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INTRODUCTION

This course will study needs to provide modern airport with models for simulation to help Air Traffic Management (ATM) and Air Traffic Controllers (ATC) for easy operation or management as well for passengers departing and arriving.

FIRST TOPIC

Previous ATC models.

Then Airports had been relying on first generation Air Traffic Control models which was basically two-dimensional representation of an Airport with less capabilities. Mathematical models were been used by researchers and development institutes to describe and check concepts of new Air Traffic Management for more than 30 years. Though they were developed to offset airspace capacity, sectorisation and controller workload.

SECOND TOPIC

To Replicate Airport in Models

A combined research efforts by Air Traffic Management (ATM) and some universities came up with a simulator model (Computer Aided 3D Design) aim at correctly replicating the airport in a computer. This gives ATC accurate information in 3D simulation presentation and with advance aircraft models as simulation quality improved. In addition, new generation of airport models include graphical representation featuring buildings and infrastructure on the airfield,

THIRD TOPIC

Needs for Modern Models

Both in evaluation operational and development, airport models present a high digitalise simulations and becomes important instrument to decision makers in their evaluation for any technical development.

- For the model to be fully functional it needs to be able to continuously increase and upscale computing power to simulate complete and complex scenarios, emulate precisely, allocation arrival and departure sequence and runway configuration, TMA/TRACON traffic with continuous descent approaches and RNAV procedures, ability to differentiate aircraft acceleration and de-acceleration pattern on realistic runway occupancy time, to emulate new wake turbulence concepts: dynamic separation rules, simulate taxi routing, exit and entry gates and stand allocation, advance ATM for processing and fast work flows within short period of time, well-structured airport process that include passenger flow and ground vehicle, easily modifiable graphical digitalise user interface providing a good visual representation of the simulation.

FOURTH TOPIC

Airport Simulation Building.

To build airport simulation it must go through rules. Procedures and operational rules are added to the model and as well traffic programme added. Rules can be conditional and can vary during a simulation run.

The following determine rules for each aircraft:

- The use of correct taxiways
- Departure sequence position
- When to line up and take-off
- Which TMA departure fix separation to apply

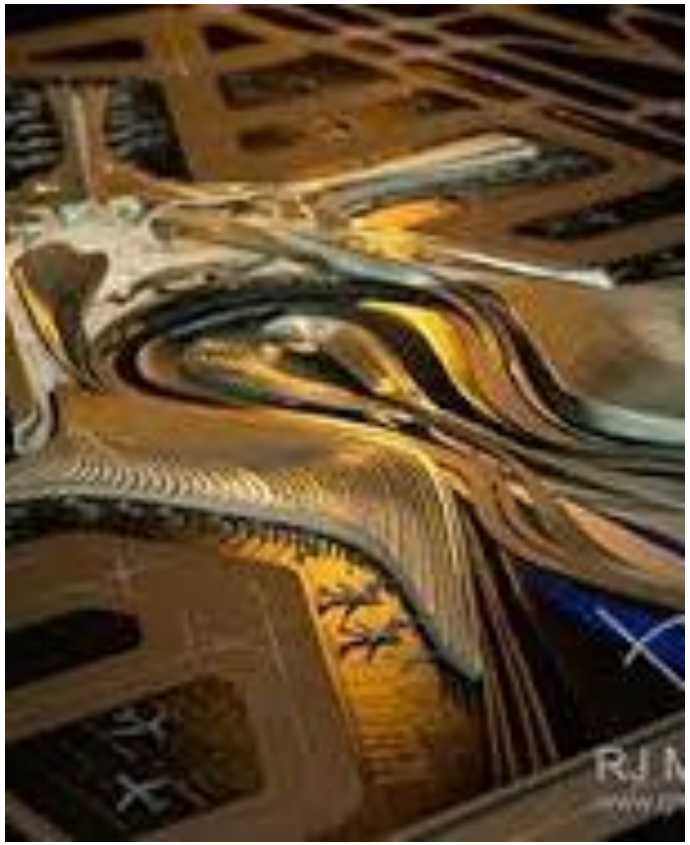
Call signs, scheduled arrival or departure times, aircraft types, gate assignments, etc are data's airport rely on. Though gate assignment can be rule-base depending on delay in departing aircraft due to another aircraft blocking the push-back, because of a departure queue at the runway. All of this can be address in simulation to ease airport workflow.

FIFTH TOPIC

State-of-the-art models Use.

As of today large airports are using models to validate new development plans in detail application from conceptual ideas. It became a lot easier building additional runway base on increase in capacity when validated by the model. With right key performance indicators (KPIs), this will give an airport expert easy understanding and document the impact on capacity, delay, taxi times, emissions and noise.

SIXTH TOPIC



Model as tool of Communication.

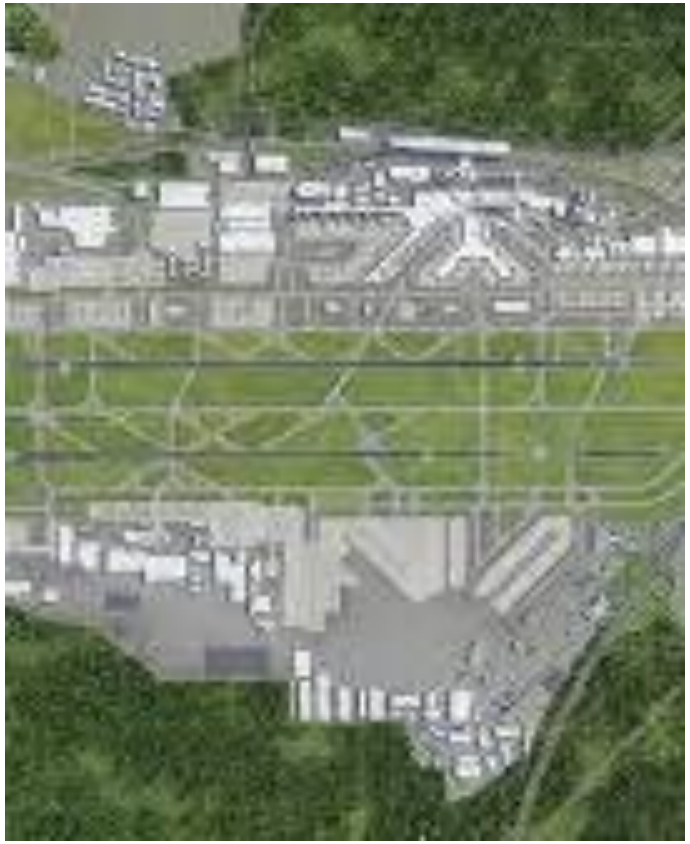
Airport model serve as communication too between non-experts. Managers, customers, airlines and even investors get a clear information when looking at the dynamic visual representation of the airport model far better than a normal paper plan.

SEVENTH TOPIC

Airport models best use.

It will be a good practice to keep different version models by operators representing a particular year for future development. It makes it easy to test impact of changes. e.g. in traffic demand or fleet mix, validate additional new applications, not only in the current environment but also in future environments, and therefore enable an agile and dynamic approach to the airport development.

AIR TOP SIMULATIONS AT FRANKFURT AIRPORT



Frankfurt Airport is a good example as they are fully using models to easy address schedules and workflow by the ATC. Future traffic programmes are well known. Permanent or temporary changes, or a combination of these, can be evaluated with very high accuracy. Changes to operations on the ground or in the air are only taken after evaluations by the simulator. The simulations are also used in discussions with the ATC service provider, giving the airport operator an in-depth understanding of the ATC aspects, including capacity and complexity issues. Fraport has, in order to ensure the best basis for taking actions that affect capacity, delay and complexity.

CONCLUSION

- Needs for Modern Airport Models (Computer Aided 3D Designs) as it's the best way to evaluate future development as airport operation increasingly complex.
- As the world is transforming from old to new technologies and increase in population, therefore airports needs latest models for simulation in order to meet the standards of current Air Traffic Management (ATM), Air Traffic Control (ATC), customers and investors.

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