OPTIMISATION OF THE AIRPORT DESIGN FOR FAST TURNAROUND OF THE AIRCRAFT

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The article analyses main priorities in shaping of the designs of modern airports , concerning movement of passengers and aircraft, as well as consequential hierarchy of various factors: logistic, financial, behavioural , which co-relate flow of traffics of people and vehicles in the airport area. The conjecture is made , that airports should be optimised for fast turnaround of the aircraft as the first priority; fast delivery of passengers to and from the airport as the second; easy and comfortable, but not necessarily fast movement of passengers within the terminal itself as the third.

Large airports are places where intensive flows of people and vehicles meet and mingle, governed by complex array of temporal,spatial, procedural and behavioural relations.

Taking into regard only some of them , e.g. time and position , therefore treating people more or less like manoeuvrable vehicles, leads to unsatisfactory designs and in consequence diminishes not only passengers comfort, but also revenues of the airport.

Along with growth of traffic increases the number of negative opinions expressed by passengers towards airports, airlines , congestion, waiting times ,etc - what is presently accepted as a natural side-effect of sheer multitude of people who want to arrive to a single place in limited time frame. The Author of the article is of the opinion, that it does not have to be this way.

In the recent years, most designs of the airports terminals where made with fast movement of people from entrance of the airport building up to the gate and in opposite direction as the main priority. Under principles of comfort and security, the baggage is first collected from passengers at the central check in. Passengers react by increasing the size of hand-carried luggage, which in the last several years has grown from small handbag to almost full-size wheeled suitcase. The reason is behavioural - people simply like to travel with their baggage nearby, and are afraid of the loss or delay - often quite reasonably . They also want to pick up their baggage immediately upon arrival, which is made impossible to them by centralised baggage delivery.

Then the passengers are passed through centralised security scanning and centralised immigration , where queues and waiting times effectively nullify any time gains which can be made on shortening intra-terminal walkways through architectural solutions. It's worth to note that time spent by passengers in queues is idle time not only for them but also in respect to airport's revenues.

Rapid growth of low-cost carriers is caused by another behavioural factor- people want to travel cheaply. This fact , although rather simple, brings along important consequences for shaping of intra-airport traffic. The low-cost airlines may remain as such only then , when they are able to reduce costs of ground services as taxi time, gate time, refuelling time and overal turnaround time.

Numbers of passengers who select cheap air ticket to an airport distant from their destination over comfort of landing at the near-city airport , show clearly peoples' preferences.[1]

The first conclusion is therefore, that aircraft terminal traffic should have prevalence over passengers terminal

traffic. Unfortunately, both these targets are usually contradictory: aircraft require relatively a lot of linear space along terminals' building, which, in case of linear gates arrangment leads to elongated buildings - and in consequence , long walkways for passengers between gates. Various concepts were therefore proposed to replace linear arragment of gates , mostly with star-shaped or circular terminals. For large airports, where airliner's wingspan can be used as metric, fractal geometry nicely helps to optimise boundary length versus building area. Maximising the boundary in order to optimise building area produces however complicated situations by docking, refuelling, deicing, pushback, and increased congestion of associated apron vehicles traffic, rendering questionable the concept of area-wise optimisation.

As another study [2] show, people are more concerned with time they spend to reach the airport, then the time spent in the airport itself. Quite many of the passengers enjoy their time spent in the duty-free area, airports restaurants , or the airport itself. The things which are negatively commented are check-in queues, security scanning procedures , immigration queues, gate waiting times.

The second conclusion is therefore, that people want to be quickly delivered to/from the airport, but may even enjoy time spent in the airport itself, lest the inconvenient procedures of check-in, separation form their baggage, security scans, immigration formalities and waiting at the gate.

This in turn , is not contradictory with financial targets of the airports which earn substantial revenues on duty-free shops and restaurant space rental.

Various studies, e.g.[3] made for shopping malls point out rather obvious positive corelation between time spent/walking distance covered on average by an individual client , and the revenues of the shops and restaurents . Therefore duty-free galleries often resemble labyrinths - to make people involountarily walk long paths.

Inverse relation rules the revenues obtained from serving aircraft: the airport earns more on quick serving of big number of aircraft in a unit of time (short turnaround times) then by keeping them long at the gates or having them queue on complex and intertwined taxiways.

In simple words, harshly as it sounds: it pays for the airport to keep passengers long and walk them far ; whereas it pays to keep aircraft as short time as possible.

Considering designs of new airports , the planners should therefore see to prioritise the principles so , that the optimisation efforts go first to the aircraft ground traffic and fast turnaround; then to efficient commuting routes of passengers to and from the airport ; then to streamlining of intra-terminal procedures ; but giving the passengers enough time in the airport to shop, dine and enjoy the travel, possibly being accompanied by friends or family up to the gate or even to aircraft's door itself - another behavioural factor, which is not impossible to align to by sufficiently creative airport designer.

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