ACRP

REPORT 61

AIRPORT COOPERATIVE RESEARCH PROGRAM

Sponsored by the Federal Aviation Administration

Elimination or Reduction of Baggage Recheck for Arriving International Passengers

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AIRPORT COOPERATIVE RESEARCH PROGRAM

ACRP REPORT 61

Elimination or Reduction of Baggage Recheck for Arriving International Passengers

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AIRPORT COOPERATIVE RESEARCH PROGRAM

Airports are vital national resources. They serve a key role in transportation of people and goods and in regional, national, and international commerce. They are where the nation's aviation system connects with other modes of transportation and where federal responsibility for managing and regulating air traffic operations intersects with the role of state and local governments that own and operate most airports. Research is necessary to solve common operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the airport industry. The Airport Cooperative Research Program (ACRP) serves as one of the principal means by which the airport industry can develop innovative near-term solutions to meet demands placed on it.

The need for ACRP was identified in *TRB Special Report 272: Airport Research Needs: Cooperative Solutions* in 2003, based on a study sponsored by the Federal Aviation Administration (FAA). The ACRP carries out applied research on problems that are shared by airport operating agencies and are not being adequately addressed by existing federal research programs. It is modeled after the successful National Cooperative Highway Research Program and Transit Cooperative Research Program. The ACRP undertakes research and other technical activities in a variety of airport subject areas, including design, construction, maintenance, operations, safety, security, policy, planning, human resources, and administration. The ACRP provides a forum where airport operators can cooperatively address common operational problems.

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FOREWORD

By Theresia H. Schatz
Staff Officer
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ACRP Report 61: Elimination or Reduction of Baggage Recheck for Arriving International Passengers (1) identifies potential alternative procedures that could be implemented to reduce or eliminate the need for the recheck of baggage for arriving international passengers at U.S. airports; (2) describes in detail the benefits and costs associated with these alternative procedures to airports, airlines, and federal agencies; and (3) compares potential alternative procedures with current practices. This report will assist airports, airlines, and other stakeholders in examining policies, processes, and other drivers behind baggage recheck facilities that could lead to improved connections.

International passengers arriving in the United States and connecting to another destination must collect their baggage within a U.S. Customs and Border Protection (CBP) facility. CBP may monitor or question passengers with respect to various issues relating to their trip purpose and duration and potentially refer them to Secondary Processing for additional baggage inspection. In reality, the large majority of passengers are cleared by CBP without Secondary Processing; however, all connecting bags must be handled by airlines multiple times. If the baggage for these passengers could be quickly identified and retrieved at the request of federal officials, other passengers would be able to continue their journey unimpeded through the terminal without having to wait for and recheck their baggage. If this streamlining were possible, there could be a potential for improving operations with cost savings.

This report was developed from the research conducted for ACRP Project 10-09 by Inter*VISTAS* Consulting Group. The report includes case studies conducted at a variety of international airport arrival facilities that represent a cross section of terminal facilities, airline alliances, and operating characteristics. Also contained are appendices that provide additional information including an inventory of current recheck procedures and an evaluation of alternative procedures as well as industry stakeholder feedback.

CONTENTS

Note: Many of the photographs, figures, and tables in this report have been converted from color to grayscale for printing. The electronic version of the report (posted on the Web at www.trb.org) retains the color versions.

SUMMARY

Elimination or Reduction of Baggage Recheck for Arriving International Passengers

Overview

International flights arriving at U.S. airports transport 180,000 passengers per day on average. Overall, one-third of these passengers proceed to a connecting international or domestic flight. Irrespective of whether passengers are connecting or terminating upon arrival to the United States, they proceed through U.S. Customs and Border Protection (CBP) inspection formalities. While the large majority of passengers have no issues whatsoever, some individuals are referred to Secondary Processing for a more detailed examination related to immigration, customs, agriculture, or other aspects of import laws/regulations.

For connecting passengers, the 2006 CBP Airport Technical Design Standards (*1*) specify that checked bags are collected during the arrivals process immediately after Primary Processing. As a result, baggage recheck facilities are typically provided immediately after CBP processing to allow passengers with connecting flights to drop off checked bags for the next flight. However, the multiple times that bags are picked up and dropped off for connections have been cited as a customer service issue, and baggage recheck facilities impose space and operating costs on airports and airlines. Further, limited time is available for passengers to successfully make close connections.

New technologies and processes present opportunities to explore ways to better manage border risks and allow international passengers to continue on to connecting flights without the impediment of a baggage recheck process. Therefore, the Airport Cooperative Research Program commissioned this study to examine in depth the potential to reduce or eliminate baggage recheck at U.S. airports.

Study Approach

Five methods of reviewing the potential to eliminate or reduce the need for baggage recheck for arriving international passengers were used: a detailed market size study, inventory of current procedures, case studies at four airports, alternative procedures definition, and testing. Overall, the approach included analyses of solutions based on a thorough risk review associated with primary border security risks. Information used for the study included qualitative and quantitative analyses, data collection at airport sites, and stakeholder interviews.

Current Context for Baggage Recheck

To understand the proportions and absolute volume of passengers that use baggage recheck facilities, a detailed review of international traffic arriving at U.S. airports was conducted. It is estimated that in 2009, international connections accounted for some 23 million passengers

carrying 31 million checked bags. The majority of connections are to domestic destinations in the United States (e.g., London Heathrow to Chicago O'Hare to Las Vegas), while a minority of connections are bound for international destinations (e.g., London Heathrow to Chicago O'Hare to Mexico City).

With future growth in international traffic, the number of bags to be rechecked could grow to 60 million by 2025. Today's facility and processing model cannot handle the growing demand; new processing options are needed.

A review of each step a passenger and bag are processed through at the top 30 international airports in the United States was undertaken. As some airports have more than one CBP operation, a total of 45 Federal Inspection Service (FIS) facilities were reviewed. Of these, 42 of the FIS facilities have associated baggage recheck. The balance of the facilities do not offer this service and instead direct passengers to the regular airline check-in along with other passengers originating in the city. Four sites—Hartsfield–Jackson Atlanta (ATL), Dallas/Fort Worth (DFW), Houston (IAH), and Guam (GUM)—already have reduced baggage recheck for a select portion of international-to-international connecting traffic.

Airport Case Studies

To better understand the impact of baggage recheck on infrastructure, local operating conditions, and current and alternative process flows, and to solicit the input of airlines, airports, CBP, and the Transportation Security Administration (TSA), four airports were selected as case study locations. The airports—DFW, ATL, San Francisco (SFO), and Seattle-Tacoma (SEA) international airports—represent a cross section of terminal facilities, airline alliances, and operating characteristics.

Testing and Evaluating Potential Solutions

Following a review of current requirements, operating environments, and best practices, and after consultation with stakeholders, seven alternative procedures were identified. The major criteria centered on the ability of CBP to effectively manage risks without the need for all checked baggage to appear in the FIS area. The alternative procedures are as follows:

1. **Exemption of Bags from FIS** by implementing procedures similar to existing international-to-international recheck reduction initiatives (i.e., bags are exempt from the FIS area, but processes are in place for on-demand bag retrieval).
2. **New Airport/Airline Processes on Arrival** that allow bags to be exempt from the FIS area and eliminate baggage recheck, yet provide CBP with additional risk management information.
3. **New CBP Processes on Arrival** that allow bags to bypass baggage claim and eliminate baggage recheck, as CBP officers can conduct a review of connecting bags at the ramp level.
4. **Enhanced Pre-departure Information** from the originating international airport for CBP review that reduces baggage recheck for those bags with the requisite information and/or X-ray.
5. **Information Sharing with TSA Programs,** e.g., X-ray images that are obtained from hold baggage screening of international transfer baggage so that bags can bypass the FIS area.
6. **Leveraging Other Department of Homeland Security (DHS) Programs,** such as Global Entry, to reduce baggage recheck reduction for members of trusted traveler programs.
7. **Door-to-Door Baggage Service** by third-party shippers or courier services (UPS, FedEx, etc.) instead of passengers using airline checked baggage.

A high-level evaluation model was compiled and evaluated through a peer review process composed of key stakeholders. Twenty-two independent criteria organized under four categories—CBP risk management, airport issues, airline issues, and market factors—emerged as the key criteria to evaluate whether an alternative solution presented a net gain over the current system. Recognizing the difference between theoretical and operational application, the following five on-site tests were conducted to further evaluate the alternative procedures:

- Radio frequency identification (RFID) timing of passengers and bags
- Information sharing by TSA and CBP on connecting bags
- Expansion of international-to-international recheck elimination processes
- Minimum connect time modeling
- Simulation modeling

Findings and Conclusions

The business case to eliminate or reduce baggage recheck is a highly complex and subjective issue that requires assessment at the local and national levels. Airports and airlines need to assess the cost of introducing a new baggage flow and CBP must evaluate the trade-off between facilitation and risk assessment capabilities.

Opportunities

There is an opportunity to eliminate or reduce baggage recheck because both industry and government are receptive to the idea of change. An immediate solution exists for reducing baggage recheck for international-to-international processes through the expansion of current programs at DFW, IAH, and ATL to other U.S. airports. The potential solutions for international-to-domestic processes are likely to follow as the risk assessment capabilities of CBP are augmented, likely through greater cooperation with TSA or enhanced pre-departure baggage information, to offset the value CBP would no longer receive from observing passengers and baggage together in the FIS area.

Challenges

A reduction or elimination of international-to-domestic baggage recheck is much more challenging because of the potential for contraband to be introduced into the United States. This finding is primarily based on CBP's need to manage risks as people/goods enter into the United States versus transit through the United States. It is imperative of course that any newly designed and implemented processes, technologies, and/or procedures remain resilient to future threats. Pilot projects, similar to the international-to-international sector reduction, may help develop the best operational approach to providing new long-term solutions to baggage recheck while preserving the strong security initiatives that address risk management.

Table 1 summarizes the impact of the alternative procedures on each of the four categories and assigns an overall assessment value for sustainable baggage recheck elimination or reduction.

In closing, baggage recheck elimination/reduction can be implemented in a risk-managed way. The implementation and further assessment of findings and conclusions of this report will help airports and CBP to deal with the growing amount of connecting traffic through major U.S. hubs, and further increase the time savings and satisfaction of passengers.

Table 1. Assessment of each alternative procedure by category and overall.

#	Alternative Procedure	Market Demand	Airline	Airport	CBP Risk Management	Analysis	Overall Assessment
1	**Exemption of Bags from FIS**	●	◐	●	○	In the near term for international-to-international transfers, this option is the best for airports and airlines to pursue with CBP. There is also existing precedent at four U.S. airports as well as Preclearance locations. However, the solution does not currently provide CBP with the necessary capabilities to manage potential introduction of contraband to the United States.	◐
2	**New Airport/ Airline Processes on Arrival**	●	◐	○	●	Introducing new processes presents major challenges to airport operators in terms of space, cost, and overall ability to deal with exceptions. Generally, airlines could incrementally deal with alternative processes on arrivals to meet most CBP requests for risk managing connecting flows.	○
3	**New CBP Processes on Arrival**	●	◐	◐	◐	Although CBP recognized the risk mitigation value of a new alternative process for transfer bags, it questioned the utilization of the officers in a satellite location/process. This issue is particularly pertinent at airports with a high variability of "eligible" transfer passengers throughout the day. All stakeholders emphasized that a reduction in bag claim/recheck should not be achieved at a net cost to the international arrivals process.	◐
4	**Enhanced Pre-departure Information**	●	◐	◐	●	To date, there are few examples of advance baggage information being shared for the purpose of border inspection. Augmenting this to include X-ray images, weight, and/or bag pictures could provide CBP with additional capabilities to evaluate an elimination of baggage recheck for onward international connections and potentially for onward domestic connections. Significant implementation issues remain, however, due to the types of technologies (e.g., international standard for multi-view X-ray image, CBP specific algorithm) and process evaluation needed to enable this process.	●
5	**Information Sharing with TSA Programs**	●	◐	◐	●	In the short to medium term, CBP recognizes the potential for improved risk assessments with access to TSA X-ray images. However, improved X-ray image assessment (i.e., algorithm) capabilities are required, which is likely to push this procedure to a medium- to longer-term solution. Once resolved, this solution presents a significant opportunity to address all international arrivals connecting onward, regardless of final destination. For airports, proximity of the TSA baggage matrix and the FIS area will facilitate an expedited retrieval process for bags referred to CBP Secondary.	●
6	**Leveraging Other DHS Programs**	●	○	◐	●	Although the use of Global Entry or other DHS programs to provide baggage recheck reduction is a good idea in concept, the major problem is the inability to confirm membership at point of origin. The new Global Entry card with RFID technology is a positive step but electronic verification during check-in is still challenged. The potential of having a non-Global Entry bag accidentally or intentionally inducted into a through-check process was cited as a risk by CBP for introducing a separate bag process for Global Entry members.	○
7	**Door-to-Door Baggage Service**	◐	●	n/a	n/a	Using express delivery has major benefits to reducing the actual demand on foreign airport systems for baggage reception and delivery. However, a sizable market is not expected to be present to take advantage of this capability. Airports and CBP are inconclusive in terms of this alternative procedure—primarily because it will not remove or reduce the need for a baggage recheck facility.	◐

● = Positive Impact ◐ = Moderate Impact ○ = Negative Impact

CHAPTER 1

Background

Context

On a typical day in the United States, close to 180,000 passengers arrive at international airports and are processed by U.S. Customs and Border Protection (CBP) to determine their validity to enter the United States. While in the Federal Inspection Service (FIS) area, all travelers must reclaim their checked baggage before exiting. However, more than 60,000 of those passengers have onward connecting flights. Currently, a number of airlines and airports operate baggage recheck facilities adjacent to the FIS area to enable connecting passengers to immediately drop off their bags before continuing to their connecting flight. These facilities are provided by airports and/or airlines as a customer service function and enable the bags to be re-entered into the system at the earliest possible time. The multiple handling of bags is cited by passengers as a customer service nuisance, requires additional space for airports, represents an additional operational cost for airlines, and increases the probability of mishandled bags. For CBP, however, the ability to manage risk from contraband or terrorist materials within bags is cited as being imperative to protect the United States from threats.

The net result is a system that is not scalable to the projected future growth of international traffic. The recheck process currently affects approximately 31 million bags annually in the United States. Mishandling of transfer baggage accounted for approximately 51 percent of missing bags in 2010 (*2*). Based on renewed growth and delivery of new international air services, this volume could easily increase to 60 million bags per year by 2025. While overall improvements are achieved by improved baggage handling systems, the recheck process adversely affects the effectiveness of the U.S. international arrivals processes.

What Mandates Baggage Recheck?

In interviews conducted with stakeholders, and in discussions at airport study sites, it was apparent that there was some degree of confusion as to whether CBP mandates the baggage recheck process. In reviewing facility design criteria, there is no specific "mandate" by CBP for baggage recheck stations; the link is instead indirect through the way CBP administers risk management.

CBP regulations (Title 19 §162.6) specify that baggage is "liable to inspection and search by a customs officer." To satisfy this regulation, the CBP Airport Technical Design Standards (ATDS) Section 2.7 specifies, "Following a determination of admissibility by CBP, passengers proceed to the baggage claim where the passengers claim and retrieve their baggage." Recheck facility provision is entirely at the discretion of the carrier or airport. The primary means of meeting this process design is through a baggage carousel within the FIS area. International connecting passengers pick up checked bags, complete the CBP process, and then exit the CBP facility.

Not all airports have recheck facilities; instead, some have their passengers check in to domestic connections along with originating passengers. For example, some carriers at San Francisco International Airport and Fort Lauderdale International Airport have stopped using recheck facilities due to staffing costs.

As a result, the elimination or reduction of baggage recheck is a byproduct of exempting connecting bags from appearing in the international arrivals hall.

Increasing Pressures

Limited time, space, and resources are some of the pressures that are facing international airports. Moreover, this is the segment of air traffic that is forecasted to have the highest growth rates.

Based on facility guidelines from CBP, passengers and bags are reunited in the FIS facility. As a result, baggage recheck facilities are offered to collect bags connecting to other flights. However, this process reduces the effectiveness of U.S. international airports to act as hubs. The adoption of liberalized traffic agreements, the growth and evolution of market partnerships and alliances, and new aircraft technology have all combined to magnify the global nature of the airline business. The market forces within the airline hub-and-spoke network serve to nurture and support an environment where international arrivals translate into a subsequent set of connections to onward domestic or international markets.

Connecting passenger growth and increased checked baggage are a direct result of new services being introduced at U.S. hub airports. The numbers of connecting market itineraries that are generated by a new spoke into a hub are impressive, whether it is Washington Dulles, Houston, or Memphis. Over the last decade alone for United and its Star Alliance partners at Washington Dulles, domestic markets have increased by 8 and international destinations have increased by 18. When multiplied across a hub's entire service pattern, these numbers can translate into thousands of potential international-to-domestic and international-to-international connections.

The points above summarize the overall development of international services based on market trends, not only in the United States, but throughout the world. The speed and consistency at which passengers and their baggage can transit an airport is of increasing importance to the growth of the hub-and-spoke model. In this context, airport and U.S. government agency processes and resources governing connection traffic and their bags have a measurable impact.

For this reason, there is such a strong focus on facilitation initiatives in the International Civil Aviation Organization (ICAO) and International Air Transport Association (IATA) aimed at simplifying the business or enhancing the future travel experience. Recent initiatives by CBP to foster a risk-based environment toward "seamless travel" are also part of this trend. The strength of hubs and the continued role of connecting passengers in the airline marketplace is a key reason why this research is timely and improvements are essential.

The "passenger experience" aspect for passengers is also increasing in prominence as passengers have additional options. Surveys from airports and other leading studies on passenger opinions continue to show reduced satisfaction corresponding with the number of times that bags need to be handled during the course of a journey. For example, a 2010 SITA global passenger survey showed that waiting for bags on arrival is the second most important area of air transport in which passengers would like to see improvement (*3*). This dissatisfaction is exacerbated by the need for international arrivals to recheck their bags only moments later when connecting through a U.S. airport. Improving this experience by reducing or eliminating these steps is a goal that all stakeholders—airports, airlines, and CBP—share.

The approach to this research also examines risk management solutions and incremental benefits to airports and airlines. New technologies, processes, and capabilities could yield facilitation and security benefits, provided they can be met within the space and time constraints inside the airport environment.

Improving the speed of passenger processing is an ongoing trend within the airport and airline market. As previously indicated, passengers prefer to handle their baggage as little as possible over the duration of a trip. Introducing alternative approaches or new technology to enhance a baggage bypass system for passengers not only benefits the user, it also benefits the air carriers and the airports that serve them. The air carriers could benefit from a reduction in minimum connect times, which currently range from 60 to 90 minutes at various U.S. airports, and/or a solution that would provide greater consistency in meeting existing times. A reduction in minimum connect times and greater reliability in airline schedule performance allows a hub to dramatically increase connecting possibilities and allow routing options to be selected by consumers based on a greater range of time/pricing options.

The benefits for airports can be realized through cost savings in space allocation, as well as improvements in global hub strategies for major air carriers. The elimination of baggage recheck will allow air carriers to strengthen their hubs at key international airports that may provide this service, thus increasing passenger volumes, which in turn leads to increased revenues for airports.

Cost-Effective Risk-Based Solutions Needed

At the root of this study is an examination of the trade-off between processes, risk management, and the growing volume of passengers and checked bags. Due to key terrorist events (e.g., September 11, 2001, and December 25, 2009) and real and perceived threats, passengers and their baggage arriving at air ports of entry continue to face a disproportionate degree of scrutiny. For example, while 180,000 passengers per day enter at international airports, 300,000 passengers per day flow through land border checkpoints to the United States (*4*)—and only a small minority of bags in passenger vehicle trunks are ever "seen" by CBP.

Risk management of international arrivals continues to challenge CBP and other agencies responsible for dealing with the evolving threats facing the United States and the aviation industry. An emerging theme is the need to economize existing resources to better work toward a system of collaborative risk management. This means that agencies such as the Transportation Security Administration (TSA) and the Department of Homeland Security (DHS) and industry participants must work collaboratively. Ultimately, a system aimed at cost-effective solutions will maximize targeting, screening, and inspection within a finite period of time. CBP and TSA have increased their degree of cooperation, with greater integration and collaboration of programs for international travelers:

> To counter the threat of terrorism and secure our borders, CBP relies on a balanced mix of professional law enforcement personnel, advanced technologies and fully modernized facilities and infrastructure both at and between the ports of entry. CBP officers utilize advanced targeting, screening and inspection technologies to quickly identify persons or cargo that warrant additional scrutiny without unduly impeding the traveling public or commerce.
>
> CBP Commissioner Bersin and TSA Administrator Pistole Statement
> November 2010

The following issues are a small selection that CBP faces at international airports of all sizes in the United States:

- In May 2011, CBP seized nearly 90 pounds of cooked Ethiopian sheep meat at a major international hub.

- From November 2010 to January 2011, CBP made more than 190 seizures of fake merchandise with a total retail value of more than $2 million at a medium-sized hub.
- In January 2011, CBP intercepted an individual who had swallowed more than 90 pellets of heroin at a medium-sized international airport.
- In April 2011, CBP seized 13 packages containing more than 33 pounds of cocaine at a smaller international airport.

In addition to CBP's mandate to manage border risks, its sister agency TSA has the mandate to protect the nation's transportation systems, including aviation. From the perspective of TSA, the concept of eliminating or reducing baggage recheck has a very limited, if any, risk value because all bags will be screened per TSA standards before being loaded onto the outbound aircraft.

Differentiating Between "Eliminate" and "Reduce"

The purpose of this study is to identify opportunities to eliminate or reduce the need for baggage recheck at U.S. airports. Because of the vast number of potential interpretations (e.g., system-wide, airport-by-airport, sector-by-sector) of the terms "eliminate" and "reduce" and the importance in understanding the differences, the findings and conclusions of this study are based on the following definitions:

- *Eliminate*—Remove the need for baggage recheck entirely, on an airport-by-airport basis, so that any eligible connecting passenger can have bags routed by default to the next flight segment.
- *Reduce*—Define a subset of passengers whose process may be facilitated. The limitations that may be applied at the airport in question could include airline, class of passenger, country of origin, sector, status with CBP trusted traveler programs, etc.

The ability to eliminate or reduce the need for baggage recheck at an airport also depends on numerous other elements, including the following:

- Size and layout of airport
- International traffic volume
- Historic and future risk analyses
- Short- versus long-term solutions

Each of these elements will be addressed in this report. Furthermore, this study is based on the understanding that only those passengers who are connecting travelers (i.e., in possession of onward ticket and baggage, if applicable) are eligible for eliminated or reduced baggage recheck procedures.

Research Approach

The project included activity from 2009 to 2011 for the purpose of conducting analyses on the market, facility, flow, and risk management aspects related to baggage recheck elimination or reduction. The following approach was used:

- *Review of Connection Volumes*—The first priority was to determine the extent of the demand for baggage recheck services. Through a review of entry data to the United States, a model was developed to estimate the size of connecting traffic for international arrivals at U.S. airports.
- *Inventory of Current Recheck Procedures*—A second priority was to examine the types of flows. Major differences exist throughout U.S. airports based on markets served, size of facilities, and type of airlines present. The team performed a thorough review of existing systems, practices, and procedures. Five different types of baggage recheck flows were documented for 30 U.S. airports, representing more than 97 percent of international arrivals.

- *Identification and Review of Case Study Airports*—The study team proposed nine potential case study airports based on a review of substantial differences across airport/airline markets. Criteria for review included traffic volumes, market dynamics, facility layout, and operational characteristics. Case study reviews were conducted from November 2009 to March 2010 to examine the dynamics on baggage recheck at San Francisco (SFO), Dallas/Fort Worth (DFW), and Hartsfield–Jackson Atlanta (ATL) international airports. A fourth site—Seattle-Tacoma International Airport (SEA)—was added and reviewed from September 2010 to March 2011. The objective of the task was to conduct a detailed study of the international connection process and to determine the feasibility of conducting alternative procedures at these airports. During the case study, the research team met with the appropriate air carriers, airport operators, and government agencies (e.g., CBP and TSA) in order to garner a greater level of detailed local understanding from each organization.
- *Definition of Alternative Procedures*—During the case studies, the study team defined potential alternative procedures to eliminate or reduce the need for baggage recheck. The definition process included a full evaluation of the types of technologies [e.g., biometrics, radio frequency identification (RFID), smartcards] or programs (e.g., Global Entry) that could be leveraged to reduce or eliminate baggage recheck. Meetings were held with CBP and TSA in December 2010 to review potential solutions. A peer review was conducted in January 2011 in Washington, D.C., with representatives from airports, airlines, and trade associations.
- *Criteria Development and Testing*—A set of criteria was put forward to assess the value of the alternative procedures for baggage recheck elimination. These criteria were formulated into three site-based tests involving several aspects of recheck elimination. The results were put into a simulation model to assess suitability for broader applications and associated findings for the research.

To formulate the findings, analyses were undertaken with the above approaches, including interviews with selected technology vendors.

CHAPTER 2

Current Context for Baggage Recheck

This chapter summarizes the key market size and processes in place for baggage recheck facilities.

International Arrivals Connection Market

Current Size of Baggage Recheck Market

Each year, CBP processes 76 million passengers at the top 30 U.S. airports for international arrivals traffic. Excluding those passengers precleared at 14 sites outside the United States, a review of U.S. Department of Transportation (U.S. DOT) data by the study team indicated that approximately 35 percent of passengers connect to another flight upon arrival at a U.S. airport (see Figure 1).

The balance (65 percent) of international arrivals are considered to be "terminating passengers"—those who have no further flights from the arriving airport. For the purposes of this study, self-connecting passengers (i.e., a flight journey with two separate itineraries) and non-interlined connections are considered "terminating."

Twenty-three million connecting passengers per year could have a demand for baggage recheck facilities, with the large majority (20 million) being domestic connections (e.g., London Heathrow to Chicago O'Hare to Las Vegas). A smaller number (3 million) of passengers are proceeding to an international flight (e.g., London Heathrow to Chicago to Cancun).

Sizable Variation in Demand for International Arrival Connections

In analyzing the market context for baggage recheck elimination, the study team conducted a site-by-site review of the demand for connections (see Figure 2).

The review revealed an interesting dynamic between those airports with high volumes of international arrivals compared to a low percentage of onward connections (and vice versa). Of the 30 airports analyzed, two extreme examples of this dynamic are:

- **New York, John F. Kennedy International Airport (JFK)**—Highest ranking in total international arriving passengers, but one of the lowest percentages of connections (16 percent) in the United States.
- **Memphis (MEM)**—A relatively low-volume site for international arrivals (28th in the United States) but the highest proportion of passengers with connections (80 percent of international arrivals connecting to other flights).

The study team also reviewed the international traffic volumes with other traffic metrics to understand local operating characteristics. For example, although Memphis and Charlotte

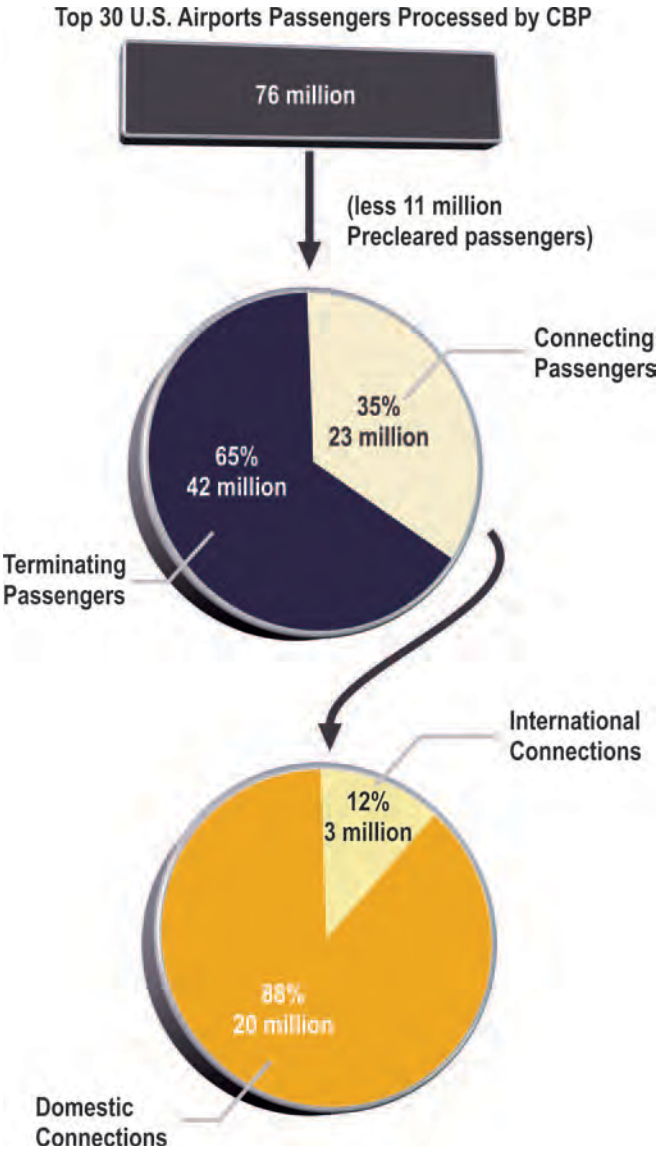


Figure 1. International arrivals and connections volumes (2008).

(CLT) airports presented the highest proportion of international arrivals connecting onward, all international arrivals comprise less than 1.5 percent of total airport traffic.

In order to truly measure and gauge the opportunities to eliminate or reduce the need for baggage recheck, the research team needed to ensure that a representative sample of current processes was selected. This will be detailed in the following chapter.

Process Flows for Terminating and Connecting Passengers

The 2006 CBP Airport Technical Design Standards form the basis for the generic template that depicts the process for terminating and connecting flows (see Figure 3). The italicized text outlines CBP and TSA risk elements associated with each step of the process. This analysis is driven by the critical component to any international arrivals process change—the ability for CBP to enforce its mandated mission to safeguard the U.S. homeland.

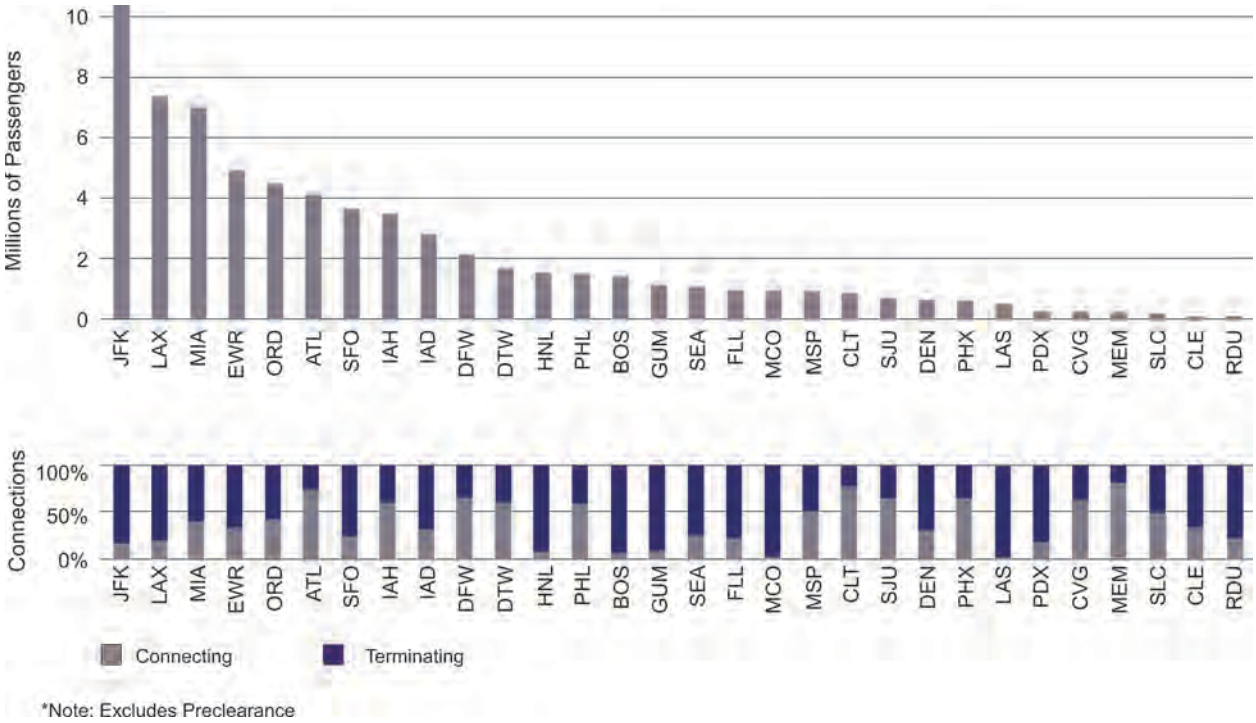


Figure 2. Annual international arrivals and ratio of connecting to terminating traffic.

As a baseline, terminating passengers follow Steps 1 through 4 in Figure 3 to exit at arrivals with their checked bags. Transfer passengers, on the other hand, as a baseline proceed through the same four steps, but also have an additional process for baggage recheck through to enplanement for the next flight (Steps 5 through 7). These steps are explained as follows:

1. **Deplane:** International arrivals to the United States arrive at segregated areas of the airport terminal, which prevents interaction with other passengers (ensuring sterility) until they have been processed by CBP. Typically, passengers deplane and proceed to Step 2 (CBP Primary) via a sterile corridor that takes the passengers from the arrival gate to the FIS area.

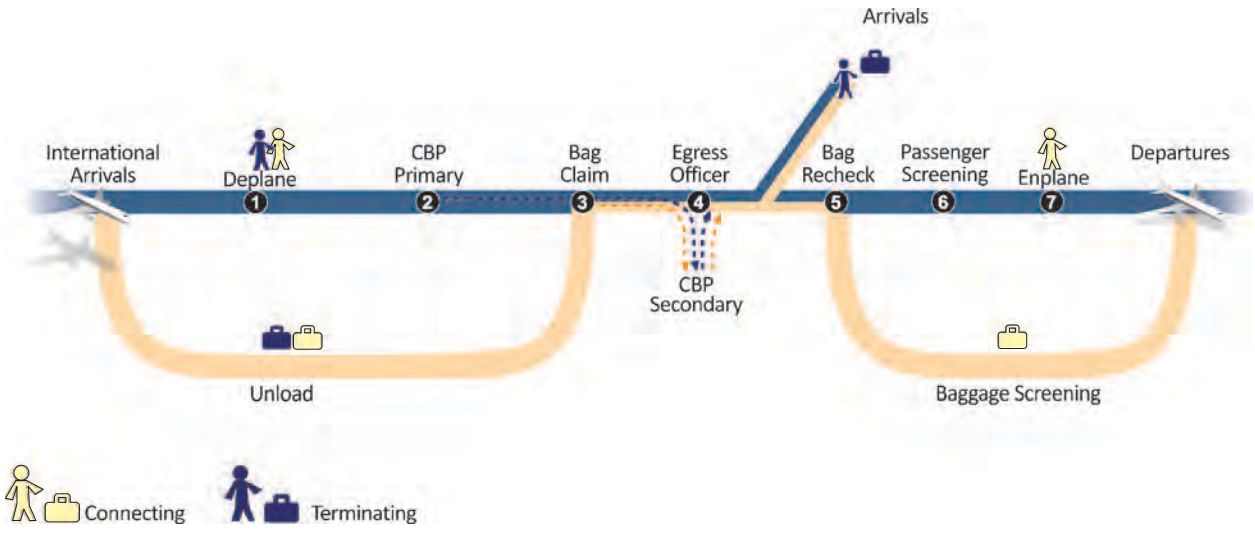


Figure 3. Generic process flow.

The sterile corridors leading from the arrivals gate to the FIS area are secured with access control solutions that include automatic alarms, closed-circuit television (CCTV) cameras and staffed personnel, and directional signage. CBP maintains sterility to prevent mixing of cleared and uncleared passengers, as well as the potential for contraband exchange.

2. **CBP Primary:** All international arriving passengers and crew members to the United States must be processed by CBP to determine their admissibility to the United States. CBP Primary is the initial point of contact for an officer to question passengers and to understand the intent of their travel to the United States. The CBP officer at the primary position has the option of deeming the passenger admissible, or referring him/her for inspection in CBP Secondary.

   One of CBP's missions is to keep terrorists and their weapons from entering the United States. CBP officers are trained to address risks in order to prevent radioactive materials, narcotics, agricultural pests, and smuggled goods from entering the country, and also to identify and arrest those with outstanding criminal warrants. CBP officers utilize advance passenger information (API) and passenger name record (PNR); behavioral detection; and the information provided from the traveler declaration card, entry visa documentation, and passport to compile their assessment of the passengers' worthiness to enter the United States. The officer has the authority to refer a passenger to CBP Secondary if the officer believes a more thorough inspection is warranted. Some reasons that could prompt an officer to refer a passenger to Secondary are agricultural concerns, documentation issues, immigration uncertainties, currency reporting, or counterfeiting.

   CBP Secondary: CBP Secondary is the location to which a number of passengers are directed for further inspection. Passengers may be referred to Secondary at any time from Primary, Baggage Claim, or Egress. The Secondary officer may ask a number of additional questions and has the authority to search the person and/or their baggage. In the past, separate Secondary areas existed for different agencies (i.e., former Immigration and Naturalization Services, Animal and Plant Health Inspection Service, Customs Service). CBP is in the process of amalgamating Secondary areas into one unified location; for most airports, however, Secondary areas are still separated based on past practices.

   Secondary Processing is an important component of CBP's operations, in that it provides a location for more intensive scrutiny that is physically separated from Primary Processing. This allows passengers without any issues to be processed more quickly through Primary Processing.

3. **Baggage Claim:** Generally, international arriving passengers with checked baggage are required to retrieve their bags from carousels located within the FIS area. The carousels may be located on either the same floor as CBP Primary or on a separate floor.

   Within the baggage claim area, CBP may have roving uniformed officers as well as plain-clothed officers. Other risk management tools (e.g., canine teams) are also occasionally deployed within the baggage claim area. This provides CBP officers with an opportunity for visual observation of passengers and their bags when claimed as part of their risk assessment. It also provides CBP officers with the ability to act upon intelligence received from the direct observation of specific bags.

   The study team notes that some within CBP adhere to the long-standing practice of reuniting bags with passengers to have a "complete package" to visually manage risks. Other views cite the power of alternative risk management methods that will be detailed in Chapter 6.

4. **Egress Officer:** The Egress officer is the last point of contact for passengers within the FIS area, and is responsible for exit control and collecting the passenger's declaration cards. The Egress officer may permit the traveler to exit the FIS area or refer the traveler to CBP Secondary.

   The Egress officer is primarily responsible for collecting declaration cards and directing passengers to Secondary. While CBP has design principles to remove the Egress officer function, this will depend on the consolidation of Secondary Processing facilities into one location (i.e., immigration, customs, and agricultural in the same place instead of split onto separate levels).

5. **Baggage Recheck:** Baggage recheck facilities were established to provide the traveler with an easier process for re-inducting their checked baggage into the airport baggage handling system.

Passengers typically deliver their baggage to a conveyor belt, which transports it to TSA baggage explosive detection systems (EDS) before introducing it into the domestic baggage system.

6. **Passenger Screening:** To meet the 2001 Aviation and Transportation Security Act (ATSA), every passenger boarding a commercial aircraft in the United States must be screened by TSA. The screening process is conducted with walk-through metal detectors, X-ray imaging, and physical searches.

   TSA screening is conducted using walk-through metal detectors, explosive trace detection, advanced imaging technology and X-ray imaging, and physical searches. All travelers must submit to TSA screening in order to enter the departures area.

   As witnessed recently (e.g., the TSA response to the December 25, 2009, Umar Farouk Abdulmutallab mid-flight incident), passenger screening programs, technologies, and processes to address the risk environment may undergo changes that will impact the transfer.

   Baggage Process Screening: In accordance with the ATSA, all baggage to be loaded onto an aircraft scheduled to depart a U.S. airport must be screened by TSA.

   TSA screens bags for explosives or other dangerous items. Early TSA deployments consisted of units the size of minivans in lobby areas. This location made the recheck process more complicated due to the lack of adequate space. More recent evolutions to in-line systems built into airport/airline baggage systems could help the speed of transfer bag screening.

7. **Enplane:** The passenger's journey through the connecting airport ends when they board their outbound domestic or international flight. All passengers and baggage loaded onto the outbound aircraft will have been screened by TSA.

   TSA requires that any baggage loaded onto the aircraft must have a positive match associated with a passenger who has been boarded onto the aircraft. If a passenger has checked baggage but ultimately does not end up boarding the flight, his or her baggage is to be pulled prior to departure.

For the purpose of this study, Steps 3 and 4 will receive the greatest attention as they are most relevant to managing risks presented by checked baggage.

Variation in Connection Processes by Airport

An inventory of current recheck procedures was conducted for all FIS sites at U.S. airports to categorize similar facilities. Some airports have multiple FIS facilities, e.g., Los Angeles (LAX), and as a result, an individual airport may have multiple processing types depending on the terminal. In total, the 30 airports surveyed had 45 FIS facilities.

The review found that of the 45 FIS facilities:

- One facility (i.e., Guam) has eliminated baggage recheck.
- Three facilities (i.e., Dallas/Fort Worth, Hartsfield–Jackson Atlanta, and Houston) have already reduced baggage recheck for international-to-international connections.
- Forty-two FIS facilities have baggage recheck facilities located immediately after CBP clearance processing.
- Three facilities have recheck processing at the regular outbound check-in.

These processes (Types A–E) are summarized in Appendix C and described in Figure 4.

Types D and E are of note: Some facilities direct passengers to regular airline check-in processes to recheck bags (Type D). Furthermore, due to local facility considerations or airline/airport proposals for process changes, bags are already exempt from CBP processing areas at several sites (Type E):

- Guam: Continental (United) Airlines operations
- Hartsfield–Jackson Atlanta: Delta Air Lines on international-to-international operations
- Dallas/Fort Worth: American Airlines, British Airways on select international-to-international connections

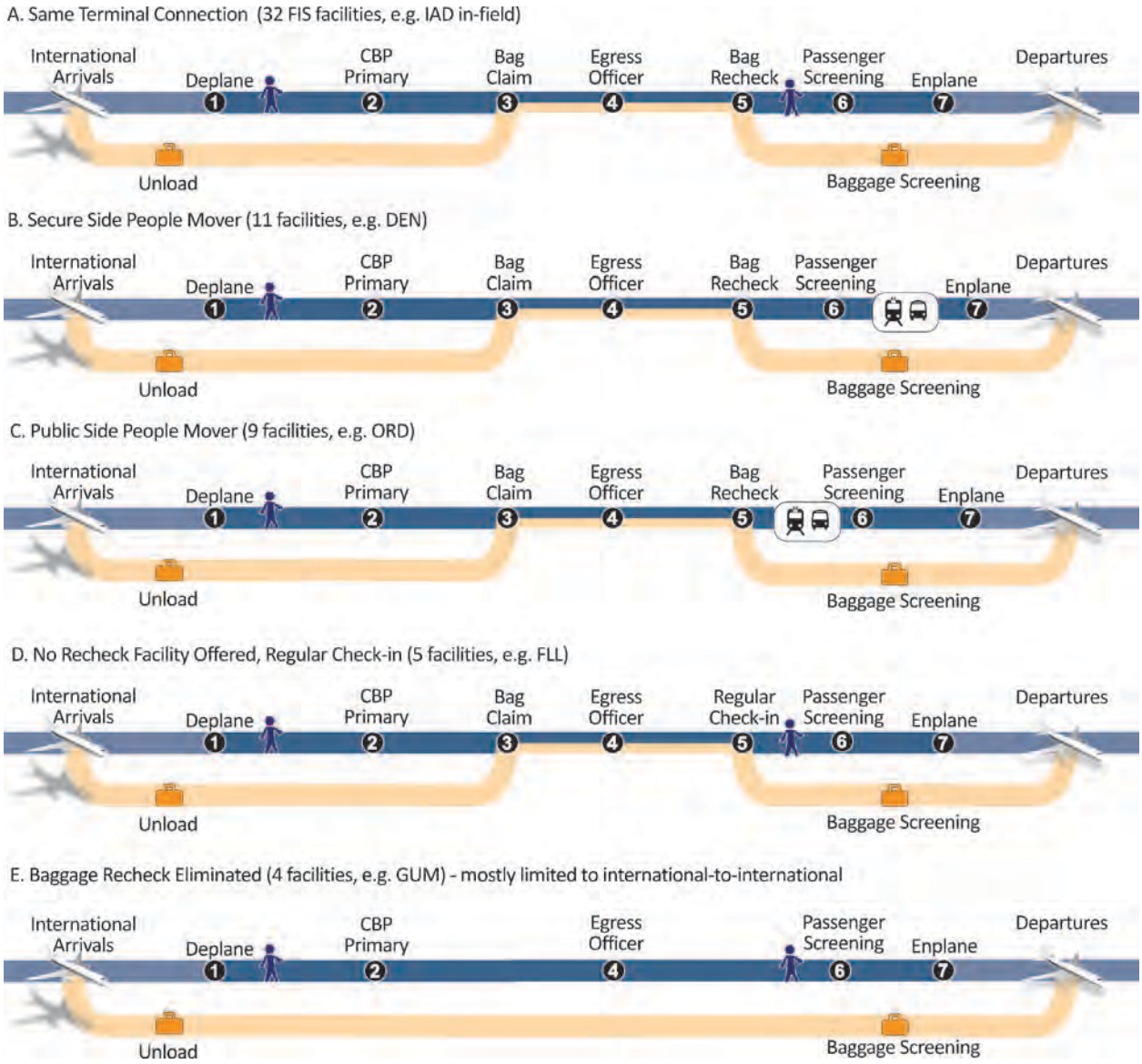


Figure 4. Five process types for international arrival connections.

- Houston: Continental Airlines on international-to-international flights
- Preclearance airports: All carrier operations in Vancouver, Halifax, Ottawa, Montréal, and Shannon; some operations in Edmonton

Altogether these 10 facilities have 7 million passengers per year whose bags are exempt from being present in the FIS area—this constitutes just under 10 percent of the 76 million passengers CBP clears every year. Note that bags are not exempt from CBP processing; alternative means have been developed to process checked bags at these sites. Procedures are in place to manage risk and to route bags to CBP Secondary Processing as needed.

The other 90 percent of passengers not exempt from being reunited with their checked bags are from Preclearance facilities in foreign countries for admission to the United States. Flights arriving from Preclearance airports are treated similarly to U.S. domestic flights in that passengers deplane directly into the departures area of the terminal (i.e., no passenger rescreening), and bags are exempt from the FIS area. Checked bags, however, must still be rescreened by TSA at the transfer airport.

CHAPTER 3

Airport Case Studies

Four airports were selected for a more detailed evaluation of the current baggage recheck scenario. During the site visits, the team developed detailed passenger and baggage flows and consulted with airlines, airport operators, and local CBP and TSA officials. The visits were critical to understand local characteristics that support or discourage an elimination or reduction in baggage recheck, to discuss alternative procedures, and to gather the input of stakeholders on site.

Case Study 1: Dallas/Fort Worth International Airport

Current Processes

Based on the scope of work, the study team evaluated the four different types of flows—international arrivals, connections to other flights, and precleared passengers and bags—to validate existing processes. See Appendix C for a description of generic flows in greater detail.

International Arrivals/Terminating Passengers and Bags

Passengers who terminate at DFW represent 30 to 35 percent of international arriving traffic. Since DFW is their final destination (or an overnight connection), they collect their bags upon arrival and do not use the recheck facilities. The specific process is illustrated in Steps 1 through 4 in Figure 5:

1. Passengers deplane from an international arriving aircraft.
2. Passengers proceed to the CBP Primary Processing area, where processing lasts 30 to 60 seconds on average. This typically involves an interview of the passenger together with checking of appropriate forms, visas, and documents. Some passengers may use Global Entry trusted traveler self-service kiosks to enter the United States. A number of travelers will be directed to a CBP Secondary Processing area for further interviews regarding immigration issues.
3. At DFW, Terminal D is a multi-level facility. Passengers descend to the baggage claim area via an escalator or elevator.
4. After picking up their bags, passengers proceed past the CBP Egress Point. A CBP officer collects the declaration card and may at this point refer a passenger for Secondary examination.

Passengers terminating in DFW then proceed to the public area of the terminal with their checked bags. Note that Terminal D has domestic swing capability for departures; some international-to-domestic traffic could occur.

Checked bags follow a similar process. Bags are unloaded from the international arriving aircraft and are transported to conveyors leading to the baggage claim area to be picked up by passengers (Step 3).

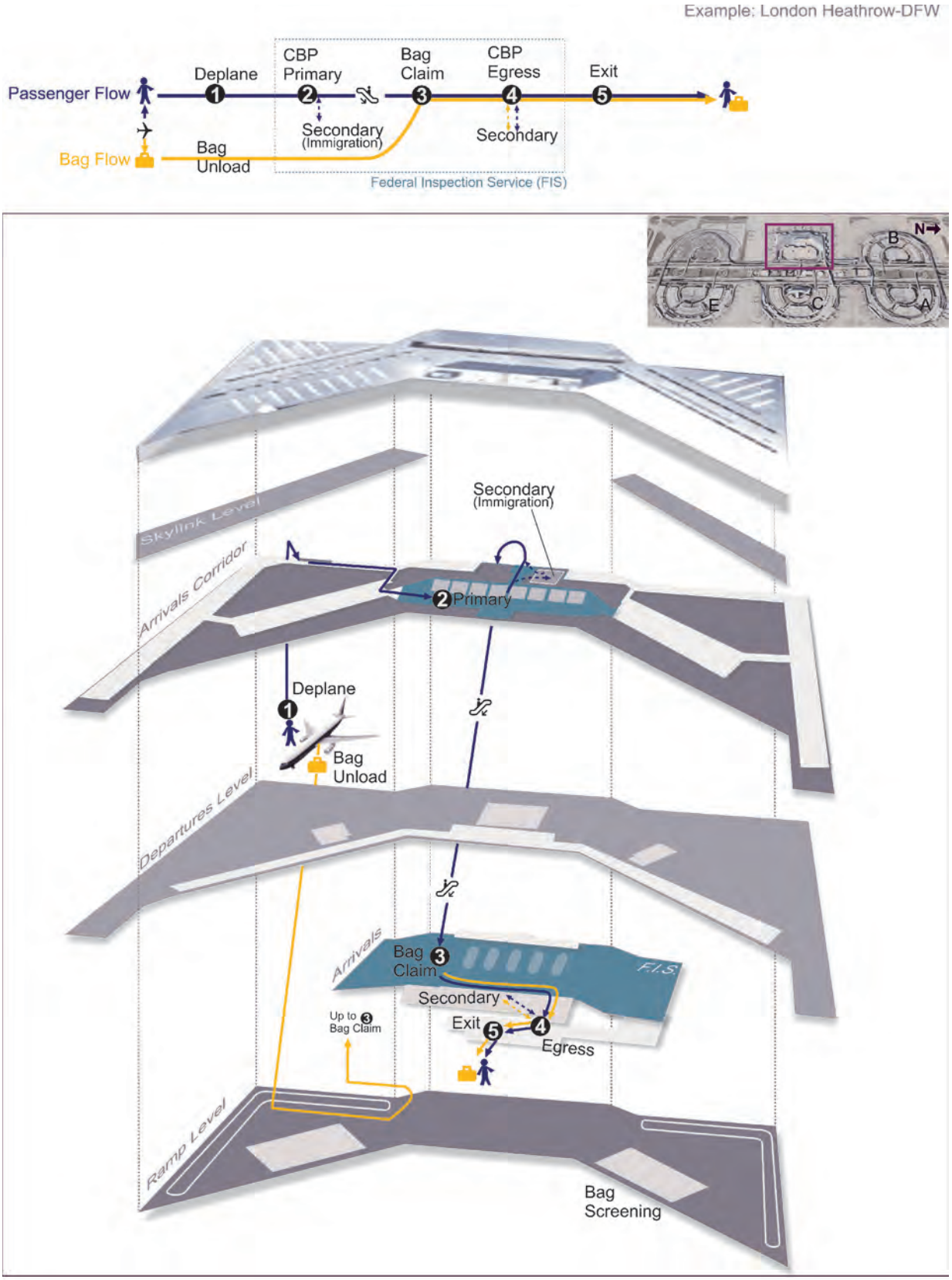


Figure 5. DFW international terminating passenger and bag flow.

International-to-Domestic Connections

At DFW, a large majority of baggage recheck users are international-to-domestic passengers. The current international-to-domestic process [e.g., Tokyo Narita (NRT)–DFW–Miami (MIA)] at DFW typically requires that passengers change terminals. Terminal D is an international terminal, and domestic flights typically depart from Terminals A, B, and C.

Like terminating passengers, international-to-domestic passengers proceed through Steps 1 through 4. After exiting to the public area of the terminal through the CBP Egress Point, passengers have the option of rechecking their bags at a bag drop point staffed by airline agents. After proceeding back up to the departures level, passengers undergo TSA passenger screening. To get to their departure gate, typically in another terminal, passengers proceed up two levels to the Skylink airside people mover.

Bags are unloaded from aircraft and transported up to the baggage claim carousels for passenger pickup. After being picked up and dropped off by passengers, bags proceed through the TSA baggage screening process before reaching the baggage make-up carousels. After all bags from Terminal D that make the same subsequent domestic connection are accumulated, they are transported in baggage carts to the appropriate terminal to be loaded.

An overview of the process is provided in Figure 6 with passenger process Steps 1 through 7 as well as the corresponding bag processes.

International-to-International Connections

Before 2007, all international-to-international baggage connections used baggage recheck facilities. In April 2007, a streamlined international-to-international baggage connection program [e.g., NRT–DFW–Cancun (CUN)] for American Airlines at DFW was instituted. At the originating airport, special stickers/labels are affixed to the back of passenger passports and to checked baggage to identify the international-to-international connection. When passengers arrive at DFW, they deplane from the aircraft and proceed to CBP Primary like all other passengers. After CBP Primary Processing, they proceed down two levels to the arrivals level but do not have to retrieve their bags. When CBP officers at the Egress Point encounter passengers without checked baggage but who wish to exit to the public area, they check for the sticker on the back of the passengers' passports. If no Secondary inspection is required, travelers are free to proceed out past the baggage recheck area (without bags) and up to the departures level. At this point, passengers proceed through TSA passenger screening and enter the departures area to enplane at a gate in Terminal D.

Bags in the international-to-international process are identified as such with the clearly marked baggage tag label. They are unloaded from the aircraft but are brought immediately to the designated connection induction point on the ramp level. Bags proceed directly to TSA baggage screening and then directly to the baggage make-up carousel. They are held separately on baggage carts until 30 minutes before departure, at which time they are loaded onto the aircraft. Typically only one cart is needed for staging; higher volumes may demand further space for storage. At any time up to 30 minutes before departure, baggage handlers can expect to receive a request for retrieval of these bags to CBP Secondary.

CBP ensures that the passenger is not sent out of the sterile area. In other words, bags are requested for retrieval if and when a passenger is directed to Secondary.

An overview of the international baggage connection program process is provided in Figure 7, with passenger process Steps 1 through 7 as well as the corresponding bag processes.

For international-to-international connections on airlines other than American Airlines (which represents a very small percentage of total traffic), the process is identical to the international-

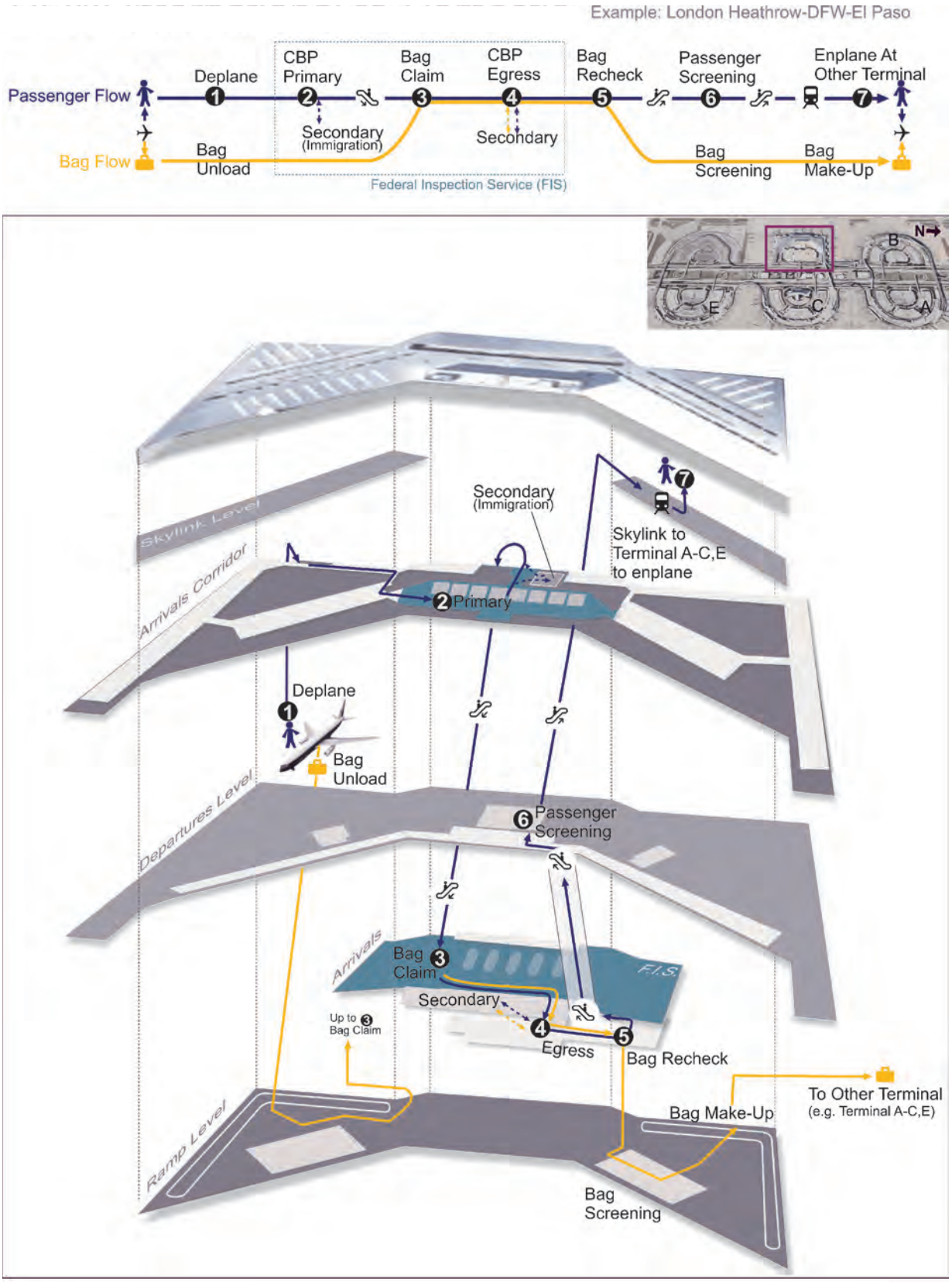


Figure 6. DFW international-to-domestic passenger and bag flow.

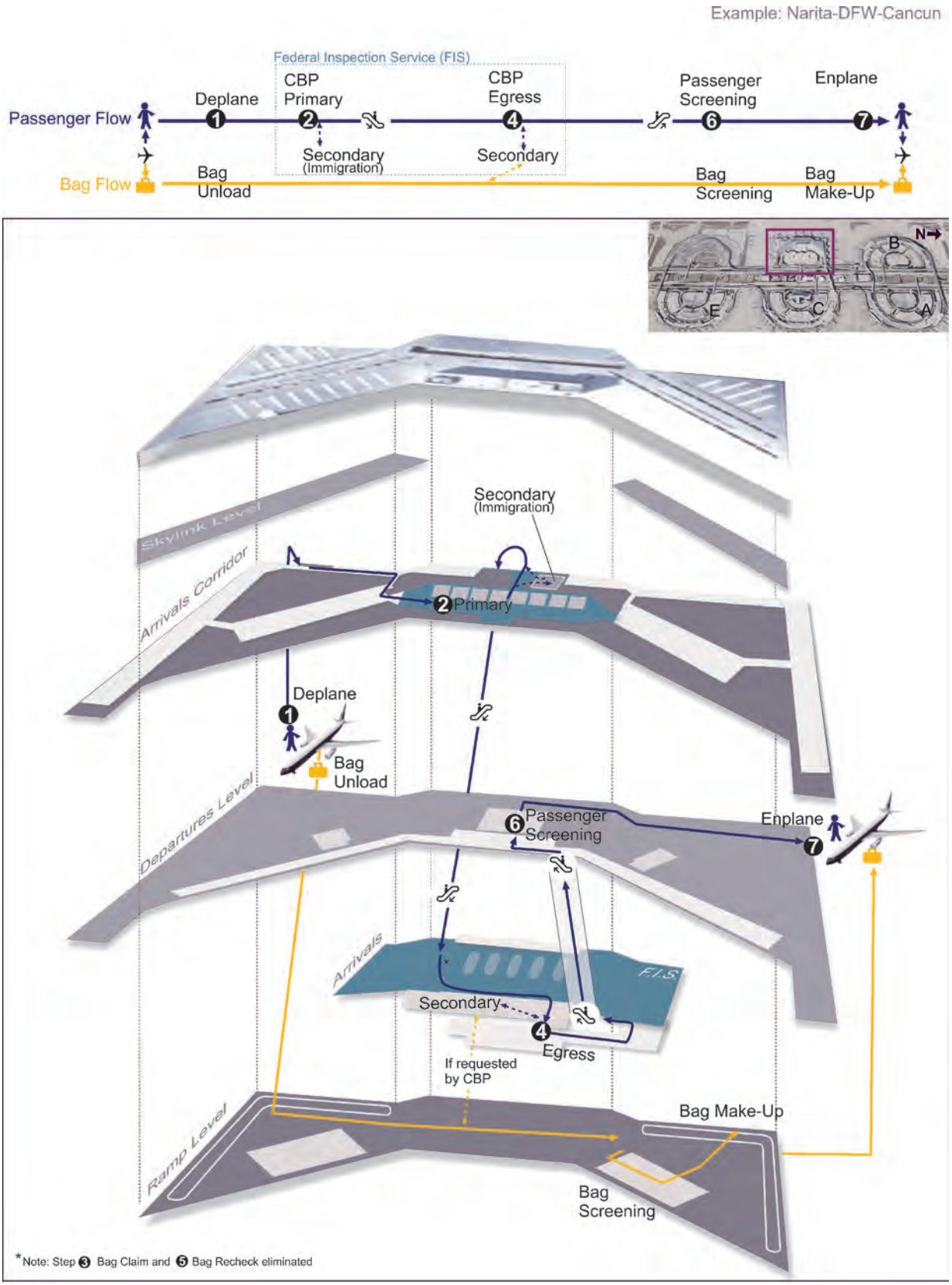


Figure 7. DFW international-to-international passenger and bag flow.

to-domestic connections process (i.e., with baggage recheck) except that departing flights are from Terminal D, so no change in terminal is required for passengers and their checked baggage.

Preclearance Connections

Although connecting checked bags for flights arriving at DFW from Preclearance airports do not need to be rechecked and do not come in contact with passengers, TSA has required that all checked bags from these flights must be rescreened before enplanement for a subsequent flight. The passenger process is much like a domestic arrival process in that passengers arrive at the terminal building in the departures area and do not proceed to CBP Primary. Passengers departing on domestic flights through other terminals use the people mover stops accessible from the departures areas. Otherwise, passengers departing on subsequent international flights remain in Terminal D.

The specific process for these bags is that they are unloaded from arriving aircraft, fed to an induct conveyor for Preclearance connections, sent through TSA bag screening, and routed to the appropriate baggage make-up carousel.

Preferential Connections on Airline Alliances

The primary airline alliance at DFW is the oneworld Alliance, which consists of American Airlines, American Eagle, British Airways, Japan Airlines, LAN Airlines, Cathay Pacific, and others. Although the international-to-international connections program at DFW is allowed for American Airlines-to-American Airlines connections, a number of oneworld Alliance partners are eligible to participate in the international baggage connection program (e.g., British Airways) and, at the time of this report, those partners are implementing the program. Otherwise, connections between airline alliance partners are not given preferential treatment in terms of passenger and baggage flows.

Relevance of Eliminating Baggage Recheck

Airlines

Both American Airlines and American Eagle agreed that the primary benefits of eliminating baggage recheck would be a potential reduction in mishandled bags and the improved ability to maintain schedule fidelity.

The experience from implementing the current international-to-international connections process has provided the airlines with evidence that the reduced number of "touches" of the bags (i.e., conveyor to the baggage claim area, pickup by passengers, transport to the baggage recheck area belts, and induction back into the baggage handling system) resulted in fewer mishandled bags. American Airlines estimated that a 25 percent improvement could be achieved. The possible reasons for this improvement may be attributed to passengers no longer being able to forget bags on the baggage claim carousel, less damage to baggage tags, and more accurate read rates by automated tag readers in the baggage handling system.

Schedule fidelity is also improved with the elimination of baggage recheck through the reduction of both process steps and time. Whereas bags that proceed up to the baggage claim area are retrieved and dropped off by passengers, bags that are directly re-inducted into the baggage handling system at ramp level are made more quickly available for baggage make-up and aircraft loading. The enhanced ability to ensure that bags are ready to depart can contribute to maintaining schedule fidelity.

The cost of operationally implementing an international-to-domestic connection process similar to that of the international connections baggage program would be minimal. Originating stations (e.g., Tokyo Narita on a NRT–DFW–CUN trip) are accustomed to identifying passengers with connections, providing proper instructions, and marking their bags appropriately. Processes could be quickly implemented to remove baggage recheck for domestic connections relatively

quickly. The processes and systems used for the international connections baggage program can be ported over to an international-to-domestic scenario, depending on the alternative processes used, with little additional training.

Airport

The main cost identified by DFW is to the infrastructure at the airport, or specifically the connecting induction point on the ramp level is not able to accept the significantly increased number of bags—more than 50-fold—that domestic destination connections represent over the current number of international destination connections. Similarly, the number of bag retrievals for CBP Secondary processes may overwhelm the current system of manual retrievals for bags on an individual basis. Both facilities and operational costs to the airport would be incurred as a result.

While one of the potential improvements from eliminating baggage recheck is a reduced minimum connection time (MCT) through DFW, this benefit has not yet been realized in the international-to-international connection program.

Customs and Border Protection

CBP views the implementation of the international-to-international connection program that eliminates baggage recheck for other passengers as a successful endeavor. CBP assessed the risk posed by this segment of passengers and their bags and ensured that appropriate steps were implemented to mitigate risk (e.g., retrieval of checked bags to CBP Secondary when requested).

While the principles required to implement an international-to-domestic connections process that reduces the need for baggage recheck remain the same, the risk and corresponding mitigation measures will likely be different. The contents of an international-to-domestic passenger's bag are more likely to enter the commerce of the United States than are those of an international-to-international passenger. Therefore, appropriate steps must be taken to prevent prohibited goods from entering the country if baggage recheck is removed.

The international connections baggage processes that eliminate baggage recheck are already in operation at DFW and a number of DFW facility features are available for use in international-to-domestic connections processes (e.g., a legacy conveyor divert system that leads to the baggage carousels area currently exists in Terminal D and may accommodate baggage X-ray machines and ramp-level connection induct points into the baggage handling system). If all operational and risk management issues can be resolved, the cost to CBP to eliminate baggage recheck for international-to-domestic connections similar to that of the existing international-to-international connections would be moderate.

Transportation Security Administration

As referenced earlier, TSA has no change in screening processes with baggage recheck elimination or reduction. However, TSA screening operations may be affected by the timing of when passengers arrive at the passenger screening checkpoint and when checked bags are inspected through the baggage screening system. No significant cost savings to TSA are foreseen by eliminating baggage recheck.

Case Study 2: Hartsfield–Jackson Atlanta International Airport

Current Processes

The following describes the current processes through Concourse E at ATL for four different flows.

International Arrivals/Terminating Passengers

Passengers who are terminating in Atlanta (or are staying overnight on a connection) proceed through Steps 1 through 4 shown in Figure 8. While passenger processing is similar to that of DFW through CBP Primary, baggage claim, and egress, there is a major difference in Atlanta from the usual process for terminating airports. Unlike other case study airports, all terminating passengers need to first recheck their bags because Concourse E is an airside international arrivals building. Following baggage recheck, passengers are sent to security screening by TSA before being allowed in the secure area of the facility (i.e., the people mover system).

One difference noted in baggage processing is that bags are unloaded from international arrivals and transported underground by conveyor belts to the baggage claim area for pickup by passengers.

A graphical depiction of the process is shown in Figure 8. Note that for terminating passengers, the process is identical to connecting passengers until Step 7 where they are required to reclaim their baggage before exiting the airport. In 2012, the Maynard H. Jackson Jr. International Terminal will have a second CBP international arrivals area for ATL which will not have a baggage recheck process for terminating passengers.

International-to-Domestic Connections

For connecting passengers, international-to-domestic connections represent a sizable connection flow. The current international-to-domestic process [e.g., Lima (LIM)–ATL–Boston (BOS)] at Hartsfield–Jackson Atlanta International Airport follows two main flows:

- Passengers:
  - Deplane (Step 1) and proceed through CBP Primary (Step 2).
  - Descend to the baggage claim area and are reunited with their bags (Step 3).
  - After exiting through the CBP Egress Point (Step 4), recheck their bags (Step 5).
  - After being processed through TSA passenger screening (Step 6), *either* proceed upstairs to outbound gates on Concourse E *or* downstairs to the people mover system depending on the domestic connecting flight (Step 7).
- Bags
  - Bags are unloaded from aircraft and transported up to the baggage claim carousels.
  - After being claimed and rechecked by passengers, bags proceed through a TSA in-line baggage screening process in Concourse E before being forwarded to other concourses.

An overview of the process is provided in Figure 9 with passenger process Steps 1 through 7, as well as the corresponding bag processes.

International-to-International Connections

Hartsfield–Jackson Atlanta International Airport has eliminated baggage recheck for international-to-international connections.

For a number of flight routings (e.g., Africa–ATL–South America), there is an increasing focus on facilitating process flows.

In reviewing volumes, the study team found that ATL had one of the largest scale programs of baggage recheck elimination to date, estimated at 360,000 passengers/year. International-to-international bags are separated and kept at the ramp level, where they are introduced into TSA's EDS in Concourse E. Meanwhile, corresponding passengers deplane with other types of passengers (domestic connections, terminating) and are processed by CBP. If CBP refers a passenger to Secondary, then the baggage is delivered to the Secondary area. In Atlanta's case, the layout of the terminal is conducive to this arrangement given that all bags remain on the apron level.

An overview of the international baggage connection program process is provided in Figure 10 with passenger process Steps 1 through 7, as well as the corresponding bag processes.

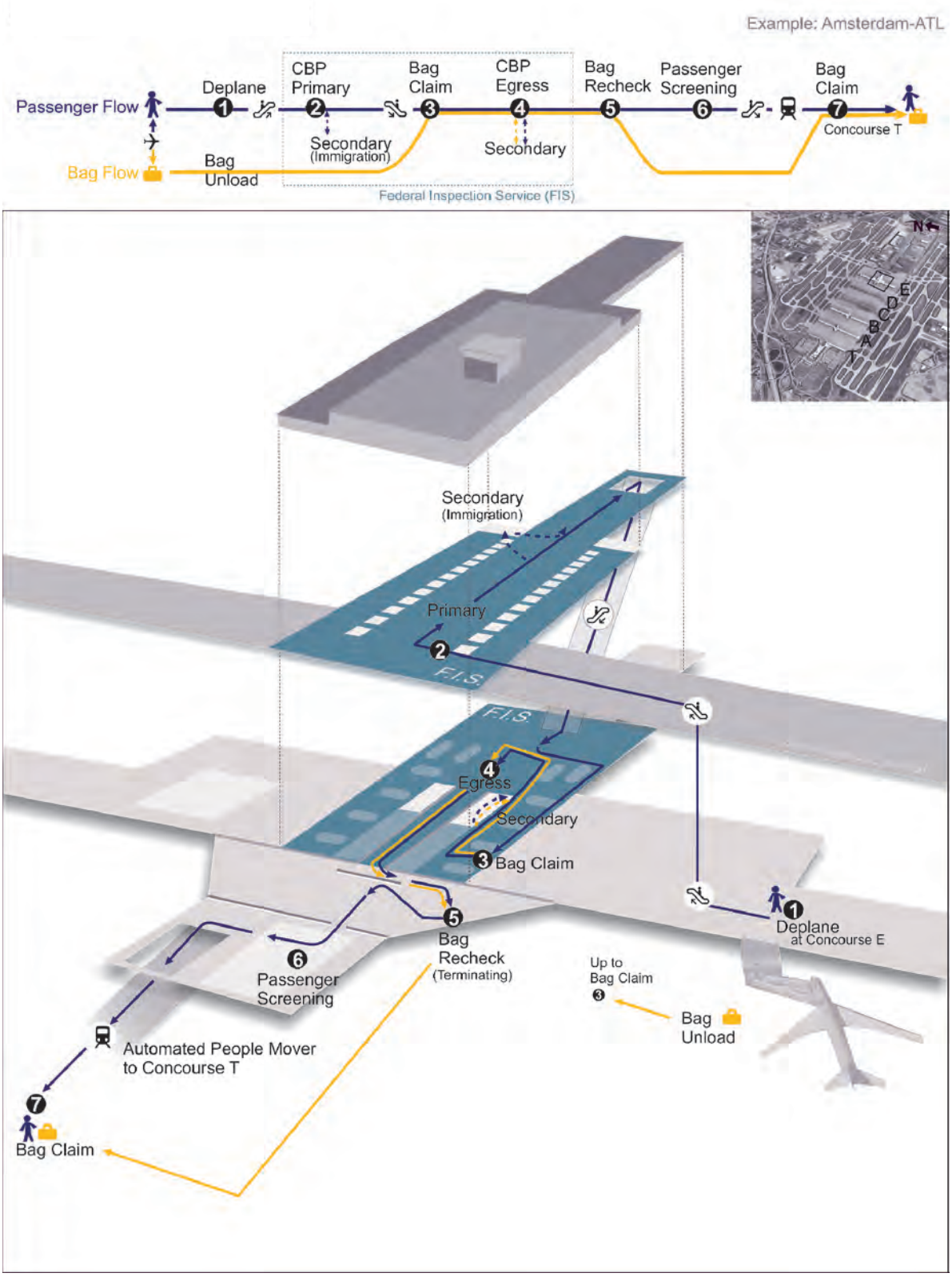


Figure 8. ATL international arrivals passenger and bag flow.

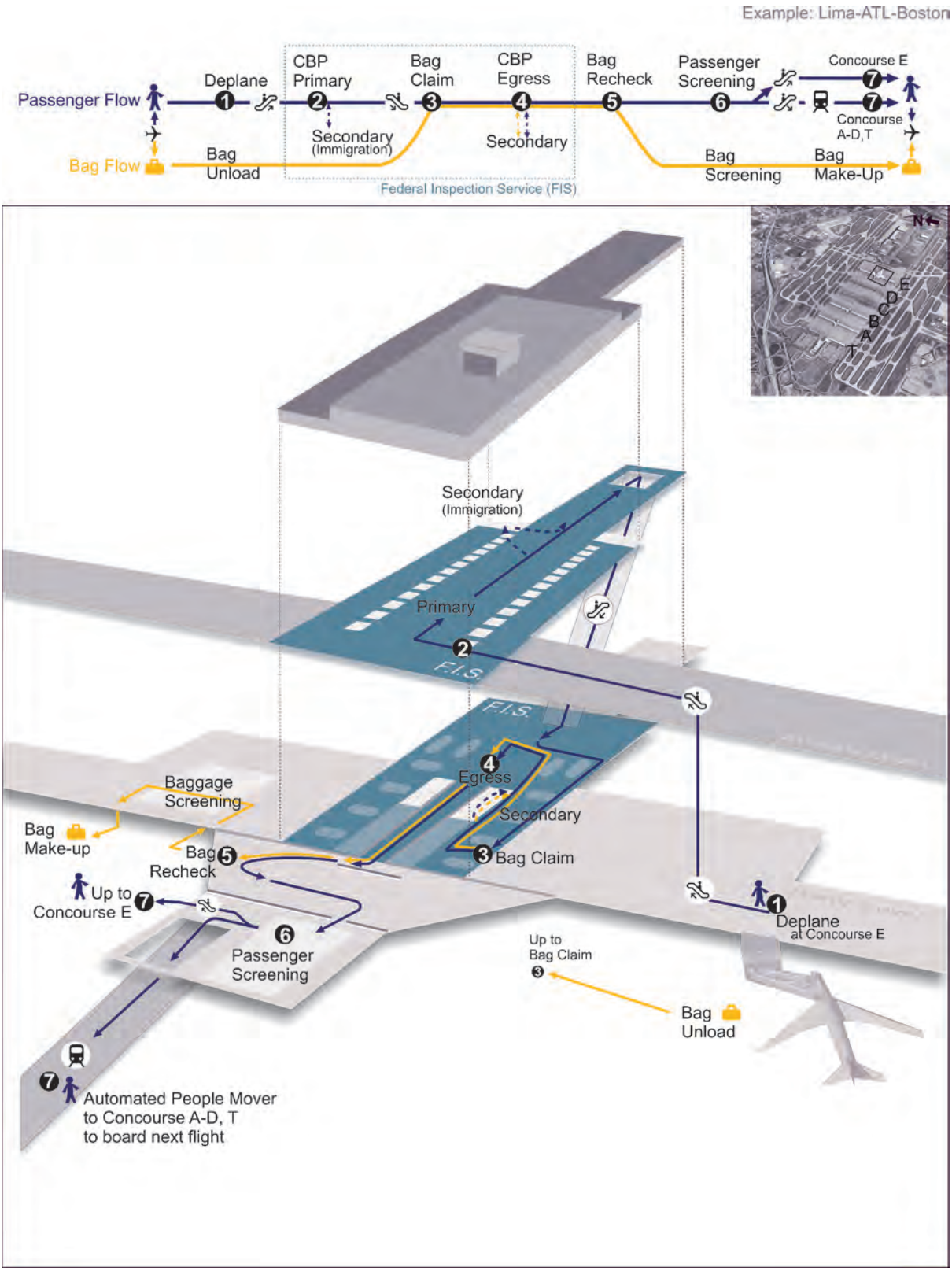


Figure 9. ATL international-to-domestic passenger and bag flow.

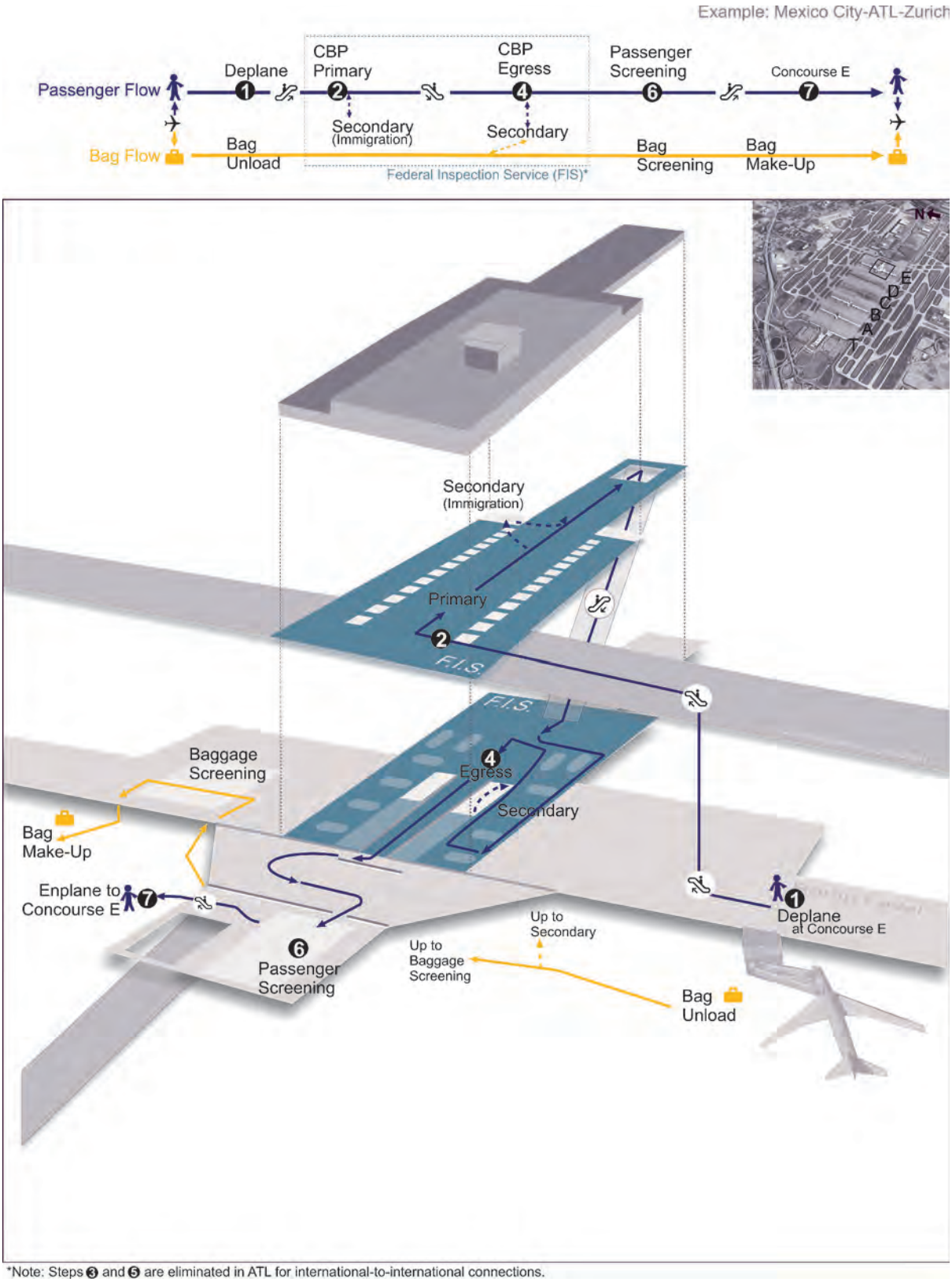


Figure 10. ATL international-to-international passenger and bag flow.

Preclearance Connections

ATL is the recipient of U.S. Preclearance flights from the Caribbean (e.g., Nassau) and Canada (e.g., Toronto). Precleared arriving passengers are treated similarly to those arriving on domestic flights: passengers deplane directly into the departures area and can proceed directly to their subsequent connecting flights. Precleared flights from the Caribbean typically arrive on Concourse E, while precleared flights from Canada arrive on Concourse D. Rescreening of bags from these flights occurs within one of three screening areas (two within the main terminal building and one under Concourse E). To meet this requirement, bags must be presented to the TSA by the carrier for rescreening before enplanement for a subsequent flight.

Preferential Connections on Airline Alliances

SkyTeam is the primary alliance for connections at ATL. While the baggage recheck facility is primarily geared toward the dominant carrier and alliance, there are also desks and capabilities for United Airlines and British Airways/American Airlines staff to use recheck facilities.

Relevance of Eliminating Baggage Recheck

Airlines

Discussions with airlines highlighted several key benefits of baggage recheck elimination, including reduced staffing costs and improved connections.

The challenge of the baggage process stems from the volume of bags and passengers being handled. International movements at ATL typically call for approximately 23,000 arriving bags per day. This amounts to an hourly peak of more than 1,100 bags on average, with peaks that could approach 1,500 bags depending on the number of wide body aircraft. The relevance of the baggage recheck connection issue is based on connection times and accommodating the large volumes of passengers.

At present, 80 minutes is the standard for international–domestic connection times at ATL. However, as 12 wide body aircraft currently arrive between 3:30 and 5:00 p.m., peak baggage volumes can result in up to 20 percent of international bags missing connections. By comparison, domestic connections are listed at 40 minutes. Atlanta's very large volume of baggage is impacted by insufficient connection time, and the baggage delay is often misperceived by passengers to be the fault of CBP.

With international-to-international processes in place for handling bags at the ramp level, there was anecdotal evidence that substantial improvements on the number of mishandled bags were made for this flow.

Airport

One of the chief customer service complaints about Hartsfield–Jackson Atlanta International Airport is the baggage recheck process for terminating passengers. While the new Maynard Holbrook Jackson, Jr. International Terminal will address this recheck for terminating flows, there is considerable interest in eliminating all baggage recheck due to space constraints. Simplifying access to inter-concourse trains could result in dramatic gains in passenger flows and convenience.

Customs and Border Protection

CBP is generally supportive of a technological approach to improving the baggage recheck processes. While mindful of the risk environment, CBP noted that Hartsfield–Jackson Atlanta International Airport was one of the fastest growing sites for Global Entry. The relevance to the baggage recheck issue is based on the opportunity for testing ideas for a group of vetted low-risk

passengers. Other technologies have been reviewed in the past, including sharing information from other agencies such as TSA, and the use of passenger tracking tools such as RFID.

Transportation Security Administration

There was no direct comment from TSA on baggage recheck elimination. However, at an operational level, the study team identified potential issues at a number of flows/cross-flows, as well as space associated with queuing for TSA processes.

Case Study 3: San Francisco International Airport

Current Processes

This section maps the five current passenger and baggage flows at San Francisco International Airport (SFO).

International Arrivals/Terminating Passengers

The FIS facilities are adjacent to each other to serve "A" and "G" gates in the international terminal. For the purpose of this review, the study team focused on G gates that primarily service Star Alliance (United) flights.

All international arriving passengers to SFO deplane and follow a sterile corridor to CBP Primary. SFO is different from ATL and DFW in that the international arrivals area is on one level. All passengers present themselves to CBP for primary processing and are subsequently directed to CBP Secondary or the baggage carousel area. Terminating passengers are responsible for collecting their checked baggage (if applicable) and proceeding to the Egress Officer position before exiting to the public area of the terminal.

Baggage is unloaded from the international arriving aircraft and loaded onto the appropriate conveyor belt(s) to distribute the bags to the baggage carousels one level above.

An overview of this process is provided in Figure 11 with passenger process Steps 1 through 5. To simplify the description of this process, Figure 11 outlines the flow of an international arriving passenger at International G gates. For passengers arriving at the A gates, the flow is a mirror image.

International-to-Domestic Connections

International-to-domestic connecting passengers (see Figure 12) follow the same path as terminating passengers through the CBP Egress officer position, but they use separate exits. After international-to-domestic passengers exit, United Airlines and Star Alliance passengers turn left (other carrier passengers turn right) to approach the United Airlines baggage recheck facility where they place their baggage into the SFO baggage system. Airline staff is present to help passengers address issues such as missed connections, re-booking, or termination of any previously checked baggage.

Once the recheck process is complete, passengers follow a public corridor to TSA security screening. United and Star Alliance passengers are typically directed toward the international checkpoint for TSA passenger screening and then follow a secure side corridor to Terminal 3 for domestic connections.

International-to-domestic transfer baggage is unloaded from the aircraft (with terminating and other transfer baggage) and loaded onto the appropriate conveyor belt(s) to distribute the bags to the baggage carousels one level above. Once collected by the passenger and re-inducted into the system at the recheck facility, the bag is transported via a high-speed conveyor belt to the

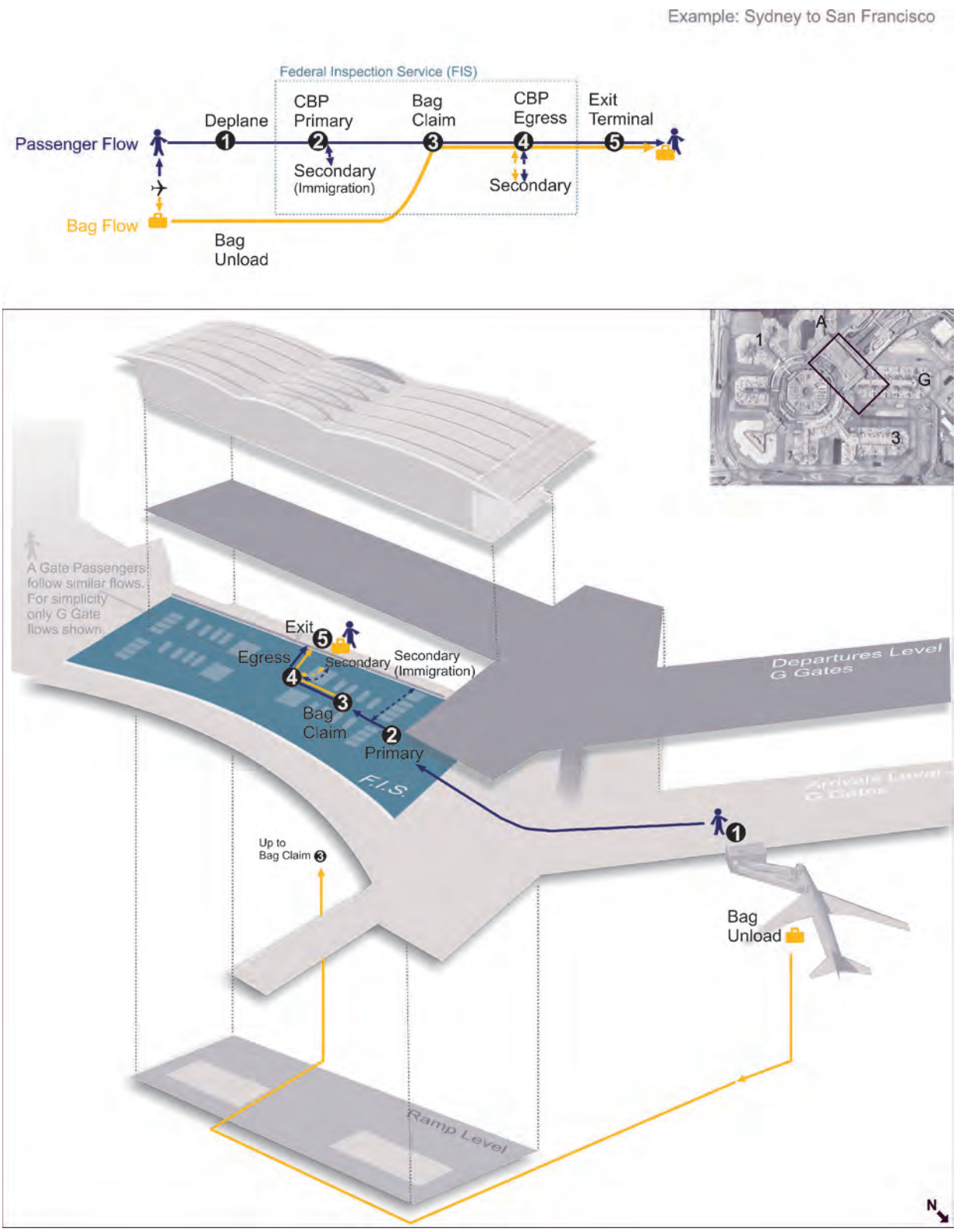
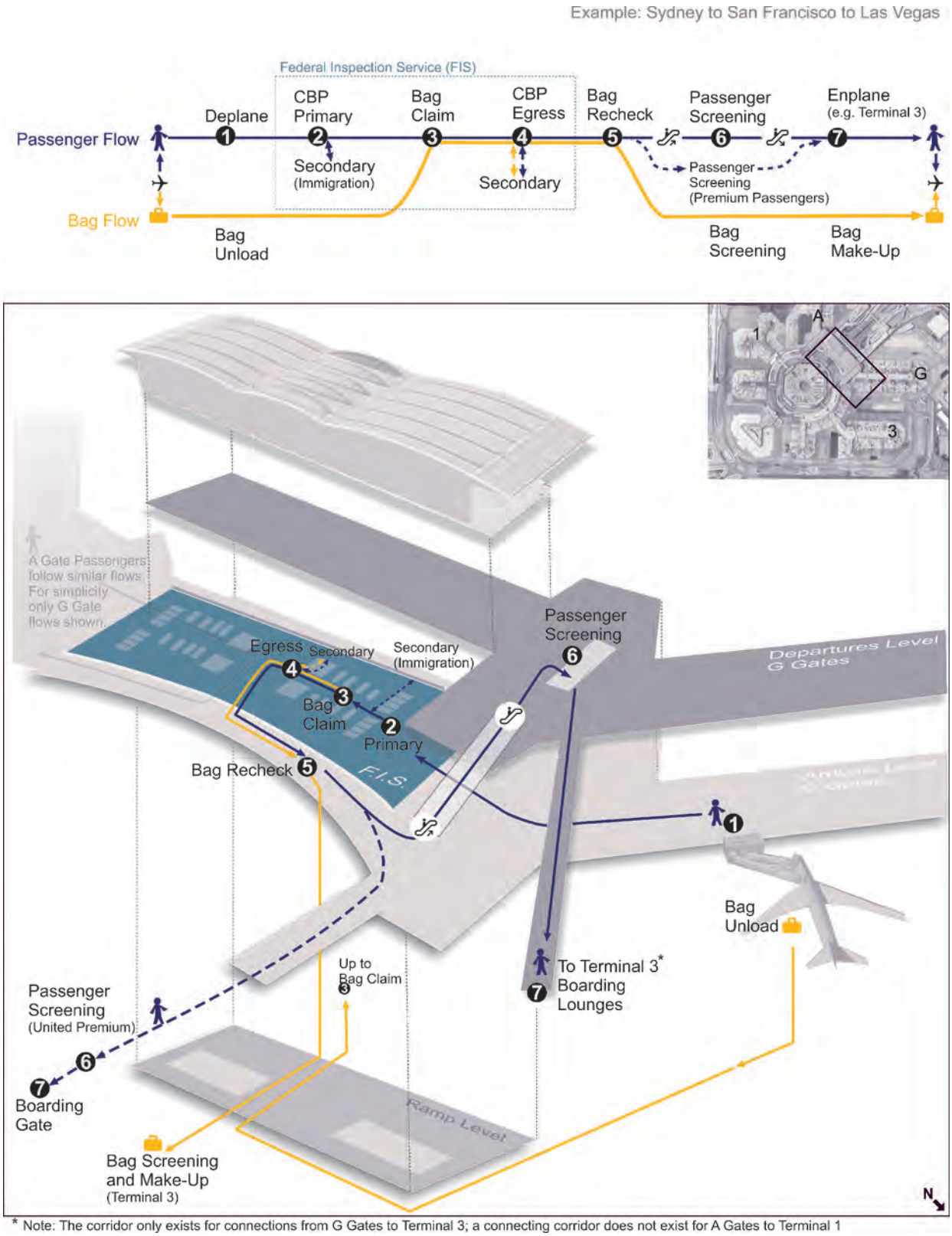


Figure 11. SFO international terminating passenger and bag flow.



* Note: The corridor only exists for connections from G Gates to Terminal 3; a connecting corridor does not exist for A Gates to Terminal 1

Figure 12. SFO international-to-domestic connections passenger and bag flow.

appropriate terminal (typically Terminal 3). Upon arrival at the outbound terminal, the interterminal conveyor belt has second priority to originating passengers to enter the TSA X-ray screening matrix. Once screened, the bag is sorted to its appropriate outbound baggage make-up unit.

Figure 12 depicts the flow of an internationally arriving United Airlines/Star Alliance passenger connecting to a domestic flight from Terminal 3. The process is a mirror image for those arriving at the A gates and connecting to Terminal 1 for a domestic flight, with the exception that a sterile airside corridor does not exist between the A gates and Terminal 1.

Several carriers have opted not to utilize the baggage recheck facility provided by the airport because of the incremental costs of staffing positions to serve a select few passengers. Instead, international-to-domestic passengers are required to approach other check-in areas to recheck their baggage alongside other domestic passengers originating in San Francisco.

International-to-International Connections

The international-to-international connection process is the same as the international-to-domestic process through the recheck process. The only difference is the baggage process. Instead of using a high-speed conveyor to the domestic terminal (1 or 3), bags are directed to the TSA X-ray screening matrix in the international terminal. If cleared by the TSA, the baggage is sorted to the appropriate outbound make-up unit.

An overview of the process is provided with passenger process Steps 1 through 6 as well as the corresponding bag processes (see Figure 13).

Preclearance Connections

SFO has precleared flights arriving to the airport from Canada (e.g., Vancouver, Calgary, and Toronto). To meet ATSA requirements, TSA mandates that the bags be delivered for baggage screening.

The passenger process is much like a domestic arrival process in that passengers arrive into the terminal building in the departures area and do not proceed to CBP Primary. Passengers departing on domestic flights stay within the same terminal or can exit to the public side and proceed to the other terminal.

The specific process for these bags is that they are unloaded from arriving aircraft, fed to an induct conveyor that leads directly to TSA bag screening, and routed to the appropriate baggage make-up carousel.

Preferential Connections Process

United Airlines has a designated TSA passenger checkpoint, located between the International Terminal and Terminal 3, which services United Preferred passengers (connecting and originating). During peak periods, this United Preferred checkpoint provides an easier connection process for international arriving passengers to connect to domestic flights.

Relevance of Eliminating Baggage Recheck

Each stakeholder consulted at SFO was asked a series of questions with regard to the relevance of eliminating baggage recheck for international connections. The discussions centered on the operational impact, cost, timing, and benefits of eliminating/reducing baggage recheck.

Air Carrier

The dominant air carrier operating services to/from SFO is United Airlines, which therefore has the greatest opportunity to benefit from eliminating or reducing the need for baggage recheck.

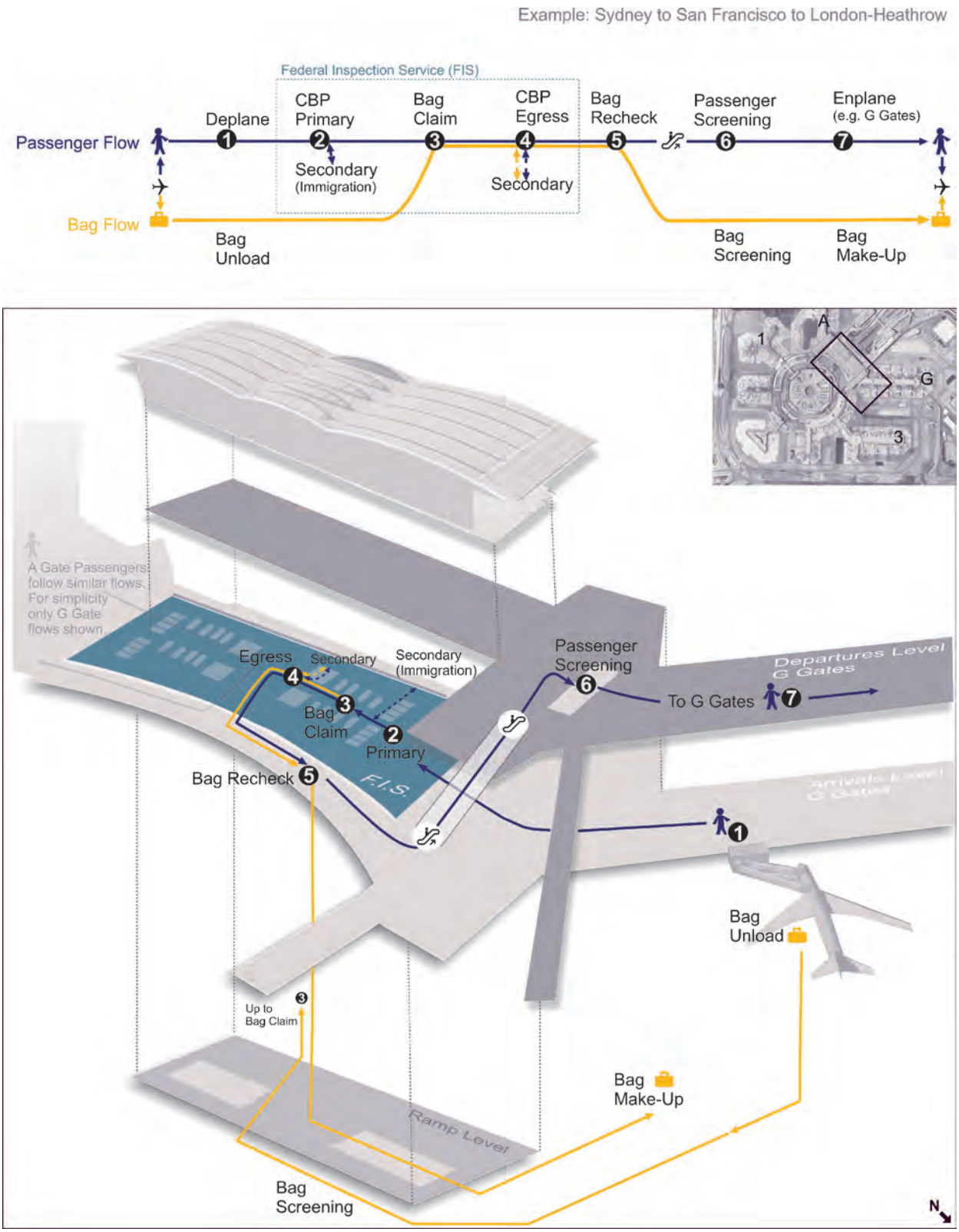


Figure 13. SFO international-to-international connections passenger and bag flow.

The dominant connecting market for United Airlines is the international-to-domestic sector rather than the international-to-international market, which is more prominent through LAX.

In examining the volumes of connecting passengers in Summer 2010, however, United Airlines reported that there were insufficient volumes to invest in new processes to remove recheck processes. While not opposed to process improvements, United Airlines gave priority to sites other than SFO.

Airport

SFO staff also identified the international-to-domestic connections as the market that would generate the greatest benefits should the need for baggage recheck be eliminated. For the airport, the greatest benefits would be realized through improvements to passenger convenience—and their potential to spend more money on retail/concessions if not waiting for baggage. Currently, it is acknowledged that the critical bottleneck in the connection process is wait time at the baggage carousels in the international arrivals area, and again at the recheck facility. CBP has proven to effectively staff the more than 70 Primary podium positions to sufficiently manage the queue lengths during the morning peak-hour volumes.

The ability to remove onward connecting passengers from the baggage carousel area and the recheck facility would provide significant space savings as well.

The opportunity to provide customers (i.e., air carriers) with a facilitated process would help develop the airport as a gateway to/through North America. The airport also acknowledged the impact of TSA rescreening of U.S. Preclearance bags as a hindrance to its gateway operations.

For the betterment of the airport, reducing or eliminating the need for baggage recheck would have universal air carrier participation due to the volume of connecting non–United Airlines passengers (e.g., Virgin Atlantic, British Airways).

One factor of concern to the airport is its ability to temporarily store bags in the outbound baggage area (based on the International Baggage Connection Program in DFW). This issue is likely to be a factor for many ports of entry across the United States.

Customs and Border Protection

The discussion with San Francisco–based CBP officers centered on the international-to-international connections through DFW and ATL for American Airlines and Delta Air Lines passengers, respectively. Unaware of the two programs, SFO CBP highlighted the value of seeing the passenger and baggage interaction as an element of the risk management inspection they undertake with each passenger.

CBP also acknowledged the regular queues that form at the international arrivals baggage carousels as passengers wait to retrieve their checked baggage. CBP noted that passengers often misperceived that the baggage delays were the fault of CBP. They also recognized the passenger convenience that could be improved through the elimination or reduction of passengers retrieving their baggage. However, this could not occur at a detriment to their risk management provisions.

Transportation Security Administration

At present, there is a conveyor system to feed baggage directly into the TSA X-ray screening in unit in the international terminal facility.

Case Study 4: Seattle-Tacoma International Airport

Current Processes

This section maps the three current general passenger and baggage flows at Seattle-Tacoma International Airport (SEA).

International Arrivals/Terminating Passengers

All international arrival passengers, excluding those arriving on precleared flights, proceed through the FIS facility located in the South Satellite terminal. After passengers claim their bags and exit the FIS area, they must drop their bags for separate transport to the Main Terminal. Passengers must be rescreened before boarding the secure airside people mover that transports them to the Main Terminal. Bags are moved via a conveyor to the Main Terminal baggage claim to be retrieved by passengers. Figure 14 depicts these flows.

International-to-Domestic and International-to-International Passengers

Connecting passengers, whether international-to-domestic or international-to-international, must currently recheck their bags after exiting the FIS area. Passengers are screened in the South Satellite before proceeding by secure airside people mover to the Main Terminal or up to the departures level of the South Satellite. After baggage screening, the luggage waits at the bag make-up area to be picked up by airline baggage handlers to be loaded onto aircraft either at the Main Terminal or at the South Satellite. Figure 15 depicts these flows.

Preclearance Connection

Checked baggage for flights arriving at SEA from Preclearance airports in Canada does not need to be retrieved and does not come in contact with passengers. Passengers arrive and deplane directly into the departures area of the terminal, but TSA still requires that all checked bags from these flights be rescreened before being loaded onto the subsequent connecting flight. Bags are unloaded from arriving aircraft and then fed to an induct conveyor for Preclearance connections at the Main Terminal; bags then proceed through TSA bag screening and are sorted to the appropriate connecting domestic or international flight.

Preferential Connections on Airline Alliances

SEA is a hub airport for Delta and Alaska/Horizon Air. Numerous international-to-international and international-to-domestic connections take place between these airlines. Preferential treatment of passenger and baggage flows by airline, however, is not currently in place at the airport.

Relevance of Reducing Baggage Recheck

While representatives of the airline, CBP, and the airport were consulted at SEA, Port Seattle (airport) was the only local representative that engaged in an in-depth discussion regarding the reduction of baggage recheck for international-to-international connections.

Airport

The discussions centered on the operational requirements, cost, timing, and benefits of reducing baggage recheck. While a number of minor operational adjustments would be required to implement a near-term international-to-international bag transfer program for a specific set of flights, the costs are relatively low and the benefits are significant. Some of the benefits cited include alleviating congestion in the baggage claim carousel area while also freeing up capacity on the carousel, acting as a potential step to eliminate need for bags in the FIS area for destination passengers, helping improve minimum connection times, and reducing bag handling and potential issues.

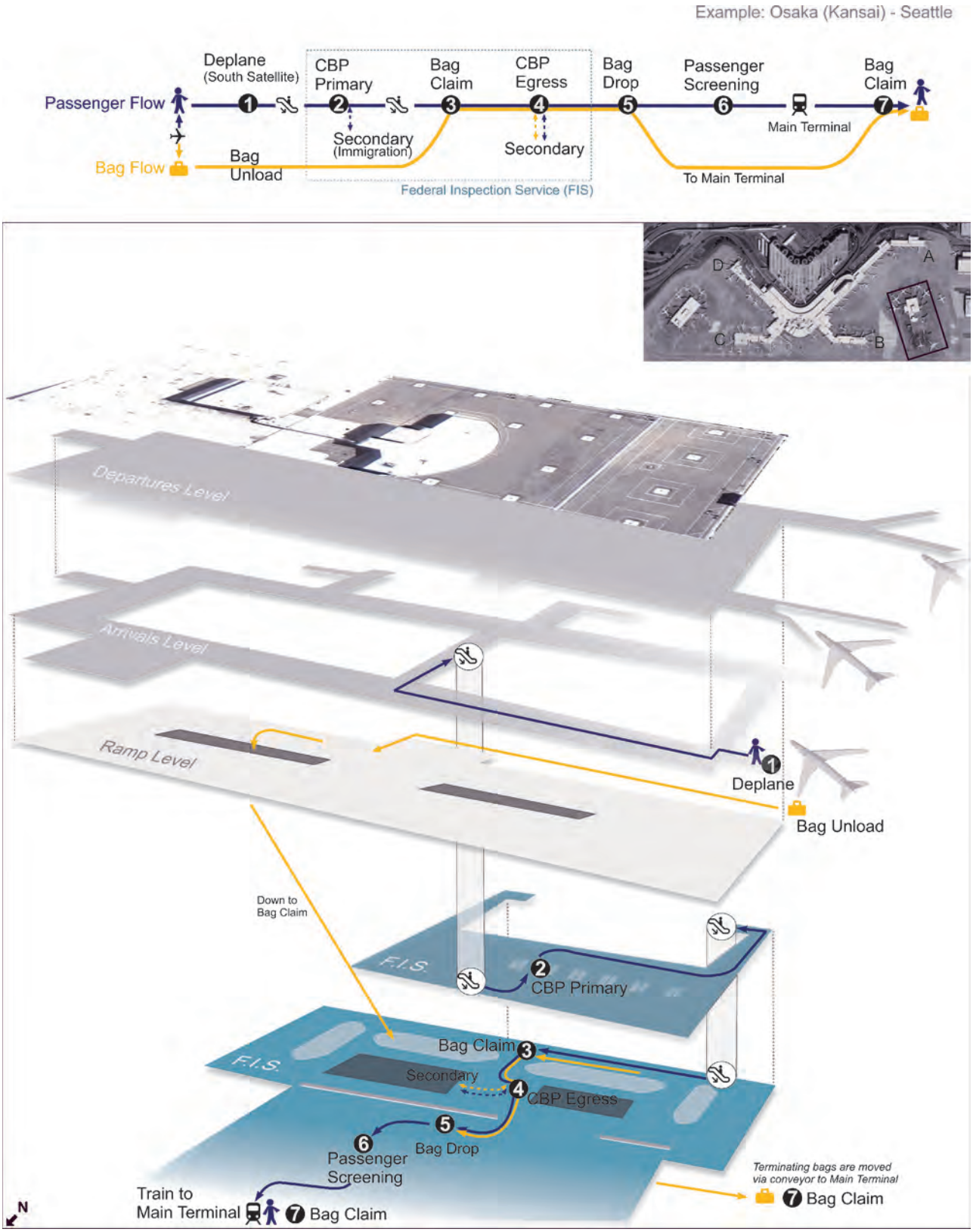


Figure 14. SEA terminating passenger and bag flow.

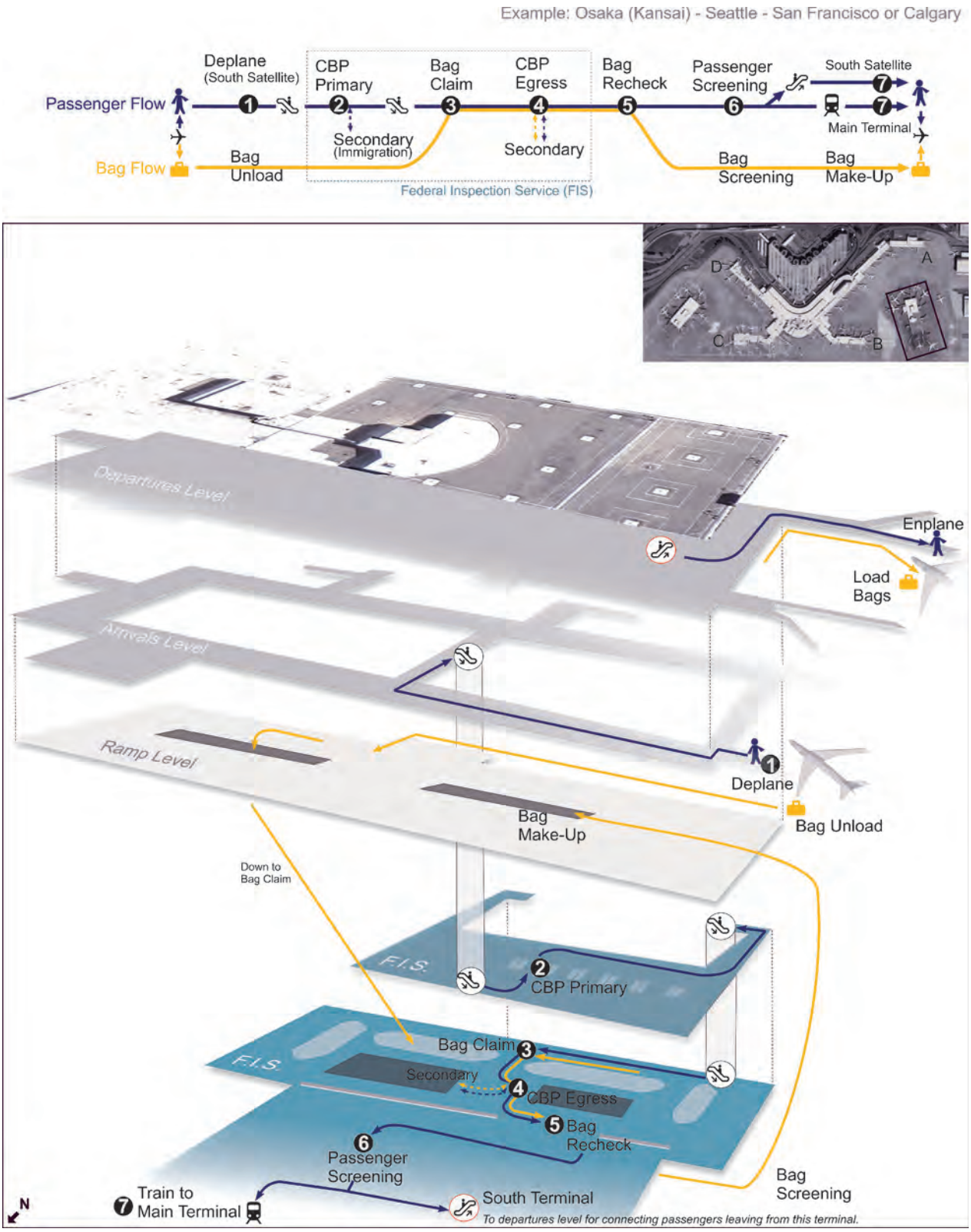


Figure 15. SEA connecting passenger and bag flow.

CHAPTER 4

Testing and Evaluating Potential Solutions

To eliminate or reduce baggage recheck, CBP must specifically exempt international connecting bags from appearing in the FIS area. To provide such an exemption, CBP must be satisfied that it is able to effectively manage all people and goods that seek entry to the United States. Given the pilot projects in place at four U.S. airports to reduce baggage recheck for select international-to-international connections, CBP is open to discussing opportunities to provide a facilitated process for passengers.

Trends in Border Risk Management Relevant to This Study

The study team found three opportunities for risk management that are relevant to baggage recheck elimination:

- Activities *before* a flight takes off from a foreign airport
- Processes *immediately upon arrival* at a U.S. airport
- Other measures undertaken *prior to the next flight*

Overall, border authorities worldwide are increasing the amount of risk management before flight departures and augmenting the arrivals processes. This effort is intended to "push out the border" in order to identify (and mitigate) potential threats as early as possible.

Activities Before a Flight Takes Off from a Foreign Airport

In the past, CBP and other border agencies around the world relied almost exclusively on processes upon arrival. Since 1997, CBP has dramatically increased the use of advanced risk management tools *before* a flight takes off from a foreign airport. These tools include a range of initiatives, from the use of API/PNR data to the recent introduction of Electronic System for Travel Authorization (ESTA), Secure Flight, and other board/no-board programs. More information on these programs can be found in Appendix D.

For the most part, the programs have facilitated handling immigration risks for CBP. The U.S. Visitor and Immigrant Status Indicator Technology (US-VISIT) program, for example, has assisted in minimizing visa fraud through the use of biometrics.

There are, however, few activities that actually take place before an international arrival that deal directly with customs or agricultural risks. Two examples are preclearance and an Australia/New Zealand initiative to share X-ray images for the purpose of agricultural inspection.

There are several potential opportunities for managing risks before arrivals.

Processes Immediately upon Arrival to a U.S. Airport

CBP could introduce a new arrival process/system that would enable a complementary baggage risk management technique to occur between a bag being offloaded from the plane and it being introduced to the airport baggage handling system. This new process would help mitigate the risk involved in the bag not appearing in the FIS area (by default). For example, existing irregular operations procedures have contingencies for how to handle/inspect baggage that arrives at a port of entry without the passenger (e.g., weather delays or baggage mishandle). A range of potential solutions that could be provided to eliminate or reduce baggage recheck include additional screening by a human (e.g., CBP officer visual inspection), technology (e.g., radiation scan), or canine inspection.

Other Measures Undertaken Prior to the Next Flight

There are additional processes that may manage risks prior to a connecting flight. Some jurisdictions (e.g., Lufthansa and German authorities) regularly employ a hold process to prevent passengers/checked bags from boarding a subsequent flight should an issue arise. Other jurisdictions also employ customs/agricultural processes at the final airport destination, rather than at the intermediary point.

These options are not readily available to use in the United States because of significant differences in rules/laws governing border operations.

Potential Solutions

Based on a preliminary review of the opportunities, risks, benefits, and costs, seven alternative procedures were evaluated; these procedures take into account pre-flight, arrival, and pre-connection opportunities. Table 2 identifies the procedures and indicates when they would occur.

Alternative Procedure 1: Exemption of Checked Baggage from FIS

Since 2007, CBP has been piloting the concept of reduced baggage recheck at select airports. At present, Atlanta, Dallas/Fort Worth, Houston, and Guam have airports with a model of CBP processing in which not all bags need to be delivered into the FIS area from international flights. As a result, passengers do not need to claim and recheck bags for selected flights. Figure 16 shows a basic flow for baggage exempt from the FIS area.

Process

For international arrival passengers connecting to another flight, checked bags would be unloaded from the aircraft and delivered directly to TSA baggage screening (either by direct belt

Table 2. List of alternative procedures and timing of risk mitigation.

No.	Alternative Procedure	Before Arrival	Upon Arrival	After Arrival
1	Exemption of Checked Baggage from FIS			X
2	New Airline/Airport Processes on Arrival		X	X
3	New CBP Processes on Arrival		X	X
4	Enhanced Pre-departure Information	X	X	
5	Information Sharing with TSA Programs			X
6	Leveraging of Other DHS Programs	X	X	
7	Door-to-Door Baggage Service	X		

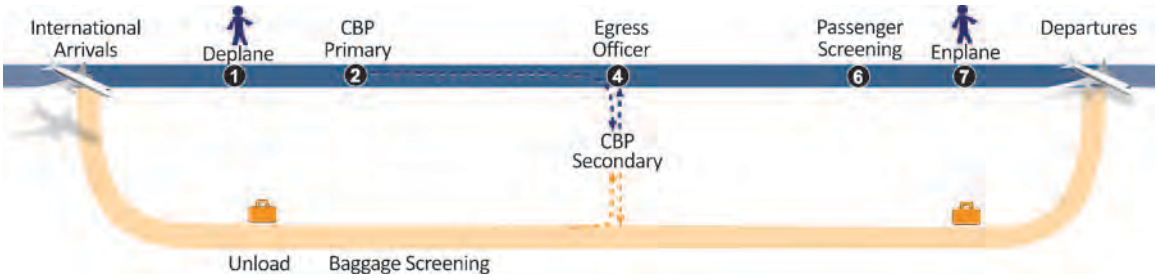


Figure 16. Passenger/baggage flow for checked baggage exemption from FIS.

or manual delivery). Once screened and cleared by the TSA, the bag would be diverted to the outbound baggage make-up area. Depending on local operating conditions, the onward connecting baggage would be separated from originating outbound bags until a locally agreed-upon pre-flight release time.

At any point during the baggage process, CBP has the absolute authority to request that a selected passenger's checked baggage be retrieved and delivered to CBP for secondary processing. It is the responsibility of the operating carrier (and the baggage handling team) to retrieve and deliver the requested baggage within a pre-determined timeframe (e.g., 20 minutes).

Issues and Considerations

There are three major obstacles for widespread implementation of this alternative procedure:

- **Risk levels:** Historically, CBP is amenable to this alternative process when applied for international-to-international flights, but views international-to-domestic with significant caution due to the potential for contraband to enter the commerce of the United States.
- **Operations:** Separating bags between connecting/terminating passengers requires improved tracking capability or dedicated ground handlers to sort/retrieve bags.
- **Facilities:** Bags directed to TSA for explosive detection system screening may involve a manual process; storage of bags for connecting flights may also be an issue.

Overall, the key implementation issue is whether airport facilities have sufficient space to deal with ramp-level transfers for connecting bags, particularly those airports with a 50 to 75 percent connection volume during peak periods.

Alternative Procedure 2: Alternative Procedure 1 + New Airline/ Airport Processes on Arrival

To secure support for various facilitation processes, some airports with CBP Preclearance have introduced new processes to provide CBP with more information to assist in risk management. Alternative Procedure 2 outlines procedures that the participating air carriers or the airport operator could advance at the airport which would provide additional information to CBP to assist in its risk analysis.

The precedent for this concept is contained within the CBP requirements at Preclearance sites for exempting bags from being present in the FIS area.

Process

As shown in Figure 17, there are new processes that CBP has accepted to mitigate potential risks:

- **Bag image:** With a transfer passenger's baggage no longer appearing in the FIS area, a digital photograph of the passenger's baggage is shown on CBP officers' workstations. This practice

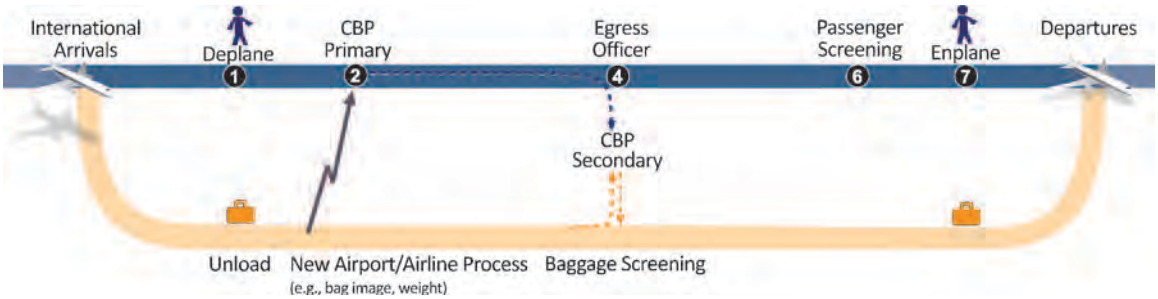


Figure 17. Arrival passenger and baggage flow for new risk mitigation by airline/airport.

has been used at CBP clearance facilities since 2006 outside the United States. (e.g., Halifax, Shannon, Vancouver, Montréal, Ottawa, and for some flights through Edmonton).

- **Bag weight:** Similar to the bag image concept, the ability for CBP Officers to monitor the weight of a bag can help in evaluating its contents.
- **Other:** Other risk management tools that the air carrier or airport operator can provide to augment information that CBP has to work with may be developed from site to site.

Issues and Considerations

There are commercial off-the-shelf systems that could provide CBP with the appropriate information. However, the costs borne by airports and airlines to provide additional information to CBP represent a potential obstacle to this alternative procedure. While cost may not be an issue at some facilities, the study team notes that the high variability of "risk" as defined by CBP, and discretion for a Port Director to implement local procedures, can impact the feasibility of this alternative.

Alternative Procedure 3: Alternative Procedure 1 + New CBP Processes on Arrival

Local cooperation with CBP management has resulted in a third type of alternative procedure: developing special processes for transfer bags on arrival (see Figure 18).

Process

The specific process will vary from site to site, but could include the following:

- **CBP Officer Positioning at Transfer Bag Area:** To ensure adequate checked bag inspection (i.e., for drugs, agricultural products, or other threats) is undertaken, an officer (and CBP dogs) could be stationed at the international transfer baggage induct point to monitor bags

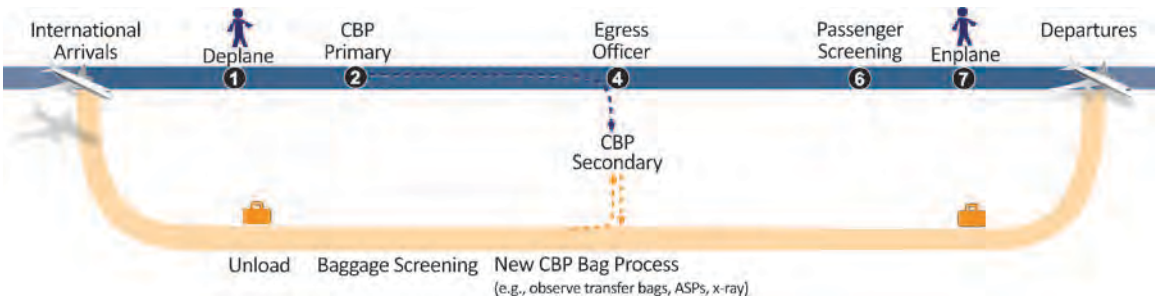


Figure 18. Passenger and baggage flow for new CBP process for transfer bags.

being offloaded from the aircraft. Any baggage that requires further inspection would be routed to the CBP Secondary area and the passenger would be directed from CBP Primary (or Egress) to the Secondary area.

- **Advanced Spectroscopic Portals:** CBP is investing heavily in advanced spectroscopic portals (ASPs) to detect radiation at all ports of entry. CBP's airport facilities guidelines specifically require radiation detection capabilities to be in place for Preclearance facilities in which bags are exempt from the FIS area. Pilot project funding to assist in the improvement of detecting dirty nuclear weapons parts could, therefore, be attractive to CBP. For this study, deploying ASPs for transfer bags could be an important improvement to assist with eliminating baggage rechecks.
- **X-ray Baggage Screening:** CBP does not perform X-ray screening of bags upon arrival as part of its Primary Processing. Depending on the site, an X-ray unit could be located in a separate part of the FIS area or in-line with the conveyor system at ramp level. Eligible baggage could be 100 percent screened or sampled through an adequate statistical method. This capability would enhance CBP's current screening provisions, which only provide officers a review of the contents of bags when inspected in CBP Secondary where X-ray equipment is located.

Issues and Considerations

Any alternative that proposes different procedures for CBP means new training for officers and raises concerns about appropriate officer utilization. Airports and airlines have long expressed concern about the lack of CBP officers at Primary booths. There needs to be a careful balance to ensure that the benefits of baggage recheck elimination or reduction outweighs staffing allocation costs to ensure smooth Primary Processing at hub airports.

Alternative Procedure 4: Enhanced Pre-departure Information

A major trend in border management in recent years is to "push the border out" through analysis of information before flight arrival. API and watch list-based board/no-board directives are some examples of this trend. API is a powerful tool but is focused on a select few risk elements—the identity of the passenger—with limited information about checked bags (other than number of bags). Alternative Procedure 4 is the development of new tools that help to provide risk management before a flight reaches the United States.

Process

Before departure, agreed-upon information is provided to CBP in a standard format (Figure 19). CBP could then process and review information and flag a passenger for Secondary Processing hours before flight landing. The information could include the following:

- **Bag Image:** Making an image of the exterior of checked bag(s) available to CBP is one enhancement that has assisted in managing risks for more than one million passengers since 2006. When

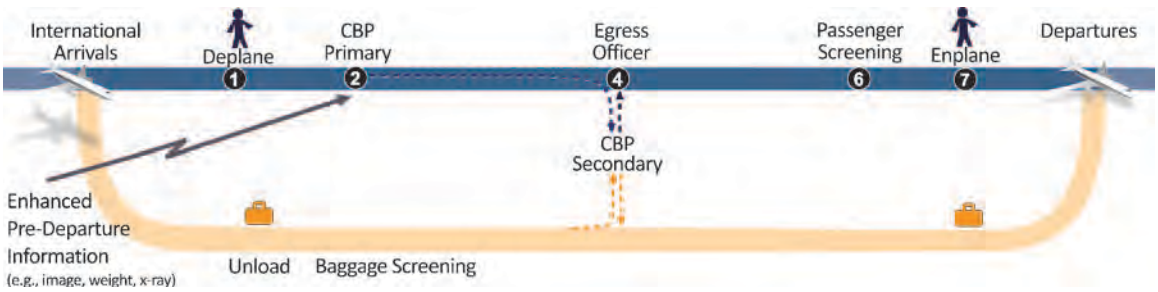


Figure 19. Enhancement of pre-departure information.

used in combination with baggage weight image, some CBP officers have cited the ability for assessing certain types of contraband.
- **X-ray Image:** Several countries have started to share X-ray images from EDS to assist with risk management. While the state of this technology is in its infancy, there is strong potential for X-ray images from abroad to play a role in risk management at home.

Issues and Considerations

Since the failed attack on a flight from Amsterdam to Detroit on December 25, 2009, the capabilities of pre-departure intelligence vetting have taken on renewed prominence. The complexity of information sharing between countries, as well as the privacy rules airlines must abide by, should not be understated.

At an operational level, the potential cost of administering a program to send information to CBP (e.g., the proposed US-VISIT Exit Program) could make solutions difficult to implement. Furthermore, there are technical challenges for information sharing because of the size of photographs or other information transmitted to CBP.

Nevertheless, this alternative procedure could prompt creative solutions that could serve as a future platform for the evolution of pre-departure intelligence and information processing.

Alternative Procedure 5: Information Sharing with TSA Programs

TSA and CBP are currently in an era of renewed data sharing. From cargo security to the implementation of Secure Flight, both DHS agencies have improved collaboration to combat potential terrorist and other threats. The level and urgency of cooperation has also been strengthened since the failed attack in Fall 2010 on UPS and FedEx aircraft. As a result, the opportunity to leverage TSA activities was discussed.

Currently, all connecting baggage is subject to TSA baggage screening. For the international bag connection procedures operating at DFW, IAH, ATL, and GUM, all bags are inspected by the TSA after being unloaded from the aircraft and before being moved to the baggage make-up area (Figure 20). The TSA X-ray image could be of great value in augmenting the current CBP inspection process. The opportunity to share the X-ray image and/or intelligence between the branches of the DHS would provide CBP with increased awareness of baggage contents and could occur through multiple mechanisms:

- CBP officer in TSA bag screening area
- Transmission of TSA X-ray image to a workstation monitored by a CBP officer
- Dual processor within X-ray unit to run the TSA algorithm and a CBP-designed algorithm

It is recognized that these concepts need further evaluation within the existing DHS regulations, codes, and policies.

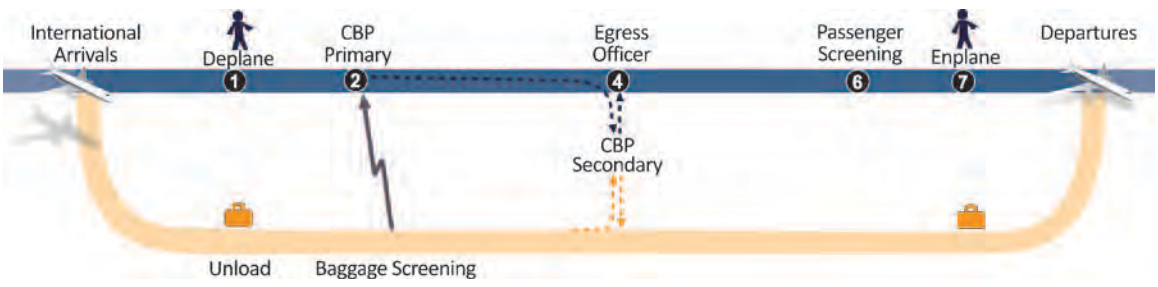


Figure 20. Passenger and baggage flow for information sharing with TSA programs.

Alternative Procedure 6: Leveraging Other DHS Programs

Using existing DHS programs, such as Global Entry, that allow trusted travelers to not have to claim their checked baggage is one way to reduce baggage recheck (see Figure 21). Global Entry is a voluntary trusted traveler program that enables a kiosk-facilitated international arrivals process into the United States for travelers who have successfully passed a detailed risk/background analysis. Upon completion, the accepted members are deemed by CBP to be of "low risk." The benefit to the traveler is a consistently faster CBP inspection process on arrival to the United States. CBP has the benefit of conducting a much more thorough risk assessment of Global Entry members before they arrive at the port of entry and thus can focus its resources on those travelers for which they have less information upon arrival.

At the time this study was conducted, Global Entry had no interaction with airlines overseas, nor does it deal with Global Entry members' checked bags.

In concept, reducing the need for baggage recheck for all Global Entry members is sound, as these individuals have already been recognized as "low risk" and thus worthy of a facilitated process. Further, it would support the CBP initiative to increase Global Entry participation by improving the benefits of membership. As of mid-2011, there are 100,000 members, and this volume is set to grow with increased international collaboration. Although the program was initially designed with frequent fliers in mind, it is open to anyone who holds U.S. citizenship (or lawful permanent residents), Dutch citizens, Mexican nationals, and Canadian Nexus (a joint U.S./Canada trusted traveler program) members.

For the bags of Global Entry members with an interlined/same carrier connection to be processed without baggage recheck, a number of procedural changes are necessary:

- **Confirmation of Global Entry Status:** Airline check-in agents overseas need a way to confirm participation in Global Entry in order for this to be a sustainable solution. In August 2011, CBP announced the introduction of a Global Entry membership card with RFID technology (i.e., the same technology as the Nexus card). This card is an important step but not a complete solution to enable point-of-origin confirmation of active status in Global Entry. The critical issue is validating that the person presenting the card is in good standing with their Global Entry membership, for example, ensuring that the passenger is not presenting a fraudulent Global Entry card, that the current passport is updated to the Global Entry account, and that the passenger has not recently been removed from the program without confiscation of the card. A complete solution, one without a "hole," would require confirmation that the holder of the Global Entry card is the same person identified on the card and that the person is an active participant in the Global Entry program (e.g., TSA Secure Flight verification at point of origin).
- **Tagging to final destination:** Assuming that airline agents are able to differentiate Global Entry members from non-members, the next step is to ensure that bags can be adequately

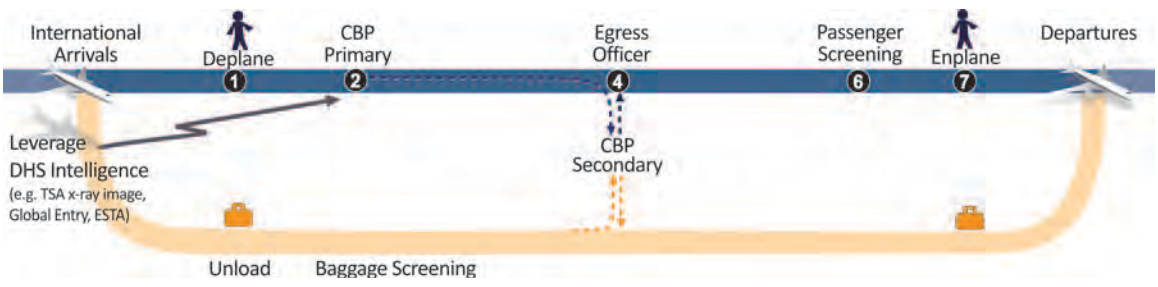


Figure 21. Passenger and baggage flow for leveraging other DHS programs.

tagged and separated for individuals participating in this process. Manual solutions (e.g., special transfer tags) could work, but these may vary from air carrier to air carrier. Automated solutions, such as a permanent bag tag (i.e., RFID-enabled Qantas Q-tag), could be used in the future for Global Entry members. Other opportunities could include an additional data field within the Baggage Source Message, or API/PNR sets.

- **Control on arrival:** Similar to other solutions, the ability to fully differentiate and manage Global Entry connecting bags from others would be needed.

The latter two issues could be resolved with existing processes used by a variety of airlines and/or new tracking solutions. However, the ability to confirm Global Entry status at point of departure worldwide is a critical component that requires further systems development. Ultimately, a system that can provide electronic verification of active participation in Global Entry can provide the necessary trust for travelers that their bags will be managed appropriately, and evidence for CBP that it can fully meet risk management objectives.

Alternative Procedure 7: Door-to-Door Baggage Service

In 2010, SITA estimated that 51 percent of lost bags were due to mishandled transfers. While the overall number of lost bags declined because of reduced traffic, the risk of lost bags in transfers continues to be higher than point-to-point services.

A seventh alternative procedure is the expansion of door-to-door baggage services beyond the current limitations within the continental United States (*5*). Figure 22 depicts the separate flows for passengers and baggage.

Process

Should this process be available globally, a passenger would print out a waybill through an air carrier website linked to a courier service. The passenger would indicate the destination address on the waybill. Before travel, the passenger would drop off the bag or have it picked up.

CBP risk management would review the checked bag as a cargo shipment. The information from the waybill would be analyzed by CBP's Automated Targeting System in order to identify high-risk cargo shipments that require further review.

On the day of the journey, the passenger would travel separately from the bag and proceed through the airport FIS upon arrival to the United States without checked bags.

Issues and Considerations

With the growth of fees for checked bags as well as fees for cabin carry-on items, there is some potential for third party door-to-door shippers to grow in prominence over the coming years.

While this alternative procedure can help to remove the need for baggage recheck for one passenger, it does little to eliminate an airport baggage recheck outright. Moreover, there are issues

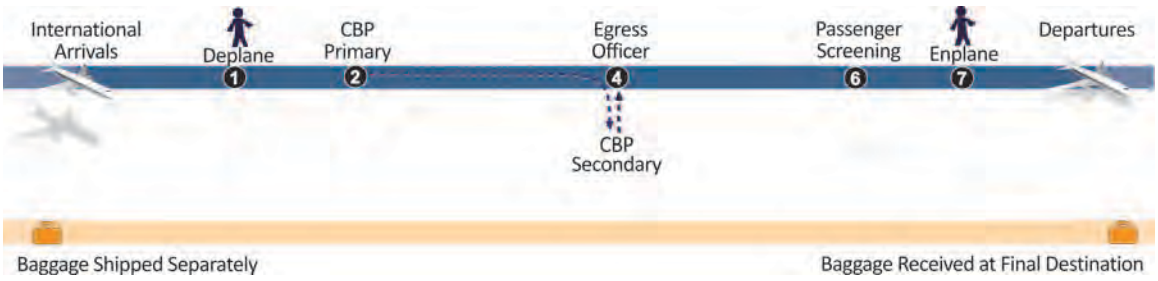


Figure 22. Passenger and baggage flow for door-to-door service.

associated with the rejection of a bag being imported into the United States that would increase both the fee for international door-to-door services and the logistics of handling CBP referrals to Secondary for air cargo shipment of passenger bags.

Alternative Procedure Variations

Beyond the seven categories of alternative procedures, several additional directions could be considered, pending further development:

- **Large group handling:** Where there are large groups of people (e.g., conventions, cruises, special events) with identical connecting routes, special procedures to deal with eliminating baggage recheck have been developed. These are site specific but could offer potential solutions that are relevant during peak-hour conditions. For example, the large number of visitors at and then departing Disney World is provided an off-site check-in facility to facilitate their process.
- **Remote declaration:** Global Entry has modified the Customs Declaration process to be an on-screen kiosk interaction between a passenger and CBP. Should technologies for in-flight communications continue to evolve, there may be additional programs developed that could assist in managing the flow of bags at transfer points.

High-Level Evaluation Model

A high-level evaluation model was outlined to prioritize the key benefits/costs for baggage recheck elimination/reduction based on the following four categories.

Market Demand

All solutions must be derived from market demand. A critical mass of travelers is needed to enable solutions to be facilitated. These can be based on improving customer satisfaction and new routing potential, among other criteria.

Airlines

New solutions could impose additional capital/operational costs on airlines. Of critical concern to the airlines are the incremental costs associated directly with the alternative process to produce a system cost reduction or neutral impact. For example, a shift of resources from the baggage recheck area to the ground handling team, or the process/costs, could be absorbed within existing ground handling and customer staff processes. The costs of the upline management (i.e., before a flight leaves for the United States) also must be factored into the evaluation criteria.

Airports

Airport costs are related to transport equipment and facilities (e.g., storage, sortation), passenger way-finding solutions, and/or additional facility/signage changes. However, the costs associated with the airport are mitigated by its ability to stimulate new traffic, which in turn can stimulate additional aeronautical and non-aeronautical revenues (e.g., concessions).

CBP Risk Management

Finally, CBP's continued ability to conduct effective risk management techniques/protocols is of primary importance. While there are national parameters that will be used to mitigate key

threats (e.g., customs, agriculture, immigration), there could be variability in risk mitigation from site to site based on local conditions.

A more detailed list of criteria is outlined in Appendix F.

See Appendix G for the results of the peer review session ratings of each of the aforementioned alternative procedures.

Testing Process and Results

Based on the high-level evaluation model, a series of tests was defined to identify the potential for eliminating or reducing the need for baggage recheck:

- **Test 1:** Process flows were tracked using RFID tags to determine the timing of bags and passengers in order to assess air carrier, airport, and CBP process timing (DFW).
- **Test 2:** The proposed solution for CBP review of TSA X-ray images as a risk mitigation solution was examined (ATL and TSA Transportation Systems Integration Facility).
- **Test 3:** The potential expansion of international-to-international baggage recheck elimination at a facility (SEA) was reviewed.
- **Test 4:** The market demand benefits of baggage recheck elimination was modeled based on minimum connection time reduction (ATL).
- **Test 5:** The results were modeled in a discrete simulation program.

Test 1: Radio Frequency Identification Passenger and Bag Timing

The first test was driven by a major concern shared by stakeholders during the original site visits. If baggage recheck was eliminated and bags were not needed in the FIS area, could there be situations where passengers would nevertheless be delayed, reducing the time savings benefits of eliminating baggage recheck?

RFID technology was selected to enable automatic collection of large amounts of process timing data. The test airport (DFW) already had an international-to-international program with baggage recheck eliminated. As a result, there was a good control timing to compare with a sector of traffic (international-to-domestic connections) that had baggage recheck.

Test Objectives

The purpose of the test was to characterize the timing for both bags and passengers (via a carry-on item) in order to quantitatively test the operational impact under real airport conditions and enable a comparison of current bag program processes versus potential alternative processes in order to estimate the order-of-magnitude time savings for alternative steps.

The objectives of the carry-on process time testing, conducted in conjunction with the airline RFID baggage study, were as follows:

- Characterization of baggage reclaim process timing (i.e., does the passenger wait for bags at the carousel or vice versa? How frequently does this occur?)
- Comparison of baggage recheck process times (i.e., current international-to-domestic connections) against those of the international-to-international program
- Establishment of the order-of-magnitude time savings for eliminating baggage recheck

Methodology

Working closely with the airline, CBP, and the airport, the study team installed a series of RFID tag readers throughout the arrivals process to record timing data at each step. Tags affixed

to carry-on bags and checked bags enabled the mapping of flows on select flight segments. For more details on the methodology, see Appendix E.

Key Results

For passenger timing from flight arrival to exit from the FIS area, a significant reduction in time occurred as a result of baggage recheck elimination. Although bags were often ready to be picked up by passengers at the baggage claim carousel, connecting passengers needed additional time to locate baggage carts, find/identify their bags, and exit the FIS area. This delay is exacerbated during peak periods with queues forming at the CBP Egress Point. International-to-international passengers using baggage recheck elimination, and other passengers with no bags, could proceed directly from CBP Primary to the Egress Point and would typically avoid the congestion caused by passengers leaving the FIS area with bags.

Key results were as follows:

- The net result was an average time savings of 26 minutes for passengers with baggage recheck elimination (Figure 23).
- Transfer bags were available, on average, 34 minutes earlier for sortation for the next flight.
- Those passengers with baggage recheck eliminated stayed within the FIS area for an average of about 34 minutes and no longer than 80 minutes.
- By comparison, the range for passengers without baggage recheck elimination was 60 minutes, with some passengers staying within the FIS area well over 120 minutes.

While the study team found positive results for time savings for baggage recheck elimination, it also noted that there were some aspects of passenger processing that limited some of the full benefits:

- Without baggage recheck elimination, the study team found that 65 percent of bags were ready to be picked up by passengers at the claim carousel and remained on the carousel for 11 minutes, 19 seconds on average.
- The 35 percent of passengers who had to wait for their bags to appear waited on average for 12 minutes, 45 seconds.

Baggage recheck elimination would completely remove the 12-minute, 45-second average wait for bags. However, the study team found the 11-minute, 19-second average wait by bags for passengers to be a function of the overall wait time for CBP Primary Processing, which can vary by time of day and peak periods found at international arrivals.

For more information on this study site, see Appendix E.

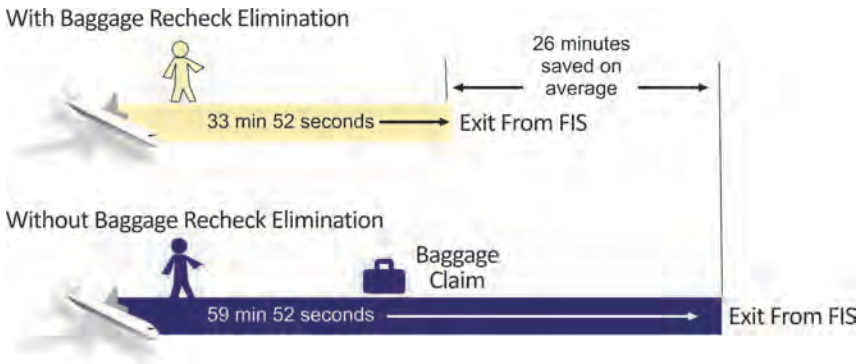


Figure 23. Time savings from baggage recheck elimination.

Test 2: Information Sharing Between TSA and CBP on Connecting Bags

At a number of sites interviewed for this study, CBP and TSA staff commented on the need for greater cooperation between both DHS agencies. In 2010, new positions were created in each organization in order to increase the liaison between both agencies. Responses to averted terrorist attacks in Fall 2010 further increased the level of cooperation and advanced specific initiatives to bolster information sharing.

The study team reviewed the relevance of information sharing in the context of baggage recheck elimination. A proposed model of operations in Atlanta was highlighted whereby TSA images from EDS would be available for CBP review. Like a number of airports, ATL featured a design where EDS are located immediately beneath the CBP facility, providing easy access to image review rooms.

Instead, TSA agreed to host a test at the TSA Systems Integration Facility (TSIF), with a CBP-trained individual to operate a test.

Test Objectives

X-ray images can provide added information for CBP, but TSA equipment is currently geared toward explosive detection. In fact, CBP has its own X-ray equipment specifically designed for agricultural screening in its Secondary Processing area. Nevertheless, the ability to view the interior contents of checked bags would provide more information than CBP currently has within its FIS. Therefore, the test objective was to determine whether images obtained during the screening of transfer baggage by Transportation Security Officers are useful to address the mission-critical needs of other law enforcement and regulatory agencies, such as CBP.

Methodology

A test kit was developed to emulate common threat objectives. No testing was done for explosive detection or prohibited items. Instead, items were selected in a test kit to emulate common threat items CBP seeks to interdict. These items included fruits and vegetables, stuffed animals, vegetable matter, pills and various powders, bars of clay, and bonds and currency. Contraband or illegal items were simulated with look-alike replacements. For more details on the methodology, see Appendix E.

Key Results

Key results were as follows:

- As shown in Figure 24, the individual trained in CBP detection processes was able to use TSA EDS images for positive matches of suspect and contraband items.
- A false acceptance rate of 7 percent was found, primarily around paper and items with lower densities.

Figure 24. Test results for detecting contraband and clearance of checked bags.

- Next generation three-dimensional scanned images are far superior for identifying items of interest in baggage for border and agricultural purposes compared to current technologies.
- Vegetable/fruit products were easy to detect, and in some instances the test team identified the threat because of the density of the vegetable product involved.
- If a Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) volatile product has a bone or calcified structure, it would likely be detected on either technology or equipment.
- Time for each image reviewed was about 36 seconds; note that the CBP staff person did not have specific EDS equipment training for this test, so this process rate could be improved significantly with training and experience.

Overall, the test was positive in demonstrating a small-scale application of existing EDS technologies, tailored toward an individual trained in CBP/agricultural products detection. Qualitative feedback indicated the images were useful in achieving CBP's mission. Note that EDS machines are not geared specifically for CBP purposes. However, the low false acceptance rate and false rejection rate were seen as overall positive indicators of the potential for useful information sharing between TSA and CBP.

Discussion with EDS manufacturers indicated increasing future potential for automated detection and improved algorithms to enable EDS units to perform one scan for multiple agencies/threat detection parameters.

Test 3: Expansion of International-to-International Recheck Reduction Process

The study team has a significant concern about the limitations of baggage recheck elimination for medium-sized international hubs. Even with IAH, DFW, and other larger airports having economies of scale, there were questions throughout the study about the viability of international-to-international processes. One air carrier provided the feedback early in the project that some sites (e.g., SFO) would have difficulty sustaining process changes. Unfortunately, without evaluating each site and carrier on a case-by-case basis, it is difficult to establish a specific threshold for which a DFW-type international-to-international process could be suitable. The inconsistency across airports/carriers is due to the multiple factors that would have to be considered, including peak-hour connecting traffic, existing processes and infrastructure, and prominence of connecting traffic to airport success.

To test this, SEA participated in a feasibility assessment to review the potential to reduce baggage recheck using a similar process.

Historically, 25.5 percent of international arrivals at SEA are connecting passengers. Based on Bureau of Transportation Statistics data, it is estimated that of these connections, 16.8 percent are international, while 83.2 percent are domestic. This represents the third-highest percentage for international-to-international connections in the United States, behind MIA (22.7 percent) and Newark (EWR) (17.8 percent). The bulk of these international connections are transborder flights to Canadian airports.

Methodology

A select number of international-to-domestic flights was studied on a Monday in May 2011 at SEA for flights arriving at the South Satellite terminal. Actual live data and observations were made, working with operational baggage handling staff.

The timing for each step was evaluated against flight schedules, published airport border wait times, and other data to determine whether improved international-to-international bag connections could be feasible in terms of timing.

Some timing data could be captured based on existing operations, while other numbers were estimated based on operational personnel's experience.

Key Results

- On average, between 5 and 20 bags arriving on a Delta international flight connect to a Canadian destination on a Horizon flight.
- A potential route for bag retrieval delivery to CBP Secondary was identified. Actual walking time from the potential international transfer bag holding area (i.e., an unused conveyor) to CBP Secondary was 2 minutes, 10 seconds—well within an acceptable delivery time standard.
- The study team found that a "hold" time of 20 minutes was sufficient to ensure that a bag was available at CBP Secondary.
- The study team noted that there were some operational issues that would ultimately require capital investment:
  - Baggage handlers will be transporting bags that have been screened (domestic connections) and others that still need to be screened (international connections) on the same trip from the South Satellite to the Main Terminal.
  - There is a possibility that bags might be transported to the Main Terminal before passengers are processed through CBP Primary or Egress during times of severe congestion and long wait times in the FIS area.
  - Congestion may result at the one elevator used for oversized bag routing (and personnel movement to/from ramp level to the South Satellite terminal).
- Ultimately there was sufficient time for CBP to request a bag for redelivery, as well as to advance potential searches in Secondary.
  - Average processing times easily allow passengers to be at the boarding gate within 25 minutes for the next flight.
  - Peak periods would lengthen this time to 45 minutes.
  - A 20-minute "hold" after international arrivals could provide sufficient risk management capabilities to CBP (see Figure 25).

Overall, with cooperation, training, and action required from participating airlines (i.e., informing passengers and marking bags as connections from origin airport), it would be feasible for an improved process to work for international-to-international transfers.

Test 4: Minimum Connection Time Modeling

Reducing minimum connection times at airports generates benefits for airlines and the airport in two ways without requiring any change in scheduling or incremental investment by air carriers. First, in low-frequency markets, shorter MCTs may permit new connecting itineraries to be built and sold, by eliminating some misconnections between cities. This capability would allow carriers to compete for a share of city pair markets in which they are not currently present. Second, for higher-frequency markets, shorter MCTs may allow longer connections to be replaced by shorter connections, thereby reducing the elapsed travel time and improving the attractiveness of the connecting itinerary, in addition to the reliability of airline schedules.

Test Objectives

The objective of this test, on actual flight schedule data, is to quantify the incremental benefits of potential reductions in minimum connection times from eliminating baggage recheck for international-to-domestic connections. Each MCT scenario result is expressed in terms of new connecting markets and additional capacity in existing markets at ATL.

Methodology

The analytical core of this analysis was undertaken with Sabre Profit Essentials, a high-speed traffic and revenue allocation model used to forecast the market share, traffic composition,

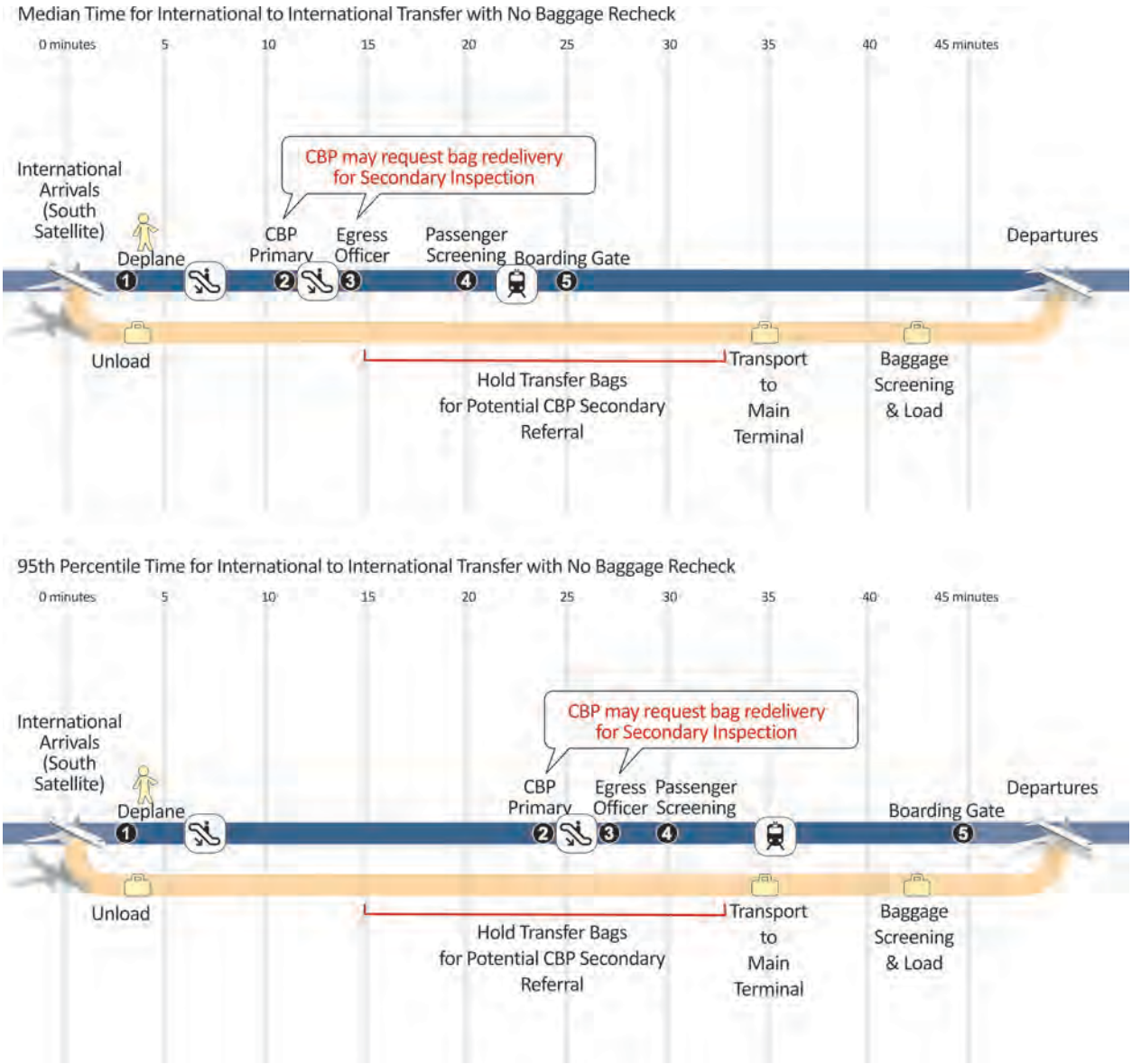


Figure 25. Median and 95th percentile testing results for removal of baggage recheck.

connectivity, load factor, and profitability of existing and potential air services. The model is a sophisticated Quality Service Index (QSI) route-planning application used by major U.S. and international carriers such as Delta Air Lines.

Pricing, competitor response, and other factors remained static for the purpose of this test in order to evaluate the expansion of baggage recheck elimination to international-to-domestic flows.

Key Results

The testing highlights a reduction of connection times of 20 to 30 minutes due to the reduction of the need for passengers to wait for baggage redelivery. To assess the changes from reduced MCT, the published MCT in the Profit Essentials parameter was changed and then the ATL schedules were re-evaluated to determine the increase in connecting itinerary frequency and capacity on a directional city pair basis.

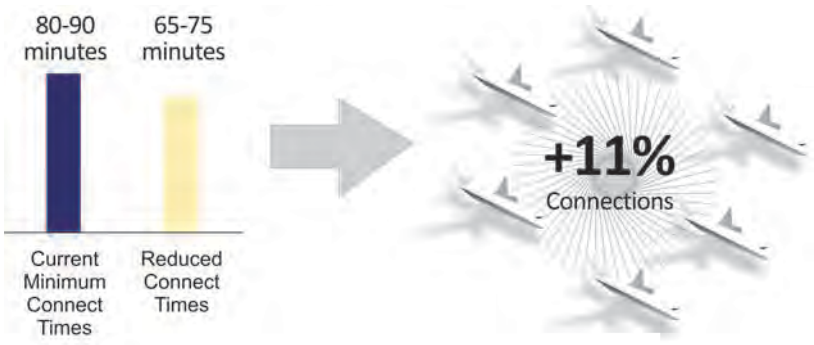


Figure 26. Minimum connection time savings of 15 minutes results in 11 percent more connecting network possibilities.

Key results were as follows:

- A 15-minute reduction in minimum connection times at ATL (i.e., 65 minutes for Delta and 75 minutes for other airlines) yields an 11 percent increase in potential seat connections for passengers (see Figure 26).
- A 30-minute reduction in connection times would gain a 25 percent increase in connection possibilities.
- Where current minimum connection times are high, a greater reduction in MCT is possible and would result in relatively larger gains for air carriers, whereas airports with low minimum connection times would only allow for minor reductions in MCT and thus smaller benefits to airlines.

Test 5: Simulation Modeling

Discrete event simulation models are useful for evaluating scenarios in which the results are driven by time-dependent interactions of events. A simulation has the ability to run a number of scenarios in which the model can accept input parameters and assumptions to predict realistic outcomes and provide a virtual test environment. The role of the simulation is to support the conclusions obtained from the evaluation of the seven alternative procedures.

Test Objectives

The objective was to develop an environment to test a number of scenarios and parameters related to eliminating or reducing baggage recheck. Specifically, the model is able to test scenarios in which international-to-international baggage recheck is eliminated, international-to-domestic baggage recheck is eliminated, an additional bag process is implemented, or a combination of these scenarios.

Methodology

The methodology was as follows:

(1) Develop a process-oriented simulation model that can accept flight arrival schedules
(2) Input parameters for process times, percentages for passenger characteristics, etc.
(3) Run a number of scenarios
(4) Have a visual interactive interface
(5) Provide quantitative results of each simulation run

The base model was developed using the simulation software SIMUL8. The software primarily simulates processes at a high level and is not intended as a three-dimensional (3-D) emulation or physical and spatial modeling system.

Key Results

The resultant change in timing between scenarios tested provides useful information for the relative impact of implementing connections programs and validates alternative procedures. On

an operational basis, eliminating baggage recheck for both international and domestic connections decreases the time benefits of only eliminating baggage recheck for international connections. This decrease is due to the bags of both connection types being prioritized above those of terminating passengers. With only a small percentage of bags typically making an international-to-international connection, the timing benefits are quite significant. With the majority of bags getting higher priority, the connecting bags essentially receive the same priority and all connecting bags are slowed as a result.

The key results of Test 5 are as follows:

- International-to-international baggage transfer generates moderate benefits of improving capacity for the entire system, as checked bags that would normally be present in the reclaim carousel in FIS are instead directed to the onward connecting flight.
- International-to-domestic baggage recheck elimination would provide comparable benefits with neither bags nor passengers going to baggage claim.
- Benefits would accrue to terminating passengers as well in terms of less congestion at the inbound FIS carousel, although bags would arrive slightly later to the claim carousel due to their relative de-prioritization.
- Time is available for additional bag processes, if required (e.g., special screening for transfer bags or CBP hold):
  - The extra time available for additional bag processes is approximately 10 minutes (see Figure 27).
  - After 15 minutes, the system benefits tend to decay beyond the point at which MCT reduction objectives would not be met.

While the simulation model predicted passenger and bag times under each scenario, the resultant times themselves are specific to a particular facility and its configuration. When calibrated for a particular airport, the simulation is useful for quantification of the time benefit (for bags and passengers) achieved by eliminating baggage recheck and identification of the constraining process (bag or passenger).

On an infrastructure and facilities design basis, significant constraints on the system appeared at the ramp level for connecting bags without recheck requirements that are proceeding directly to bag screening. A larger in-feed conveyor or dedicated buffer space is required to accommodate the significantly higher volumes of bags. Note that the model does not consider the space requirements for temporary holding in case bags need to be recalled. The storage area might be used before bag rescreening or after rescreening and after bag sortation.

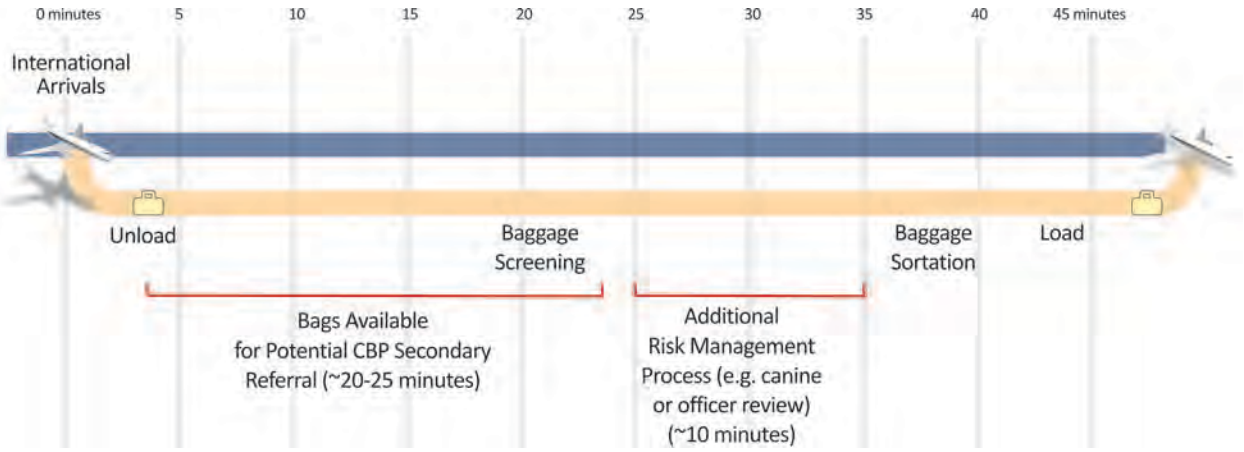


Figure 27. Time limitations shown in simulation of 30 minutes for baggage processes at ramp level.

CHAPTER 5

Findings

Eliminating or reducing baggage recheck is a highly complex set of issues with trade-offs related to volume, process, time, cost, and preserving the integrity of the U.S. border. Any solution also has to weather the ever-changing threat dynamic for contraband, terrorism, and less malicious scenarios related to import of goods into the commerce of the United States.

However, simplifying connections would offer significant benefits to traveler satisfaction, the sizing of facilities, and hub development opportunities that could improve the competitiveness of airports to capture international traffic.

This chapter outlines the findings associated with eliminating or reducing baggage recheck.

Stakeholder Analysis

The introduction, or change, of a process or technology must be evaluated with an understanding of the impact to those involved. Table 3 outlines the intended benefits that the elimination or reduction of baggage recheck could have on the stakeholders/process owners involved. If successful, the benefits to each group are generally universal across the alternative procedures. It is important to note that the specific costs and benefits would vary greatly across the respective airports and airlines.

Generic Impact Analysis

To document the potential impact on the air transportation industry, an order of magnitude of benefits for eliminating baggage recheck is provided that was based on perceived savings to airports, airlines, and passengers. For each group, the impact was estimated for day-to-day operations, deferred or reduced capital costs, passenger convenience/value of travel time, and other benefits.

Passenger and Bag Traffic

As noted in Chapter 3, there are approximately 23 million connecting passengers processed annually by CBP at the 30 busiest airports. The impact analysis has been calculated based on the potential savings from facilitating all international arrival transfer bags (i.e., eliminating baggage recheck for international-to-international and international-to-domestic connections). Based on a ratio of 1.35 bags per passenger (as specified in the 2011 SITA Baggage Report), the approximate annual number of checked bags is 31 million.

The peak-hour passenger traffic was estimated using the Federal Aviation Administration's recommended relationship for Typical Peak-Hour Passengers (TPHP) computations from

Table 3. Stakeholder analysis of benefits of eliminating or reducing baggage recheck.

Stakeholder	Benefits
Air Carriers	▪ Outbound baggage is available for sortation sooner ▪ Enhanced passenger experience for transfer process ▪ Reduction in mishandled bags leading to cost savings and improved schedule integrity ▪ Reduced staffing resources at baggage recheck facility ▪ Reduced/eliminated bottlenecks at FIS baggage carousels and/or baggage recheck facility
Airports	▪ Increased transfer passenger convenience ▪ Enhanced gateway/hub capabilities ▪ Ability to use the baggage recheck area for other purposes ▪ Increased passenger time available for retail/food services
Passengers	▪ Improved transfer experience—particularly for families, the elderly, and the infirm ▪ Reduced time in the FIS area ▪ Increased time for retail/food services
TSA	▪ Potential spreading of passenger arrival at passenger screening checkpoint
CBP	▪ Improved passenger perception with elimination of baggage claim in FIS ▪ Spreading of passenger arrival at Egress officer position ▪ Decreased congestion surrounding FIS baggage carousels ▪ Improved customer service ▪ Enhanced capacity to focus on those passengers/bags potentially presenting a risk

annual figures. The ratio of 0.0350 percent peak-hour passengers to total annual passengers was used. Although the ratios vary based on total annual passengers, the category "30 million and over" was used because the average annual passengers at the top 30 U.S. airports is 35 million. Applying the ratio to the total connecting passenger and bag traffic, the peak-hour traffic that is currently impacted by baggage recheck is estimated to be 8,050 passengers and 10,868 bags.

Savings in Day-to-Day Operations

For each passenger who does not have to claim and recheck bags, the expected benefits are as follows:

- Time eliminated from claiming bags, waiting to exit the FIS area, and rechecking bags.
- Increased passenger convenience (less contact time with processes).
- Reduced baggage handling costs.

Airport Staffing

In terms of airport staffing, there is the possibility of improved savings for operations through baggage handling and customer service staff. However, there are highly variable orders of magnitude of airport operation costs savings depending on the type of baggage systems used. As a result, and to be conservative, annual airport operational staff savings have not been included as a net benefit. A potential cost, however, could be the requirement for dedicated baggage retrieval staff if an automated bag return system cannot be installed at a particular airport.

Airline Baggage Recheck Staffing

There are potential savings in the reduction of staff needed for baggage recheck. A significantly reduced number of bags required to be rechecked should allow airlines to reduce staffing requirements at recheck.

Based on a very conservative estimate that eliminating two recheck staff positions for each of the top 30 airports could yield net savings of 60 full-time equivalents (FTE) and using a total FTE cost

of $80,000 per year, approximately $4.8 million in labor costs could be saved each year. Cost savings could be much higher when the reduction of ramp staff who deliver baggage to claim carousels and handle baggage after recheck is also considered. Relative costs vary from facility to facility.

Deferred Capital Costs and Equivalent Savings

The elimination of baggage recheck has a profound impact on the planning parameters for international arrivals facilities. Hundreds of millions of dollars have been spent on new/expanded international arrivals halls in the past decade and billions more in construction or design stages. There is a potential to extend the useful life of existing facilities through improved baggage flows. The actual benefit will vary from airport to airport but could include the following:

- Improved utilization of existing space for today's passenger volumes,
- Deferred future facility expansion required for growth of passenger volumes, and/or
- Designs for less-expensive new facilities.

Airport Baggage Carousel and Baggage Recheck Space

A critical part of the FIS is the provision of baggage reclaim carousels. Airports plan their international arrivals hall based on peak-hour aircraft and passenger arrivals. Depending on the baggage carousel system, these units typically handle 500 to 1,000 bags. The average cost of a carousel, in-feed conveyors, and the space that it occupies is at least $2 million. Based on peak-hour bag delivery to the claim carousels with an average capacity of 600 bags, the reduction in rechecked bags would remove the need for an estimated 18 claim carousels, offering a savings of over $36 million. Capacity would still be available to serve destination passengers in this scenario.

Existing baggage recheck facilities and space could similarly be repurposed or future construction could be avoided. For each baggage claim carousel saved, it is estimated an equivalent 1,000 square feet of recheck space could be saved. With an average construction cost of $1,000 per square foot, this translates to approximately $18 million in recheck space savings.

However, this number should be treated with extreme caution. For most international airports, there is no room to simply "add" a baggage carousel or recheck facility to achieve greater capacity. The addition of new carousels could trigger the need for an expanded/new FIS that could add hundreds of millions in costs, depending on the airport configuration.

Passenger Convenience/Value of Travel Time

Typically, a passenger will select an international connecting airport based on a select few conditions that include total travel time and passenger convenience. As concluded in Test 1, the elimination of baggage recheck should save passengers considerable amounts of time while in transit (about 25 minutes).

The value to passengers of these time savings has been estimated using standard value of time calculations commonly used in the economic assessment of projects. The U.S. DOT Revised Departmental Guidance for the Valuation of Travel Time in Economic Analysis (*6*) provides a recommended average value of time for air travelers, in 2000 dollars. This valuation was adjusted to 2009 dollars using income data from the U.S. Census Bureau Current Population Survey tables of historical mean income per capita, an approach consistent with the original calculation of the value of time (the original U.S. DOT values were based on a percentage of hourly income). The resulting value of time was calculated to be $33.95 per hour, in 2009 dollars.

The average time savings from not having to reclaim or recheck bags was conservatively estimated at 15 minutes per passenger for all airports. Based on 23 million enplaned passengers annually, the number of hours saved is 5.75 million with an estimated value of $192 million each year.

Table 4. Estimated potential annual savings from eliminating recheck.

Operation Area	Savings
Airline baggage recheck staffing	$5 million
Passenger value of travel time	$195 million
Aircraft productivity	$62 million
Total annual savings	**$262 million**

Table 5. Estimated potential capital/ infrastructure savings from eliminating recheck.

Capital/Infrastructure	Savings
Airport baggage carousel space	$36 million
Airport baggage recheck space	$18 million
Total one-time savings	**$54 million**

Other Benefits

There is a range of other quantifiable benefits for eliminating baggage recheck. Reducing lost bags, as well as additional efficiencies in customer service provision, are some of the key categories. Because these benefits are more indirect and highly variable depending on the airport site, they were not included in the impact analysis. One estimate worth noting, however, is the opportunity for greater utilization of aircraft due to the time savings from transferring bags from the origin flight to the connection flight as noted in Test 1. If 15 minutes of flight time is saved, it could produce $653 in savings to an airline in improved productivity of aircraft (based on the ICAO estimates for block hour operating costs for a B737-300/700). The Bureau of Transportation Statistics estimates that more than 9.5 million annual scheduled revenue departures are performed annually. A conservative assumption of 1 percent of flights being able to realize an improvement on time was applied to estimate airline savings. The increased aircraft productivity could result in savings of up to $62 million for connections per year.

Impact Summary

Eliminating baggage recheck could deliver significant economic benefits, both annually and in one-time cost avoidance. The annual estimated savings are about $260 million in operating costs (Table 4) and $54 million in capital costs (Table 5). The reduction of baggage recheck would have similar benefits but to a lesser extent.

Solutions

As outlined previously, the risk environment for connections is considerably different depending on the final destination. Therefore, an independent evaluation of each sector is provided in the following subsections.

International-to-International Solutions

The study team found that very few reasons stand in the way of scaling the DFW, GUM, IAH, and ATL programs for baggage recheck elimination for international-to-international flights to other major hubs.

As shown in Figure 28, three elements are critical for an airport to consider in order to pursue this capability:

- **Priority for connecting bags:** Implement air carrier processes to sort bags upline to ensure that connecting bags are prioritized. If this is not achieved, the risk is that the bags will not be available for retrieval and ultimately undermine the timeliness of passenger processes.
- **CBP access:** Providing CBP access to the baggage area to review arriving bags is an important part of the overall operation of the FIS areas. For international-to-international connections, however, protocols to allow CBP review and oversight of bags that will not be present in the FIS area are important. The study team found that specific processes could vary from site to site, ranging from availability of CBP officers to having canine teams occasionally deployed in connecting bag areas. There may be possibilities for technological solutions to link CCTV images to the CBP Control Center.
- **Baggage retrieval:** Processes must allow a bag to be redelivered on demand within 20 to 30 minutes. Typically, manual retrieval could be instituted; automated retrieval systems through RFID or baggage handler tug barcode scanning procedures could be employed.

Beyond the basic commonalties just outlined, local operating procedures that were designed to address site-specific risk and facilities are in effect at each of the airports.

International-to-Domestic Solutions

There are significant obstacles for expanding the aforementioned process for international-to-domestic transfers. The rationale for greater concern by CBP is the potential consequence of introducing contraband or other risk items into the commerce of the United States.

To this end, the study team has found that the ability for TSA EDS images to be available for CBP officers to review could provide a valuable tool to assist in risk management. Further tech-

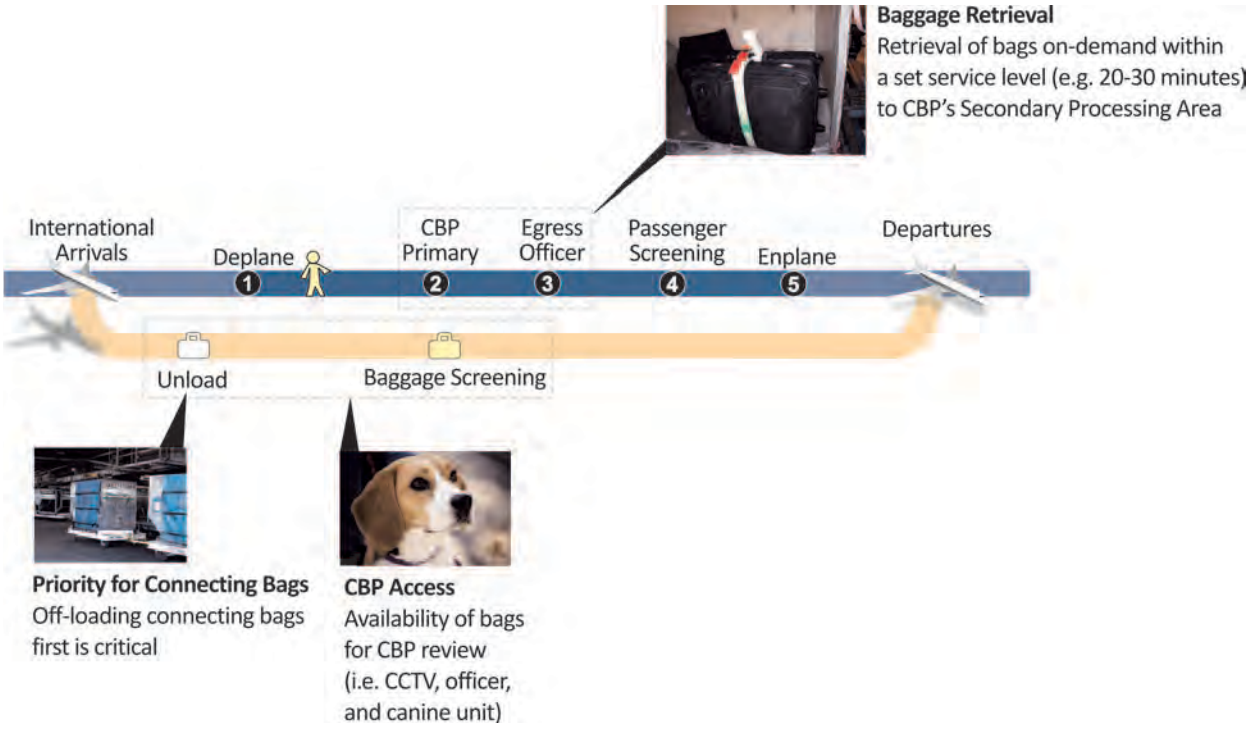


Figure 28. International-to-international baggage recheck elimination.

nical developments could enable EDS to be an appropriate long-term solution for eliminating/reducing baggage recheck. The initial testing conducted by the study team allowed for adequate detection of common threat items, as well as a reasonable false-positive result.

As shown in Figure 29, the availability of screening images could supplement other procedures locally instituted by CBP to assist with risk management of checked baggage flow for domestic connections from international arrival flights.

There are major implications for facility design should protocols for data sharing between TSA and CBP be accepted:

- Not all facilities have the ability for this process to occur because of the distance of TSA EDS screening from CBP facilities (i.e., travel time to redirect bags back to FIS for further inspection within allocated time).
- An appropriate induction point may or may not be possible depending on the original design of EDS machine configurations.
- Some facilities may have multiplexing to rebroadcast images to the CBP Control Center; further testing is needed to adequately track and relate potential suspect bags for CBP inspection.

Although there will undoubtedly be technological and policy improvements to allow for better TSA/CBP data sharing, the study team found practical design issues with FIS facilities that affect the feasibility of incorporating EDS screening.

As shown in Figure 30, the study team found that the placement of connecting bag screening proximate to CBP has measurably improved its potential to assist with baggage recheck elimination over the placement of connecting bag screening well away from CBP facilities. The primary reason for this improved potential is that by the time a passenger reaches the Egress officer (Step 3), the clearance process is much more streamlined for bags to be cleared at the same time.

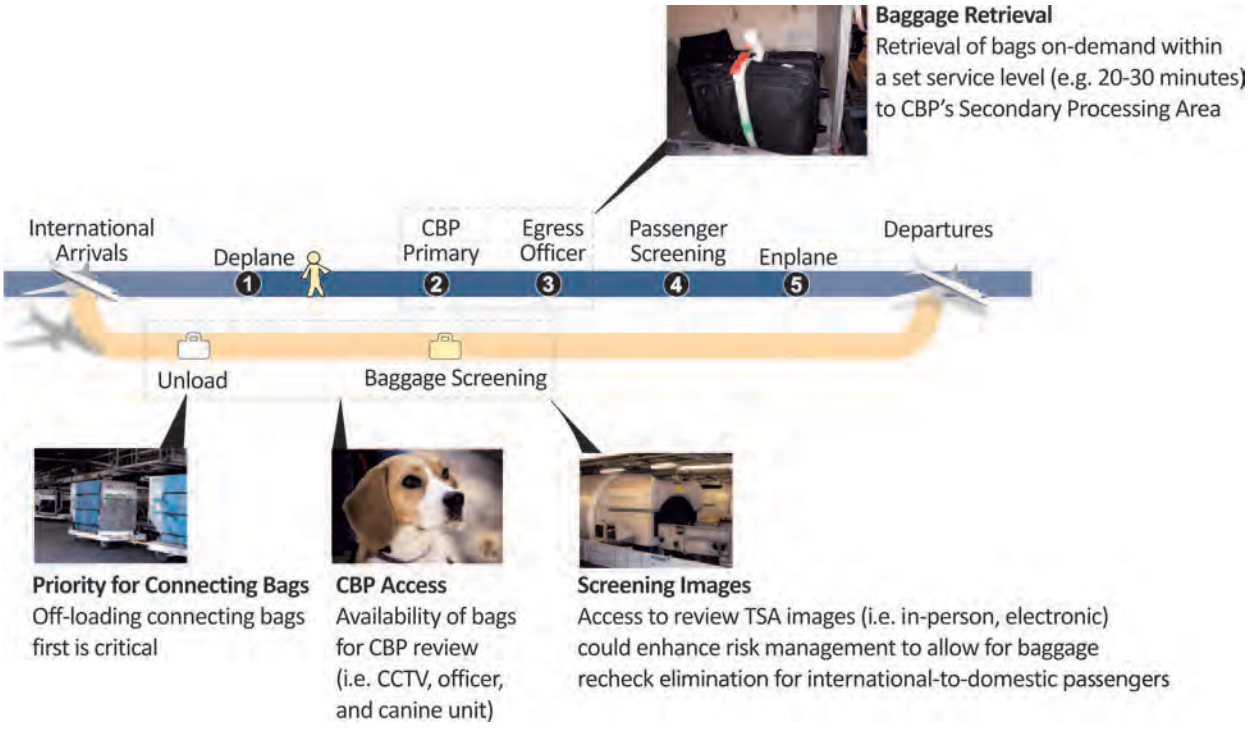


Figure 29. International-to-domestic baggage recheck elimination.

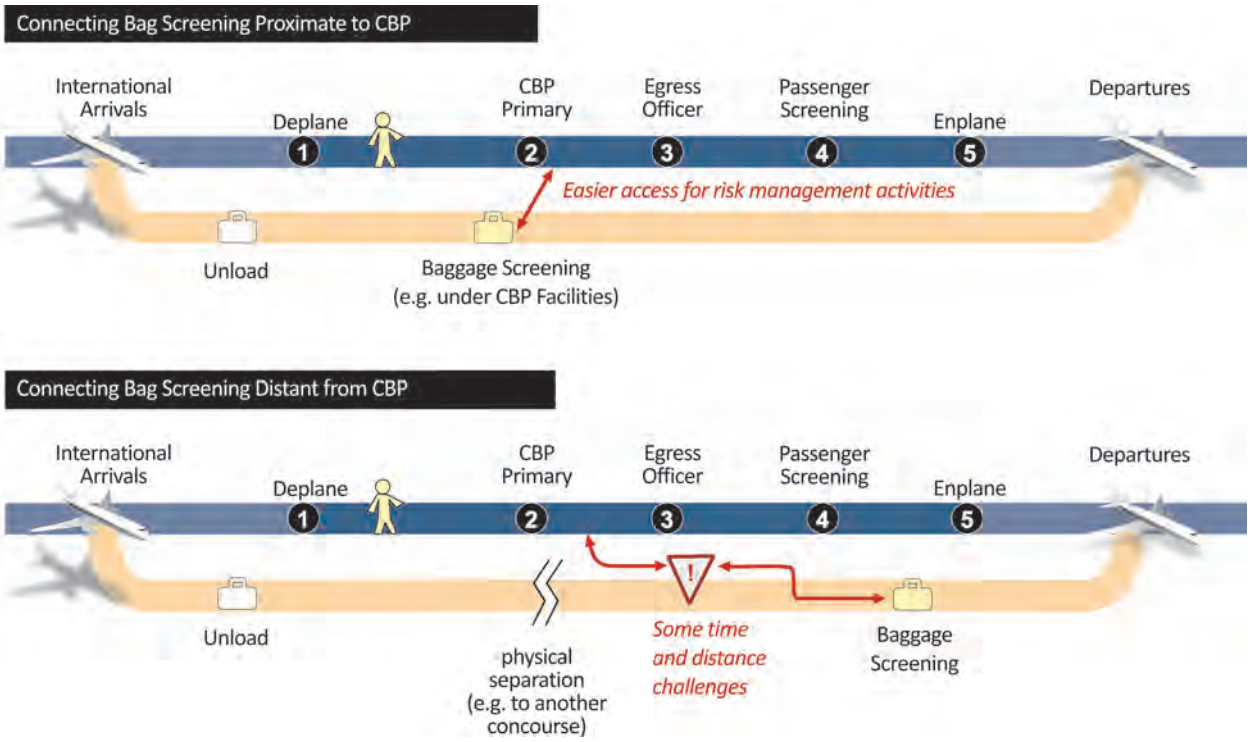


Figure 30. Ideal flow for locating TSA screening for connecting flows.

In reviewing sites, the study team found that some facilities (e.g., DFW, ATL) are well suited to enable TSA screening to take place near CBP. Other facilities may require modifications or capacity enhancements that may need to be defined within the TSA EDS reinvestment program.

Enhancements to Baggage Recheck Elimination

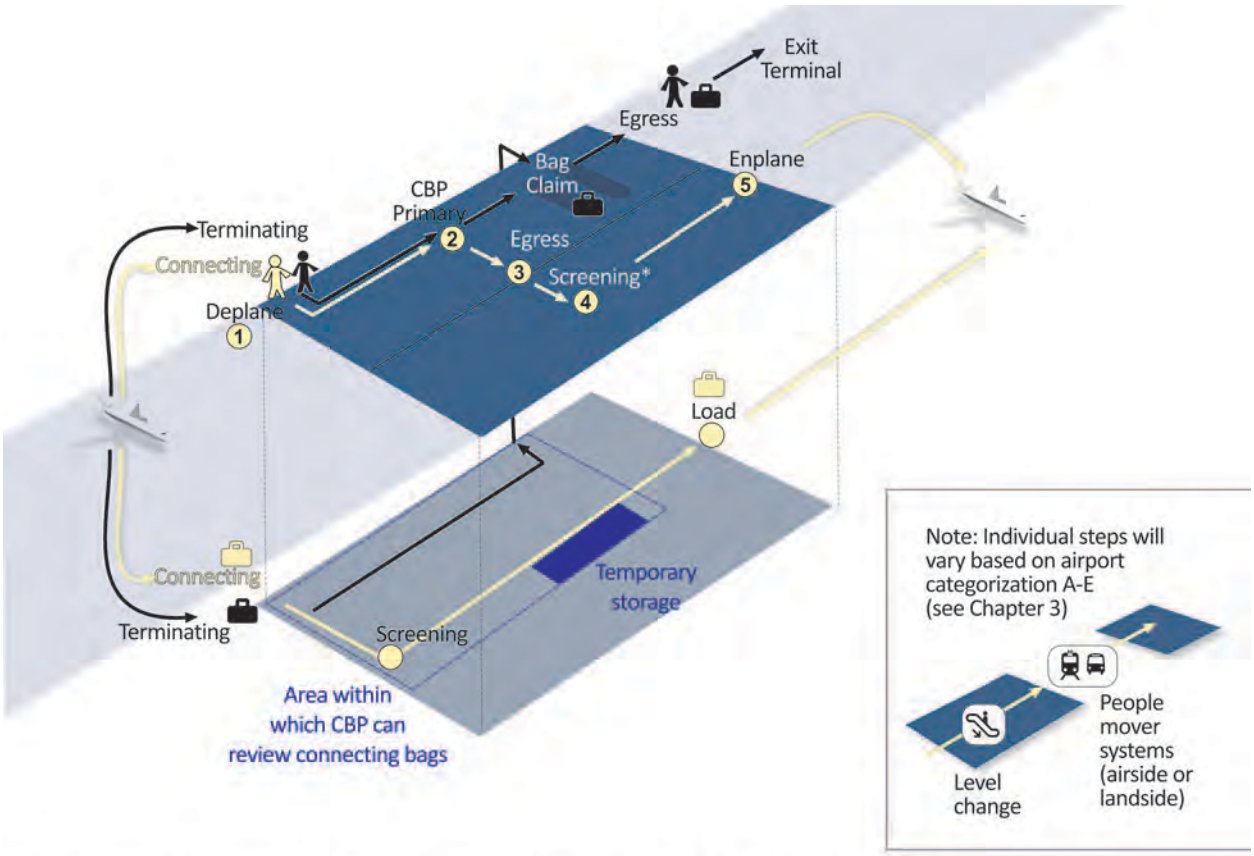
International-to-international and international-to-domestic baggage recheck elimination have the potential to be implemented based on appropriate local protocols. Two enhancements could foster improved performance:

- Egress officer processes: In 2010, a number of improvements occurred at O'Hare International Airport (ORD), IAH, ATL, and DFW in Egress processing (i.e., alternative door exit for travelers with no checked bags). For baggage recheck to work more favorably for connect time reduction, alternative exits for connecting passengers near CBP Primary (e.g., IAH), or alternative exit points (e.g., DFW), can be considered.
- CBP operating area: Expansion of the area that CBP officers could review bags "held" for connecting flights would allow for more opportunity to deal with checked bags before the passenger is released from the FIS area.

Figure 31 summarizes the facility implications based on the international-to-international and international-to-domestic protocols.

Long-Term Baggage Recheck Elimination Solutions

In the long term, more robust tools will be needed at U.S. airports to allow for baggage recheck elimination. With a continually changing threat environment, it is important for all stakeholders to review the sustainability of facilitation programs relative to future trends. For



*Note: Screening requirements depend on adherence to the *Aviation and Transportation Security Act*.

Figure 31. Generic FIS facility flow with baggage recheck elimination.

example, the earthquake and tsunami in Japan in February 2011 resulted in a sizable concern from border authorities regarding the spread of radioactive substances, which extended to reviewing checked bags. Furthermore, the nature of terrorist threats to the United States continues to create more concern.

There are also other potential opportunities that are based on bilateral and multilateral discussions that involve changing security policies. For example, in June 2011 Germany instituted full recognition of TSA screening processes so that no rescreening had to occur for passengers connecting through a German airport hub. Future discussions with other countries, such as the President Obama/Prime Minister Harper U.S.–Canada Beyond the Border Action Plan, could produce further enhancements relevant to baggage recheck elimination.

The study team found three long-term enablers and enhancements relevant to this study (Figure 32):

- **Risk-based data enhancements:** The potential for digital images to be transmitted as part of the airline manifest data is undergoing testing in a number of jurisdictions, namely air travel between Australia and New Zealand. Should this opportunity be used for flights going into the United States, there is the ability for CBP to conduct risk assessments on checked bags 10 hours before a flight lands.
- **Rescreening elimination:** Should "one-stop screening" be adopted with selected countries, there is the opportunity for FIS facilities to maximize the benefits of baggage recheck elimination and even to realize 30-minute international connection times.

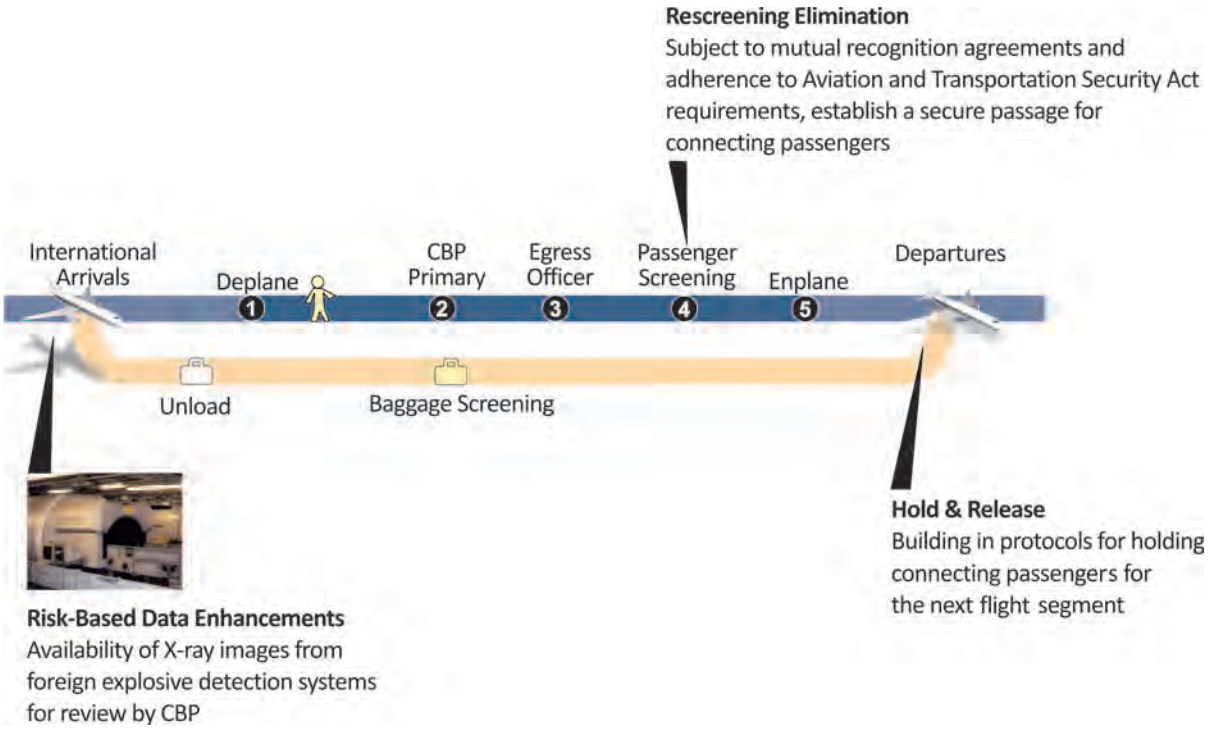


Figure 32. Enablers and enhancements to baggage recheck elimination (all sectors).

- **Hold and release:** To ensure that CBP has the ability to respond to any identified threat/issue during the connecting process, the ability to "hold and release" a passenger and his/her checked baggage until the moment of onward flight departure could be an important dimension for risk management.

The specific elements of long-term solutions require much more detailed legal, policy, and technological evaluation. However, for airport designers and FIS facility planners, there are potential long-term trends worth considering for planning purposes for future passenger flows in any new facility design.

Solutions with Inconclusive Findings

A range of technological and process solutions that could be advanced for baggage recheck elimination were reviewed with inconclusive results. Findings are as follows:

- **Transfer baggage source message:** To date, CBP has mandated a sizable amount of data about passengers be collected to assess risks. API/PNR data have proven invaluable to enabling targeting functions to deal with risks and past travel history. However, this information does not capture any baggage information. The IATA has developed a Baggage Source Message (BSM) system to enable baggage transfers to occur automatically. BSM includes first name, last name, PNR record, and routing data. As a file format that is universally accepted by airports and airlines, it could also provide enforcement capabilities to allow risk management for baggage recheck to occur and is used by some authorities in Europe for this purpose. While electronic transmittal of all BSM records is technologically possible, SITA reported in 2011 that 15 percent of transfer BSM records were not transmitted and required manual recoding.
- **Baggage imaging and weight system:** The study team examined the implementation of a baggage image/weight system at a number of airports. CBP, airports, and airlines interviewed indicated that while useful in concept, there are times when the system could not deliver data

on time to successfully exempt checked bags from being seen in the FIS area, or to prevent passengers from having to await data availability.
- **RFID tags:** The study team tested the use of RFID tags to track passengers and checked bags through the arrivals process. Several ideas were generated to use this technology to retrieve bags that were exempted from being seen by CBP. The study team views this application as one that could potentially help with large-scale management and retrieval processes, but also views manual or barcode-enhanced retrieval processes as alternative solutions to meet objectives. Using RFID to enable recalling passengers at domestic concourses for further CBP scrutiny at Secondary was also evaluated; however, the privacy impacts of tracking passengers with an electronic tag were deemed highly problematic as a concept of operations. Additionally, the legal status of CBP's interaction with passengers in the domestic departures area could be an issue given the Fourth Amendment (i.e., protection against unwarranted searches, arrests, and seizures of property).

Other Findings

CBP currently provides full port-of-entry clearance at 14 Preclearance sites, including 8 in Canada. However, since 2002 the interpretation of the Aviation and Transportation Security Act has resulted in the rescreening of checked bags on arrival to meet TSA requirements for explosive detection. For example, at Minneapolis–St. Paul International Airport (MSP), more than 15 percent of peak-hour baggage systems are consumed by the rescreening of bags before a connecting international or domestic flight. While it is not the primary focus of this study, implementing solutions for advanced information transmission (e.g., upline X-ray image) may provide some enhanced risk management capabilities relevant for this study. However, an investment in new ATSA-compliant hold baggage screening equipment at Preclearance airports may be the ideal solution to this issue.

Evaluation Results

Based on tests, process flow analysis, stakeholder input, and peer review, a comprehensive set of 22 criteria was defined to evaluate alternative procedures.

The criteria were categorized based on market, airline, airport, and CBP risk management considerations that are critical to the potential success of baggage recheck elimination or reduction. The valuation of outputs reflects critical judgment based on a variety of qualitative and quantitative factors. In fact, the valuation of "risks" themselves could be quite difficult given the degree of subjectivity about risk/probability/consequence. Wherever possible, space savings and labor savings were calculated (notes are provided in Appendix F).

The alternative procedures were evaluated based on the potential to provide immediate opportunities (i.e., near-term) as well as a sustainable solution that would withstand the test of time and market/risk evolutions. Ultimately, the evaluation favored procedures that could be sustainable solutions that would benefit the greatest number of travelers. As shown in Table 6, the alternative procedures were evaluated to provide overall ratings as follows:

- **Positive impact:** Sharing TSA X-ray images upon arrival (AP5) and pre-departure information sharing (AP4)
- **Moderate impact:** Exempting bags from CBP outright (AP1), additional CBP officer/process implementation at the connecting level (ramp area) (AP3), and door-to-door baggage service (AP7)
- **Negative impact:** Initiatives to leverage other DHS programs (AP6) and establishing new airline/airport obligations for connecting processes (AP2)

Table 6. Review of alternative procedures based on evaluation criteria.

Category	Criteria	Alternative Procedures						
		1. Bags Exempt from FIS	2. New Connecting Bag Process (Airport/ Airline)	3. New Connecting Bag Process (CBP)	4. Enhanced Pre-departure Information	5. Sharing TSA Info	6. Leveraging Other DHS Programs	7. Door-to-Door Baggage Service
Market	1A Project volumes	●	●	●	●	●	◐	◐
	1B Time savings	●	◐	◐	●	◐	◐	●
	1C Improved customer satisfaction	●	●	●	●	●	●	◐
Airlines	2A Additional time needed for upline management	◐	◐	◐	◐	◐	○	●
	2B Cost/materials for upline processing	◐	◐	◐	◐	◐	○	●
	2C Costs of retrieving bags	◐	○	◐	◐	◐	◐	n/a
	2D Other operational impacts	◐	○	◐	◐	◐	●	●
	2E Improved fidelity of baggage handling	●	●	●	●	●	◐	n/a
	2F New routing potential	●	●	●	●	●	◐	n/a
	2G Reduced labor	●	●	●	●	●	◐	n/a
	2H Training	●	●	●	●	●	◐	n/a
Airport	3A New space requirements	◐	○	○	●	◐	●	n/a
	3B Additional staff	◐	○	◐	◐	◐	◐	n/a
	3C Costs of retrieving bags	◐	○	◐	◐	◐	◐	n/a
	3D Incremental revenues	●	◐	◐	●	◐	◐	n/a
	3E Terminal space savings	●	●	●	●	●	◐	n/a
	3F Competitive advantages	●	●	●	●	●	◐	n/a
CBP	A Capital costs	◐	●	◐	◐	◐	◐	n/a
	B Risk management	○	●	●	●	●	◐	n/a
	C Re-focusing resources	●	◐	○	●	●	●	n/a
	D Redelivery capabilities	●	●	●	●	●	●	n/a
	E Other impacts	○	●	◐	●	●	●	n/a
Overall		◐	○	◐	●	●	○	◐

● = Positive Impact; ◐ = Moderate Impact; ○ = Negative Impact

Table 7 summarizes the evaluation by category and presents a brief overview of the analysis. This evaluation should not discount the opportunity for near-term gains to be realized by Alternative Procedure 1 or for future developments of new processes or technologies to enhance the potential for others (e.g., Alternative Procedure 2).

Specific qualitative and quantitative analysis for each of the evaluation results is provided in Appendix F. It is worth noting that the door-to-door express delivery through a third party was mostly ranked "not applicable," as passengers would use a shipping service through an integrator (e.g., DHL, FedEx, UPS) for baggage delivery.

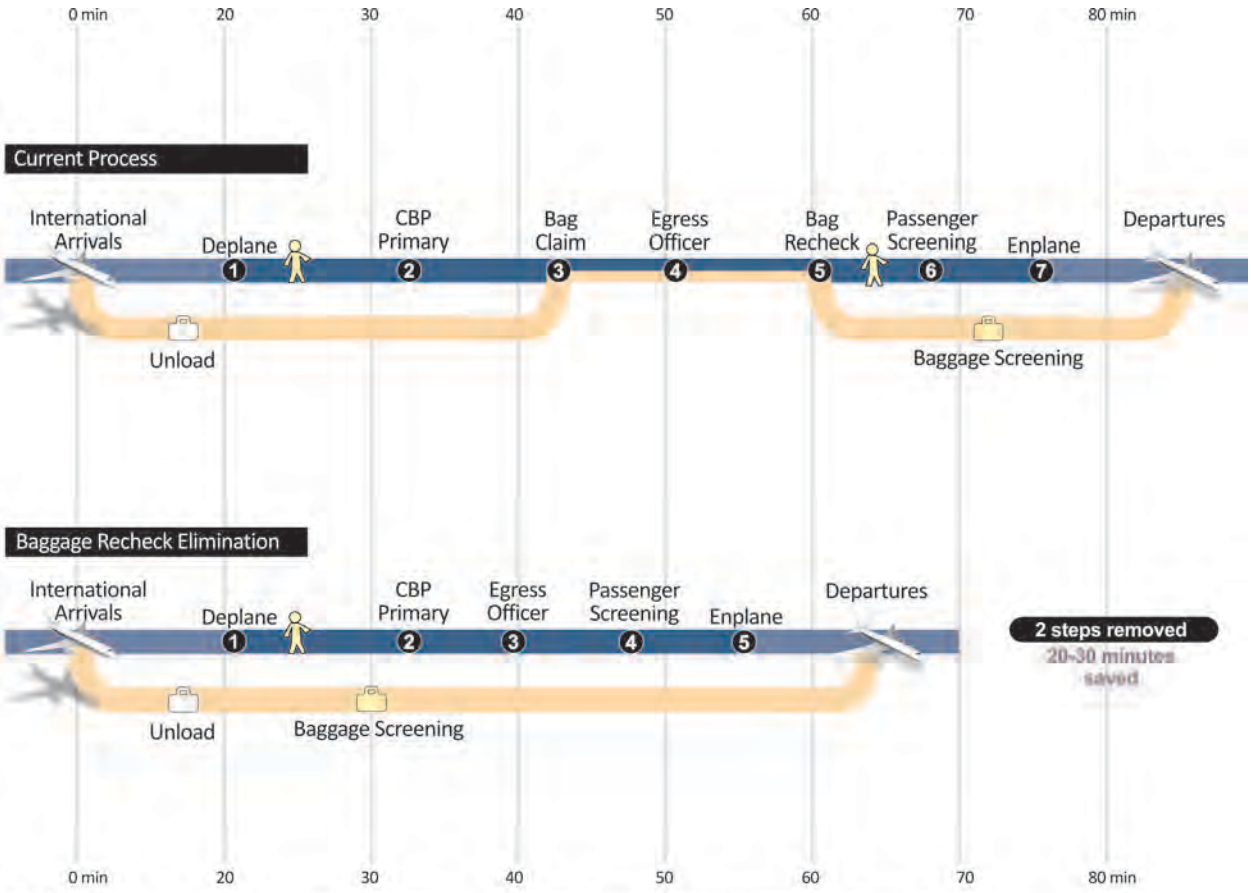
Table 7. Assessment of each alternative procedure by category.

Alternative Procedure	Market Demand	Airlines	Airport	CBP Risk Management	Analysis	Overall Assessment
1	●	◐	●	○	In the near term for international-to-international transfers, this option is the best option for airports and airlines to pursue with CBP. There is also existing precedent at four U.S. airports as well as Preclearance locations. However, the solution does not currently provide CBP with the necessary capabilities to manage potential introduction of contraband to the United States.	◐
2	●	◐	○	●	Introducing new processes presents major challenges to airport operators in terms of space, cost, and overall ability to deal with exceptions. Generally, airlines could incrementally deal with alternative processes on arrivals to meet most CBP requests for risk managing connecting flows.	○
3	●	◐	◐	◐	Although CBP recognized the risk mitigation value of a new alternative process for transfer bags, it questioned the utilization of the officers in a satellite location/process. This issue is particularly pertinent at airports with a high variability of "eligible" transfer passengers throughout the day. All stakeholders emphasized that a reduction in baggage claim/recheck should not be achieved at a net cost to the international arrivals process.	◐
4	●	◐	◐	●	To date, there are few examples of advance baggage information being shared for the purpose of border inspection. Augmenting this to include X-ray images, weight, and/or bag pictures could provide CBP with additional capabilities to evaluate an elimination of baggage recheck for onward international connections and potentially for onward domestic connections. Significant implementation issues remain, however, due to the types of technologies (e.g., international standard for multi-view X-ray image, CBP specific algorithm) and process evaluation needed to enable this process.	●
5	●	◐	◐	●	In the short to medium term, CBP recognizes the potential for improved risk assessments with access to TSA X-ray images. However, improved X-ray image assessment (i.e., algorithm) capabilities are required, which is likely to push this procedure to a medium- to longer-term solution. Once resolved, this solution presents a significant opportunity to address all international arrivals connecting onward, regardless of final destination. For airports, proximity of the TSA baggage matrix and the FIS area will facilitate an expedited retrieval process for bags referred to CBP Secondary.	●
6	●	○	◐	●	Although the use of Global Entry or other DHS programs to provide baggage recheck reduction is a good idea in concept, the major problem is the inability to confirm membership at point of origin. The new Global Entry card with RFID technology is a positive step but electronic verification during check-in is still challenged. The potential of having a non-Global Entry bag accidentally or intentionally inducted into a through-check process was cited as a risk by CBP for introducing a separate bag process for Global Entry members.	○
7	◐	●	n/a	n/a	Using express delivery has major benefits to reducing the actual demand on foreign airport systems for baggage reception and delivery. However, a sizable market is not expected to be present to take advantage of this capability. Airports and CBP are inconclusive in terms of this alternative procedure—primarily because it will not remove or reduce the need for a baggage recheck facility.	◐

● = Positive Impact; ◐ = Moderate Impact; ○ = Negative Impact

Potential time savings were estimated based on the removal of two steps from the current process, as shown in Figure 33. The actual time savings will vary based on the differences in process steps and timing between airports. For example, baggage claim time could vary by 20 minutes depending on the peak arrival periods or CBP Primary staffing levels.

Within the connecting process, the main time variables for the passenger are Primary Processing, potential for Secondary Processing, baggage claim, and TSA passenger screening. In eliminating or reducing the baggage claim and recheck processes, the passenger will also experience a more reliable connecting process (in addition to the obvious time savings), which should help improve the customer experience.



Note: Actual times vary considerably within an airport, and between sites (e.g. CBP Primary, Bag Claim, Egress Officer and Passenger Screening)

Figure 33. Overview: Potential time savings.

CHAPTER 6

Conclusions

Eliminating baggage recheck is a difficult objective; a further reduction in the need for baggage recheck is a feasible objective. The potential risk that CBP associates with a traveler connecting to a destination outside the United States versus inside the United States is the key differential. At present four airports provide a facilitated process for select international-to-international connecting passengers. This existing precedent and CBP's willingness to support other passenger facilitation initiatives, which are not detrimental to its ability to complete its mission to protect the U.S. border, should provide airports, airlines, and travelers with general optimism.

The elimination or reduction of baggage recheck for international arrivals could benefit more than 60,000 passengers and 21,000 bags per day and create savings of more than $400 million per year. These figures are based on 2010 traffic volumes. Some experts have projected a growth in international air traffic to 60 million by 2025; if that happens, U.S. airports and airlines will have a difficult time coping with the rapid growth in baggage handling services, staffing, and infrastructure.

The range of potential solutions identified, analyzed, and tested include:

- Activities *before* a flight takes off from a foreign airport,
- Processes *immediately upon arrival* to a U.S. airport, and
- Other measures undertaken *prior to the next flight.*

The conclusions of this study reflect the aim to:

- Introduce new ideas to allow CBP to meet its risk assessment of checked bags,
- Reduce minimum connection time or increase reliability of connections,
- Enhance passenger satisfaction,
- Establish appropriate processes to ensure that the large majority of bags that have no risk issue are facilitated by airports and through airport arrivals processes, and
- Introduce solutions that are amenable to facilities of various layouts and sizes.

The conclusions of the study team are driven by two key directions:

- **Expand the number of airports** (near term) that offer international-to-international facilitation services and airline participation at existing airports. Work on process and technological improvements to augment CBP risk management capabilities.
- **Introduce new risk management techniques** (long term) such as X-ray image sharing and CBP algorithms to eliminate baggage recheck for international-to-international passengers and reduce baggage recheck for international-to-domestic passengers.

Applying Research to Practice

Opportunities

To implement the findings of this report, there are four key opportunities to pursue.

Next-Generation Security Screening Equipment

As the definition of layouts and data processes for the next generation of explosive detection systems develops, there are opportunities to accommodate baggage recheck elimination:

- Augmenting API to include advance baggage information (ABI)
- Incorporating the ability to route international arrival bags for screening
- Testing other algorithms to enable one scan to meet detection capabilities relevant to explosives, agricultural, and customs purposes

Outside the United States, there are also opportunities to review next-generation technology as other countries move to full computed tomography systems for explosive detection systems. Sharing X-ray images across different countries will require standard protocols for transmitting ABI.

Facility Retrofit for International Arrivals

The number of new port-of-entry FIS facilities at U.S. airports is quite limited (e.g., Las Vegas, Houston Intercontinental). Retrofits to existing facilities (e.g., Washington Dulles) are more common, as airports focus on upgrading the international arrivals experience, in concert with CBP's initiatives to improve the quality of passenger processes.

While each airport will invariably have a different facility layout and time requirements for analyzing the feasibility of baggage recheck elimination, airport planners and designers would be well served to allow space for routing of bags and passengers through flows described in this document. While any solution is subject to local approvals, anticipating future outcomes of baggage recheck elimination could avert future structural changes to FIS facility design.

Working with CBP to update its Airport Technical Design Standards would be a positive step to achieving guidelines to this end.

International-to-International Connections

Four airports have already implemented procedures to reduce international-to-international baggage recheck. Although similar in nature, the alternative procedures deployed at each airport follow local operating procedures that were agreed to by all stakeholders. The commonalities are as follows:

- Option for CBP to request delivery of selected bags for Secondary Processing
- Delivery of bag(s) within a set period of time as CBP warrants
- Commitment by the airport and participating airline to audit and monitor processes
- Contingencies for exceptions to account for irregular operations

A national set of guidelines could assist other airports and airlines that wish to institute an alternative procedure for international-to-international baggage.

International-to-domestic baggage presents a different threat profile but could follow a similar process should this be implemented broadly across U.S. airports.

Alignment with Airport Marketing and Air Service Development Objectives

The greatest success was realized in the alignment of carrier and airport service development objectives. Some airports found it beneficial to facilitate as few as 20 bags per hour in order to increase potential market share and the reliability of systems. The business case may be indi-

vidual to each airport, but the fundamental principle is to enable shorter minimum connection times and capture increased carrier connecting possibilities.

Challenges

Resilience to Changing Conditions

Border facilitation programs such as reducing international baggage recheck require a longer-term view (more than 5 years) to demonstrate the potential for relevance to changing conditions. Airports tend to have a much longer-term view (more than 25 years) for the life cycle of facilities.

With changing threats and conditions, any solution must anticipate future needs, whether integration of pandemic planning or responses to other emerging threats to border security. To ensure sustainability, any proposed process must incorporate features to

- Scale to different risk levels and
- Expand to different volumes of bags/passengers.

The resiliency of alternative processes will ultimately depend on the maturation of risk management techniques. As CBP has demonstrated through the success of its Customs Trade Partnership Against Terrorism program, oftentimes good security depends on the full engagement of private sector, traveler, and other stakeholders in the process—in addition to CBP officers themselves.

International Standards

The study team found numerous cases of baggage recheck elimination worldwide. While the practice is prevalent in Europe and new technologies are being tested between Australia and New Zealand (i.e., X-ray image sharing for the purpose of agricultural inspection), an emerging issue is the ability to foster international standards associated with baggage information. The study team noted that 15 percent of the time, SITA found there was no incoming BSM received, to allow airlines to sort baggage effectively. Without fidelity and standards adherence, there are sizable challenges to the ability of international data transmission to assist CBP to risk-manage bags.

A Path for Improvement

The first step toward an airport improving its connections effectiveness as a hub is to identify opportunities that save time, improve passenger convenience, and/or reduce costs; in this case eliminating the need for baggage recheck. The second step is to find a solution that will provide a net benefit for all stakeholders. For example, while the need for baggage recheck at SFO was recognized as a burden on the connection process, an airline determined that the cost of an alternative process for international-to-international baggage outweighed the benefits. However, at SEA, it was determined that a similar new process was a worthwhile pilot program to pursue. It is this type of analysis and decision making that is required at each airport. Ultimately, each airport and respective airline(s) must evaluate the incremental costs and benefits associated with an alternative procedure.

Based on the airports/airlines that have successfully reduced baggage recheck for international-to-international connections, as well as research with other industry members, the following elements need to be reviewed:

- **Costs:** Airports and airline(s) need to collaboratively document the costs associated with baggage recheck to establish the need for change from a commercial perspective. They also need

to determine the costs associated with the introduction of a new process/system (e.g., staff training, resources, conveyors, induction points).

- **Benefits:** CBP could evaluate the historical—and future—benefit of having connecting passenger baggage present in the FIS area for both onward domestic and international flights. Airports and airlines need to review the incremental costs in relation to the benefit that would be gained through a reduced baggage recheck.
- **Cooperation:** A collaborative effort between all stakeholders involved is important to determine local operating procedures for a successful reduction in baggage recheck, or to outline the necessary steps for a future reduction.
- **Implementation:** An effective, efficient, and consistent set of actions is required to ensure that all parties uphold their responsibilities as outlined in the established procedures. Where possible, airports and/or airlines should introduce pilot projects that provide CBP with the opportunity to evaluate alternative procedures in a controlled environment. A long-term solution will be viable only if CBP can continue to effectively manage the international arrivals process and the airports/airlines realize a net benefit.

The key element that has been evident throughout the course of the study is that all stakeholders (i.e., CBP, airports, airlines, and TSA) are willing to work together to design a better system for themselves as well as the traveling public. To advance the discussions further, a pilot initiative could be considered:

1. **Design a concept.** Airports and/or airlines need to identify alternative solutions that would satisfy their operational needs within a cost structure that provides a net benefit.
2. **Incorporate CBP early in the process.** Too often, the government is presented with a finalized concept that does not provide any opportunity for discussion or input (or is at least perceived as such). At such a point, the government may be forced to provide a yes/no answer without the airport/airlines having the opportunity to make minor modifications that could secure government support.
3. **Define a path forward.** Once a concept of operations has been agreed to by all parties, a schedule for implementation should be agreed to that ensures the pilot initiative is introduced in a timely manner.
4. **Evaluate the pilot initiative.** Upon implementation, it will be important to monitor key performance and operational statistics to properly evaluate the successful, and unsuccessful, elements. This will enable all stakeholders to properly assess the merit of a longer-term solution or to adapt the existing initiative to realize greater benefits.

Potential Additional Actions

To fully implement the ideas contained within this report, the study team further concludes the need for several key activities:

- Pilot projects: Joint pilot projects between TSA, CBP, airlines, and airports are needed to provide a proof-of-concept for the findings on international-to-domestic baggage recheck elimination.
- Standard operating procedures: Development of national guidelines around baggage recheck elimination will assist in consistency of processes from site to site.
- Facility guideline changes: Design documents for CBP and TSA may need to be introduced to assist airport designers and planners in implementing baggage recheck elimination.

Notes and References

1. At the time this study was completed, CBP was updating the 2006 Airport Technical Design Standards. The results of this study are applicable to the 2006 edition and the initial revisions CBP advanced in the 2011 update.
2. SITA Baggage Report 2011. http://www.sita.aero/content/baggage-report-2011
3. 2010 SITA–Air Transport World Passenger Self-Service Survey. http://www.sita.aero/content/2010-passenger-self-service-survey-webinar
4. Based on 2009 U.S. Department of Homeland Security, Customs and Border Protection optical mark reading database as reported by U.S. Department of Transportation.
5. In March 2010, United Airlines temporarily offered overnight door-to-door baggage service via FedEx for $25 per bag. Competitor pricing ranges from $80 to $270 per bag. See http://www.united.com/page/genericpage/1,,52860,00.html for more information.
6. U.S. Department of Transportation, Office of the Secretary of Transportation, Revised Departmental Guidance Valuation of Travel Time in Economic Analysis (2000). http://regs.dot.gov/docs/VOT_Guidance_Revision_1.pdf

List of Abbreviations and Acronyms

3D	Three-Dimensional
ABG	Automated and Biometric-Supported Border Controls
ABI	Advance Baggage Information
ACRP	Airport Cooperative Research Program
AMS	Amsterdam Airport Schiphol
API	Advance Passenger Information
ASP	Advanced Spectroscopic Portal
ATDS	Airport Technical Design Standards
ATL	Hartsfield–Jackson Atlanta International Airport
ATSA	Aviation and Transportation Security Act
BOS	Logan International Airport (Boston)
BSM	Baggage Source Message
BWIS	Baggage Weight and Imaging System
CBP	Customs and Border Protection
CCTV	Closed-Circuit Television
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CTL	Charlotte Douglas International Airport
CUN	Cancun International Airport
DEN	Denver International Airport
DFW	Dallas/Fort Worth International Airport
DHS	Department of Homeland Security
EDS	Explosive Detection System
ESTA	Electronic System for Travel Authorization
EWR	Newark Liberty International Airport
FAA	Federal Aviation Administration
FIS	Federal Inspection Services

FLL	Fort Lauderdale-Hollywood International Airport
FLUX	Fast Low Risk Universal Crossing
FTE	Full-Time Equivalent
GUM	A.B. Won Pat International Airport (Guam)
IAD	Dulles International Airport (Washington)
IAH	George Bush Intercontinental Airport (Houston)
IAP	Immigration Advisory Program
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
JFK	John F. Kennedy International Airport (New York)
LAS	McCarran International Airport (Las Vegas)
LAX	Los Angeles International Airport
LIM	Jorge Chavez International Airport (Lima)
MCO	Orlando International Airport
MCT	Minimum Connection Time
MEM	Memphis International Airport
MIA	Miami International Airport
MSP	Minneapolis–St. Paul International Airport
NRT	Tokyo Narita International Airport
O&D	Origin and Destination
OMR	Optical Mark Reading
ORD	O'Hare International Airport (Chicago)
PNR	Passenger Name Record
QSI	Quality Service Index
RFID	Radio Frequency Identification
SEA	Seattle-Tacoma International Airport
SFO	San Francisco International Airport
TPHP	Typical Peak-Hour Passengers
TSA	Transportation Security Administration
TSIF	Transportation Security Administration Systems Integration Facility
TSO	Transportation Security Officer
U.S. DOT	United States Department of Transportation
US-VISIT	U.S. Visitor and Immigrant Status Indicator Technology
VWP	Visa Waiver Program

Glossary

Advanced Spectroscopic Portal (ASP)	An advanced nuclear screening portal system designed to identify material emitting certain quantities of radiation. Used to aid interdiction of radiological/nuclear threats.
Aeronautical Revenue	Revenue generated from aviation-related movements such as airfield area use and aircraft parking charges.
Airport Technical Design Standards (ATDS)	Developed by U.S. Customs and Border Protection (CBP) to reflect policy, procedures, and facility sizing parameters for the design and construction of Federal Inspection Service (FIS) facilities at airports.
Automated Targeting System (ATS)	An enforcement and decision support tool that is the cornerstone for all CBP targeting efforts. CBP uses ATS to improve the collection, use, analysis, and dissemination of information that is gathered for the primary purpose of targeting, identifying, and preventing potential terrorists and terrorist weapons from entering the United States.
Baggage Handling Systems	A type of conveyor system installed in airports that transports checked luggage to/from ticket counters, arriving airplanes, baggage screening, and outbound departure gates.
Baggage Make-up Area	The area within the baggage handling system where bags are sorted for an outbound flight.
Baggage Recheck	For passengers who have just arrived from an international flight and are connecting to other flights, major international airports have "baggage recheck" facilities to allow passengers to drop off bags for their next flight. Airlines will typically have customer service agents to provide services such as retagging and boarding pass issuance.
Baggage Screening	The process to screen checked baggage for aviation security purposes to intercept prohibited items. This screening is accomplished primarily through the use of X-ray imaging and may include other technologies or physical search.
Baggage Source Message (BSM)	A data packet that contains the flight details and passenger information that enables an automated baggage handling system to sort a bag automatically once it has scanned the bar code on the carrier tag.

Baggage Weight and Imaging System	System installed at select Preclearance Airports that captures the image and weight of each checked bag that is available for a CBP officer to view when processing a passenger.
Biometrics	The measurement and recording of the physical characteristics of an individual for use in subsequent personal identification (e.g., fingerprint, iris, facial topography).
Border Facilitation Programs	Programs and/or processes that are designed to provide travelers or goods with a simplified experience of the border inspection process at time of entry or exit from a country.
CBP Egress Point	The traveler exit point from the Federal Inspection Services area where travelers typically submit their CBP declaration cards.
CBP Primary Processing	The primary inspection of individuals by CBP officers who present themselves for entrance to the United States within the FIS area. Officers have the discretion to permit entry or refer individuals for further inspection/Secondary Processing.
CBP Secondary Processing	After CBP Primary Processing, the CBP officer has the discretion to refer an individual or family for a more complete inspection before determining their eligibility to enter the United States. An individual may also be referred at random for Secondary Processing.
Carry-on Items or Baggage	Personal items or baggage that remain with a traveler throughout his/her journey including during the flight.
Checked Baggage	Items of baggage delivered to an airline for transportation in the hold (or belly) of an aircraft, which means it is inaccessible to the passenger during the flight.
Connecting Bag Process	The defined process that a passenger and/or airlines perform to ensure the passenger's checked baggage is retrieved from an incoming flight and transported to the outbound flight.
Connecting Flight	The second (or greater) flight segment of a traveler's itinerary that are with the same airline, or with multiple airlines operating under a commercial agreement (e.g., code-share).
Customs and Border Protection (CBP)	A component of the Department of Homeland Security "with a priority mission of keeping terrorists and their weapons out of the United States. It also has a responsibility for securing and facilitating trade and travel while enforcing hundreds of U.S. regulations, including immigration and drug laws."
DB1B O&D Database	The Airline Origin and Destination Survey (DB1B) is a 10% sample of airline tickets from reporting carriers collected by the Office of Airline Information of the Bureau of Transportation Statistics. Data includes origin, destination

	and other itinerary details of passengers transported. This database is used to determine air traffic patterns, air carrier market shares, and passenger flows.
Department of Homeland Security (DHS)	The department that is charged with the responsibility "to ensure a homeland that is safe, secure, and resilient against terrorism and other hazards where American interests, aspirations, and way of life can thrive." DHS has two agencies relevant to this study: Transportation Security Administration and Customs and Border Protection.
Destination Passenger	A traveler who has reached the final airport of his/her flight itinerary.
Domestic Flight	A flight between two airports located within the same country.
Federal Inspection Services (FIS)	Area operated by CBP within which it (and other government departments) has authority to search all persons and goods entering the country.
Full-Time Equivalents (FTE)	A unit used to measure employed persons or students in a way that makes them comparable, although they may work or study a different number of hours per week. An FTE of 1.0 means that the person is equivalent to a full-time worker; while an FTE of 0.5 signals that the worker is employed only half-time.
Global Entry	Global Entry is a Customs and Border Protection program that allows expedited clearance for pre-approved, low-risk travelers upon arrival in the United States. As of the writing of the report it is a pilot program.
Induction Point	The location at which a checked bag enters into an airport's baggage handling system.
International Air Transport Association (IATA) Airport Code	A three-letter code used to identify many airports around the world (e.g., JFK = John F. Kennedy International Airport), defined by the IATA. For example, airport codes are printed on baggage tags at airport check-in desks in order to identify the specific flight routing of checked bags.
International Flight	A flight that originates in one country and is destined for an airport in a different country.
Minimum Connection Time (MCT)	The amount of time, agreed between airlines and airport authorities, that is considered sufficient for a passenger to make a connection between an arriving flight and a departing flight.
Multiplexing	A method by which multiple analog message signals or digital data streams are combined into one signal over a shared medium. This method allows X-ray scanners to have images reviewed in real time from a geographically separate location.

NEXUS	NEXUS is designed to expedite the border clearance process for low-risk, pre-approved travelers into Canada and the United States. The program is operated jointly by the Canada Border Services Agency and Customs and Border Protection.
Non-aeronautical Revenue	Revenue generated from non-aeronautical sources such as land leases or rental payments from retail outlets within airport terminals.
Non-interlined Connections	Two or more flight segments within a traveler's itinerary with multiple air carriers that are not operating under a commercial agreement.
Official Airline Guide (OAG)	Aviation information and analytical services sourced from its proprietary airline schedules, flight status, fleet, maintenance & repair overhaul, and cargo logistics databases. OAG is best known for its airline schedules database that holds future and historical flight details for more than 1,000 airlines and over 4,000 airports.
Originating Passenger	A passenger whose first flight segment begins at that airport.
Passenger Screening	Screening performed to review passengers and their carry-on items for potential threats to commercial aviation. This screening is accomplished primarily through the use of walk-through metal detectors, X-ray imaging, explosive trace detection, and physical search.
People Mover System	An automated system (e.g., train) used to move passengers from one terminal to another or within a terminal in an expedited manner. Such systems may operate within the public side and/or the airside/secure areas of the airport.
Port of Entry	The first location at which a person presents him/herself for entry into a country.
Preclearance Airports	Preclearance allows passengers arriving on international flights to obtain advance approval to enter the United States from established locations in airports outside the country.
Quality Service Index (QSI)	The QSI forecasting tool allows airports to perform route forecasts for a single new route with up to three daily roundtrips. The tool allows the user to input many variables that go into this calculation, such as airline, flight timings, aircraft type, connection windows, code shares, and traffic stimulation. The output provides an overview of the different itineraries of passengers that take the proposed flight, the fares they will pay, and the incremental traffic and revenue for the airline.
Radio Frequency Identification (RFID)	A technology that uses radio waves to transfer data from an electronic tag, called RFID tag or label, which is attached to an object, through to a reader for the purpose of identifying and tracking the object. Some RFID tags can be read from several feet away and beyond the line of sight of the reader.

Ramp-Level Transfers	The movement of checked baggage from an arriving airplane to a departing airplane without it leaving the air-field tarmac.
Risk Management	The identification, assessment, and prioritization of risks followed by a coordinated and economical application of resources to minimize, monitor, and control the probability and/or impact of unfortunate events.
Schedule Integrity	The consistency or reliability of an airline's ability to perform within the defined schedule of its operations (e.g., arrival time, departing time).
Self-Connecting Passengers	A flight journey with a connection in which the traveler holds two separate itineraries.
Simulation	A computer-generated model of a set of processes or events that can be used for scenario testing.
Swing Gate	An aircraft gate that can be used for flights originating from or departing to different sectors (i.e., domestic or international), based on the ability to segregate access to only passengers of that sector.
T-100 Database	A monthly report of domestic and international airline market and segment data for U.S. air carriers that is collected by the Department of Transportation. In addition, foreign carriers that have at least one point of service in the United States or one of its territories report monthly air carrier traffic information using Form T-100.
Terminating Airport	The airport at which a traveler finishes his/her air travel journey.
Transfer Baggage	Baggage that is to be transferred from an arriving airplane to a departing airplane based on the passenger's flight itinerary.
Transportation Security Administration (TSA)	An agency of the Department of Homeland Security that "protects the Nation's transportation systems to ensure freedom of movement for people and commerce."
TSA X-Ray Screening Matrix	The area within a U.S. airport's baggage system where TSA screens bags using X-ray machines or other equipment.
X-Ray Algorithms	A defined set of rules and instructions that the X-ray unit applies when screening bags that detects the presence, or potential presence, of prohibited items.

APPENDIX A

Connecting Traffic Analysis (2008)

A thorough analysis of the current aviation market was undertaken in order to investigate the order of magnitude of volume of baggage recheck. A critical component of the analysis was to select the three case study locations for a detailed review of the need for baggage recheck in order to ensure that the airports represented

(1) Substantive volume of traffic and
(2) International best practices and trends.

The data review focused on the arriving traffic volume, outbound connecting routes, and the proportionality of connecting versus terminating international arrivals. U.S. DOT's T-100 data was the primary source for the traffic analysis. The T-100 data provides the number of passengers flying into the United States on all carriers but only up to the first U.S. point of entry (i.e., CBP facility). Although this data provides an accurate number of passengers traveling on nonstop flights to the United States, it does not reflect each passenger's true destination and connection to another domestic/international flight—the focus of this proposed study.

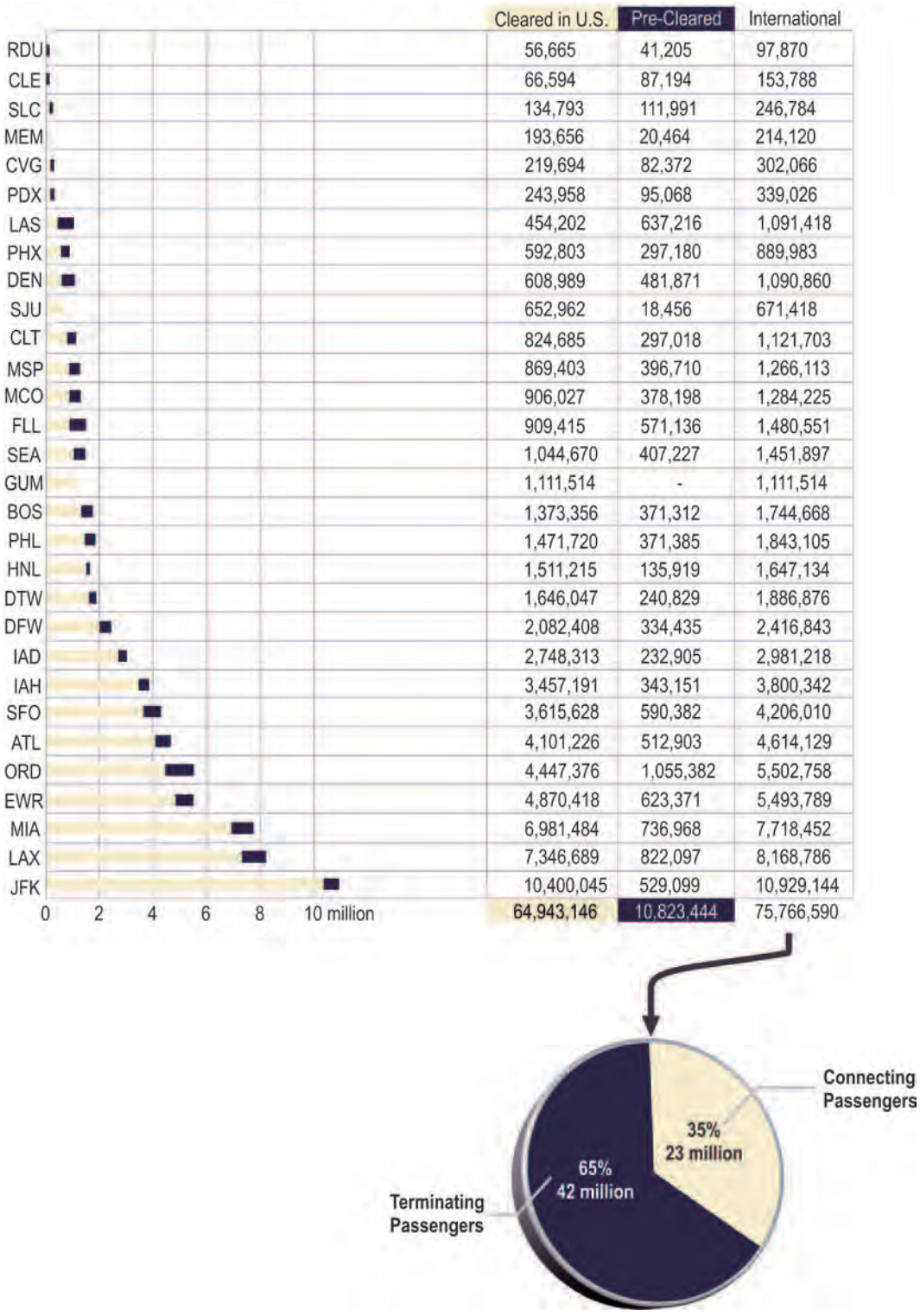
As a result, the study team applied additional sources and expert insight to determine the ratio of origin and destination (O&D) traffic relative to connecting traffic volumes, cross-referencing U.S. DOT's T-100 database and the International O&D DB1B database to Inter*VISTAS*' analyses on connection ratios to domestic and international traffic. This data was also combined with Official Airline Guide data to estimate online alliance traffic. Ultimately, all the data sources were used to define the percentage of "onward connections" to estimate the magnitude of eliminating/reducing baggage recheck from international arrivals by facility.

O&D routing was examined to show how much, if any, of that traffic entered the United States at another point-of-entry airport for U.S. carriers. For foreign flag carriers (e.g., British Airways), there was no central data source to show connection volumes. Instead, the study team reviewed a category of data called "Domestic Portion of International Journey." By taking inbound passenger numbers in this category with routings that include foreign carriers for the international flight into the point-of-entry airport, the team achieved an approximation of foreign carrier local versus connecting traffic at the point-of-entry airport.

The study team progressed through four criteria to filter the results down to the top 30 airports:

- **Criteria 1:** Preclearance facilities were removed to focus on the airport processes within the United States.
- **Criteria 2:** A review of the passenger services offered at the airport ports of entry in the United States showed that the critical mass of scheduled international services were offered at 54 airports. The other 47 airports as such did not offer sufficient services to warrant consideration to be a case study airport.

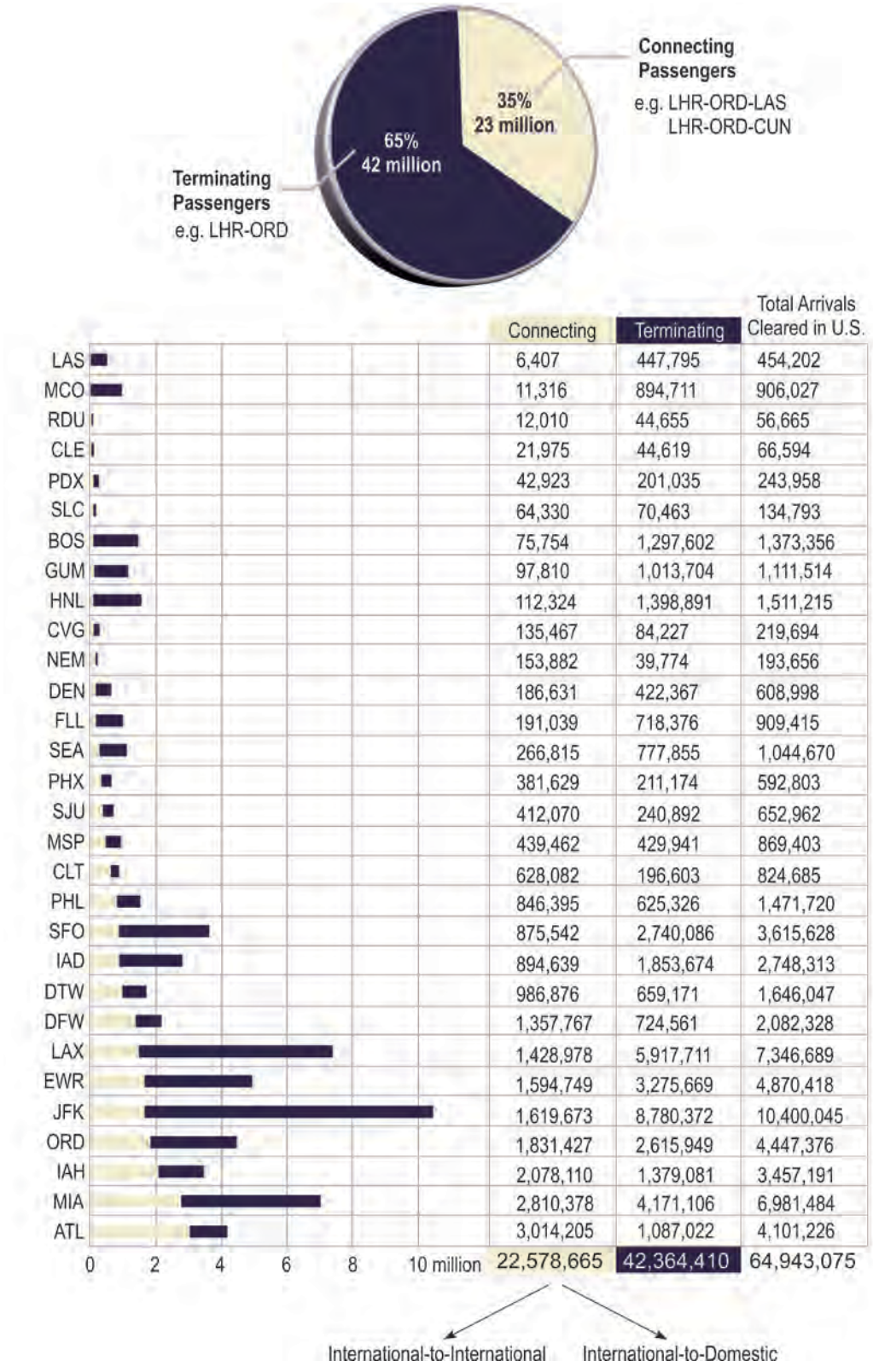
- **Criteria 3:** A further review of the data revealed that the top 30 airports receiving international arrivals also handle approximately 97 percent of passengers. Recognizing the importance of selecting case study airports that could display the magnitude of the baggage recheck issue as well as to gauge the benefits and costs that would be realized through the elimination or reduction in baggage recheck, the study team determined that airports outside the top 30 would not be case study locations.
- **Criteria 4:** Operational characteristics of the remaining 30 airports were reviewed to ensure that a range of airport systems, processes, practices, and technologies were reviewed during the case study process. This enabled the study team to best gauge the issues at hand and heightened the added value of each case study. Figures A-1 through A-3 elaborate on the study team's current thinking process for specific criteria within the operational characteristics.



	Cleared in U.S.	Pre-Cleared	International
RDU	56,665	41,205	97,870
CLE	66,594	87,194	153,788
SLC	134,793	111,991	246,784
MEM	193,656	20,464	214,120
CVG	219,694	82,372	302,066
PDX	243,958	95,068	339,026
LAS	454,202	637,216	1,091,418
PHX	592,803	297,180	889,983
DEN	608,989	481,871	1,090,860
SJU	652,962	18,456	671,418
CLT	824,685	297,018	1,121,703
MSP	869,403	396,710	1,266,113
MCO	906,027	378,198	1,284,225
FLL	909,415	571,136	1,480,551
SEA	1,044,670	407,227	1,451,897
GUM	1,111,514	-	1,111,514
BOS	1,373,356	371,312	1,744,668
PHL	1,471,720	371,385	1,843,105
HNL	1,511,215	135,919	1,647,134
DTW	1,646,047	240,829	1,886,876
DFW	2,082,408	334,435	2,416,843
IAD	2,748,313	232,905	2,981,218
IAH	3,457,191	343,151	3,800,342
SFO	3,615,628	590,382	4,206,010
ATL	4,101,226	512,903	4,614,129
ORD	4,447,376	1,055,382	5,502,758
EWR	4,870,418	623,371	5,493,789
MIA	6,981,484	736,968	7,718,452
LAX	7,346,689	822,097	8,168,786
JFK	10,400,045	529,099	10,929,144
	64,943,146	10,823,444	75,766,590

Source: T-100 onboard & DB1B O&D databases.

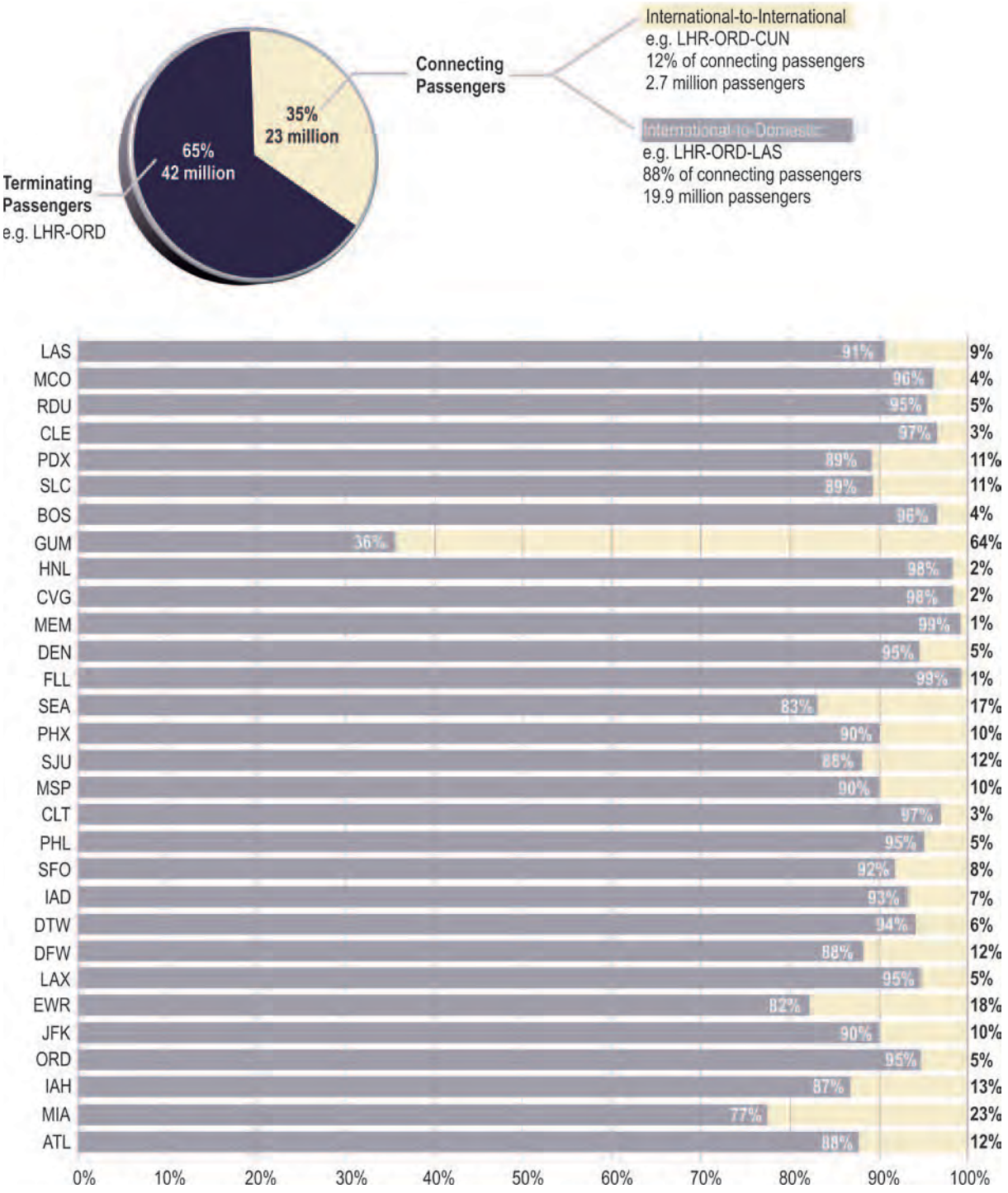
Figure A-1. Number of international arrival passengers by Customs and Border Protection clearance status (in United States or Precleared). Top 30 international airports in the United States for calendar year 2008.



	Connecting	Terminating	Total Arrivals Cleared in U.S.
LAS	6,407	447,795	454,202
MCO	11,316	894,711	906,027
RDU	12,010	44,655	56,665
CLE	21,975	44,619	66,594
PDX	42,923	201,035	243,958
SLC	64,330	70,463	134,793
BOS	75,754	1,297,602	1,373,356
GUM	97,810	1,013,704	1,111,514
HNL	112,324	1,398,891	1,511,215
CVG	135,467	84,227	219,694
NEM	153,882	39,774	193,656
DEN	186,631	422,367	608,998
FLL	191,039	718,376	909,415
SEA	266,815	777,855	1,044,670
PHX	381,629	211,174	592,803
SJU	412,070	240,892	652,962
MSP	439,462	429,941	869,403
CLT	628,082	196,603	824,685
PHL	846,395	625,326	1,471,720
SFO	875,542	2,740,086	3,615,628
IAD	894,639	1,853,674	2,748,313
DTW	986,876	659,171	1,646,047
DFW	1,357,767	724,561	2,082,328
LAX	1,428,978	5,917,711	7,346,689
EWR	1,594,749	3,275,669	4,870,418
JFK	1,619,673	8,780,372	10,400,045
ORD	1,831,427	2,615,949	4,447,376
IAH	2,078,110	1,379,081	3,457,191
MIA	2,810,378	4,171,106	6,981,484
ATL	3,014,205	1,087,022	4,101,226
	22,578,665	42,364,410	64,943,075

Source: T-100 onboard & DB1B O&D databases for calendar year 2008.

Figure A-2. Number of international arrival passengers clearing CBP in the top 30 U.S. airports with international arrivals, ascending order by connecting passengers.



Source: T-100 onboard & DB1B O&D databases for calendar year 2008.

Figure A-3. Percentage of international arrival passengers clearing CBP in the top 30 U.S. airports with international arrivals, ascending order by number of connecting passengers.

APPENDIX B

Airport Profiles

Figures B-1 through B-9 provide a standardized overview of candidate airports for selection as a case study site. Each profile provides an assessment of the following:

- Basic airport characteristics
- Passenger and baggage flows
- Percentage of connecting traffic
- International aircraft arrival types
- International origin market

The profiles were used in the site selection process, as well as for understanding the potential view of risk based on countries of origin for flights to hubs. In addition, the nature of market alliances was considered to better understand the potential connectivity and magnitude of baggage recheck users.

Airport Profile: Atlanta Hartsfield

% of Total Traffic as International Arrivals	6.2%
Hub Role (International to Domestic)	Major Single
Number of FIS Halls	Single
New Terminal Planned	New Intl Terminal planned for 2011
Carrier Run Facilities, Advantages	Single International Facility
Global Alliance Flows	SkyTeam
Global Entry	Yes
100% agricultural inspection on arrivals	-

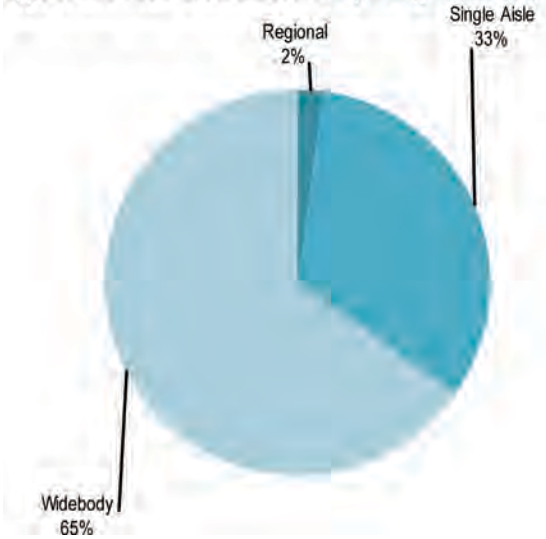
Passenger & Baggage Flows

Walk to FIS After Arrival	Yes	
People Mover/Transporter to FIS After Arrival		
CBP Arrivals Hall + Baggage Claim Multiple Levels	Yes	
Recheck ➔ Passengers walk to next gate	Yes	
Recheck ➔ TSA screening ➔ airside rail/bus ➔ gate	Yes	Train System connects passengers within Secure area
Recheck ➔ Change terminals ➔ TSA screening ➔ gate	Yes	
Recheck only at regular airline check-in	Yes	
Recheck process eliminated	Yes	
Dedicated TSA Connecting Passenger Checkpoint	Yes	
EDS In Lobby Deployment	Yes	
EDS In-line Deployment	Yes	

Connecting Airline Market

73.4 % Connections upon arrivals (3014205 pax a year)

Type of International Aircraft Arrival (Average Seats 155)



International Origin Market

Figure B-1. ATL profile.

Airport Profile: Seattle/Tacoma

% of Total Traffic as International Arrivals	1.5%	
Hub Role (International to Domestic)	Small Single	
Number of FIS Halls	Single	
New Terminal Planned	No plans at this time	
Carrier Run Facilities, Advantages	Single International Facility but Delta is in same	
Global Alliance Flows	None	
Global Entry	Yes	
100% agricultural inspection on arrivals	-	

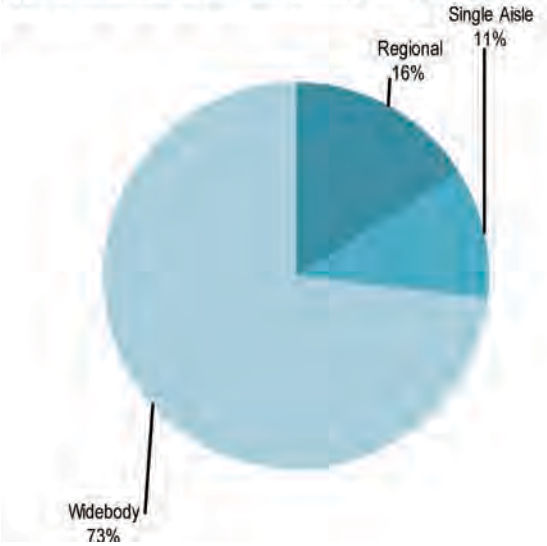
Passenger & Baggage Flows

Walk to FIS After Arrival	Yes	
People Mover/Transporter to FIS After Arrival		
CBP Arrivals Hall + Baggage Claim Multiple Levels		
Recheck ➔ Passengers walk to next gate	Yes	
Recheck ➔ TSA screening ➔ airside rail/bus ➔ gate	Yes	Train System connects passengers within Secure area
Recheck ➔ Change terminals ➔ TSA screening ➔ gate	Yes	
Recheck only at regular airline check-in	Yes	
Recheck process eliminated	Yes	
Dedicated TSA Connecting Passenger Checkpoint	Yes	
EDS In Lobby Deployment	Yes	
EDS In-line Deployment	Yes	

Connecting Airline Market

25.5 % Connections upon arrivals (266815 pax a year)

Type of International Aircraft Arrival (Average Seats 125)



International Origin Market

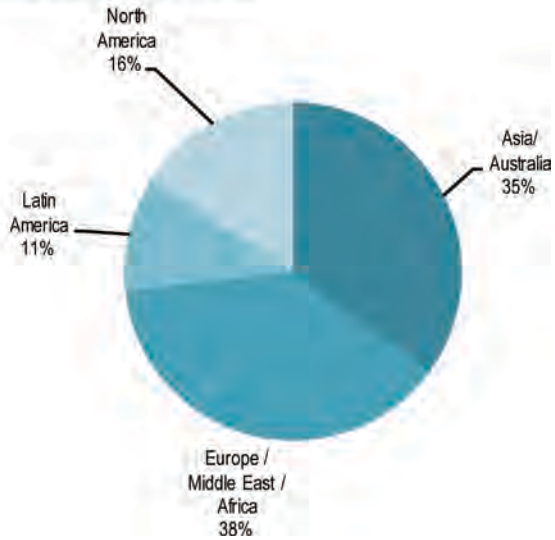


Figure B-2. SEA profile.

Airport Profile: Houston

% of Total Traffic as International Arrivals	5.2%
Hub Role (International to Domestic)	Major Single
Number of FIS Halls	Single
New Terminal Planned	Expansion of FIS to Concourse B
Carrier Run Facilities, Advantages	FIS Hall area in D/E connects into Continental Hub
Global Alliance Flows	Star
Global Entry	Yes
100% agricultural inspection on arrivals	-

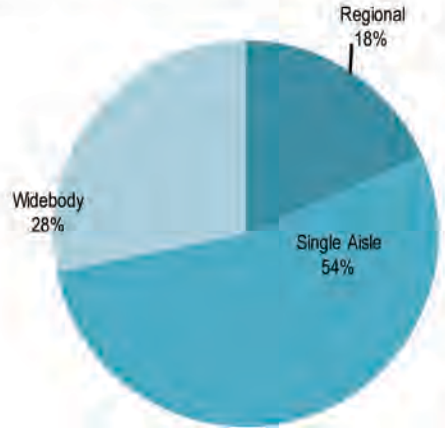
Passenger & Baggage Flows

Walk to FIS After Arrival	Yes	
People Mover/Transporter to FIS After Arrival		
CBP Arrivals Hall + Baggage Claim Multiple Levels	Yes	
Recheck ➔ Passengers walk to next gate	Yes	
Recheck ➔ TSA screening ➔ airside rail/bus ➔ gate	Yes	Train Systems connect passengers in both secure and non-secure areas (two train system)
Recheck ➔ Change terminals ➔ TSA screening ➔ gate	Yes	
Recheck only at regular airline check-in	Yes	
Recheck process eliminated	Yes	
Dedicated TSA Connecting Passenger Checkpoint	Yes	
EDS In Lobby Deployment	Yes	
EDS In-line Deployment	Yes	

Connecting Airline Market

60.1 % Connections upon arrivals (2078110 pax a year)

Type of International Aircraft Arrival (Average Seats 88)



International Origin Market

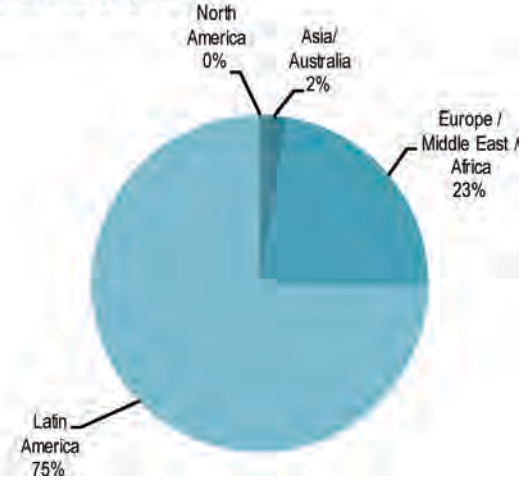


Figure B-3. IAH profile.

Airport Profile: San Francisco

% of Total Traffic as International Arrivals	5.4%
Hub Role (International to Domestic)	Major Single
Number of FIS Halls	Multiple
New Terminal Planned	No plans at this time
Carrier Run Facilities, Advantages	Single International Facility with connection facilities
Global Alliance Flows	Star
Global Entry	Yes
100% agricultural inspection on arrivals	-

Passenger & Baggage Flows

Walk to FIS After Arrival	Yes
People Mover/Transporter to FIS After Arrival	
CBP Arrivals Hall + Baggage Claim Multiple Levels	
Recheck ➔ Passengers walk to next gate	Yes
Recheck ➔ TSA screening ➔ airside rail/bus ➔ gate	Train System used to connect passengers in non-secure areas
Recheck ➔ Change terminals ➔ TSA screening ➔ gate	Yes
Recheck only at regular airline check-in	
Recheck process eliminated	
Dedicated TSA Connecting Passenger Checkpoint	Yes
EDS In Lobby Deployment	
EDS In-line Deployment	Yes

Connecting Airline Market

24.2 % Connections upon arrivals (875542 pax a year)

Type of International Aircraft Arrival (Average Seats 224)

International Origin Market

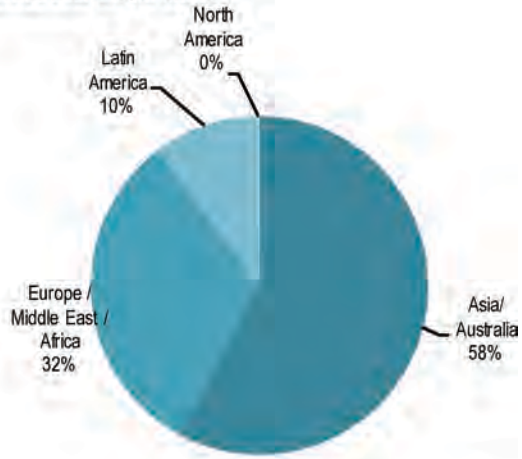


Figure B-4. SFO profile.

Airport Profile: Dallas/Fort Worth

% of Total Traffic as International Arrivals	3.1%
Hub Role (International to Domestic)	Major Single
Number of FIS Halls	Single
New Terminal Planned	No plans at this time - Intl Terminal relatively new
Carrier Run Facilities, Advantages	Single International Facility
Global Alliance Flows	Oneworld
Global Entry	Yes
100% agricultural inspection on arrivals	-

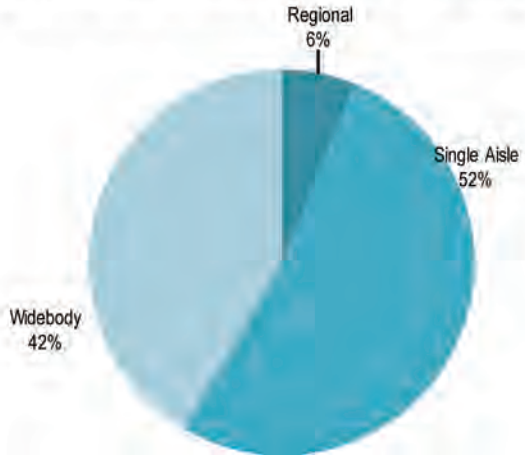
Passenger & Baggage Flows

Walk to FIS After Arrival	Yes
People Mover/Transporter to FIS After Arrival	
CBP Arrivals Hall + Baggage Claim Multiple Levels	
Recheck ➔ Passengers walk to next gate	
Recheck ➔ TSA screening ➔ airside rail/bus ➔ gate	Train System connects passengers within Secure area
Recheck ➔ Change terminals ➔ TSA screening ➔ gate	
Recheck only at regular airline check-in	
Recheck process eliminated	
Dedicated TSA Connecting Passenger Checkpoint	
EDS In Lobby Deployment	
EDS In-line Deployment	

Connecting Airline Market

65.2 % Connections upon arrivals (1357767 pax a year)

Type of International Aircraft Arrival (Average Seats 114)



International Origin Market

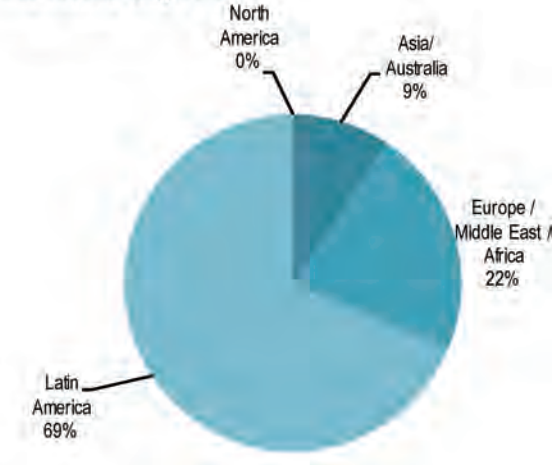


Figure B-5. DFW profile.

Airport Profile: Newark

% of Total Traffic as International Arrivals	7.3%
Hub Role (International to Domestic)	Major Single
Number of FIS Halls	Multiple
New Terminal Planned	No plans to upgrade FIS halls at this time
Carrier Run Facilities, Advantages	Continental has its own facility in Terminal C
Global Alliance Flows	Star
Global Entry	Yes
100% agricultural inspection on arrivals	

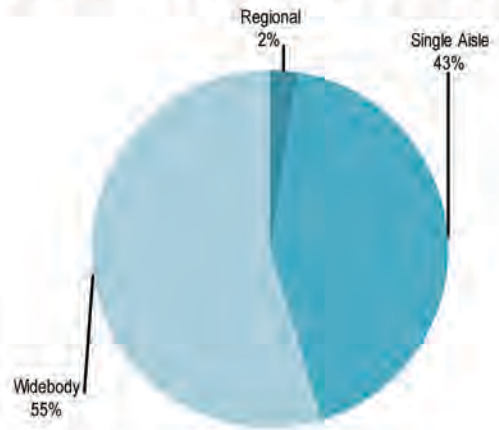
Passenger & Baggage Flows

Walk to FIS After Arrival	Yes	
People Mover/Transporter to FIS After Arrival		
CBP Arrivals Hall + Baggage Claim Multiple Levels		
Recheck → Passengers walk to next gate	Yes	
Recheck → TSA screening → airside rail/bus → gate	Yes	Train System used to connect passengers in non-secure areas
Recheck → Change terminals → TSA screening → gate		
Recheck only at regular airline check-in		
Recheck process eliminated		
Dedicated TSA Connecting Passenger Checkpoint		
EDS In Lobby Deployment		
EDS In-line Deployment		

Connecting Airline Market

32.7 % Connections upon arrivals (1594749 pax a year)

Type of International Aircraft Arrival (Average Seats 146)



International Origin Market

Figure B-6. EWR profile.

Airport Profile: Washington

% of Total Traffic as International Arrivals	4.2%
Hub Role (International to Domestic)	Major Single
Number of FIS Halls	Multiple
New Terminal Planned	New FIS Hall opened September 2009
Carrier Run Facilities, Advantages	United maintains its own connecting FIS in Terminal C
Global Alliance Flows	Star
Global Entry	Yes
100% agricultural inspection on arrivals	-

Passenger & Baggage Flows

Walk to FIS After Arrival	Yes
People Mover/Transporter to FIS After Arrival	Yes
CBP Arrivals Hall + Baggage Claim Multiple Levels	
Recheck ➔ Passengers walk to next gate	Yes
Recheck ➔ TSA screening ➔ airside rail/bus ➔ gate	Train System recently opened in secure area
Recheck ➔ Change terminals ➔ TSA screening ➔ gate	
Recheck only at regular airline check-in	Yes
Recheck process eliminated	
Dedicated TSA Connecting Passenger Checkpoint	Yes
EDS In Lobby Deployment	Yes
EDS In-line Deployment	Yes

Connecting Airline Market

32.5 % Connections upon arrivals (894639 pax a year)

Type of International Aircraft Arrival (Average Seats 183)

International Origin Market

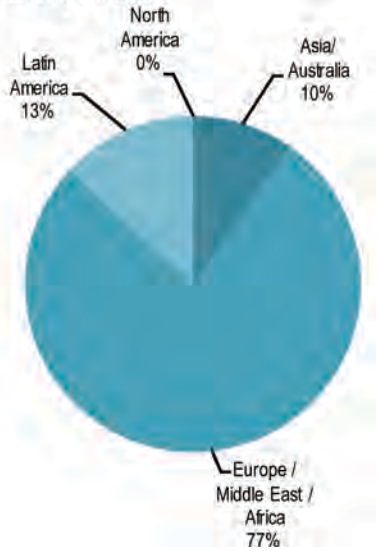


Figure B-7. IAD profile.

Airport Profile: Denver

% of Total Traffic as International Arrivals	0.9%
Hub Role (International to Domestic)	Major Single
Number of FIS Halls	Single
New Terminal Planned	No plans at this time
Carrier Run Facilities, Advantages	Single International Facility
Global Alliance Flows	Star
Global Entry	No
100% agricultural inspection on arrivals	-

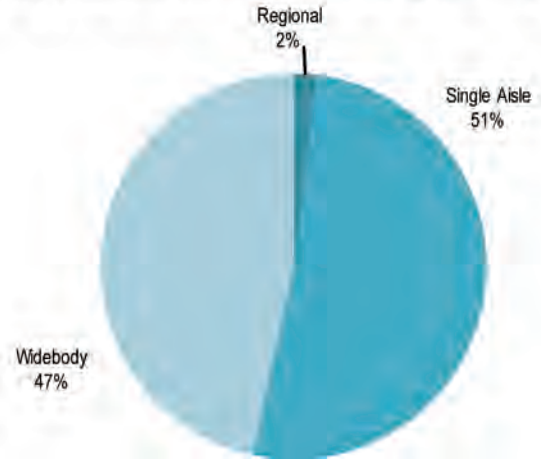
Passenger & Baggage Flows

Walk to FIS After Arrival	Yes
People Mover/Transporter to FIS After Arrival	
CBP Arrivals Hall + Baggage Claim Multiple Levels	
Recheck ➔ Passengers walk to next gate	
Recheck ➔ TSA screening ➔ airside rail/bus ➔ gate	Train System connects passengers within Secure area
Recheck ➔ Change terminals ➔ TSA screening ➔ gate	
Recheck only at regular airline check-in	
Recheck process eliminated	
Dedicated TSA Connecting Passenger Checkpoint	
EDS In Lobby Deployment	
EDS In-line Deployment	

Connecting Airline Market

30.6 % Connections upon arrivals (186631 pax a year)

Type of International Aircraft Arrival (Average Seats 144)



International Origin Market

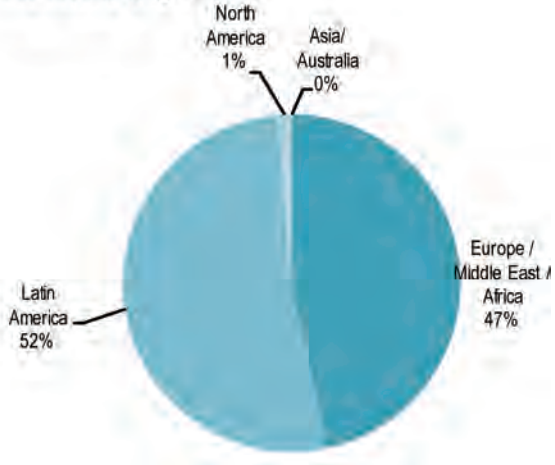


Figure B-8. DEN profile.

Airport Profile: Miami

% of Total Traffic as International Arrivals	10.5%	
Hub Role (International to Domestic)	Major Single	
Number of FIS Halls	Multiple	
New Terminal Planned	North Terminal opening in 2011	
Carrier Run Facilities, Advantages	American an FIS in Central Terminal and will have one	
Global Alliance Flows	Oneworld	
Global Entry	Yes	
100% agricultural inspection on arrivals	-	

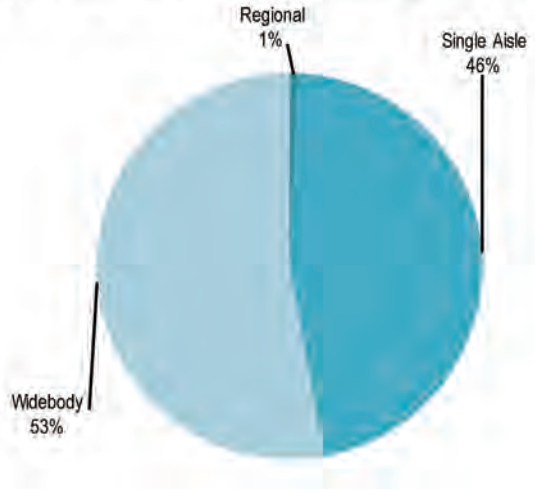
Passenger & Baggage Flows

Walk to FIS After Arrival	Yes	
People Mover/Transporter to FIS After Arrival		
CBP Arrivals Hall + Baggage Claim Multiple Levels		
Recheck ➔ Passengers walk to next gate	Yes	
Recheck ➔ TSA screening ➔ airside rail/bus ➔ gate		
Recheck ➔ Change terminals ➔ TSA screening ➔ gate	Yes	Train System and bussing used to connect international passenger flows inside secure area
Recheck only at regular airline check-in		
Recheck process eliminated		
Dedicated TSA Connecting Passenger Checkpoint		
EDS In Lobby Deployment	Yes	
EDS In-line Deployment	Yes	

Connecting Airline Market

40.2 % Connections upon arrivals (2810378 pax a year)

Type of International Aircraft Arrival (Average Seats 143)



International Origin Market

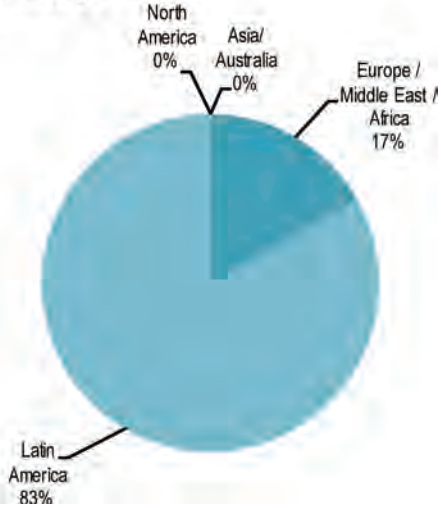


Figure B-9. MIA profile.

APPENDIX C

Inventory of Current Recheck Procedures

The first objective of the study is to understand and categorize the large variety of processes in use within the system today based on a major evolution of related government agencies who work with the federal inspection process. This is especially important given that the processes or technologies currently operated will impact the ability of alternative procedures to work effectively (e.g., different baggage processes for same terminal transfer versus different terminal transfers). The nation's busiest 30 airports represent 97.5 percent of all international passenger traffic; the majority of these facilities will be relevant to this study. In total, the study team looked at categorization based on airports, their FIS facilities, and connecting process flows:

- **30 Airports:** Five process categories were developed to categorize the top 30 airports of interest to this study (based on a data review). The top 30 airports of entry used in this study composed over 97 percent of the total international arrivals into the United States (excluding Preclearance locations).
- **45 FIS Facilities:** Within the top 30 airports there are 9 that have multiple FIS areas within the airport facilities. The multiple facilities can be housed within the same terminal (e.g., SFO) or across multiple terminal buildings (e.g., LAX, JFK).
- **60 Process Flows:** Variations in the process depend upon the outbound flight sector at some airports (airports can have processes under multiple categories). For example, DFW has one FIS but can be classified under Category A for international-to-international connections and Category B for international-to-domestic connections. In total, 60 different process flow variations were classified across the five categories.

Category A: Same Terminal Connection

Category A is the generic process that has passengers staying within the same terminal or connecting to another terminal through a secure-side corridor whether passenger screening is dedicated to connections or includes originating passengers.

This process prevailed as the most common flow with 32 FIS facilities falling under this category. The process, as illustrated in Figure C-1, is the least complicated of the five categories identified. As such, solutions that benefit Category A facilities offer the greatest ability to realize benefits from the alternative procedures.

The following FIS facilities were included within Category A:

- Boston Logan
- Cleveland
- Charlotte Douglas
- Cincinnati
- Dallas/Fort Worth
- Detroit—McNamara
- Fort Lauderdale
- Houston

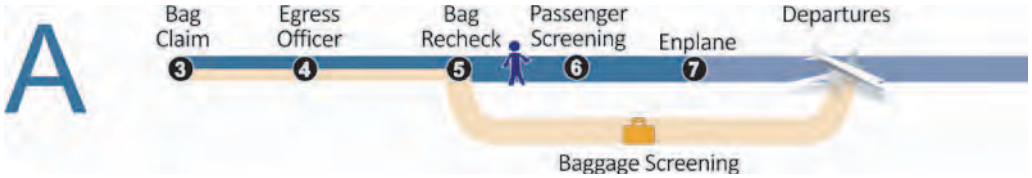


Figure C-1. Category A: Same terminal connection.

- JFK
  - Terminal 1 JAL/AF
  - Terminal 3
  - Terminal 4
  - Terminal 7 UA/BA
  - Terminal 8 AA
- LAX
  - Terminal 2
  - Terminal 4
  - Terminal 5
  - Terminal 7
- Memphis
- Miami
  - E Pier
  - J Pier
- MSP—Lindbergh
- Newark—Terminal C
- Orlando—Airside 4
- Phoenix Sky Harbor
- Portland
- Raleigh/Durham
- Salt Lake City
- San Juan
- SFO
  - Terminal A
  - Terminal G
- Seattle-Tacoma
- Washington Dulles—Infield

San Francisco International Airport and Dallas/Fort Worth International Airport were selected as two of the case study locations to provide a closer examination of the issues and potential alternative procedures related to Category A.

Category B: Secure-Side People Mover

Passengers recheck their baggage in the public area of the airport and proceed through TSA screening before boarding a people mover, shuttle bus, or landside bus to another terminal (Figure C-2).

This category is the second largest category with 11 FIS facilities. The airside people mover, located after passenger screening but before enplanement, creates a potential bottleneck in the system and the adjoining public TSA screening queues due to the extended path that the passenger and rechecked baggage must travel to arrive at their departing gate.

The following FIS facilities were included within Category B:

- Hartsfield–Jackson Atlanta
- Cleveland
- Cincinnati

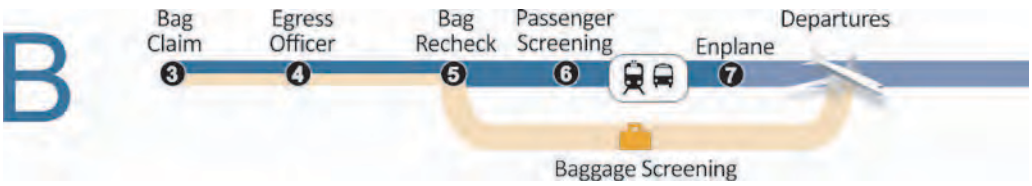


Figure C-2. Category B: Secure-side people mover.

- Dallas/Fort Worth
- Denver
- Houston
- Newark—Terminal B
- Orlando—Airside 1
- Philadelphia
- Portland
- Seattle-Tacoma

Hartsfield–Jackson Atlanta International Airport and Dallas/Fort Worth International Airport were selected as two of the case study locations to provide a closer examination of the issues and potential alternative procedures that relate to Category B. Note, however, that Atlanta will open a second FIS in 2012 and will have a hybrid model of Categories A and B.

Category C: Public-Side People Mover

Passengers are required to board a non-sterile people mover or shuttle bus after baggage recheck but before TSA passenger screening.

Nine FIS facilities currently operate a connecting flow as illustrated in Figure C-3. This process presents an issue in that passengers are being transported across terminals without the ability to immediately proceed to their departure gate.

The following FIS facilities were included within Category C:

- Chicago O'Hare
- Fort Lauderdale
- Las Vegas McCarran
- Los Angeles—Bradley
- Miami
  - E Pier
  - J Pier
- Phoenix Sky Harbor
- SFO
  - Terminal A
  - Terminal G

The selection of San Francisco International Airport (international A Gates to domestic connections) was also chosen to provide a closer examination of the issues and potential alternative procedures that relate to Category C.

Category D: People Mover to Recheck and Terminating

Passengers connecting onward to domestic or international flights are required to approach the airlines check-in area to recheck their baggage as no recheck facility is offered (Figure C-4).

Figure C-3. Category C: Public-side people mover.

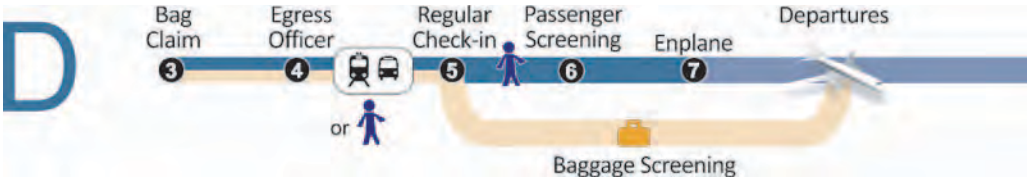


Figure C-4. Category D: People mover to recheck & terminating.

Only five facilities provided no baggage recheck facilities to connecting passengers. The lack of a baggage recheck facility offers a significant opportunity for improved connections processes to be introduced. The elimination or reduction in the need for baggage recheck would enable the air carriers to provide a better product to those transfer passengers as well as originating passengers at the check-in area.

The following airports were included within Category D:

- Detroit—North
- Fort Lauderdale
- Honolulu
- Washington Dulles—Main Terminal
- MSP—Humphrey

None of the case study locations were selected from Category D due to the limited number of facilities as well as the study team's existing familiarity with the Main terminal of Washington Dulles International Airport.

Category E: Baggage Recheck Eliminated

Airports within this category have already eliminated baggage recheck (Figure C-5), primarily for international-to-international connections only.

Three airports are operating a model that eliminated baggage recheck. Of the three, Guam International Airport is the only one without the requirement across all air carriers. Both Hartsfield–Jackson Atlanta and Dallas/Fort Worth offer this opportunity for Delta and American Airlines, respectively, on international-to-international routes.

The following airports were included within Category E:

- Guam
- Dallas/Fort Worth
- Hartsfield–Jackson Atlanta

Dallas/Fort Worth and Hartsfield–Jackson Atlanta were included as case study locations due to the unique opportunity they presented to further understand the process and requirements established to reduce baggage recheck.

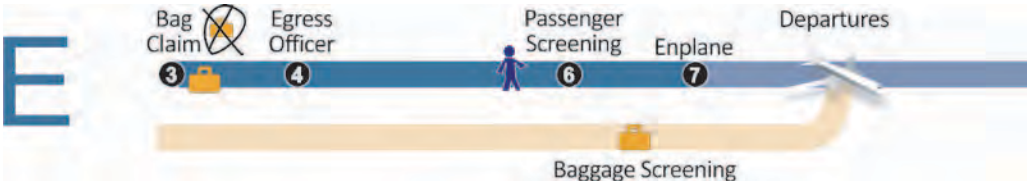


Figure C-5. Category E: Baggage recheck eliminated.

APPENDIX D

Primer on Airport Processes and Border Risk Management

To understand the potential risk and/or issues that arriving international passengers present to federal agencies, it is important to understand the start of the journey. Figure D-1 outlines the current processes that take place up to departure at originating airports and that provide additional information which enables improved risk management.

In the past, border agencies were confined to a limited set of tools generally focused at the U.S. airport of entry (e.g., passport control, customs declaration form, etc.). However since 9/11, CBP and the DHS have invested human and financial resources to "push out the border" in order to improve their intelligence prior to a passenger boarding an aircraft. Throughout the past decade, the developments in advance passenger information, biometric entry visa requirements, and intelligence gathering, among others, have radically transformed the nature of pre-departure processes.

As shown in Figure D-1, new tools, technologies, and processes have emerged to complement traditional risk management capabilities at the originating airport or country before departure to the United States. Each of the processes is described in the following pages and outlines the potential issue, mitigating factor, and how it benefits CBP's risk management. The evolution of the CBP and TSA pre-departure risk management capabilities should warrant discussion for how these complement, benefit, or negate the need for passengers and their checked baggage to appear together in the FIS area.

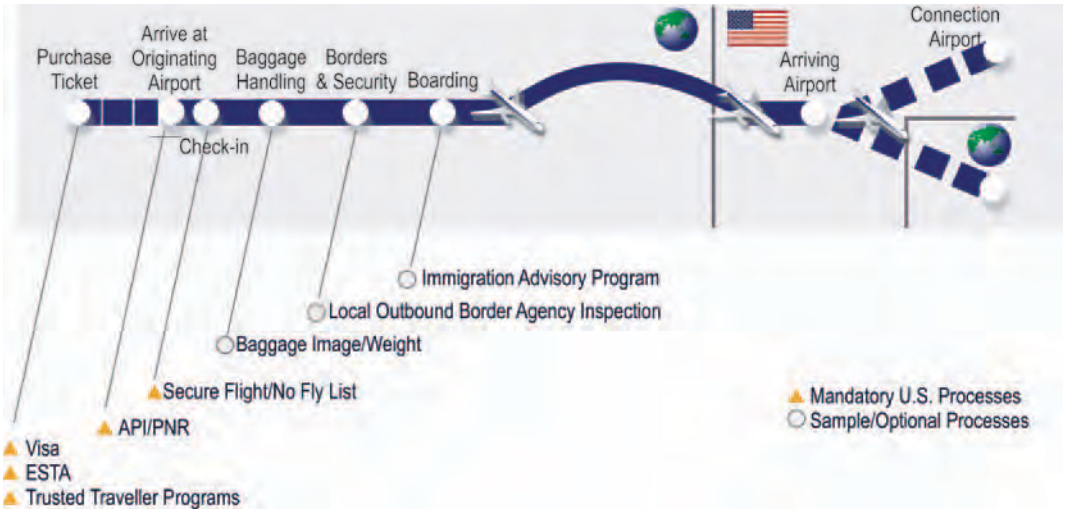


Figure D-1. Airport-of-origin process.

Entry Visa/US-VISIT

Risk: Identity management and inadmissible individuals arriving to the United States	**Mitigation:** Visa approval requires biometric confirmation of traveler identity and advance screening of traveler

A citizen of a foreign country who seeks to enter the United States generally must first obtain a U.S. visa. Exceptions have been given to 39 countries for visa-free travel—36 under the Visa Waiver Program and 3 under provisions of the Immigration and Nationality Act.

An entry visa provides CBP the ability to confirm an intending traveler's identity, purpose of travel (e.g., business, student, temporary visitor) and compare their history against CBP intelligence. All of this information assists CBP to better understand their qualifications for admissibility, but an approved visa does not guarantee admission to the United States upon arrival. The visa is obtained at a U.S. Embassy or Consulate in the originating country through an interview process. The CBP officer interviewing the traveler is responsible for admission of travelers to the United States, for a specified status and period of time.

The evolution of visa requirements to now require visa applicants to provide biometrics—digital fingerprints and a photograph—has further enhanced the risk management of CBP upon the passenger's arrival to the United States. In particular, the introduction of U.S. Visitor and Immigrant Status Indicator Technology (US-VISIT) confirms the identity of the traveler with a visa through biometric confirmation upon presentation to CBP at the port of entry.

Electronic System for Travel Authorization

Risk: Visa Waiver Program (VWP) applicants who could pose a risk to the United States (e.g., links to terrorism)	**Mitigation:** Conduct enhanced screening of VWP applicants in advance of travel to the United States

Introduced in 2009, the Electronic System for Travel Authorization (ESTA) is a web-based system that determines the eligibility of visitors to travel to the United States under the Visa Waiver Program. ESTA is similar in concept and functionality to the Electronic Travel Authority implemented in Australia in 1996. VWP nationals are required to complete an online form consisting of name, birth date, passport document, and travel intentions among others (i.e., same fields as the Form I-94W). In return, the intending traveler is provided an immediate response to confirm or deny their eligibility to travel to the United States.

ESTA applications may be submitted at any time prior to travel; however, it is recommended travelers apply when they begin preparing travel plans. The critical benefit for CBP and the DHS is the ability to pre-screen passengers prior to boarding an aircraft destined for the United States.

Advance Passenger Information / Passenger Name Record

Risk: Passengers with issues noted in law enforcement data, intelligence databases, records of lost/stolen travel documents, prior immigration or customs violations and visa refusals	**Mitigation:** Obtain passenger and travel information and apply targeting rules against passenger name and travel record

Shortly after 9/11, the United States implemented a requirement for airlines to submit passenger information in advance of the passenger's arrival to the United States in an effort to pre-screen all international arrivals by air. Advance Passenger Information (API)/Passenger Name Record (PNR) consists of each travelers biographical information and purchase and travel details. Due to the sensitive nature of some of the information, certain originating countries have required country-to-country agreements that have shaped the specific data fields submitted, but generally, 31 fields of data are submitted to CBP for review up to 72 hours prior to departure.

Together mandatory submission of API/PNR data has provided CBP the ability to make a number of decisions regarding which passengers require additional inspection at the port of entry based on law enforcement information and other intelligence. Collecting and analyzing this information in advance provides CBP adequate time to research possible matches against derogatory records to eliminate false positives. To date, aviation is the only transport mode subject to mandatory API/PNR submissions.

Trusted Traveler Programs

Risk: Prescreening of passengers	**Mitigation:** Thorough prescreening of low-risk pre-approved travelers enables greater focus on passengers not pre-screened

Several countries (e.g., Canada, the United States, and the Netherlands) have developed trusted traveler programs to pre-screen low-risk travelers in order to deliver a facilitated border crossing process. The ability to pre-screen frequent travelers and remove them from the traditional flow of passengers presenting themselves to a CBP Primary Officer creates a safer environment and enables increased passenger processing per officer. The United States currently offers two such programs for air travelers: Global Entry and NEXUS.

Global Entry: Intended for frequent international travelers, but open to all U.S. citizens, Global Entry provides an expedited kiosk-based border clearance process at 20 airports to participants who are deemed "low risk." Interested individuals are required to submit an online application to outline their personal and professional history in order to be accepted into Global Entry.

NEXUS: Beginning in 1999, NEXUS was introduced as a joint Canada and U.S. program to expedite border travel between the two nations. Similar to Global Entry, applicants are required to apply online but the success of the applicant is based on a review by both the U.S. and Canadian governments. NEXUS is also available for use at land and marine ports of entry to the United States.

Recently, like-minded nations established the Fast Low Risk Universal Crossing (FLUX) alliance to provide a multinational platform from which to establish coordination and recognition of other nations' trusted traveler programs. The first success was the coordination of the Dutch Privium program and Global Entry for participants of one program to be eligible participants in the other. Additionally, Germany and the United States recently announced an intent to integrate the German program Automated and Biometric-Supported Border Controls (ABG) into Global Entry.

Secure Flight

Risk: Travelers identified as not permissible on aircraft destined for (or flying over) the United States	**Mitigation:** Perform a check against a watch list

Secure Flight is a Transportation Security Administration (TSA) program in which passenger information is collected by the airline when making a reservation. The collected data provides the TSA with an opportunity to pre-screen international and domestic travelers against the U.S. No-Fly List. Since November 2010, the TSA has screened 100 percent of passengers on all domestic and international flights that cross U.S. airspace. The required data is

- Name as it appears on government-issued I.D. when traveling,
- Date of birth,
- Gender, and
- Redress number (if available).

The airline transmits this information to Secure Flight, which uses it to perform watch list matching. This matching serves to prevent individuals on the No-Fly List from boarding an aircraft and to identify individuals on the Selectee List for enhanced screening. After matching passenger information against government watch lists, Secure Flight transmits an immediate response back to the airlines with the ultimate goal of denying boarding pass issuance if required. Airlines are responsible for ensuring that passengers with positive matches on the No-Fly List are denied boarding.

Baggage Image and Weight

Risk: Passenger-checked baggage	**Mitigation:** Electronic image and weight measurement matched to passengers

Baggage image and weight systems have been installed at a number of Preclearance airports at which security is in advance of Preclearance processes or the airport has a baggage connection program. The main goal of the system is to manage records of baggage information for use by CBP officers in the Preclearance facility. Baggage items are placed on a weigh conveyor at an induction station. The induction station operator scans the luggage tag barcode, which triggers the digital camera to take a photo and the scale to record the bag weight. The barcode on a passenger's boarding pass can be read to retrieve the digital image and weight of all bags associated with the passenger.

The system allows CBP officers to view the baggage image and weight despite dropping off luggage at a location before approaching the officer. Procedures are in place for physically retrieving bags if the passenger is directed to Secondary for further inspection.

Local Outbound Border Agency Inspection

Risk: Unknown passenger threats that do not trigger warnings in other risk management tools	**Mitigation:** Gather additional information from foreign border agency, if possible

A number of foreign states have outbound border agency inspection in addition to inbound processes. The types of questions posed during interviews and the data collected varies by nation. Depending on country-to-country information-sharing agreements, intelligence gained during outbound inspection can be useful to CBP for travelers entering the United States and potentially making subsequent domestic or international connections.

Immigration Advisory Program

Risk: Known passenger threats in foreign countries	**Mitigation:** Station CBP officers at foreign airports

The Immigration Advisory Program (IAP) stations CBP officers overseas at nine airports in seven countries and is separate from Preclearance. The IAP officers are provided with information about positive passenger name matches for terrorism screening, U.S. visa revocation, ESTA denials, lost or stolen passports, or persons of interest for public health as provided by the Centers for Disease Control and Prevention. While they do not act in a law enforcement capacity in foreign countries, they play a role in training and providing advice to local law enforcement and airlines in detecting fraudulent travel documents and in irregular migration and in making "no board" recommendations.

APPENDIX E

Technical Memorandum on Testing

RFID Testing

Methodology

The airline was independently conducting a diagnostic study of its baggage handling operations at the test airport using radio frequency identification (RFID) stickers affixed to checked baggage tags. The opportunity arose to conduct a complementary study of passenger timing at the baggage carousels for reclaiming bags and of participants in the international-to-international program through the use of RFID stickers attached to carry-on items. The basic process was as follows:

- Airline check-in agent at the originating station issues RFID stickers with unique number to connecting passengers traveling through the test airport.
- RFID sticker affixed to passenger carry-on item and to corresponding checked baggage read by scanners at the test airport.

Figures E-1 and E-2 show process flows and RFID reader locations for international arriving passengers and bags.

The test provides an automated and independent measurement of passenger process times from completion of CBP Primary (and Immigration Secondary) through to the FIS Egress Point (i.e., focus on baggage claim). Figure E-3 shows two reader locations. RFID stickers were issued to checked bags and one passenger carry-on item at originating international airports (e.g., Tokyo Narita) for domestic connections (e.g., Miami) and international connections (e.g., Cancun). Over the course of one month, thousands of stickers were issued at multiple originating airports and affixed to passenger carry-ons. The RFID stickers were linked to corresponding baggage RFID stickers from the existing airline study for direct comparisons but was not and cannot be attributed to a passenger record (i.e., study results are anonymous).

Results

Passenger time spent queuing for and proceeding through CBP Primary processes versus the unload time and transportation time to baggage claim dictate whether bags or passengers are ready at the baggage claim carousel. The percentages and wait times will also be affected by where a passenger is seated on an aircraft (i.e., those sitting closer to the front of an aircraft will typically deplane first and queue for CBP Primary earlier than others) and how checked bags are prioritized or randomly distributed in the aircraft hold.

The timing was only measured for international-to-domestic connections (i.e., international-to-international bags do not need to be claimed or rechecked). In general, it was found that 65 percent of bags were ready to be picked up by passengers at the claim carousel and remained on the carousel

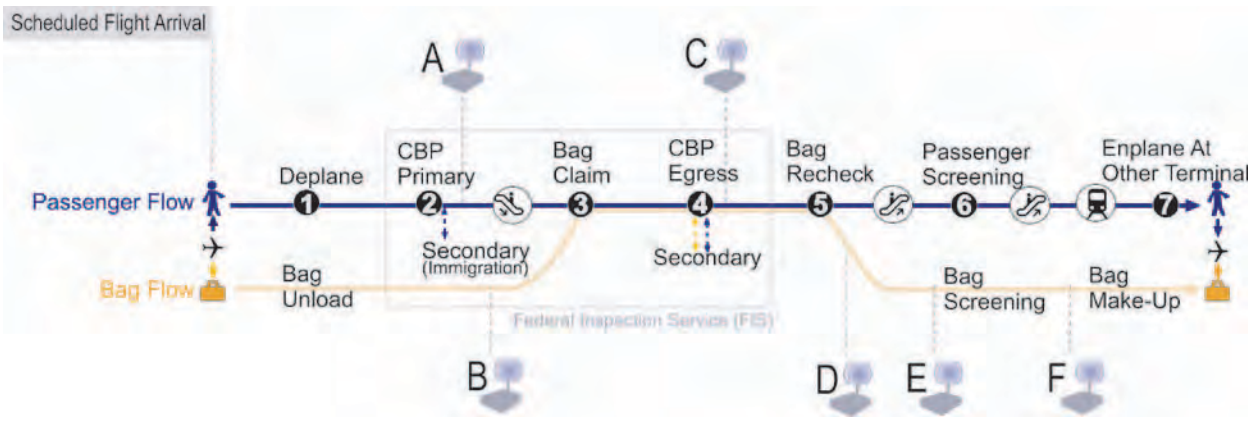


Figure E-1. International-to-domestic passenger and bag process flows and RFID reader locations.

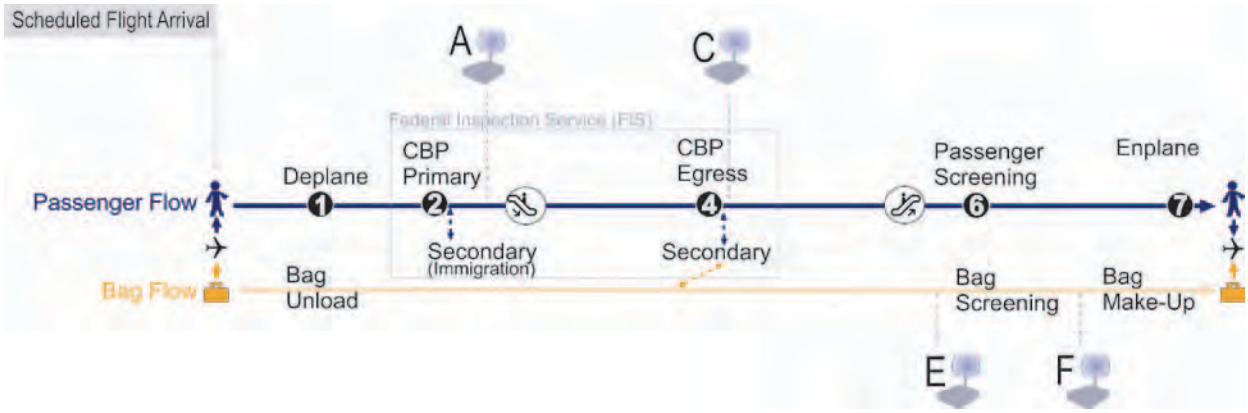


Figure E-2. International-to-international passenger and bag process flows and RFID reader locations.

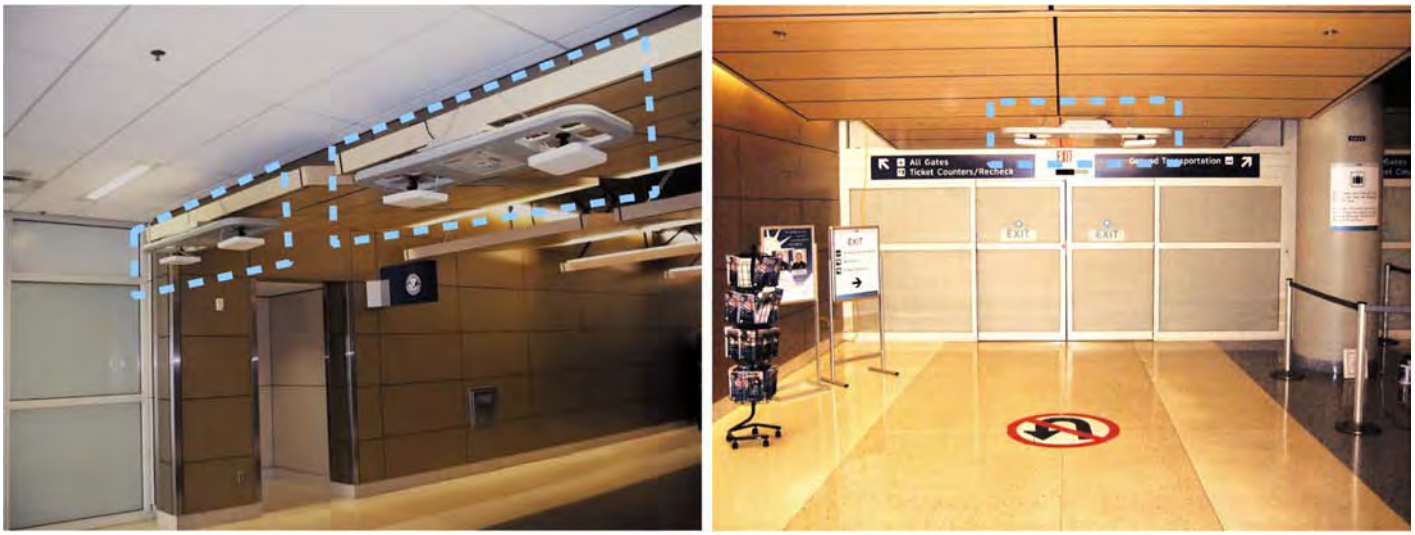


Figure E-3. RFID reader locations for passenger carry-on timing (after CBP Primary and before CBP Egress).

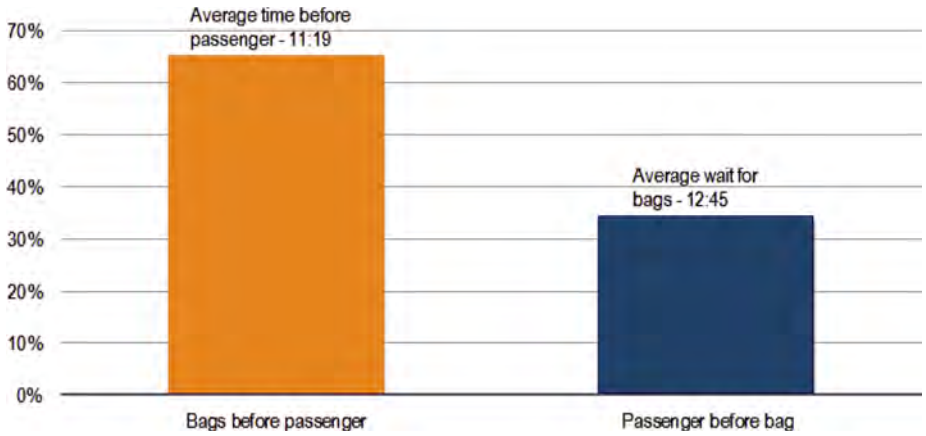


Figure E-4. International-to-domestic baggage versus passenger timing at claim carousel.

for 11 minutes, 19 seconds on average. Figures E-4 and E-5 depict breakdowns of average wait times of passengers for bags and bags for passengers. The 35 percent of passengers who had to wait for their bags to appear waited 12 minutes, 45 seconds on average.

It appears that passenger processes are generally the constraint for flight connections that require baggage claim and recheck.

For passenger timing from flight arrival to exit from the FIS area, there is a significant reduction in time for international-to-international connection passengers versus passengers making international-to-domestic connections (Figures E-6 and E-7). Although bags are often ready to be picked up by passengers at the baggage claim carousel, domestic connecting passengers spend additional time to locate baggage trolleys, find/identify their bags, and exit the FIS area. During peak periods, queues will form at the CBP exit point. International-to-international passengers (and others with no bags) may proceed directly from CBP Primary to the exit point and will typically avoid the congestion caused by passengers leaving the FIS area with bags.

For bag timing from flight arrival to bags ready at sortation, there is also a significant reduction in time for international-to-international connection passengers versus passengers making

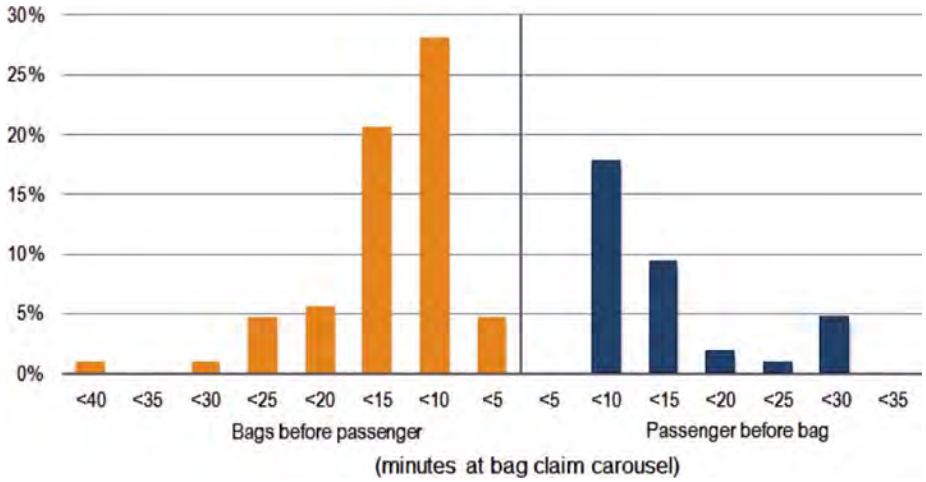


Figure E-5. International-to-domestic baggage versus passenger timing at claim carousel—Histogram.

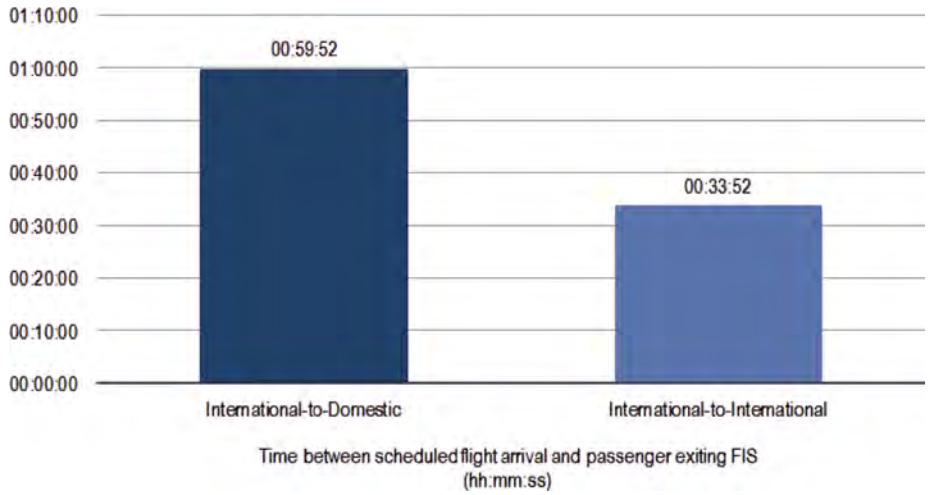


Figure E-6. Time between scheduled flight arrival to passenger at exit from FIS (international-to-domestic vs. international-to-international).

international-to-domestic connections. Bags not only have to wait at the claim carousel for passenger pickup, they must also be rechecked by passengers. This represents about a 53 percent reduction in time for bags facilitated through the international-to-international program (Figures E-8 and E-9).

It appears that the baggage claim process adds a significant amount of time for both passengers in the FIS area and bags to be ready for sortation.

Relevance to Eliminating/Reducing Baggage Recheck

For connections at the test airport, international-to-international (no baggage recheck) connections are significantly faster than international-to-domestic (with baggage recheck) for passengers and their checked bags. The study shows 34-minute and 26-minute reductions in times

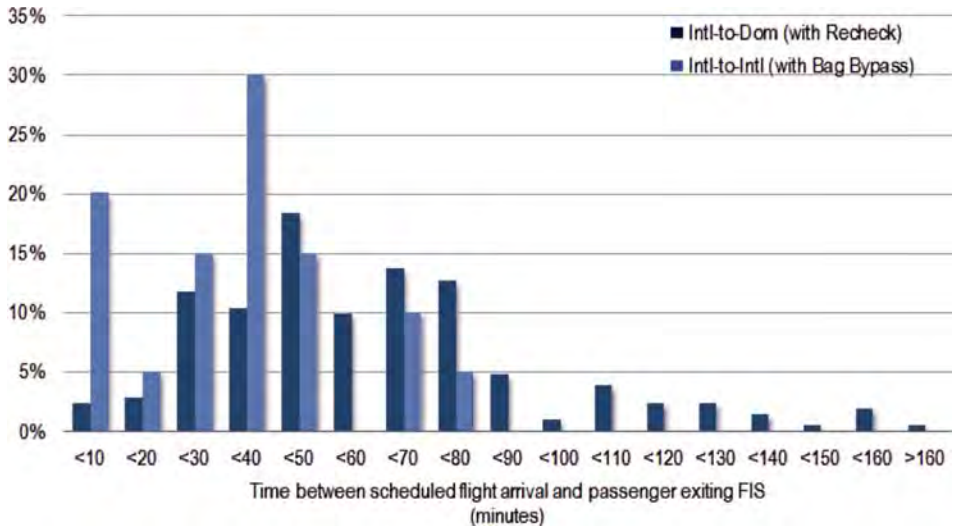


Figure E-7. Time between scheduled flight arrival to passenger at exit from FIS (international-to-domestic vs. international-to-international)—Histogram.

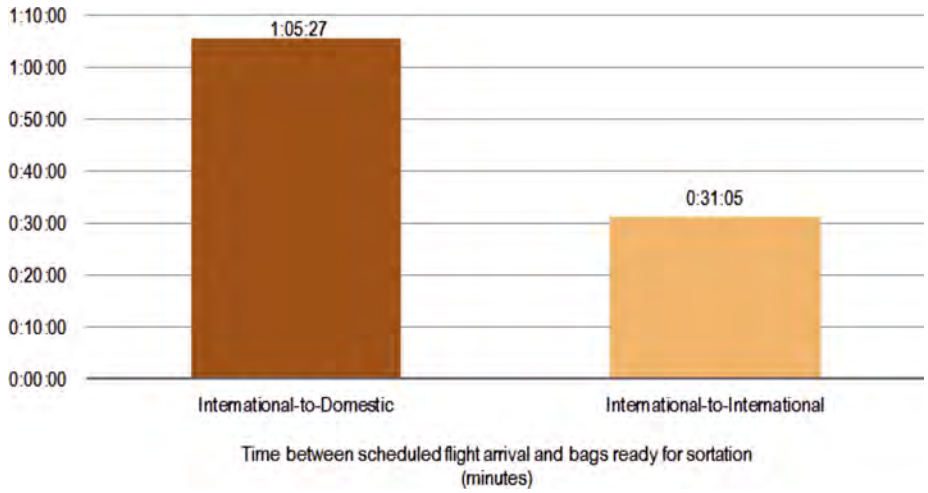


Figure E-8. Time between scheduled flight arrival to bags ready for sortation (international-to-domestic vs. international-to-international).

for equivalent processes for bags and passengers, respectively. This represents an improvement of approximately 50 percent.

Note that the airline's upstream operations prioritize the international-to-international connection bags so that they are available to be unloaded first and can be inducted into the hub airport's baggage handling before terminating or domestic connecting bags. If international-to-domestic baggage recheck can be eliminated, bags can similarly be prioritized but would represent a significantly larger volume of bags for the airport and airline to facilitate.

Eliminating baggage recheck for either international-to-international or international-to-domestic connections could result in significant reduction of time for passengers and their bags (i.e., 30 minutes) that could lead to (a) potential reduction in minimum connection times (see the Minimum Connection Time Modeling section), and (b) increased reliability of connections and schedule integrity.

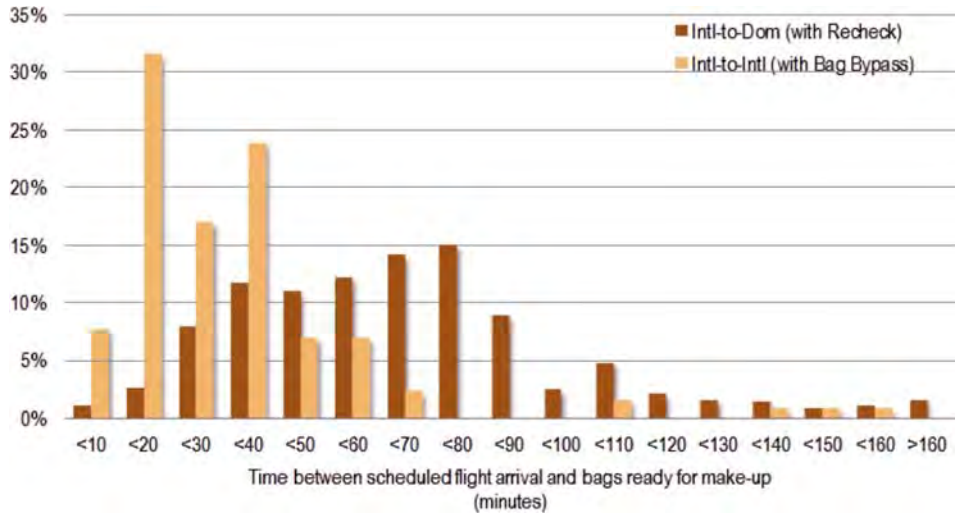


Figure E-9. Time between scheduled flight arrival to bags ready for sortation (international-to-domestic vs. international-to-international)—Histogram.

Bag Screening Test

Under current regulations and requirements, virtually all connecting bags must undergo EDS screening by a TSA officer before being allowed to be sorted and loaded onto departing aircraft in the United States. The images obtained from the screening process may potentially be used for purposes other than aviation security and could be used for border purposes (i.e., illegal items, contraband, agricultural, etc.).

Test Objectives

The objective of this test was to determine if images obtained during the screening of transfer baggage by Transportation Security Officers are useful to address the mission critical needs of other law enforcement and regulatory agencies, e.g., U.S. Customs and Border Protection.

Methodology

A variety of mock-up items of interest were introduced, on a random basis, into 25 different types of passenger baggage for screening at the Transportation Security Administration Systems Integration Facility (TSIF). These items included fruits and vegetables, stuffed animals, vegetable matter (loose oregano), pills and various powders (milk and spices) to denote narcotic substances, bars of clay to denote plastic explosives, and paper denoting bonds and currency.

Table E-1 lists risk items that were tested through the bag screening equipment. Simulated contraband or illegal items were approximated with suitable replacements.

Each bag was labeled with a unique number to track the bags in order to determine which ones contained the introduced materials from those "control" bags having none of the mock-up products.

The team attempted five separate runs of the baggage on two different types of machines. The first three tests were conducted on current scanning technology using a CTX 9400. It is rated to scan approximately 200 to 300 bags per hour and provides a 2-D image of the baggage. The last

Table E-1. Items tested through bag screening equipment.

Risk Item	Simulated Test Items
Fruits and vegetables	Boniato (Cuban sweet potato) Malanga lila (tropical root vegetable) Yuca root Chayote squash Jicama Yellow apples Lemon Navel oranges
Narcotics	Cocaine—substituted with powdered milk: two 500 mg bags, wrapped and taped Marijuana—substituted with oregano leaves: two 68 g bags and one 34 g bag MDMA (Ecstasy)—substituted with 500 mg calcium carbonate tablets: 50 tablets in one bag and 25 tablets rolled in aluminum foil Heroin—Ground cumin: two 90 g bags, tightly rolled Amphetamines—50 acetaminophen tablets in a zipped bag
Currency	Counterfeit U.S. currency—substituted with fake bills in bundles with rubber bands (average 50 bills per bundle)
Recorded/copyright media	Pirated media—substituted with plastic spindle of 25 DVD-Rs
Negotiable instruments	Negotiable bearer bonds—18 printed A4 sheets stacked together
Animals (stuffed)	Endangered animal species—two plush children's toys with synthetic fur

Table E-2. Illegal or contraband items detected by screening equipment.

Risk Item	Number of Items Placed	Number of Threats Identified	Accuracy
Fruits and vegetables	13	13	100%
Narcotics	8	7	88%
Currency	4	4	100%
Recorded/copyright media	2	2	100%
Negotiable instruments	1	0	0%
Animals (stuffed)	1	1	100%
Total	**29**	**27**	**93%**

two tests were conducted on equipment that is currently in testing for future use at high-volume airports. The L3 XLB system is rated to handle approximately 1,000 bags per hour and provides a 3-D image of baggage.

Results

Of the 84 bags, 26 had substances representing illegal or contraband items placed in them. The remaining 58 bags had no contents presenting an issue to CBP clearance. These bags were all screened using CTX 9400 (2-D X-rays) and L3 XLB (3-D) machines at an average of 36 seconds per item.

Table E-2 shows the results for the 29 illegal or contraband items. Using TSA screening equipment, the threat identification was 27 out of 29 (93% accurate).

Table E-3 shows the number of false positives (i.e., identified threat, but no contraband or illegal item) and false negatives (i.e., missed threats). Note that some bags contained more than one type of contraband or illegal item and as a result the total of 87 is slightly greater than the number of bags (84).

Test Team Qualitative Results

(1) 3-D scanned images are far superior for identifying items of interest for border and agricultural purposes in baggage compared to current 2-D technology.
(2) In each test run, regardless of the scanning technology used, vegetable/fruit products were easy to detect and the test team identified the threat because of the density of the vegetable product involved in some instances. The same is true for the clay bars used to simulate plastic explosives.
(3) Using the current technology, it was virtually impossible to identify products with lower densities, e.g., the oregano, milk powder, and spices meant to simulate marijuana, cocaine, and heroin. The same is true for the paper currency and the bonds. However, the 3-D scanning provided more information using the ability to rotate images on several axes and, in some instances, the image inversion capabilities of the machine.
(4) The stuffed animals, although detected in the bag, appear similar to clothing. If a Convention on International Trade in Endangered Species of Wild Fauna and Flora

Table E-3. False positives and negatives identified.

Identification	Number of Misidentifications	Total	Accuracy
Positive	7	58	88%
Negative	2	29	93%
Total	**9**	**87**	**90%**

(CITES) prohibited product has a bone or calcified structure it would likely be detected by technology.

Test Team Notes

The test screener did not have any training on either scanner but is a former U.S. CBP officer. Transportation Security Officers (TSOs) normally are trained in the use of the scanning equipment for approximately 2 to 3 weeks. The EDS equipment is also programmed to assist the screening officer in identifying potential aviation security risks and not necessarily border or agricultural threats. The systems have built in parameters to focus on the density of materials (e.g., shoe soles in relation to other items in proximity), but not to detect other types of materials.

Relevance to Eliminating/Reducing Baggage Recheck

The results from the test indicate that TSA checked baggage screening images can be used by CBP as an alternative or additional risk management tool in order to enable the elimination of baggage recheck. Specifically, it would be useful for international-to-domestic connection bags since these bags are eventually destined to enter the United States. A number of issues would need to be addressed (e.g., training of CBP officers for identification of risks, difficulty in identifying certain types of threats, location of the TSA EDS screening room with respect to the FIS area, etc.).

The test team concluded, however, that the review of TSA EDS screening images provides a far superior risk management tool for CBP when compared to the current domestic connections process of viewing the exterior of passenger bags at the Egress Point from the FIS area.

International-to-International Connections Feasibility Assessment

The current practice for international-to-international connections at SEA is for passengers to reclaim checked bags immediately after being processed by U.S. CBP Primary. After exiting the FIS Hall, passengers must recheck their bags before passenger screening and proceeding onwards to their subsequent international flight. Traditionally, this practice has existed to assist with the identification of risks to the mission of FIS agencies.

Historically, 25.5 percent of international arrivals at SEA are connecting passengers. Using data from the Bureau of Transportation Statistics T-100 Onboard and DB1B O&D databases, it is estimated that, of these connections, 16.8 percent are international while 83.2 percent are domestic. This percentage is the third highest for international-to-international connections in the United States behind MIA (22.7 percent) and EWR (17.8 percent). The bulk of these international connections are transborder flights to Canadian airports.

Test Objectives

The purpose of the test was to perform an on-site assessment of the infrastructure, timing, benefits, and potential issues of implementing international-to-international connections at the airport.

Methodology

The following set of potential operational flows (Figure E-10) is for low-risk international-to-international connections destined for Canada for the purposes of this feasibility assessment:

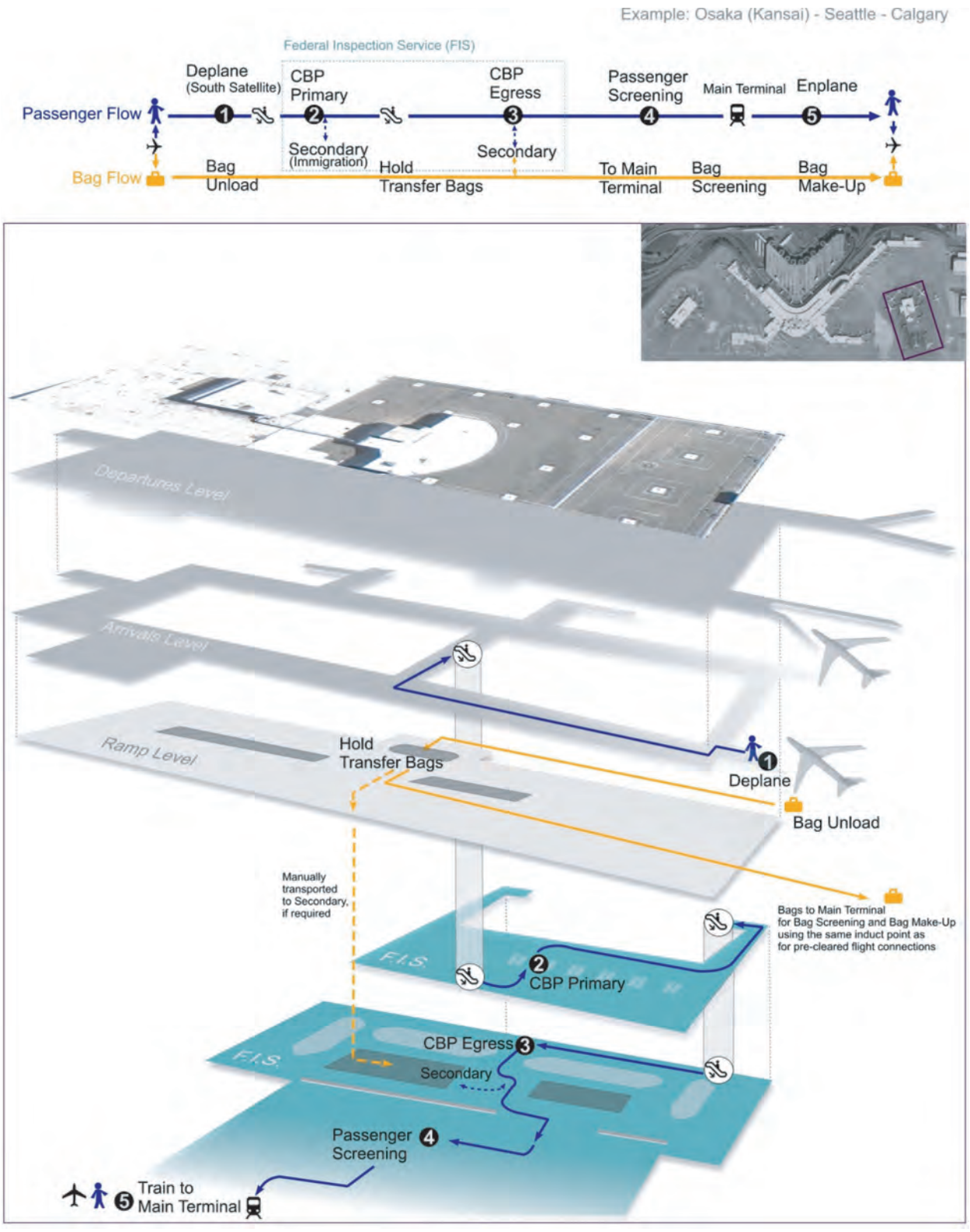


Figure E-10. SEA potential international-to-international connection bag and passenger flow.

- **Arrivals process:** Passengers will exit the aircraft with all other passengers and proceed directly to the FIS Hall and U.S. Customs and Border Protection Primary Processing. Checked baggage participating in the program will be unloaded from the aircraft and held at the ramp level on an unused carousel for possible delivery to the FIS Hall for CBP Secondary Processing.
- **Bag process:** After a predetermined amount of time, if bags are not requested for retrieval by CBP, they may be transported by Alaska/Horizon ground handlers to the Main terminal to be inducted back into the baggage handling system using the same process as Preclearance connecting bags.
- **Departure process:** Once inducted into the system, bags are inspected by TSA. If cleared, they will be diverted to the appropriate baggage make-up units and subsequently loaded onto the Canadian bound aircraft at the Main terminal.

Data collection took place on a select number of international-to-domestic flights on a Monday in May 2011 at Seattle-Tacoma International Airport for flights arriving at the South Satellite terminal. Actual live data and observations were made when possible, while estimates and averages were provided by the operational staff who actually perform much of the baggage handling tasks. It is estimated that approximately 5 to 20 bags of the 150 to 250 total bags on a Delta international arrival flight are destined for a Canadian destination on a Horizon flight.

Results

Infrastructure and Operations Assessment

For upstream operations at the originating airport, airline representatives would need to identify which bags and passengers can participate in the international-to-international pilot. The international-to-international programs in place at IAH and DFW make use of identifying stickers on baggage tags and on passenger passports for this purpose. The passengers need to be informed not to wait to claim bags but to proceed to CBP Egress after CBP Primary processes. At CBP Egress, passengers would provide their passport with the indicator sticker and, potentially, their onward boarding passes to leave the FIS Hall without bags.

At SEA, transfer bags can be held at an unused baggage make-up carousel at ramp level. The location of the carousel provides an easy location to retrieve and deliver bags in case of inspection at Secondary. The route for delivering bags requested at CBP Secondary would be the same as that of oversize bags (i.e., manually via an elevator). On-site data collection shows that the actual time from the unused conveyor, through the elevator to CBP Secondary is 2 minutes, 10 seconds.

For bags connecting to flights to Canada on Horizon, baggage handlers can transport these bags with domestic connecting bags from the South Satellite to the Main terminal. The main difference is that international connecting bags would use the same screening and bag sortation induction point as that used for Canadian Preclearance connecting bags at the ramp level in the Main terminal.

Timing Evaluation

The timing for each of the steps above was initially evaluated against flight schedules, published airport border wait times, and other estimates to determine whether international-to-international bag connections could be feasible in terms of timing. It was concluded that the timing for Canadian connections with the potential flows should work better, if not the same, as the current flows.

On-site, live data collection for a select number of actual flights was conducted at SEA in order to verify and confirm these conclusions. Some timing data could be captured based on existing operations, while others are based on operational personnel's experience as shown in Table E-4.

Table E-4. Timing data collected at Seattle-Tacoma International Airport.

Data Collected	Source
Aircraft	
Scheduled arrival time	Published
Number of seats	Published (aircraft type)
Actual arrival / block time	Live data
Passenger	
First off bridge	Live data
First to CBP Primary	Live data and published
Average/median to CBP Primary	Live data and published
Last (95th percentile) to CBP Primary	Live data and published
Time from CBP Primary to Egress	Live data
Time for passenger screening	Operations estimate
Bags	
Begin bag unloading	Live data
End bag unloading	Live data
Conveyor time from ramp to claim carousel	Live data
First bag to claim carousel conveyor	Live data
Number of transfer bags to Canadian destinations	Live data
Transport time – South Satellite to Main Terminal	Operations estimate
Delivery time to CBP Secondary/FIS Hall	Live data

The average resulting timing and forecasted estimates, based on the flows outlined, are shown in Figure E-11.

The recommended time to hold transfer bags at ramp level, in case a bag needs to be delivered to CBP Secondary, is 20 minutes. This amount of time ensures that all passengers from a flight have deplaned and have been processed through CBP Primary and to Egress on the basis that they do not have to wait to claim their bags.

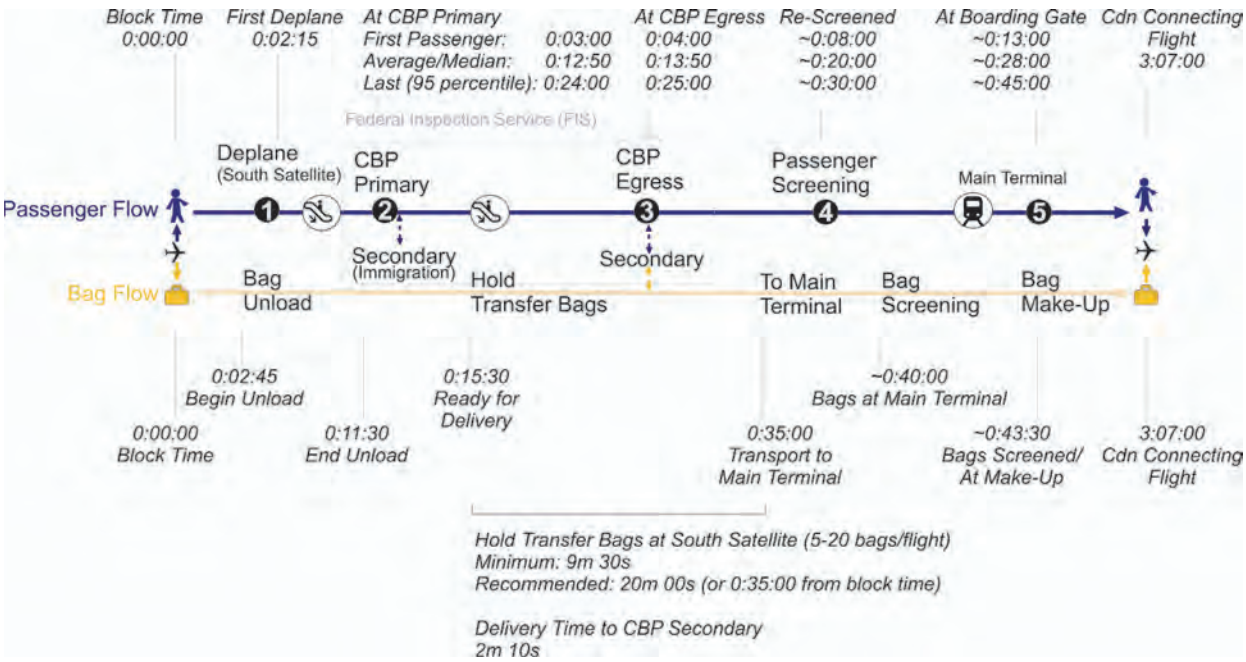


Figure E-11. Average timing and forecasted estimates for passenger and bag flow.

Anticipated Benefits

A number of benefits have been identified if baggage recheck can be reduced, specifically for international-to-international connecting passengers:

- Passenger congestion alleviated in baggage claim carousel area
- Capacity freed up in baggage claim carousel area
- Minimum connection times potentially reduced
- Less bag handling and potential issues
- Passenger convenience increased
- Potential step in examining need for bags in FIS area for destination passengers

Potential Issues

A number of potential issues have also been identified that may need to be addressed:

- Baggage handlers will be transporting bags that have been screened (domestic connections) and still to be screened (international connections) on the same trip from the South Satellite to the Main Terminal
- The possibility that bags might be transported to the Main Terminal before passengers are processed through CBP Primary or Egress during times of severe congestion and long wait times in the FIS Hall
- Resource requirement to physically deliver bags to CBP Secondary
- Congestion for one elevator used for oversize bag route (and personnel movement to/from ramp level to the South Satellite terminal)
- Cooperation, training, and action required from participating airlines (i.e., informing passengers and marking bags as connections from origin airport)

Relevance to Eliminating/Reducing Baggage Recheck

While a number of relatively minor operational issues need to be addressed with local stakeholders (i.e., U.S. Customs and Border Protection, air carriers, Transportation Security Administration, etc.), international-to-international connections similar to existing programs at other U.S. airports can be implemented relatively easily. The infrastructure, operations, and timing at SEA all exist to make the initiation of an international-to-international connections pilot or program feasible.

Minimum Connection Time Modeling

Reducing minimum connection times (MCTs) at airports generates benefits for airlines and the airport in two ways, without requiring any change in scheduling or incremental investment by air carriers. First, in low-frequency markets, shorter MCTs may permit new connecting itineraries to be built and sold, by eliminating some misconnections between cities. This allows carriers to compete for a share of city pair markets they are not currently present in. Second, for higher-frequency markets, shorter MCTs may allow longer connections to be replaced by shorter connections, thereby reducing the elapsed travel time and improving the attractiveness of the connecting itinerary.

Test Objectives

The objective of this test, on actual flight schedule data, was to quantify the incremental benefits of potential reductions in minimum connection times from eliminating baggage recheck

for international-to-domestic connections. Each MCT scenario result is expressed in terms of new connecting markets and additional capacity in existing markets at ATL.

Methodology

The analytical core of this analysis was undertaken with Sabre Profit Essentials (formerly known as Planet), a high-speed traffic and revenue allocation model used to forecast the market share, traffic composition, connectivity, load factor, and profitability of existing and potential air services. The model is a sophisticated Quality Service Index (QSI) route-planning application used by major U.S. and international carriers such as Delta Air Lines.

The following approach and methodology stages for this analysis were employed:

1. **Status Quo Analysis:** To provide a baseline for comparison, the existing ATL flight schedules were evaluated to determine the frequency and seat capacity of existing connecting itineraries via ATL on a directional city pair basis (e.g., Orlando (MCO)–ATL–SEA and SEA–ATL–MCO). This stage of the analysis was undertaken utilizing Profit Essentials' July 2011 schedule, which is preloaded with published MCT parameters for each airline/airport/sector combination, as provided by the airlines for scheduling and booking purposes.
2. **Reduced MCT Analysis:** To assess the changes from reduced MCTs, the published MCTs in the Profit Essentials parameter were changed and then the ATL schedules re-evaluated to determine the increase in connecting itinerary frequency and capacity on a directional city pair basis. To observe the change achieved from moving from the current MCT to a best-case scenario, the MCT was reduced by 5-minute increments up to a maximum reduction of 35 minutes. For example, Delta has a current MCT of 80 minutes; thus, analysis was conducted using 75-minute MCT, 70-minute MCT, and so on all the way to a 45-minute MCT. Other airlines at ATL currently have a MCT of 90 minutes.

Results

The total number of potential new connections by aircraft seat capacity under seven different scenarios of incremental minimum connection time reductions provided varying percentage increases (Figure E-12). For example, a 15-minute reduction in the MCT at ATL (i.e., 65 minutes for Delta and 75 minutes for other airlines) yields an 11 percent increase in potential seat connections for passengers.

The total number of potential new connections by markets served under the MCT scenarios provided similar percentage increases. For example, a 15-minute reduction in MCT at ATL (i.e., 65 minutes for Delta and 75 minutes for other airlines) yields an 11 percent increase in potential seat connections for passengers.

Relevance to Eliminating/Reducing Baggage Recheck

ATL has an international-to-international connections program in place that eliminates baggage recheck for other passengers and their bags. The elimination of two steps (baggage claim and baggage recheck) provides a time benefit (see the RFID Test section) and results in passengers being able to reach departures gates sooner and bags being ready to be loaded earlier. These time gains from the elimination of recheck, if consistent, can lead to reduced published minimum connection times.

The previously mentioned tests show potential gains of 10 to 15 percent in increased possible connections (seats, flights, and markets served) with a 15-minute reduction in minimum connection times. Where current minimum connection times are high, a greater reduction in MCT

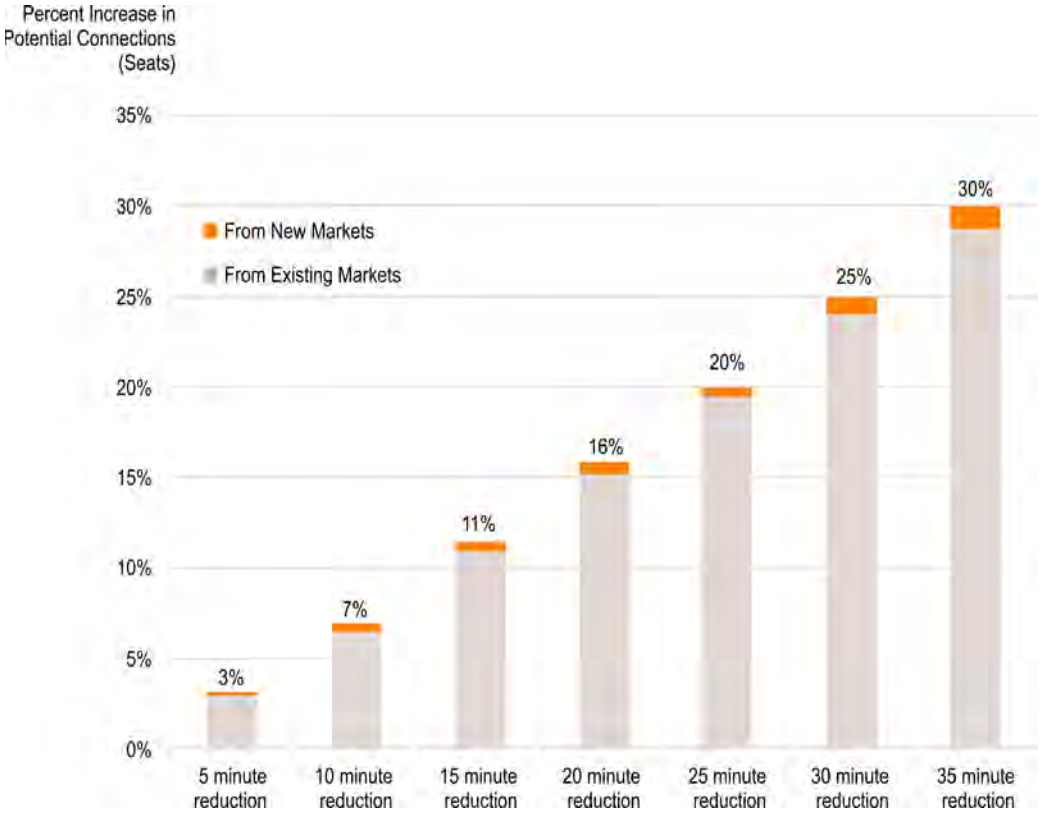


Figure E-12. Potential increase in connections in terms of seats from reduced MCTs.

is possible and would result in relatively larger gains for air carriers, whereas airports with low minimum connection times would only allow for minor reductions in MCT and smaller benefits to airlines.

Simulation Modeling

Discrete-event simulation models are useful for evaluating scenarios in which the results are driven by time-dependent interactions of events. A simulation has the ability to run a number of scenarios in which the model can accept input parameters and assumptions to predict realistic outcomes and provide a virtual test environment.

Test Objectives

The objective of this test is to develop an environment to test a number of scenarios and parameters around eliminating or reducing baggage recheck. Specifically, the model is able to test scenarios in which international-to-international baggage recheck is eliminated, international-to-domestic baggage recheck is eliminated, an additional bag process is implemented, or a combination of these scenarios.

Methodology

A process-oriented simulation model was developed that can accept flight arrival schedules; input parameters for process times, percentages for passenger characteristics, etc.; run a number

of scenarios; have a visual interactive interface; and provide quantitative results of each simulation run. The base model was developed using the simulation software SIMUL8. The software primarily simulates processes at a high level and is not intended as a 3-D emulation or physical and spatial modeling system.

As much operational data was gathered as possible as input parameters for such things as average typical processing times for current processes (i.e., walking times, CBP Primary, bag unload times, conveyor speeds, etc.). Anticipated process times for potential alternatives or data items that are not currently or easily collected were assumed from experience and any input from airport operational staff. In order to capture real airport conditions, actual scheduled flight arrivals (i.e., arrival times, aircraft type, and seat capacity) were used along with some stochastic features (i.e., random variation of flight load factors, etc.). Much of the process flows and process timings characterized from the case study site visits formed the basis of the discrete-event computer simulation model.

Model variables were adjustable via user forms such as those demonstrated in Figure E-13. The rudimentary simulation model interface is shown in the screen capture in Figure E-14.

Operational rules were integrated into simulation logic where appropriate to simulate actual current or anticipated standard operating procedures. For example, connection bags that do not have to appear in the FIS area are prioritized for aircraft unloading and induction into the baggage handling system.

Results

The primary performance measurement quantitative results obtained from the simulation were the following:

- Passenger times (to get to departures)
- Bag times (to get to sortation)
- Wait times at baggage claim

Several scenarios were conducted using the simulation; the results are shown in Table E-5.

Relevance to Eliminating/Reducing Baggage Recheck

While the simulation model provided results of predicted passenger and bag times under each scenario, the specific times themselves are specific to a particular facility and its configuration. When calibrated for a particular airport, the simulation is useful for quantification of time benefit (for bags and passengers) by eliminating baggage recheck and the identification of constraining process (bag or passenger).

The resultant change in timing between scenarios tested provides useful information for informing the relative impact of implementing connections programs and validates alternative procedures. On an operational basis, eliminating baggage recheck for both international and domestic connections decreases the time benefits of only eliminating baggage recheck for international connections, because the bags of both connection types are prioritized above those of terminating passengers. With only a small percentage of bags typically making an international-to-international connection, the timing benefits are quite significant. With a larger proportion of bags getting higher priority, the connecting bags essentially receive the same priority.

On an infrastructure and facilities design basis, significant constraints on the system appeared at the ramp level for connecting bags without recheck requirements proceeding directly to bag screening. A larger in-feed conveyor or dedicated buffer space is required to accommodate the

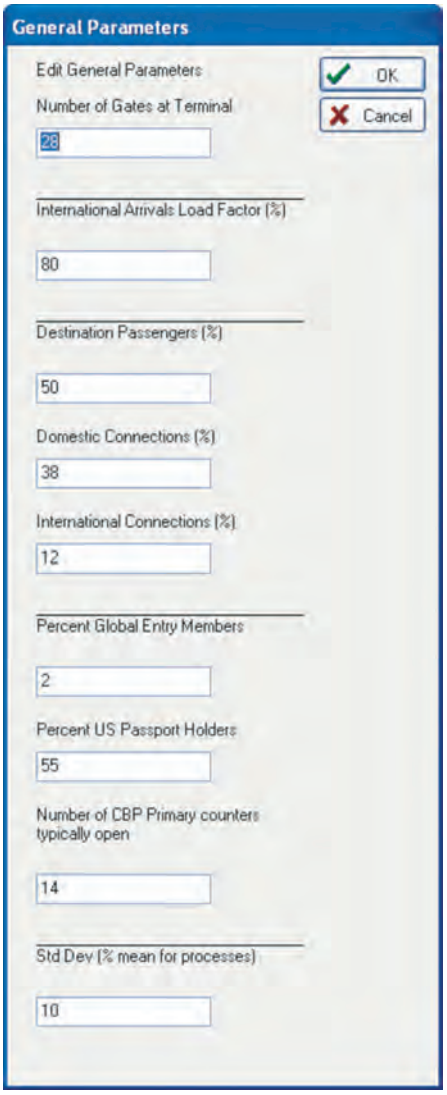


Figure E-13. Input parameters form for simulation modeling test.

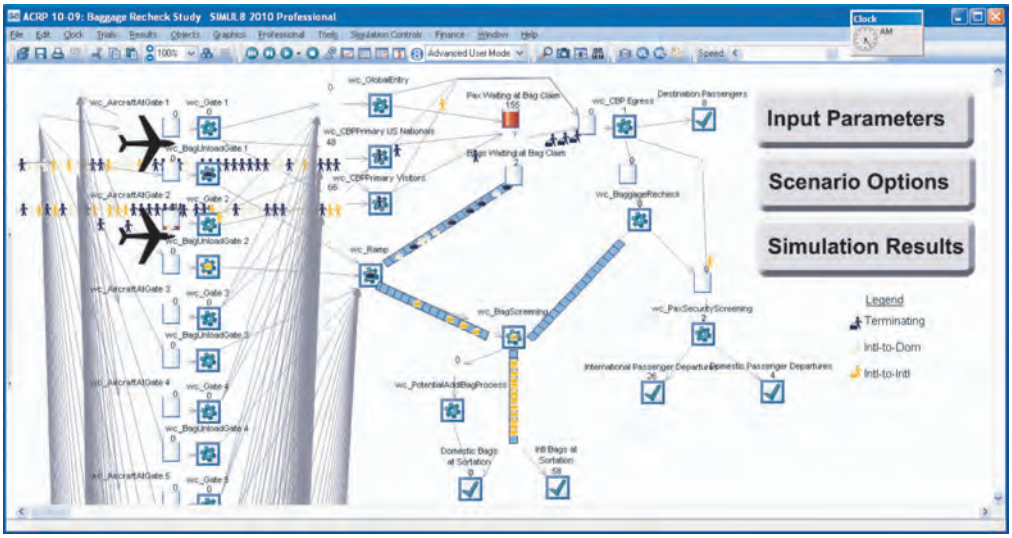


Figure E-14. Simulation model interface screen capture.

Table E-5. Simulation results.

International-to-International			International-to-Domestic		
Recheck	**Passenger to departures (minutes)**	**Bag to sortation (minutes)**	**Recheck**	**Passenger to departures (minutes)**	**Bag to sortation (minutes)**
Required	68.4	73.4	Required	71.4	76.4
Eliminated	31.9	17.9	Required	76.6	81.8
Eliminated	33.6	23.8	Eliminated	33.8	23.8
Eliminated	33.6	23.8	Eliminated (but with additional process)	33.8	33.8

significantly higher volumes of bags. Note that the model does not consider the space requirements for a temporary holding in case bags need to be recalled. The storage area might be used before bag rescreening or after rescreening and after bag sortation.

In terms of an overall decision whether to implement baggage recheck for either international or domestic connections, the simulation model results indicate that a small percentage of connecting passengers not required to recheck bags generally provides greater time benefits. The low volume of facilitated connections, however, may not justify the operational and facilities costs required to implement a connections program.

APPENDIX F

Evaluation of Alternative Procedures

Table F-1 shows a set of 22 evaluation criteria for four primary categories that was developed to assess each of the seven alternative procedures.

These evaluation criteria were applied to each of the alternative procedures; detailed results are in Tables F-2 through F-8.

Table F-1. Evaluation criteria to assess alternative procedures.

Criteria	Type	Example
1. Market Demand		
A. Projected volumes	Quantitative	Sufficient passenger volumes to justify alternative process
B. Time savings	Quantitative	Passenger connecting process saved *x* time
C. Improved customer satisfaction	Quantitative & Qualitative	Satisfaction scores increased by *xx* percent at connecting airport/whole journey
2. Airline Impacts		
A. Additional time needed for upline management	Quantitative & Qualitative	Additional time for passenger care/ground handling at international airport
B. Cost/materials for upline processing	Quantitative	Additional consumables needed to separate bags
C. Costs of retrieving bags	Quantitative	Incremental cost for ground handler to retrieve bags to CBP Secondary
D. Other operational impacts	Qualitative	Potential to delay other processes based on requirements
E. Improved fidelity of baggage handling	Qualitative & Quantitative	Benefits to baggage handling processes (e.g., reduction in mishandled bags)
F. New routing potential	Quantitative	Airline can generate potential routing possibilities
G. Reduced labor	Quantitative	Reduced FTEs spent on recheck function
H. Training	Quantitative	Incremental costs for training employees on local procedures
3. Airport Impacts		
A. New space requirements	Quantitative	Bag storage at ramp level for connections
B. Additional staff	Quantitative	Potential staff needed to aid with passenger processes
C. Costs of retrieving bags	Quantitative	Potential operational capital costs for retrieval (depending on the air carrier relationship)
D. Incremental revenues	Quantitative	Additional fees, concession spending, or other revenue generation
E. Terminal space savings	Qualitative	Potential re-use of recheck facilities
F. Competitive advantages	Qualitative	Competition against other foreign gateways and their international processes
4. CBP Risks/Costs		
A. Capital costs	Quantitative	New systems to address CBP risks (e.g., radiation detection portals)
B. Risk management	Quantitative & Qualitative	Ability to address potential risks from alternative processes including referral rates to Secondary
C. Refocusing Resources	Qualitative	Ability to refocus resources to higher-risk passengers and/or bags
D. Redelivery Capabilities	Boolean or Quantitative	Ability to meet delivery of bags on-demand to CBP within 20 minutes
E. Other impacts	Qualitative	Other impacts on passenger enforcement processes

Table F-2. Alternative Procedure 1—Exemption of checked baggage from FIS.

Category	Criteria		Evaluation	Detailed Analysis
Market	1A	Projected volumes	●	Passengers would experience a through-checked bag with this alternative as a default—similar to the experience of connecting through most foreign hub airports.
	1B	Time savings	●	Modeling and testing indicated a 20- to 30-minute savings for most U.S. airport hubs.
	1C	Improved customer satisfaction	●	While difficult to quantify overall satisfaction, ratings from ACI, IBM, SITA and other global studies show a sizable dissatisfaction with misconnect bags.
Airlines	2A	Additional time needed for upline management	◐	This alternative procedure works best with upline management—sortation by the air carrier at the origin airport to allow for priority off-loading of connecting bags.
	2B	Cost/materials for upline processing	◐	Manual coding or tagging may be needed as consumables; largely not a sizable cost item.
	2C	Costs of retrieving bags	◐	Processes to retrieve bags may be using existing ground handling staff, or automated systems to locate bags.
	2D	Other operational impacts	◐	Exception handling procedures during inclement weather needed (e.g., flight delays).
	2E	Improved fidelity of baggage handling	●	Fewer bags would require delivery to handling in FIS halls or recheck facilities (i.e., fewer "touches").
	2F	New routing potential	●	An 11 percent increase for 15-minute reduction in connecting time was modeled as a conservative benefit for route development.
	2G	Reduced labor	●	Reallocation of positions currently dedicated to baggage recheck possible, including third party contractors.
	2H	Training	●	Airline feedback was incremental training could be built into existing operating procedures.
Airports	3A	New space requirements	◐	Some new space needed for baggage storage for transfers—the planning parameters will depend on peaking analyses.
	3B	Additional staff	◐	Customer service staff will be needed in the first years of any program to help passengers adjust to a new system.
	3C	Costs of retrieving bags	◐	Relatively minimal costs to airports for bag retrieval, unless a larger system is defined requiring automation.
	3D	Incremental Revenues	●	20- to 30-minute savings possible for passengers; a share of those passengers will spend money on retail/concessions.
	3E	Terminal space savings	●	About one-third of passengers connect upon international arrival; peak-hour volumes could reduce the amount of carousels needed in the FIS area.
	3F	Competitive Advantages	●	20- to 30-minute savings in connect time could help grow a route network to compete for international services.
CBP	4A	Capital costs	◐	Some new capital costs needed to monitor the program.
	4B	Risk Management	○	While random and targeted referrals will help deal with issues of contraband, there is a potential risk to introducing controlled items into the commerce of the United States for domestic transfers.
	4C	Refocusing Resources	●	The initiative would be consistent with the "Seamless Travel Initiative" advanced by CBP.
	4D	Redelivery Capabilities	●	Airports studied all have protocols for redelivery to CBP to help deal with Secondary Processing.
	4E	Other Impacts	○	The sustainability of the alternative procedure to a range of potential future scenarios for risk mitigation is questionable.

● = Positive Impact ◐ = Moderate Impact ○ = Negative Impact

Table F-3. Alternative Procedure 2—New airline/airport processes on arrival.

Category	Criteria		Evaluation	Detailed Analysis
Market	1A	Projected volumes	●	Passengers would experience a through-checked bag with this alternative as a default—similar to the experience of connecting through most foreign hub airports.
	1B	Time savings	◐	Any new step (and associated alarm/error response) adds a contact point to diminish time savings potential.
	1C	Improved customer satisfaction	●	While difficult to quantify overall satisfaction, ratings from ACI, IBM, SITA and other global studies show a sizable dissatisfaction with misconnect bags.
Airlines	2A	Additional time needed for upline management	◐	This alternative procedure works best with upline management—sortation by the air carrier at the origin airport to allow for priority off-loading of connecting bags.
	2B	Cost/materials for upline processing	◐	Manual coding or tagging may be needed as consumables; largely not a sizable cost item.
	2C	Costs of retrieving bags	○	Dedication of staff needed to establish an appropriate method to help CBP manage checked baggage risk.
	2D	Other operational impacts	○	Exception handling procedures during inclement weather needed (e.g., flight delays) and peak-hour volumes.
	2E	Improved fidelity of baggage handling	●	Fewer bags would require delivery to handling in FIS halls or recheck facilities.
	2F	New routing potential	●	An 11 percent increase for 15-minute reduction in connecting time was modeled as a conservative benefit for route development.
	2G	Reduced labor	●	Reallocation of positions currently dedicated to baggage recheck possible, including third party contractors.
	2H	Training	●	Airline feedback was that incremental training could be built into existing operating procedures.
Airports	3A	New space requirements	○	Additional space needed for activities—whether it is installing equipment or other risk management activities.
	3B	Additional staff	○	Providing staff to deal with customer service issues or operations/maintenance of process would result.
	3C	Costs of retrieving bags	○	Relatively minimal costs to airports for bag retrieval, unless a larger system is defined requiring automation.
	3D	Incremental Revenues	◐	Full time savings for passengers within the process may be limited with this option.
	3E	Terminal space savings	●	About one-third of passengers connect upon international arrival; peak-hour volumes could reduce the amount of carousels needed in the FIS area.
	3F	Competitive advantages	●	20- to 30-minute savings in connect time could help grow a route network to compete for international services.
CBP	4A	Capital costs	●	Costs would be borne by the airport/airline for any new mitigiation measure.
	4B	Risk management	●	Delegating risk management to other parties on an auditable basis is a method CBP has promoted in other areas (e.g., Customs Trade Partnership Against Terrorism).
	4C	Refocusing resources	◐	Some resources would be needed to define, monitor and review this alternative process.
	4D	Redelivery capabilities	●	Airports studied all have protocols for redelivery to CBP to help deal with Secondary Processing.
	4E	Other impacts	●	There is alignment of this option with an approach to voluntary airport/airline initiatives in return for a facilitation benefit.

● = Positive Impact ◐ = Moderate Impact ○ = Negative Impact

Table F-4. Alternative Procedure 3—New CBP processes on arrival.

Category	Criteria		Evaluation	Detailed Analysis
Market	1A	Projected volumes	●	Passengers would experience a through-checked bag with this alternative as a default—similar to the experience of connecting through most foreign hub airports.
	1B	Time savings	◐	Any new step (and associated alarm/error response) adds a contact point to diminish time savings potential.
	1C	Improved customer satisfaction	●	While difficult to quantify overall satisfaction, ratings from ACI, IBM, SITA and other global studies show a sizable dissatisfaction with misconnect bags.
Airlines	2A	Additional time needed for upline management	◐	This alternative procedure works best with upline management—sortation by the air carrier at the origin airport to allow for priority off-loading of connecting bags.
	2B	Cost/materials for upline processing	◐	Manual coding or tagging may be needed as consumables; largely not a sizable cost item.
	2C	Costs of retrieving bags	◐	Processes to retrieve bags may be using existing ground handling staff, or automated systems to locate bags.
	2D	Other operational impacts	◐	Exception handling procedures during inclement weather needed (e.g., flight delays).
	2E	Improved fidelity of baggage handling	●	Fewer bags would require delivery to handling in FIS halls or recheck facilities.
	2F	New routing potential	●	An 11 percent increase for 15-minute reduction in connecting time was modeled as a conservative benefit for route development.
	2G	Reduced labor	●	Reallocation of positions currently dedicated to baggage recheck possible, including third party contractors.
	2H	Training	●	Airline feedback was that incremental training could be built into existing operating procedures.
Airports	3A	New space requirements	○	Additional space needed for CBP activities—whether it is installing equipment or other risk management activities.
	3B	Additional staff	◐	Providing staff to deal with customer service issues or operations/maintenance of process would result.
	3C	Costs of retrieving bags	◐	Relatively minimal costs to airports for bag retrieval, unless a larger system is defined requiring automation.
	3D	Incremental revenues	◐	Full time savings for passengers within the process may be limited with this option.
	3E	Terminal space savings	●	About one-third of passengers connect upon international arrival; peak-hour volumes could reduce the amount of carousels needed in the FIS area.
	3F	Competitive advantages	●	20- to 30-minute savings in connect time could help grow a route network to compete for international services.
CBP	4A	Capital costs	◐	CBP would have some additional costs depending on the type of equipment used and deployed.
	4B	Risk management	●	Full control of risk management measures would be defined and implemented by CBP officers.
	4C	Refocusing resources	○	This alternative process could exacerbate shortage of Primary Processing CBP officers at some airport sites.
	4D	Redelivery capabilities	●	Airports studied all have protocols for redelivery to CBP to help deal with Secondary Processing; this alternative procedure may reduce the amount of redelivery to Secondary.
	4E	Other impacts	◐	Resourcing and funding will become issues at some sites for the sustainability of this alternative process.

● = Positive Impact ◐ = Moderate Impact ○ = Negative Impact

Table F-5. Alternative Procedure 4—Enhanced pre-departure information.

Category	Criteria		Evaluation	Detailed Analysis
Market	1A	Projected volumes	●	Passengers would experience a through-checked bag with this alternative as a default—similar to the experience of connecting through most foreign hub airports.
	1B	Time savings	●	Modeling and testing indicated a 20- to 30-minute savings for most U.S. airport hubs.
	1C	Improved customer satisfaction	●	While difficult to quantify overall satisfaction, ratings from ACI, IBM, SITA and other global studies show a sizable dissatisfaction with misconnect bags.
Airlines	2A	Additional time needed for upline management	◐	This alternative procedure works best with upline management—sortation by the air carrier at the origin airport to allow for priority off-loading of connecting bags.
	2B	Cost/materials for upline processing	◐	Manual coding or tagging may be needed as consumables; largely not a sizable cost item.
	2C	Costs of retrieving bags	◐	Processes to retrieve bags may be using existing ground handling staff, or automated systems to locate bags.
	2D	Other operational impacts	◐	Exception handling procedures during inclement weather needed (e.g., flight delays).
	2E	Improved fidelity of baggage handling	●	Fewer bags would require delivery to handling in FIS halls or recheck facilities.
	2F	New routing potential	●	An 11 percent increase for 15-minute reduction in connecting time was modeled as a conservative benefit for route development.
	2G	Reduced labor	●	Reallocation of positions currently dedicated to baggage recheck possible, including third party contractors.
	2H	Training	●	Airline feedback was that incremental training could be built into existing operating procedures.
Airports	3A	New space requirements	●	Minimal incremental space needed at U.S. airport.
	3B	Additional staff	◐	Customer service staff will be needed in the first years of any program to help passengers adjust to a new system.
	3C	Costs of retrieving bags	◐	Relatively minimal costs to airports for bag retrieval, unless a larger system is defined requiring automation.
	3D	Incremental Revenues	●	20- to 30-minute savings possible for passengers; a share of those passengers will spend money on retail/concessions.
	3E	Terminal space savings	●	About one-third of passengers connect upon international arrival; peak-hour volumes could reduce the amount of carousels needed in the FIS area.
	3F	Competitive advantages	●	20- to 30-minute savings in connect time could help grow a route network to compete for international services.
CBP	4A	Capital costs	●	Some new capital costs needed to receive new baggage-related pre-departure information.
	4B	Risk management	●	CBP has long promoted pre-departure information transmission; adding this to baggage data.
	4C	Refocusing resources	●	The initiative would be consistent with the “Seamless Travel Initiative” advanced by CBP and pushing the border outwards.
	4D	Redelivery capabilities	●	Airports studied all have protocols for redelivery to CBP to help deal with Secondary Processing.
	4E	Other impacts	●	Some refocused resources could result to benefit CBP’s operations.

● = Positive Impact ◐ = Moderate Impact ○ = Negative Impact

Table F-6. Alternative Procedure 5—Information sharing with TSA programs.

Category	Criteria		Evaluation	Detailed Analysis
Market	1A	Projected volumes	●	Passengers would experience a through-checked bag with this alternative as a default—similar to the experience of connecting through most foreign hub airports.
	1B	Time savings	◐	Relocation of time for TSA screening may have impacts on peak-hour volumes.
	1C	Improved customer satisfaction	●	While difficult to quantify overall satisfaction, ratings from ACI, IBM, SITA, and other global studies show a sizable dissatisfaction with misconnect bags.
Airlines	2A	Additional time needed for upline management	◐	This alternative procedure works best with upline management—sortation by the air carrier at the origin airport to allow for priority off-loading of connecting bags.
	2B	Cost/materials for upline processing	◐	Manual coding or tagging may be needed as consumables; largely not a sizable cost item.
	2C	Costs of retrieving bags	◐	Processes to retrieve bags may be using existing ground handling staff, or automated systems to locate bags.
	2D	Other operational impacts	◐	Exception handling procedures during inclement weather needed (e.g., flight delays).
	2E	Improved fidelity of baggage handling	●	Fewer bags would require delivery to handling in FIS halls or recheck facilities.
	2F	New routing potential	●	An 11 percent increase for 15-minute reduction in connecting time was modeled as a conservative benefit for route development.
	2G	Reduced labor	●	Reallocation of positions currently dedicated to baggage recheck possible, including third party contractors.
	2H	Training	●	Airline feedback was incremental training could be built into existing operating procedures.
Airports	3A	New space requirements	◐	Some airport reconfiguration needed to allow inbound international connecting bags to be screened upon arrival.
	3B	Additional staff	◐	Customer service staff will be needed in the first years of any program to help passengers adjust to a new system.
	3C	Costs of retrieving bags	◐	Relatively minimal costs to airports for bag retrieval, unless a larger system is defined requiring automation.
	3D	Incremental revenues	◐	20- to 30-minute savings possible for passengers; a share of those passengers will spend money on retail/concessions.
	3E	Terminal space savings	●	About one-third of passengers connect upon international arrival; peak-hour volumes could reduce the amount of carousels needed in the FIS area.
	3F	Competitive advantages	●	20- to 30-minute savings in connect time could help grow a route network to compete for international services.
CBP	4A	Capital costs	◐	Some new capital costs needed to receive new baggage-related pre-departure information.
	4B	Risk management	●	CBP, TSA, and DHS are actively promoting interagency data sharing to improve threat detection and analysis.
	4C	Refocusing resources	●	The initiative would be consistent with the "Seamless Travel Initiative" advanced by CBP and cooperation with TSA.
	4D	Redelivery capabilities	●	Airports studied all have protocols for redelivery to CBP to help deal with Secondary Processing.
	4E	Other impacts	●	Some potential outcome for cross-designation of functions could result between CBP and TSA.

● = Positive Impact ◐ = Moderate Impact ○ = Negative Impact

Table F-7. Alternative Procedure 6—Leveraging other DHS programs.

Category	Criteria		Evaluation	Detailed Analysis
Market	1A	Projected volumes	◐	Global Entry is growing rapidly but accounts for less than 10 percent of total arrivals. Limiting baggage recheck to this category (or other DHS programs) will limit projected volumes.
	1B	Time savings	◐	Potential passenger confusion about location of bag could result depending on status/exception handling.
	1C	Improved customer satisfaction	●	An added benefit to members of programs like Global Entry could improve customer satisfaction.
Airlines	2A	Additional time needed for upline management	○	Airlines will have difficulty mediating whether a passenger presenting themselves for check-in is eligible or not; no simple way of verifying membership overseas.
	2B	Cost/materials for upline processing	○	Additional system development to provide real-time participation verification is needed for this alternative procedure.
	2C	Costs of retrieving bags	◐	Processes to retrieve bags may be using existing ground handling staff, or automated systems to locate bags.
	2D	Other operational impacts	●	Few other operational impacts once the check-in process is advanced.
	2E	Improved fidelity of baggage handling	◐	Some benefits to baggage handling; Global Entry members however have fewer checked bags per passenger.
	2F	New routing potential	◐	Limited route development given the smaller populaton served.
	2G	Reduced labor	◐	Some savings possible, but limited due to smaller population served.
	2H	Training	◐	Airline training on accepted processes will be higher than other alternative options.
Airports	3A	New space requirements	●	Minimal incremental space needed at U.S. airport.
	3B	Additional staff	◐	Customer service staff will be needed in the first years of any program to help passengers adjust to a new system.
	3C	Costs of retrieving bags	◐	Relatively minimal costs to airports for bag retrieval, unless a larger system is defined requiring automation.
	3D	Incremental revenues	◐	Some limited benefits due to the narrow population served.
	3E	Terminal space savings	◐	Some limited benefits due to the narrow population served.
	3F	Competitive advantages	◐	Catering to premium passengers will help, but limited benefits due to the narrow population served.
CBP	4A	Capital costs	◐	Some new capital costs needed to differentiate Global Entry bags.
	4B	Risk management	◐	CBP is pushing hard on Global Entry benefits; truly equating checked bag risks requires further study.
	4C	Refocusing resources	●	The initiative would be consistent with the "Seamless Travel Initiative" advanced by CBP and pushing the border outwards.
	4D	Redelivery capabilities	●	Airports studied all have protocols for redelivery to CBP to help deal with Secondary Processing.
	4E	Other impacts	●	This alternative procedure will support some of CBP's international discussions (e.g., Canada, Netherlands, UK, etc.).

● = Positive Impact ◐ = Moderate Impact ○ = Negative Impact

Table F-8. Alternative Procedure 7—Door-to-door baggage service (e.g., FedEx, UPS).

Category	Criteria		Evaluation	Detailed Analysis
Market	1A	Projected volumes	◐	Limited take-up to date for domestic programs for door-to-door baggage delivery; international programs are planned but even greater challenges for time-definite delivery and costs.
	1B	Time savings	●	Passenger journey will be similar to those individuals without checked bags.
	1C	Improved customer satisfaction	○	Studies have shown for the most part passengers still enjoy traveling with their bags.
Airlines	2A	Additional time needed for upline management	●	This option will reduce demand of passenger checked bags.
	2B	Cost/materials for upline processing	●	This option will reduce demand of passenger checked bags without direct airline costs.
	2C	Costs of retrieving bags	n/a	Not applicable.
	2D	Other operational impacts	●	Overall capacity improvement for international bag operations.
	2E	Improved fidelity of baggage handling	n/a	Not applicable.
	2F	New routing potential	n/a	Not applicable.
	2G	Reduced labor	●	Reduced labor requirements based on fewer checked bags.
	2H	Training	n/a	Not applicable.
Airports	3A	New space requirements	n/a	Not applicable.
	3B	Additional staff	n/a	Not applicable.
	3C	Costs of retrieving bags	n/a	Not applicable.
	3D	Incremental revenues	n/a	Not applicable.
	3E	Terminal space savings	n/a	Not applicable.
	3F	Competitive advantages	n/a	Not applicable.
CBP	4A	Capital costs	n/a	Not applicable.
	4B	Risk management	n/a	Not applicable. Risk management borne by cargo shipment processes.
	4C	Refocusing resources	n/a	Not applicable.
	4D	Redelivery capabilities	n/a	Not applicable.
	4E	Other impacts	n/a	Not applicable.

● = Positive Impact ◐ = Moderate Impact ○ = Negative Impact

APPENDIX G

Industry Stakeholder Feedback

Industry stakeholder feedback for six of the alternative procedures was sought during a peer review session in January 2011. The group consisted of nine airline, airport, and aviation association representatives. Six of the seven alternative procedures were presented to the group and discussed. Participants were asked to consider and quantitatively rate each alternative as well as to provide qualitative pros and cons from their respective industry points of views. Tables G-1 and G-2 summarize the written responses received from stakeholders. Alternative Procedure 7 (door-to-door baggage service) was not reviewed by the industry stakeholder session in January 2011 as it did not directly affect airport-specific processes.

Table G-1. Peer review session ratings of alternative procedures.

Alternative Procedure	Average	Aviation Association	Airline 1	Airport	Airline 2
1: Exemption of Checked Baggage from FIS	**4.0**	5.0	5.0	2.0	4.0
2: AP1 + New Airline/Airport Processes on Arrival	**2.5**	2.0	2.0	4.0	2.0
3: AP1 + New CBP Processes on Arrival	**3.0**	2.5	1.0	4.5	4.0
4: Enhanced Pre-departure Information	**2.1**	2.5	1.0	3.0	2.0
5: Information Sharing with TSA Programs	**3.9**	3.5	3.0	5.0	4.0
6: Leveraging Other DHS Programs	**1.5**	1.0	2.0	1.0	2.0
7: Door-to-Door Baggage Service	Not reviewed				

5 = highest possible rating, 1 = lowest possible rating

Table G-2. Peer review session pros and cons of alternative procedures.

Alternative Procedure	Airport	Airline 2
1: Exemption of Checked Baggage from FIS	• "Cleanest" solution	• Resistance of CBP to change and perceived "loss of control"
2: AP1 + New Airline/Airport Processes on Arrival	• Reduced operational costs	• Significant IT and infrastructure costs
3: AP1 + New CBP Processes on Arrival	• Reduced baggage connection times	• Costly solutions
4: Enhanced Pre-departure Information	• CBP risk issues addressed	• CBP resources required
5: Information Sharing with TSA Programs	• Bag connect times reduced	• Major investment by carrier or origin airport
6: Leveraging Other DHS Programs	• Bags could be treated similar to precleared	• Regulation issues or assent from Congress, TSA, DHS
7: Door-to-Door Baggage Service	Not reviewed	

Abbreviations and acronyms used without definitions in TRB publications:

AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI–NA	Airports Council International–North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	Air Transport Association
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HMCRP	Hazardous Materials Cooperative Research Program
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
PHMSA	Pipeline and Hazardous Materials Safety Administration
RITA	Research and Innovative Technology Administration
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation