2.1 billion (down from US\$2.3 billion in 2015). The longer-term baggage performance over the last decade is even more robust. Since the 2007 peak of 46.9 million mishandled bags, passenger numbers have increased by 52.1%, while the mishandling rate per thousand passengers has plummeted 69.7%. Overall, the aviation industry has almost halved its annual mishandling cost in this period from US\$4.22bn to US\$2.1bn.

7.2% REDUCTION IN MISHANDED BAGS



Source: SITA

2007-2016: PERFORMANCE IMPROVEMENTS



Source: SITA





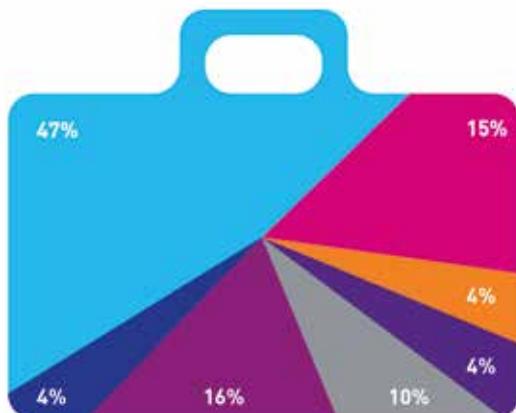
REASONS FOR DELAYED BAGS IN 2016

When passengers and their luggage need to move from one aircraft to another, or from one carrier to another, it can create a critical pinch-point in the bag handling process, particularly if connections are tight. In 2016 10.2 million of these transfer bags were mishandled. They represent the majority – 47% – of all delayed bags, broadly in line with 2015.

Failure to load accounted for 16% of all delayed bags, while ticketing errors, bag switches, security issues and other problems accounted for 15%, which is an improvement on 19% in 2015.

Overall, delayed bags accounted for 77% of all mishandled bags in 2016, while 16% were damaged or pilfered and 7% were lost or stolen.

REASONS FOR DELAYED BAGS IN 2016

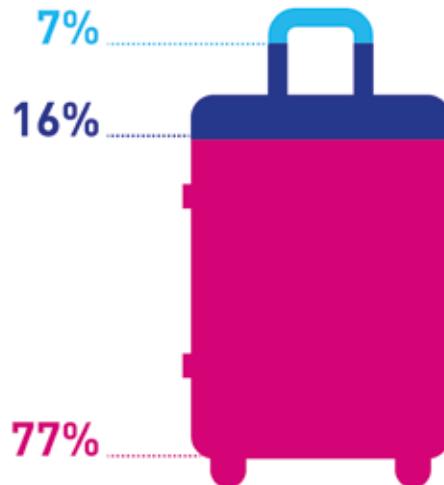


10.2 million transfer bags mishandled in 2016

- Transfer mishandling
- Ticketing error/Bag switch/Security/Other
- Loading error
- Arrival mishandling
- Airport/Customs/Weather/Space-weight restriction
- Failure to load
- Tagging error

Source SITA

2016 DELAYED, DAMAGED OR LOST BAGS



- Lost/Stolen bags
- Damaged/Pilfered bags
- Delayed bags

Source SITA

REGIONAL INSIGHTS

Airlines in the US and Asia Pacific regions both reported bag mishandling rates convincingly below the global average of 5.73 mishandled bags per thousand passengers in 2016. Using smart technologies has been one of the keys to success in both regions.

In Europe, SITA WorldTracer® data reveals that the mishandling rate in 2016 was higher than the global average, at 8.06 mishandled bags per thousand passengers. While baggage performance in Europe has declined on 2015, when the mishandling rate was 7.82 bags per thousand passengers, the longer-term trend is one of robust improvement. Europe has achieved a 51% reduction in its mishandling rate since 2007 when it stood at 16.60 bags per thousand passengers.

ASIA PACIFIC

Carriers in Asia Pacific reported mishandling rates at 1.81 bags per 1,000 passengers in 2016, a 2.3% decrease compared to the previous year, according to the Association of Asia Pacific Airlines (AAPA). This improvement was attributable to the increased utilization of advanced technologies in baggage

handling systems, which led to better airport operational efficiency. Nonetheless, the AAPA notes that airports in the region still need to ensure that airport infrastructure and operation systems keep pace with the robust growth in passenger demand.

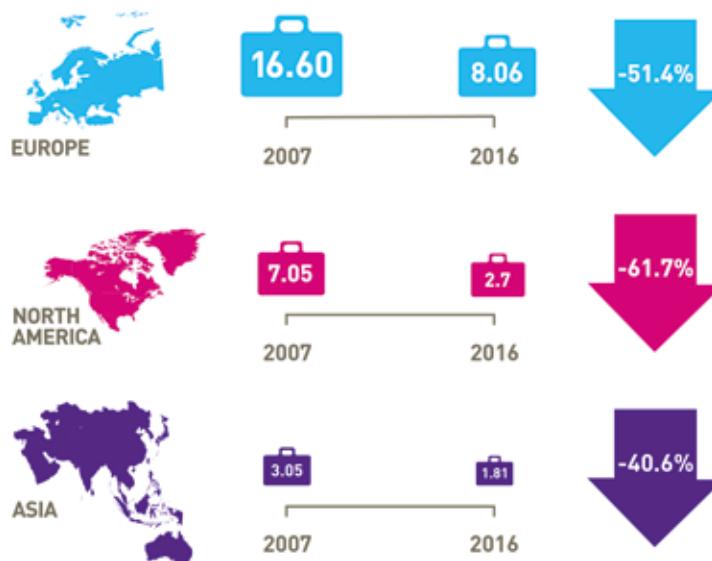
Overall, mishandling baggage rates of the region's carriers have been relatively stable over the past four years, and well below the global average, while the number of passengers carried grew by a CAGR of 7.2% per annum during the same period.

USA

"In 2016, US airline investments in staffing, systems, ground equipment and airports continued to pay off as the Department of Transportation mishandled bag rate fell to an all-time low of 2.7 reports per 1,000 domestic passengers. That translated into a 99.73 percent success rate. Mishandling often occurs at connecting hubs, and airlines have concentrated their efforts there to minimize disruption. They are also continuing to deploy technology to track bags from origin to destination."

**John Heimlich, Vice President & Chief Economist,
Airlines for America**

IMPROVING LONG TERM REGIONAL TRENDS



Data sources:
Europe: 2007 - 2013 Association of European Airlines, 2014 - 2016 SITA.
North America: Airlines for America.
Asia: Association of Asia Pacific Airlines.

APPENDIX

METHODOLOGY

In 2016, SITA updated its methodology to apply a weighting system, based on IATA passenger traffic statistics, to its WorldTracer data in order to calculate the baggage mishandling rates. This weighting ensures that the results are a representative sample in relation to global passenger traffic and compensates for annual fluctuations. Backward comparison with results published pre-2016 should be undertaken with caution.

This report uses IATA's forecast passenger total for 2016 in the analysis of 2016 baggage handling performance data. For year-on-year performance comparisons with 2015, passenger numbers and related bag handling statistics have been updated since last year's report to reflect confirmed IATA passenger data for 2015.



NOTES

1. The estimate of 4.51 billion bags is based on IATA Economic 2016 End of Year Report, which forecast 3.96 billion passengers in 2017 and the 2016 Passenger IT Trends Survey, which reports a global average of 1.14 pieces of luggage per passenger are checked in.
2. SITA Airline IT Trends Survey 2016: 24% of airlines are planning major projects to enable compliance with Resolution 753 tracking requirements as part of their IT&T investment programs over the next three years: 50% are planning pilots; and 26% have no plans.
3. Star Alliance: Star Alliance determines next steps in service enhancement, press release issued 6 June 2016.
4. SITA Airport IT Trends Survey 2016: 22% of airports already have business intelligence (BI) initiatives in place around their baggage operations; and 48% plan to implement them by the end of 2019.
5. SITA Airport IT Trends Survey 2016: 52% of airports plan to implement ACRIS recommended practice for baggage by end of 2019.
6. RFID for Bag Tracking Business Case 2017, published by SITA and IATA, October 2016.
7. Orlando International Airport: Development of the south terminal complex reaches next design benchmark, press release issued 10 February 2017.
8. Cognex Corporation: Cognex Introduces Industry's First Image-based Airport Baggage Handling Identification Solution, press release issued 20 April 2016.
9. SITA Passenger IT Trends Survey 2016: 25% of passengers have negative emotions at bag collection.
10. SITA Airline IT Trends Survey 2016: by 2019 72% of airlines plan to provide missing bag communications to passenger smartphone/tablets; 71% plan to provide real-time bag status info to passengers; and 66% plan to provide baggage location status updates.
11. Industrial Internet Consortium: Industrial Internet Consortium announces Smart Airline Baggage Management testbed, press release issued 7 June 2016.
12. Baggage's Baggage: From Checked Bag Fees to RFID Tracking, by Katie Sehl, published 2 December 2016, APEX Experience. See more at: <http://apex.aero/2016/12/02/baggage-checked-fees-rfid-tracking>
13. SITA Airline IT Trends Survey 2016: 77% of airlines say improving customer satisfaction will be a major business benefit; 61% say more accurate and timely bag information for passengers.
14. SITA Passenger IT Trends Survey 2016: 76% of passengers would definitely use bag update notifications, 65% would definitely use the ability to report a mishandled bag via mobile and 62% receiving bag collection information.
15. SITA Airline IT Trends Survey 2017: 96% of airlines say that Resolution 753 will deliver cost savings from mishandled bags; 96% also say it will improve the baggage handling performance of all parties involved; 94% says it will improve efficiency for arrivals bag handling; and 93% say it will reduce mishandled baggage rates.
16. SITA Airline IT Trends Survey 2016: A major challenge to compliance with Resolution 753 for 43% of airlines is lack of understanding of the potential investment/ongoing costs required; 39% say lack of collaboration with key airports to determine plans; and 37% say lack of awareness of airport readiness.
17. IATA: Another Strong Year for Air Travel Demand in 2016, press release issued 2 February 2017.
18. IATA: Another Strong Year for Airline Profits in 2017, press release issued 8 December 2016.

5.73
**MISHANDLED BAGS
PER THOUSAND
PASSENGERS IN 2016**





SITA AT A GLANCE

SITA transforms air travel through technology - for airlines, at airports and on aircraft.

- Our vision is to be the chosen technology partner of the industry, a position we will attain through flawless customer service and a unique portfolio of IT and communications solutions that covers the industry's every need 24/7.
- We are the innovators of the industry. Our experts and developers keep it fuelled with a constant stream of ground-breaking products and solutions. We are the ones who see the potential in the latest technology and put it to work.
- Our customers include airlines, airports, GDSs and governments. We work with about 400 air transport industry members and 2,800 customers in over 200 countries and territories.
- We are open, energetic and committed. We work in collaboration with our partners and customers to ensure we are always delivering the most effective, most efficient solutions.
- We own and operate the world's most extensive communications network. It's the vital asset that keeps the global air transport industry connected.
- We are 100% owned by the air transport industry – a unique status that enables us to understand and respond to its needs better than anyone.
- Our annual IT surveys for airlines, airports and passenger self-service are industry-renowned and the only ones of their kind.
- In 2016, we had consolidated revenues of US\$1.5 billion.

For further information, please visit www.sita.aero



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