

A View On World Class Baggage Handling System (BHS) Performance

IABSC World Class Performance Committee White Paper

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EXECUTIVE SUMMARY

The US Aviation industry is growing and changing at an unprecedented pace. Airlines and the traveling public put pressure on airports to reach new levels of service delivery in terms of improving the *Passenger Experience* and minimizing processing times. At this same time, airports must maintain a balance between optimizing the costs of bag processing with providing the best value to its airline tenants. Many precedents for new desired baggage handling standards come from outside of the US – from airports with differing operating and financial models – which presents a challenge to their adoption within the US commercial aviation market. However, slowly over time some of these improvements are being cost justified, funded and implemented at select US airports.

Most of us also have at least a faint remembrance of a time where our industry did not have the luxuries that come with growth, and the mantra of *Do More With Less* was accepted common practice across the country. On either end of the spectrum, the challenge of effectively serving airline passengers and efficiently processing their checked baggage remains one of the key challenges for US airports while striving to meet their customers' ever-increasing expectations while at the same time maintaining a cost-effective operating model in order to remain competitive.

From the public perspective, once a passenger's baggage is surrendered at a check-in position at its originating airport, it is then later retrieved by the passenger at its final destination claim area – easy, right? When successful, there is little public awareness of the complexity of the processes and magnitude of resources involved in airport baggage handling services. However, when unsuccessful, airports receive the kind of unwanted attention that comes with operational failures, disaster responses and flagging or declining passenger satisfaction ratings.

Lacking that public focus, baggage handling systems (BHS) in particular are an aspect of airport facilities which tend to be more difficult to rationalize investment in and to proactively modernize. Traditionally in the US, BHS enhancements have been treated as “behind the scenes” infrastructure, reliant upon antiquated technologies, and funded with a minimalist approach to asset management. In the meantime, public expectations for assurance of “on time” arrival, flight and baggage disposition information, and responsive customer service – including the handling of checked baggage – continue to grow.

With this understanding, the IABSC World Class BHS Performance Committee believes that our US perspective on BHS investing needs to evolve. Through this white paper, we will endeavor to describe the desired performance of a “World Class” airport BHS in terms of the following categories and do so in a manner that airport management can use to consider investment options and evaluate the value of those investments in improving baggage handling services.

-  **Passenger Experience**
-  **Airline & Airport Performance**
-  **Positioning for Growth**
-  **Total Cost of Ownership**

Airports should be in the position to create the type of experience and meet the standards set by airport leaders across the globe. By exploring the value and future needs of airport BHS, we intend to bring clarity to the role of BHS in overall airport and airline performance, and as such, solidify the rationale and business case for BHS investments.

We have provided a holistic, objective and product agnostic perspective on future BHS development based on research and interviews with airport and airline planners while noting airport trends across the US. This information targets airports and airlines focused on achieving baggage handling excellence for their respective markets and airport operations – in particular those considering investments in baggage handling systems with a critical eye on the future services and features that should be implemented along with the basis for cost-justifying each of those benefits.

WORLD CLASS BHS PERFORMANCE COMMITTEE MISSION

To define “World Class Airport Performance” (WCP) for airport baggage handling in order to create a foundation for common understanding and true collaboration between all airport industry stakeholders which will include the determination of key airport performance metrics, passenger services and the relationship of baggage handling as an enabler to achieving those metrics targets and service excellence.

Committee Chairperson – Angie McHorse, VTC

AIRPORT DIRECTION AND TRENDS

Framing the views presented on *World Class BHS Performance* is a look at general trends within the Aviation Industry. These trends are intricately tied to each other and reflect a new, more progressive way of thinking by US airport management in recent years.

CONNECTIVITY

1. **“Mega Modal” transportation** means we are integrating modes of transportation (airport, railways, maritime and ground transportation) into a single seamless travel experience – as illustrated by the concept of “Airport Cities” and mega-investments across the US to connect various forms of public transportation within and between cities. These models are being put in place in metropolitan areas across the US, including Los Angeles, Chicago, New York and New Jersey, as well as major developments internationally including those in China, Europe, and the Middle East.
2. **Connecting passengers to airports, flights and bags in real time** is an expectation of the traveling public. This information answers pressing passenger questions such as: Will my bag be there on time? Where should I pick it up? Where is my bag now that I have changed my flight? Is my bag held up for some reason?
3. **Inter-airline/terminal passenger processing** must become more streamlined and convenient for traveling passengers as airline partnering agreements continue and evolve. Consistency of process and information shared between airlines should be seamless to passengers.
4. **Airport facilities and systems standardization** provides process fluidity and the capability to scale within and between airlines. Using Common Use and other standardized technology solutions, airports meet airline expectations for establishing service, branding and operational support services but retain the needed flexibility to respond to changes that occur within and between airlines, due to market condition fluctuations and evolving regulatory compliance requirements.
5. **International routes** are becoming more common across US airports, further complicating connecting operations, security compliance and cultural expectations.

AIRPORT AND AIRLINE FLEXIBILITY

1. **Unassisted check-in processing** pushes more responsibility onto the passengers for initiating and completing reservation and check-in activities (e.g. self-service) leaving airlines with more efficient staffing models and arguably happier customers according to many studies. This concept is a central part of the “airport of the future” vision being tested in many locations worldwide allowing increases in traffic without higher operational costs.
2. **Low-cost Air Carriers** continue to be in high demand requiring accommodations for more frequent flights and terminal/gate utilization to process the high frequency of flights and number of passengers that predicate that business model. The mission of keeping fares

low is significantly impacted by the fees charged to airlines for use of the airport terminals which are driven by ongoing capital and operating costs at the airport.

3. **New retail and concessions opportunities** are sought after by airports in order to increase passenger spending and dwell time while better accommodating earlier arrivals to the airport. Coupled with personalization information designed to enhance the in-terminal experience, a new level of convenience for travelers to check in, divest checked baggage and pass through security screening is opening new doors for airport revenues.
4. **Personalization** makes the passenger's in-terminal experience seem intuitive and efficient by tailoring processes to an individual's own needs and preferences. It is used as a service differentiator for airlines and airports and supports new revenue opportunities by anticipating and creating demand for airport and retail offerings.
5. **Airport / terminal planning** must recognize the impact of checked baggage early in the layout, architecture and phasing of new and modified airport terminal facilities.

AIRPORT OPERATIONS

1. **Key Performance Indicators (KPI) and metrics** are becoming formalized and are used to establish accountability across airport organizations. Notable KPIs include the following as provided in the *ACI Guide to Airport Performance Measures* paraphrased for relevancy from "Six Key Performance Areas" [1]:

Core	Safety and Security	Service Quality
Passengers Origin and destination passengers	Occupational injuries Lost work time from employee accidents and injuries	Practical hourly capacity Gate departure delay Customer satisfaction Baggage delivery time Security clearing time Check-in to gate times
Productivity / Cost Effectiveness	Financial / Commercial	Environmental
Passengers per employee Total cost per passenger Operating cost per passenger Operating cost Work Load Unit (WLU)	Non-aeronautical operating revenue per passenger Long-term debt per passenger EBITDA per passenger	Utilities/Energy usage per square meter of terminal

2. **“Just In Time” airline operations** achieve staffing efficiencies desired by the airline operators keeping operating costs down. The extent of these efficiencies must be balanced with meeting service level and customer satisfaction targets.
3. **Checked Baggage disposition tracking** creates a real-time connection between a passenger, their checked bags and their flight(s). This information answers key questions such as: Whose bag is this? Option to accommodate a specific mishandled bag? What trends are seen with processing across the system? This information also assists airlines and TSA with efficiently performing their jobs and providing a higher level of customer service.
4. **Proactive management of conditions and situations** requires airport operators to anticipate local and downstream impacts to operations due to system performance degradation and/or spikes in traffic volumes through capacity forecasting, data analytics and trending analysis.
5. **Staffing efficiencies and safety** are sought by airline, TSA and airport functions to allow each organization to efficiently and safely utilize existing resources and redistribute staff to other areas as needed to improve responsiveness in peak and irregular operational situations.

MAXIMIZING INVESTMENTS IN AIRPORT ASSETS

1. **Full Lifecycle Cost Analysis** is more commonly used or at least sought after as a mechanism for supporting cost justifications and decision making for capital investments in airports.
2. **Rapid capacity expansion** will be a continuing need within existing airport facilities as airline strategies within and across markets rapidly evolve in response to increases in public demand. Airports’ abilities to quickly and cost effectively respond to their tenants’ changing needs will be significantly impacted by the flexibility built into its systems and solutions that maximize use of existing terminal space.
3. **“Repurposing” airport assets** must now be a primary consideration when land and/or facility limitations force a new perspective on finding options to quickly and cost effectively address requirements to grow capacity and accommodate airline needs. Traditional airport assets such as parking garages, lobby space and non-essential operations space are all subject to scrutiny when demand for facility and operation expansion must be met.
4. **Expanded maintenance services** are shown to significantly improve the life of equipment and infrastructure. Airports are embracing the need to spend additional money on expensive maintenance to prolong and preserve the life of their limited assets. Tying service contractors to performance-based contracts and service-level metrics has shown that justify investments in these types of extensive maintenance service plans are justified.

EMBRACING THE POWER OF TECHNOLOGY

1. **Adopting other industry-proven solutions** is a trend that the US Aviation Industry is slowly gaining a willingness to consider – including proven solutions from airports outside of the US, as well as from other industries. For example, networking technologies such as Ethernet I/P controls networks have shown significant benefits to performance and reliability in the manufacturing and other industries and have recently been proven as viable solution in US airports. Other BHS solutions such as Individual Carrier Systems (ICS) are being considered to address speed and accuracy issues with baggage handling services while historically doing so in materials distribution and at airports outside of the US. Case studies of the value of these solutions to airports are becoming more available as interest increases.
2. **Investment in “Smart” technologies** must be considered by airports. Many of the trends in passenger experience improvement, staffing efficiencies and extending asset life are dependent upon the use of “smart” technologies and the ability to translate vast amounts of data collected into information that is timely, predictive in nature, and reflects reality. Artificial Intelligence (AI) takes these principles to the next level when decisions are actions are taken based on information presented through robotics and mechanical automation as these technologies are entering into the Aviation Industry.
3. **Biometrics and Passenger Data** will become part of the security platform utilized to verify and track the traveling public and must be accommodated for TSA purposes. With advancements in airport Information Technology (IT), airports may leverage this information where possible to support airport operations as well. Answering questions of ownership, where and how this information is collected, and management of this information must be addressed as development occurs and is integrated into airport master plans.
4. **Advanced Security Screening Technologies** are slow to be certified and available for use within airports. However, considerations for new functionality and higher speeds must be acknowledged in the planning and design processes. The ability to adopt new technologies should enhance capacity and security without the need for further major capital investments and wholesale replacement of systems – “plug and play” design philosophies will minimize the efforts and complexities of upgrading airport security and other systems.
5. **Holistic terminal modeling** supports improved asset utilization and construction management. Adoption of new standards for Building Information Modeling (BIM) and as-built drawings provides a single view of all facilities, infrastructure and physical systems supporting maintenance, design, and cost management for new development. BHS inclusion in this modeling is critical to developing a complete view of the facilities, their limitations and obstacles, along with areas of opportunity that might not otherwise be identified.

WORLD CLASS BHS PERFORMANCE CRITERIA

As the trends presented show, airport environments are quickly evolving and the baggage handling system is an essential element of those developments. Each airport is faced with balancing budgets, competing projects, and planning for growth as it evaluates options to address aging and outdated terminals needed capacity and performance improvements. As part of those evaluations, the following BHS performance criteria offer considerations for understanding what and why various aspects of BHS development would be justified at an airport.

REVOLUTIONIZING PASSENGER EXPERIENCE

1. **Convenience** – Check bags at the earliest point possible in a passenger’s travel itinerary based on connectivity between other modes of transportation to airport flights – includes adding bag check points outside of the airport terminal and intermodal connecting points, parking garages, etc. with the goal of providing convenience by minimizing a passenger’s time to handling their own bag.
2. **Transparency** – A passenger, airlines and the TSA have visibility to the location and disposition of a particular bag from the time it is checked until the time it is claimed by the passenger.
3. **Reliability** – Passengers and airlines have a predictable and well-understood expectation for services involved with the airport and aircraft they utilize. This expectation becomes the measure for success or failure of the airport service.

AIRPORT & AIRLINE PERFORMANCE

1. **Baggage Operations Key Performance Indicators (KPI) and metrics** are becoming formalized with accountability established between airport groups, e.g., owners, operations and maintenance teams, airlines and the TSA. Baseline metrics and reports reflecting established KPIs, including the following, are being incorporated into airport performance reporting and management dashboards as critical decision support tools:
 - *Continuity of Service* includes anti-gridlock, system reliability (in service/out of service hours, etc.) and mean-time response and repair statistics;
 - *Safety and Productivity* have a direct reflection on staffing costs and include On Job Injury (OJI) and service time statistics;
 - *Screening Capacity* is impacted by hourly and peak throughput, bag tracking accuracy, bag time within the screening system and within the Checked Baggage Reconciliation Area (CBRA);
 - *Sortation Accuracy* is reflected through Automated Tag Reader (ATR) read rate and manual encode station statistics;
 - *BHS Asset Utilization* is measured through sub-system and componentry utilization statistics including passenger bag check-conveyors, baggage makeup and claim equipment as well as Explosive Detection Systems (EDS).

2. **Load balancing** between passenger check-in touchpoints balances capacity used for processing checked bags providing minimal processing gridlock and optimal utilization of airport BHS and airline staff.
3. **Oversized baggage** accepted by an airline representative as check-in occurs eliminates additional work by the passenger or airline to deliver it for processing.
4. **“Just In Time” baggage makeup** requires that baggage arrive in baggage makeup areas only as flights are being processed to achieve efficiency, as well as timely and accurate delivery of bags to the aircraft. JIT provides the ability to more systematically process carts by flight which gives the airlines efficient and reliable service models.
5. **Bag tracking data** reflects the actual path followed by a bag throughout the system which enables operators to better understand and troubleshoot areas within the BHS and identify trends and deficiencies within the system, thus improving performance based on data collected. For greatest benefit to the airlines, baggage data would integrate into airline and airport systems for a complete picture of the bag's journey.
6. **Optimal sortation accuracy** expectations are high and are being accomplished by using new technologies, including Optical Character Recognition (OCR) which interprets words, barcodes, physical bag status/condition, RFID, and other point solutions, as both primary and secondary means of identifying bags for tracking and sortation destination assignment.
7. **Proactive management of baggage handling** ensures system utilization, available capacity and performance are monitored to anticipate and plan for system failures alerting operations of the potential need for contingency operations before the issues are experienced.
8. **Contingency Plans** for baggage services are visible, documented details outlining responsibilities, resource requirements and policies required when system failure and/or inordinate volumes of passenger processing occurs.
9. **Disaster Recovery Plans** addressing the unique needs of natural disaster and airport service failure (such as loss of power) anticipate the issues and impact to the travelling public overall with remediation plans to accommodate passengers and their baggage, as well as required adjustments to ramp operations.

POSITIONING FOR GROWTH

1. **BHS maximizes screening technologies' capacity and features** utilizing the full capacity of the integrated screening equipment to achieve optimal BHS capacity overall. Also, BHS is designed to accommodate future enhancements to these technologies as they become available, and can absorb inevitable changes to TSA screening protocols by supporting new processes and volumes of baggage processed by TSA.
2. **Inter-connectivity between passenger services and TSA security functions** enable the matching of passengers to their bags and knowledge of the checked baggage disposition while in the airlines' and TSA's custody.

3. **Flexibility to adapt to varying screening protocols** gives TSA the ability to tailor screening according to particular risks assessed situationally and the ability to react to security rule changes and other circumstances as the airport security environment evolves.

MAXIMIZING TOTAL COST OF OWNERSHIP

1. **Data-driven analysis** of BHS performance and trends enable airports to extend the life of equipment and improve the overall reliability of its baggage handling service:
 - Predict system and component failures and initiate repair and contingency plans in advance of incidents using consolidated views of BHS sub-systems, componentry and Computerized Maintenance Management Systems (CMMS) statistical data,
 - Rely upon performance exceptions and trends for the BHS and its components to alert maintenance staff and trigger maintenance work orders, resource allocation and adjustments to preventative maintenance (PM) schedules,
 - Utilize quantifiable statistics and information to drive decision support by operations and airport management.
2. Today's BHS consists of an **optimized mix** of **commoditized system components** for cost control and flexibility while also incorporating **point solutions** needed to address unique, high-risk problem areas providing optimal system configuration.
 - Commodities such as belting, motors, etc. are impacted by airport decisions related to procurement strategies, equipment standardization, spare parts inventory management, etc.
 - Proprietary sub-systems or components lend airports to "single source" support requirements but allow for tailored solutions while achieving the highest quality needed to satisfy a particular airport, terminal and/or airline's unique needs.
3. BHS enhancement and new development projects are **incorporated into airport BIM models** during early design activities to recognize conflicts and routing options far in advance of installation, resulting in more reliable project costs and schedules.

CONCLUSION

In seeking to meet the traveling passenger's demands for service and ticket price sensitivity, the US Aviation Industry is slowly evolving to new service models which will require more advanced terminal systems and data strategies. "Connectivity" is the key to integrating various modes of transportation, intertwined airline and airport systems, and TSA advancements in security, as well as meeting the expectations for "information on demand" by the airline passengers, connecting them to their baggage and surrounding environments.

The goal of new baggage handling systems is to continue minimizing the use of expensive terminal space while also providing the flexibility required to support varying and ever changing baggage handling and screening operations within airports.

Finally, the ability of airports to understand and proactively manage the use and condition of its costly BHS assets provides opportunities to extend the life of these assets while continuing to meet the service level agreements established with their tenants and expectations of their shared customers – the traveling public.

Common to all airports, baggage handling is an essential aspect of the airport's services and it impacts the traveling public's view of airport and airline quality. However, airports vary greatly in size and the markets they serve which drives the complexity of their baggage handling functions and the solutions required to meet the needs of each unique market. Increases in demand, aging airport assets, depleting system reliability and evolving airline requirements trigger continual evaluation of existing and new baggage handling solutions.

How Does Your Airport BHS Measure Up?

FUTURE ENDEAVORS FOR THE IABSC

The IABSC will continue to explore the issues facing airports and airlines and will seek to provide new perspectives, ideas and solutions to the Aviation Industry. By introducing proven solutions from other industries and across the globe, the US Aviation Industry will benefit from having greater visibility and objective information enabling them to knowledgeably consider alternatives presented, conduct proofs of concept, and weigh the risks and benefits involved in airport BHS development.

REFERENCES/RESOURCES

- [1] ACI Guide to Airport Performance Measures: Robert Hazel, Oliver Wyman, Inc., "Performance Indicators in Six Key Performance Areas," ACI White Paper, February, 2012, page iii

ABOUT THE IABSC

Our mission is to be the *leading voice* for the airport baggage handling industry. We consider ourselves the industry's foremost ambassador, assisting in the continued improvement of the airline & airport baggage handling systems industry. We are committed to raising standards, furthering education, pushing innovation, and improving economic benefits across the greater industry as a whole.

Learn more at www.iabsc.org