

## NEW CONCEPT OF AIRCRAFT DOCKING SYSTEM

*An innovative solution is proposed for robotic docking system for commercial aircraft in large-scale airports of the future. The system eliminates jet bridges (aerobridges) and enables passengers' transfer through multiple doors / both sides . It envisions shortening of engines idling time, reduction of gate time and makes for streamlined airport logistics. It reduces also human factor influence by aircraft docking and potentially saves aviation fuel.*

The design of existing airports is often defined by aeronautical tradition, more than by actual logistic needs.

The airports were usually located early in XX-century, and continued in the place along the traffic growth by multi-fold over subsequent decades.

The standard sequence of check-in/ passport control/ security clearance/ waiting/gate-pass is dictated more by unreliability of schedules in the early days of aviation than by present practice.

The idea of jet bridges was conceived partly due to fears of fire – to keep aircraft far from the building, what was justified in the days when transport aircraft were fuelled with highly flammable aviation gasoline ; today, mostly low-flammable jet fuel is used. (Navigation systems setting is separate issue).

Separation of check-in from boarding gate was dictated by frequent delays due to weather or technical malfunctions, which is not the case anymore.

Passport controls and duty checkpoints were separated from gates mostly due to presence of duty-free zone , and high price difference on popular items like tobacco or liquors as both the attraction for passengers and substantial source of revenue for airport. Although the latter is still significant, but flattening of retail price differences between taxed/untaxed items is observed in many duty-free zones..

And finally, security checkpoints were located by passport control points due to fears of terror attacks against airport or aircraft – in this order of hierarchy.

All these factors together produced however number of inconveniences for the passengers and airlines: long ways of baggage transport from check-in to gates; long queues to security checkpoints; baggage lost by fast transit flights; growth of hand-carry luggage size – for which the airlines reacted with construction changes to overhead luggage compartments; necessity of extra time allowance for airport time, etc.

In order to address these inconveniences , optimise the airport for airlines and increase comfort of passengers , the author proposes a package of system solutions. First of them is presented in this paper, as a following design of aircraft docking system (description and pictures):

- the aircraft end taxi at safe distance from the terminal building and stops the engines;
- the robotic, heavy cart approaches the aircraft , connects by robotic arm to front wheels of the aircraft , and pulls it to the gate ;
- gate itself forms a recess in the terminal building , with 4 ramps on both sides of the fuselage , through which boarding/ disembarkation may be done quickly and effectively;
- movable bridges , being part of the building may be additionally used for large aircraft as B747 or A380 (or it's successors) , from both sides of the fuselage
- all the ramps/bridges are handicapped-friendly;
- the robotic cart is preferably electric , due to clean air /fuel savings/ weight requirements;
- both concepts of rail-driven and free-wheeled carts are considered , with the first having more in-built safety , and the latter more flexible in manoeuvring , especially by push-back;
- residual fire risk is addressed by CO2 flooding system in the gate recesses;

The possible engineering solution is presented on attached pictures, Fig 1,2,3,4.

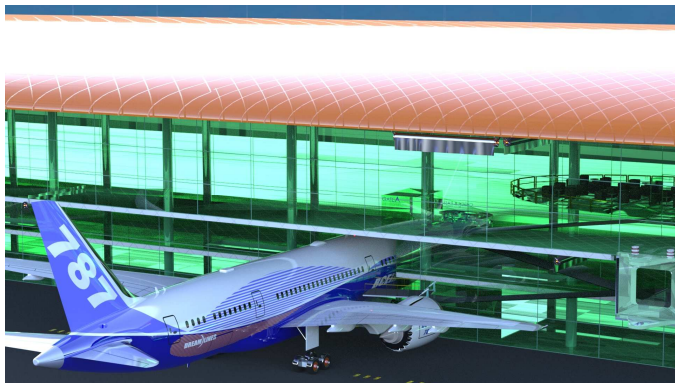
It is worth to mention that gate time is a major source of costs for both airlines and airports, therefore shortening of it should be welcome by the whole business community.

Other issues signalled in the beginning of this article shall be addressed in subsequent papers.

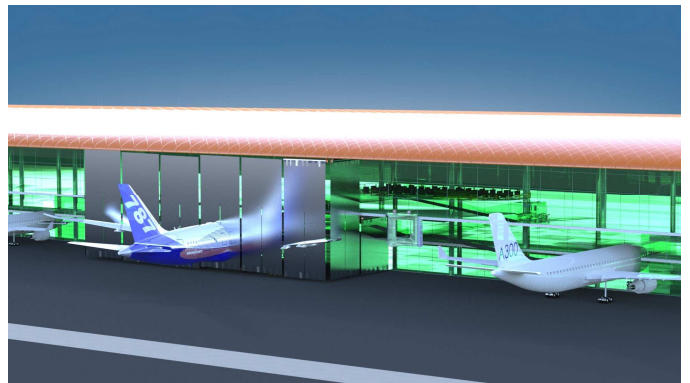
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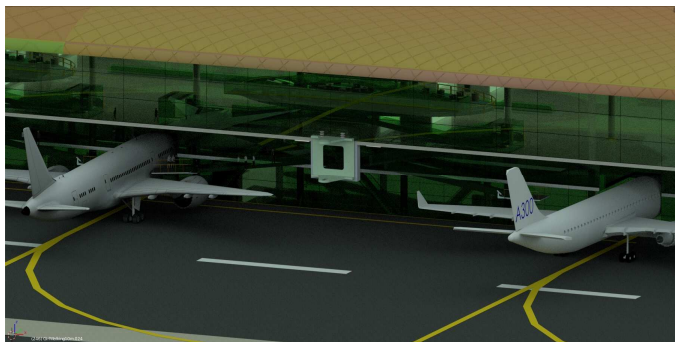
*Fig.1.Docking*



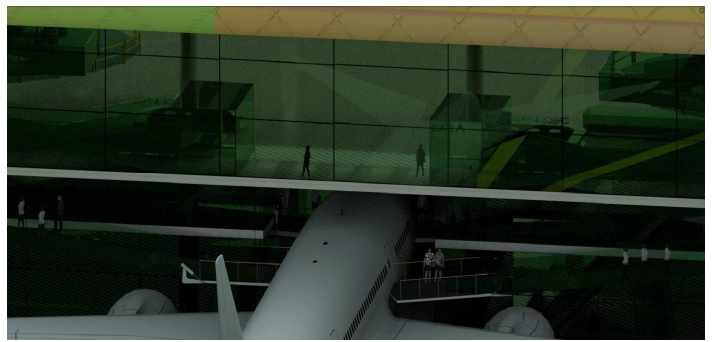
*Fig.4.Localised fire-fighting system.*



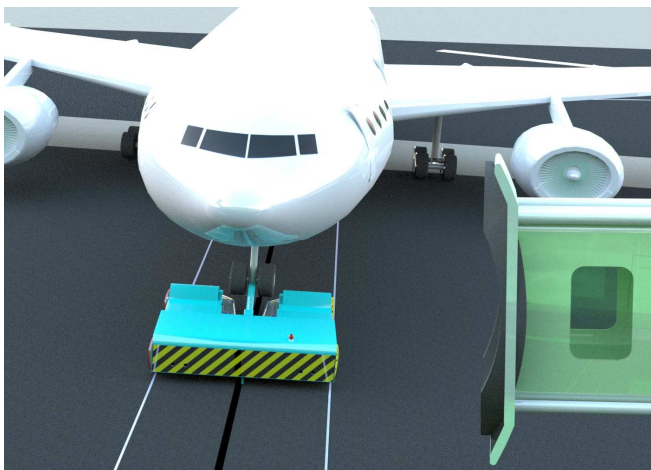
*Fig2.Docking*



*Fig.5. Boarding ramps*



*Fig3.Robotic rail cart*



*Fig.6.General view – terminal docking*

