Passenger Terminal Design

Introduction

As passenger terminals are important interfaces where passengers transition from land-based transportation modes to aircraft, special care needs to be given to ensure air travel is not only safe, but also accessible, enjoyable and affordable.

While every passenger terminal's design and requirements are different it is always recommended to follow consistent best practice design principles:

Provide a Safe and Secure Environment

Safety and security are of the highest importance in the planning, design and operation of terminal buildings. Passenger terminals provide a critical component in maintaining the safety and security of the global aviation system through the prevention of the passage of people and objects that can cause harm or lead to acts of unlawful interference.

Passenger terminals, along with all other airport facilities must meet both international and national safety and security requirements. Threats to safety and security may be of malicious intent, such as terrorists or criminals, or unintentional, such as people carrying large quantities of batteries. Due to the evolution of threats planners should work closely with authorities to determine appropriate solutions, including bringing in best practice emerging from the global aviation community.

Solutions for safe and secure terminal buildings will be anchored in the building concept and will normally require a range of controls and surveillance with significant reliance on technologies such as access control, e-gates, CCTV, screening equipment, video analytics and communications. Technology can also be used to help minimize the impact of such controls on the passenger journey and experience.

Provide Optimum Level of Service

IATA's primary objective is to inform the planning process with recommendations to determine the optimum, balanced capacity and level of service.

The IATA Level of Service (LoS) framework provides a set of industry guidelines for passenger terminal facilities, in terms of the space to be provided to passengers as well as the time passengers can expect to be queueing at individual facilities. These performance guidelines represent international best practice at many airports around the world.

The guidelines strive to promote efficiently sized facilities by finding an optimal balance between infrastructure costs with passenger comfort. IATA strongly recommends that all parties involved collaborate to jointly provide terminal facilities with an "Optimum Level of Service".

Provide Efficient, Consolidated Facilities

Providing intuitive and efficient navigation and circulation throughout the terminal is a key planning and design objective. Consolidated processing areas are generally desired and typically provide a number of benefits, most notably for the passenger, and also from a reduced land use, operational efficiency, cost-effectiveness, and sustainability perspective.

Consolidated terminal processing areas allow an airport to be more efficient in terms of its own resource deployment. This efficiency applies to its own staff, governmental agency staff, airline partners, ground handlers, and other stakeholders.

Provide Seamless Passenger Journeys

The best airport terminals are those that provide the most clear and direct path across all passenger journey paths (domestic, international, and transfer traffic). Intuitive wayfinding, limiting decision points and level changes, the use of materials, lighting, outdoor views and other physical directional clues that enhance passenger orientation are significantly more effective than reliance on signage. Passenger orientation within the passenger terminal can be greatly enhanced by adopting a transparent building philosophy.

- There is no simpler way to orientate passengers than to allow them to see their final destination.

- The simplest way to maintain passenger flow and orientation is to limit the number of choices available. "Straight ahead" is always the simplest way to maintain passenger orientation.
- Convoluted circulation routes that include changes in direction or level complicate the passenger journey.
- Passengers should not be subjected to changes in direction greater than 90 degrees and should not be made to perform repeated 90 degree turns within a short distance.
- Passenger routes that backtrack or cross other flows should be avoided.
- Walking distances from the forecourt to the gate and vice versa should be minimized.
- Walking distances in excess of 300 meters should be augmented with moving walkways.
- Commercial areas should be "on the way not in the way" and provide convenient access without impeding direct access to gates or increasing the overall walking distance.
- Quick, easy and direct routings through terminals should also be accommodated.
- Level changes should be avoided. When there is no alternative, then level changes should be achieved by modes of conveyance (i.e., escalators and elevators) with an associated staircase and/or ramp as backup.

Enable Efficient Operations

Before embarking on a capital investment program, it is recommended that airports review their current operational processes and procedures to identify any opportunity to improve efficiency. By adjusting current processes and procedures–thus, better utilizing existing facilities–the airport can gain efficiencies, increase the level of service, and often add capacity with little or no cost.

Beyond process improvements, the planning and design of passenger terminals (including renovations and expansions to existing facilities) should be based on sound planning guidelines. There should be a strong focus on efficiency which should be a goal across all aspects of the terminal. This should be supported by a concept of operations focusing on outcomes, agreed with airport users.

Efficient outcomes mean higher levels of service, lower operations and maintenance costs, and a lower carbon footprint; three desirable outcomes for any airport.

Provide Cost-Effective Design Solutions

Terminal design projects should identify cost-effective solutions seeking to ensure that functional requirements are addressed efficiently and that design solutions are selected in order to minimize operating costs for airports and users.

Proposals to extend or construct new passenger terminal facilities should consider a detailed business case and cost-benefit analysis. Business Cases must demonstrate and quantify clear benefits in terms of increased capacity, improved passenger experience and operational efficiency, as well as providing sustainable design solutions.

Business cases must consider not just the required capital expenditure (CAPEX) but ideally the whole-life-cycle cost of the project. It is also recommended to consider operating and replacement costs (OPEX/REPEX), to achieve an optimum balance between initial investment and the need for ongoing maintenance.

Airport capital investments should ultimately only proceed where a clear business case exists, supported by a positive cost benefit analysis and the explicit agreement of airlines. This recognizes that a direct cost relatedness exists between airport infrastructure investments and airport charges that airlines pay for. See IATA airport infrastructure business cases position paper for further guidance.

In order to facilitate future growth, designs should seek to ensure that airports can be expanded incrementally. Additional infrastructure should be added in an economically efficient manner on a "just in time" basis to meet increasing demand.

Furthermore, expansions must be planned to ensure their compatibility with the airport master plan to avoid negative impacts to airport operations and future constraints.

Provide Accessible Facilities

A key objective of every project should be to ensure that airport facilities are planned and designed to be used by everyone, including those with disabilities, without the need for adaptation or specialized design.

Airports should follow the principles of Universal Design from the outset of all new projects. For brownfield projects where adapting legacy facilities can be challenging, every effort should be made to

incorporate Universal Design principles, accepting that it might not always be possible to fully address the needs of all passengers with disabilities. Greenfield projects, on the other hand, can benefit greatly (and avoid subsequent costs) by incorporating universal design and inclusion early on as part of the planning process.

Plan for Integrated Systems

The systems environment of a terminal can be complex. An extensive variety of sophisticated mechanical and data systems support the operation of the airport and its partners (i.e., the airlines, governmental agencies, and others). Examples of such systems include, among many others, check-in systems, Baggage Handling Systems (BHS), data management systems including Airport Operations Data Bases (AODB), or Flight Information Display Systems (FIDS).

Many of these systems exchange data information with each other in order to provide a comprehensive airport operational system. Integrating and coordinating the input and output of these various data systems is an important part of airport management.

One of the most important systems, and the one that has the biggest impact on terminal design is the BHS. BHS are expensive to build, maintain and operate, and are an important factor in the footprint and cost of the terminal building. The BHS has a bigger impact on the design and spatial planning of a passenger terminal than any other processing systems and can be difficult to retrofit into an existing passenger terminal design.

For new terminals, the BHS needs to be considered early in the design process and should be aligned with the terminal's planning assumptions.

The processing of passengers and baggage are fully interdependent therefore any constraint in the handling of baggage can limit the overall passenger capacity.

Design for Passenger Satisfaction

Designing for passenger satisfaction should follow all the journey steps and for all different users including staff and visitors. Particular attention should be paid to journey steps that can create higher levels of stress in passengers. Good facilities for staff are important in their delivery of service excellence.

Designers should ensure that all the core components are resilient in their operation with necessary redundancy to enable maintenance to be carried out without affecting the journey.

There is increasing public interest in airports making positive interventions on important issues such as sustainability and inclusivity and clear demonstration of such values will likely add to the passenger experience.

Consider the Local Context

The journey through the passenger terminal provides an excellent opportunity for identification with the region that the airport serves, acting as a gateway with its unique culture and sense of place.

The planning and design of the airport terminal should consider the local context through showcasing the culture, heritage, spirit, and amenities that can be expected. Input from local communities is to be encouraged.

The design of the terminal will also need to meet all local standards and regulations. This may result in different layouts for similar functional requirements, in particular for fire protection, security, seismic, religion, sustainability and climate conditions.

Plan for Flexible, Modular Expansion

Each of the interconnected subsystems in an airport terminal will likely need to adapt as passenger traffic evolves. Whether it is capacity enhancement, a modification in operating protocols or the regulatory environment, utilizing modular, expandable building designs, materials and systems facilitates accommodating such required changes over time.

Terminal facilities must be designed so that they can respond to growth in a logical, phased manner.

It is recommended that, on an unconstrained site, a plan be based on modular flexibility and expandability, starting from a single terminal complex or "campus" capable of accommodating the passenger handling needs for as long as possible before embarking on the implementation of further terminals.

Each of the terminal sub-systems must be in balance with the others as there is no benefit in having surplus capacity in one sub-system if others are constrained.

A modular design philosophy enables capacity enhancements to be added to individual subsystems and facilities without unnecessarily disrupting existing operations.

Clustered siting of physical elements that are difficult, costly and disruptive to relocate (i.e., structural elements, vertical circulation and service cores) is effective.

Airports must be designed to minimize the physical constraints each element imposes on future expansion by ensuring that all elements address flexibility.

Safeguard for Innovation and Future Operational Changes

As the aviation industry continues to be an extremely dynamic business, major changes will continue to affect the way airlines operate, passengers interact with airlines, and airlines and passengers use airports. In addition, changing governmental regulations, new industry standards, availability of user data and the constant search for new revenue opportunities will further drive change.

Airlines and passengers will continue to challenge airports to optimize their processes and operate efficient facilities at the least cost generating efficiencies that can be passed on to the passenger.

Airport owners, developers, and designers are faced with the challenge of providing cost-effective airport facilities that respond to airline requirements and changing business models, all while offering the greatest possible flexibility.

It is recommended that forward looking opportunities to improve safety and operations, increase efficiencies, reduce costs (all with a focus on meeting the level of service), should be a constant airport initiative.

Champion Collaborative Partnering in Design and Development

The process of collaborative partnering brings together all project development team members, including owners, architects, engineers, construction managers, and contractors, and all project stakeholders, including airport users, operations, maintenance, properties, environmental systems, security, inspections, concessionaires, airlines, and regulators, in a formal cooperative working environment. With collaborative partnering, common goals to achieve improvements in key project performance outcomes such as safety, quality, schedule, and cost, are established and agreed at the beginning of the project and steering committees measure performance throughout the life of the project.

Consultation with stakeholders is a key component of a successful collaborative partnering arrangement. A collaborative approach between airports and airlines is essential to the overall success of a project and, when managed correctly, will ultimately deliver benefits for all parties.

Meaningful consultation requires identifying key stakeholders early in the planning process before irreversible decisions are made. While there are many stakeholders who vary by location, airlines should be regarded as a primary stakeholder. In particular, a regular, structured dialogue between subject matter experts is beneficial, to ensure user requirements are captured during concept and options selection.

Supporting Documents

IATA Airport Development Reference Manual 12th edition.

IATA Level of Service (LoS) Best Practice

IATA Airport Infrastructure Business cases

IATA Infrastructure Investment – Best Practice consultation