KEEPING MEGA-AIRPORTS HUMAN-FRIENDLY

ADP INGÉNIERIE

As the world evolves and populations are growing, numbers of flying travellers are growing exponentially as well. Current infrastructures are meeting their saturation point and have difficulties facing this increase. Moreover, the passenger experience has becoming the central focus for these passengers, a preoccupation that was not always one of airports' main concerns. Skytrax Annual World Airport Awards that reach out to millions of air travellers, must be analysed carefully but translate well passengers' expectations and show the customer's experience is central in the customer satisfaction. Asian airports thrust the first places in the different categories. They are examples of airports putting the passengers at the centre of the airport and how services are drawn around them.

No one knows how airports will look like in one hundred years, but for sure, we have to think ahead as air traffic will increase drastically in the next decades (we are talking of 7 Billion passengers traveling by 2035) and therefore demands new airport facilities, increasingly concentrated in a new generation of mega-airports.

Now that we know many airports have to invest in order to face the increase in traffic and that passengers expect a better quality of services, now seems the best time to make sure that these airports become human-friendly airports.

But beyond merely managing this growth, will airports also address passengers' most pressing concerns and criticism?

The answer is not certain, unless airports adopt a human-friendly approach to renovating, expanding and building new terminals - an approach which must be used in designing facilities as well as interior layout. This represents a real challenge for airport engineering, which must anticipate these changes and design the airports of tomorrow.

1/ What is a mega-airport?

Before detailing this human friendly approach, let's try a definition of mega airports.

At ADP Ingénierie, we consider today that above 45 to 50 M passengers with a single processor is a good criteria to be considered as a mega airport.

Actually, the drivers of mega-airport projects fall into two major categories*.

- First, regional economic development that incites organic traffic growth, both for passengers and freight.

- Second, major airlines that develop their main hubs, based on a boom in transfer traffic.

And the most successful mega-airport projects are thus those who jointly gain from regional economic development as well as the additional traffic generated by hub operations.

*For ADP Ingénierie, this new generation of mega-airports has presented a **new set of design challenges** that we have

successfully met in a series of recent projects.

In short, the planning and design of mega-airports requires rethinking our **approach to scale and technology**, in consideration of the significant amount of land to be found, secured and developed for mega-terminals, runway systems, ground transport and operational support as well as airport urban centers.

These challenges include the 6 following:

- **Density of traffic**, with high traffic volumes passing through the terminal processor, and a significant share of connecting passengers (up to 15 000 passengers at peak hours)

- **Complexity of flows**, with multiple types of passenger, staff, baggage and logistics flows and links

- **Resilience of systems**, as contingency solutions must be introduced in the design to ensure a high level of redundancy for all vital links

- **Safety and security of users**, due to the high concentration of passengers and other users on a single site

- **Clarity of orientation**, to ensure intuitive wayfinding for passengers processing through

ever larger spaces

- **Phasing of construction,** to minimize traffic disruption and ensure safe operating conditions at all stages of the development process (for instance: Chongqing will go from initially 30 M to 55 M passengers / Incheon from 40 to 70.

2/ What does human-friendly mean?

It seems that there is no precise definition but we can come close to the meaning by using the term user-friendly.

User-friendly: easy to learn, use, understand, or deal with user-friendly environment; also: agreeable, appealing *a user-friendly atmosphere.*

At the scale of an airport, it means making sure the passenger meets no difficulty in their journey through the airport, that this one must be easy to use. Even agreeable and appealing.

So how do we think and rethink the passenger experience in order to make it human-friendly?

3/ Expansion projects increase stress and dissatisfaction

Studies have shown that air travel is a source of stress, especially amidst today's heightened inspection and security procedures which impede the flow of passengers in airports. Passengers wish to be in control of their time but must now sometimes arrive at the airport well in advance to handle unforeseen circumstances.

- Access to airports is increasingly difficult due to overcrowding of more complicated access routes: New York, San Paolo, Paris, Beijing, etc.

- The route to boarding is increasingly experienced as an ordeal with long periods of time spent standing and waiting.

- In hubs, passengers must walk

long distances and often have difficulty finding their way. In Dubai, for example, the furthest departure gates are a 30-minute walk from the check-in area. Passengers with connecting flights must sometimes walk for 20 minutes or more while worrying about finding their way.

- Terminals are often very crowded noisy places.

- Though there may be access to a wide range of impressive services, this access is uneven at times, and accentuated by the exclusivity of higher-quality amenities for Premier and Business classes.

On the whole, passengers who are not frequent business flyers may feel alienated by a strange universe with its own codes and language and utter lack of familiarity. The constraints of making one's way through an airport are the exact opposite of the relaxation, well-

being, serenity and enjoyment sought by passengers.

Meeting passengers' primary expectations means approaching an expansion or design for a new terminal from as human a perspective as possible. Though this is self-evident, it can be restricting in terms of design and interior layout choices for facilities built around complex processes and in which there is a great flow of people. It led ADP Ingénierie to define a human friendly approach in designing expansion projects, notably mega airports

4/ Managing the increase in traffic

While new airports continue to be built in cities such as Dubai, where work has begun on the Dubai World Central in Al Makhtoum, Daxing in Beijing and Tianfu in Chengdu, a great number of expansion projects are also underway: Amsterdam-Schiphol is set to build a new terminal after already increasing the size of its existing one, Changi is already making plans for its T5 and Groupe ADP has started planning for Paris-Charles de Gaulle's future Terminal 4.

And mid-sized airports will not be left behind: Kathmandu is building a new international terminal to increase capacity from 4 to 7.5 million passenger; Nairobi is renovating its terminal to exceed 10 million passenger; Bahrain is rebuilding its airport and Muscat is equipping itself with a terminal with 40 gates and a capacity of 12 million passenger; Zanzibar is building its second terminal due to the increase number of tourists.

Renovations or extensions are increasingly being planned for existing buildings, such as Paris-Orly where, after extending the South terminal to include a new international pier, Groupe ADP is building an 80,000 sqm building to connect the South and West terminals and accommodate an additional 3.5 million passengers.

At the same time, a growing number of terminals are undergoing renovations or being redesigned to provide passengers with an even wider range of services, increased space and greater comfort: additional shopping areas, leisure activities, access to multimedia etc.

5/ Designing expansions and new terminals to be "human-friendly"

As a matter of fact, originally airport challenges were mostly about aircraft, then about airlines and aircraft, then about passengers, airlines and aircraft… until interest for retail revenues modifies airport functional design which led to consider the passenger merely as customer, not to mention the

impact of 9.11 attack which led to consider the passenger as a potential threat as much as a potential target.

Our conviction is that today, the passenger has to be brought back at the center of airport business as a human being.

Obviously, we must take into consideration all users and stakeholders -- owner, operator, airlines, security and immigration, transport systems, local community, etc. However, if each of them approaches the facility from a different perspective, they should become united in putting the **passenger at the center** of airport operations.

Indeed, compared to the human scale of airports in the early years of air travel, mega-airports demand an increased attention not only to the needs but also to the well-being of the passenger. And, by the way, an unstressed passenger is more likely to become a potential customer.

Therefore, looking at the airport from the passenger's point of view, ADP Ingénierie planners and designers seek to alleviate the stress induced by the most painful aspects of air travel:

- **Departure process** – travel and access to the airport, parking, getting information, getting oriented, checking-in, passing immigration, passing security – in order finally to arrive at the boarding area where it is possible to relax, shop, or work

- **Arrival process** – pass immigration, reclaim baggage, get oriented, find ground transport – in order to arrive at the final destination

In addition, the airport should be connected to the culture of the region, so that passengers will see, feel and experience in a subtle manner that they are in a specific place, and not just any place.

Arriving passengers should feel that they are home as soon as they step off the plane. Transiting passengers should feel the ambiance and the identity of the city, which will be palpable and amplified in the terminal architecture and interior design.

6/ Some examples of emblematic "human friendly" projects

To describe our human friendly approach, let's look at some examples of emblematic projects: Changi, Bahrain, Kathmandu and almost Daxing in Beijing.

This first aim is to place passengers in a setting which differs from their everyday environment as little as possible so that they may find their bearings more easily. There must be a calming atmosphere that creates a feeling of well-being while transporting passengers to the dream world associated with travel.

Changi, the gold standard in airports today, is described as an airport-garden, in the same way that Singapore is a city-garden. Designed as an extension of the city, the airport is planning a 134,000

sqm expansion of its public side, structured around a glass and steel dome, at the centre of which a 40 metre-tall waterfall will cascade from a giant rainwater collection tank. 22,000 sqm will be reserved solely for planting trees and exotic plants.
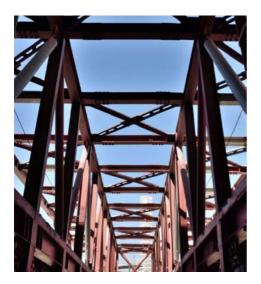
The same one roof concept, which features a central glass roof extending toward the piers, will be used to cover the entirety of the future terminal at Daxing, Beijing's new airport, designed by ADP Ingénierie in cooperation with Zaha Hadid Architects. Notre Dame de Paris could fit under the airport's soaring roof, thus giving passengers the impression that they are in a real city. And the very small number of support points adds to this impression: we forget that we are in a building. At the end of each of the five piers, exterior spaces will house

themed gardens (silk route etc.) along with specific architecture and plants.

Travellers can intuitively 'read' the terminal. The openness of the central space allows the passenger to see how the terminal functions, thus reducing the stress of not knowing what lies ahead. The central glass roof extending toward the piers helps the passengers through their movement with natural light guiding their every step. In addition, colour, pictograms and connected devices could help them to find their way and reduce the level of stress.

The feeling of well-being is

strengthened by the fluid quality of the interior space that meets the conscious and unconscious needs of all passengers. Within the "one roof" concept, the interior exudes peace, comfort and a welcoming feeling.

In addition, not only does the open architecture enhance the well-being of the passengers, it also allows flexibility for future evolution. With minimal structural supports provided by innovative mega-columns, changes in functional layout can be easily implemented.

Moreover, these spaces will feature services worthy of a city: landscaped areas and a real bridge to cross over to the international area, a swimming pool, cinemas, shops, landside and airside hotels etc. The goal is to go much further than traditional duty-free areas, which are struggling in some hubs, by offering a broader range of services accessible for all classes of passengers. It should be noted that the CRM dimension (e-services, smartphone apps, big data) is increasingly important in airports. Packed with sensors, today's terminals (and even more

so those of tomorrow) strive to be "smart airports" and interact with connected passengers in real-time to better inform and geo-locate travellers within the airport, offer services and create personal relationships. In short the goal is to humanize airports.

To cite another example of this continuity between city and airport, the location of Kathmandu airport's new international terminal was specifically studied to preserve the surrounding natural landscape.

The edges of the terminal are a direct extension of the green area (forest) already present on the site and an exterior courtyard creates a transitional space between landscape and terminal. This courtyard will serve as a meeting place/sitting area for passengers and those accompanying them while gardens along the facades of the departures lounge contribute to a feeling of calm and well-being for passengers.

The "one roof" concept was also

used in Bahrain, where a sweeping canopy recalls vast Arabian tents, and shopping areas which promise relaxation and the end of the boarding process, are visible directly from the public departures hall. Transparent areas between this hall and the departure lounges were optimised and bright colours were avoided in inspection areas (passports and security) in favour of softer warm hues.

The compact design of certain terminals, such as Daxing, contributes to passenger well-being and, it should be mentioned, also plays a role in optimising operating costs for airlines (more gates, etc.) Additionally, the terminal architecture helps make the "airport-(national) airline" duo more competitive. In a sector facing increased competition (with major private airport operators in addition to state-owned operators), this is rapidly becoming a key part of airport design.

The second aim is to facilitate passenger wayfinding. Daxing airport will be integrated within the city: a circle forms the outline of the airport city, with the 6th branch of the terminal housing the ground transportation centre, a multi-modal hub with links to a high speed rail line, a rapid regional line and express trains linking the airport to Beijing and different Chinese cities. Where it meets the central terminal, natural light channelled by the architecture will guide passengers, making them feel free to move toward the 5 boarding branches. Similarly, the upper level of the check-in area is marked by a dramatic architectural setting surrounding a large column of light which pours down to a patio located far below, orienting passengers toward the lower level and the customs area. To reach the international area, passengers must cross the bridge which spans gardens as mentioned above: they therefore leave China! This same principal is used in the arrivals area, where a single beam of light shines from the ceiling to the ground floor, acting as a sort of beacon.

Equal attention has been given to light in Kathmandu, where meticulous efforts to help passengers find their way are enhanced by

natural light in boarding process areas.

Meanwhile in Bahrain, the passenger pathway is designed to be as intuitive as possible - a straight pathway. The control tower, located at the centre of the airport, serves as a point of reference. Each path corresponds to a certain type of suspended ceiling: undulated waves for the departure process, located entirely on one level, and wood strips to accompany arriving passengers from the disembarking area to the public hall in order to help guide passengers. The next step is always visible. Signs, provided simply to reassure passengers, are intentionally limited to two lines of information per direction with a preference for pictograms.

The third aim is to reduce travel distances within the terminal and piers despite the scale of the building. Daxing is certainly the most emblematic in its handling of this objective. Passengers walk a minimum distance from landside to airside. Thanks to the compact shape of the terminal and short walking distances, passengers reach their gates quickly and easily, increasing the efficiency of the terminal process. And there is no

need for an APM in this first phase of airport development, thereby eliminating a source of passenger stress and reducing initial capital and operating costs.

This minimum walking distance is also possible thanks to stacking international and domestic process levels on top of each other, with two easily accessible sets of departure and arrival levels. Indeed, the terminal features innovative architecture which superimposes two departure levels and two arrival areas. Traditional passengers therefore use the upper departure level while the lower level enables frequent flyers to arrive at boarding gates more quickly, thus meeting their specific needs. Finally, the terminal's star shape ensures that passengers must only walk a short distance from the main service centre to any of the different piers, without requiring help from an APM.

To conclude, a human-friendly airport is also a sustainable airport and vice versa

Actually, an airport does not exist in isolation, and we must look beyond its boundaries to place it within a larger context: a human-friendly airport is also a sustainable airport that benefits the population and

the environment within its reach.

By virtue of its land expanse, airspace volume and catchment area, mega-airports exert a significant impact on their surrounding environment. The land area of mega-airports attains the size of Manhattan for Dallas-Fort Worth or a third of the city of Paris for Charles de Gaulle. By itself, the Greater CDG Airport region stretches over three French departments and three watersheds and counts 260,000 jobs.

The interactions between the airport and its environment – natural, urban or agricultural – will only grow stronger with time and demand balanced planning and management at a regional level.

ADP Ingénierie recognizes the need to assume a strategic design role to ensure a unified vision for airport development at this regional level, which is only possible with the collaboration of all stakeholders and users, both on the airport and within the larger community.

But at the end of the day, we should not forget that, providing that human friendly approach has been taking in account in terms of planning, architecture and engineering, an enhanced human friendly mega airport will also rely on the quality of human contact with passengers from all operators.

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