# Innovation and Ideas. Future Airport. Briefing Note prepared for ASCE/TDI Airport Planning and Operations Committee. Jozef Grajek, P.Eng., April 12,2015,Montreal,Canada

## **Briefing Note**

### 1. Background

Aeronautics and Air Transport ,Advisory Council for Aeronautical Research in Europe found insufficient passengers flow as the major obstacle in the air transport development. The fixed direction runways inherently limit the number of take-off and landing operations during various directions and strength of the wind. European Commission Research and Innovation Department funded the research for defining the prospective airport with a circular runway.

### 2. Future Airports

The airport infrastructure will include revolutionary architecture adapted to any new aircraft configuration and propulsion mode (i.e blended wing body and new fuels, such as hydrogen or biofuels).

New airport layouts and runway configurations could overcome weather restrictions and maintain capacity. A revolutionary airside development could be a circular runway, adapted to any wind direction, to increase capacity. Associated to a terminal centered in the 'circle', such runways would enable short, fuel-saving taxiing along radii adapted for capacity and safety.

Real or actual capacity is usually lower than declared capacity because of weather restrictions and dependencies between runways. Current trends in airport runway operations will optimise the use of the existing runway system through:

- Improved planning resulting from trajectory-based operations
- Increased use of noise abatement operations
- Capacity increases from better understanding of wake-vortices, enabling reduced separation and new approach procedures

Revolutionary concepts to save space and/or to enable operations to alleviate pressure on inhabitants include:

- Remote runways, possibly in the sea
- Large runway surfaces, enabling operations from any direction
- Large circular runways enabling operations from any direction
- Double-deck runways
- Airports in the sky (cruiser feeder concept)
- Revolutionary concepts to enable more efficient runway usage include:
- Formation flying or paired arrivals on one or several runways
- More entrance and exit points to one runway
- High-precision approach systems to allow reduced separation through
- flying different approach paths towards one runway.

### 3. Conclusions

This is an example of the Next Generation Project in aviation. European approach is similar to our Next Generation Research and Development Projects. Revolutionary concepts including circular runways or "Endless Runway" are opening the windows for new technologies within the airport network, airside, connection to landside, air traffic management, environmental, etc. First in the world circular runway project was in Oregon. US Navy pilots tested take –off and landing operations on circular GM track in Mesa, Oregon. Few patents protected these projects.

Author is continuing own research on airport engineering aspects of the Endless Runway Project(profile, length, utilities etc.,)

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