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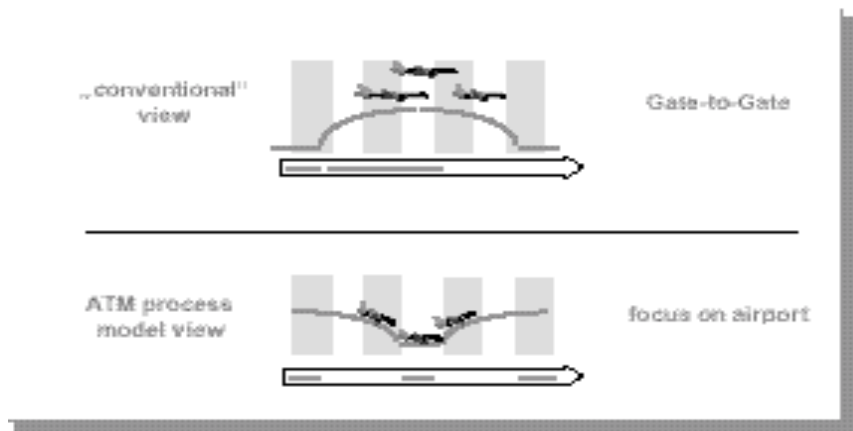
PaperTitle: *Data Flow Analysis and
Optimisation from Gate-to-Gate*

Author(s): Dr. Matthias Poppe, Dr. Georg
Bolz

Air Transportation -- Dr. Donohue

In their paper “Data Flow Analysis and Optimisation from Gate-to-Gate,” the authors Poppe and Bolz reveal the results of the Joint Air Navigation Experiments (JANE). They describe the main objective of JANE as: “. . . the evaluation and demonstration of a future ATM [Air Traffic Management] system and required components to provide support for decisions on new ground system and avionics” (2). Their intended end result is a conclusive assessment of potential areas for capacity improvement in the air and on the ground (airports)

In describing their experiment, the authors define what they call the ATM Process Model. Shifting from the norm, they employ an airport-centric view (which they dub “En-route to Airport to En-route) as opposed to the more



traditional Gate-to-Gate view (see figure 1). The main reason they chose this model is that it captures the objectives of the project more effectively than the conventional gate-to-gate model.

Figure 1: Different Views on the ATM Process

Moreover, in attempting to create a generic model, with the gate-to-gate model, two airports would need to be involved in the analysis. This would cloud the picture in terms of analysis. By focusing on the common features involved -- namely: arrival, ground handling, and departure phase, the authors were able to simplify most other variables and concentrate on those primary aspects of flight.

In terms of simulation, the authors used a single flight event as their lowest denominator. The next step involved transitioning from that single

process analysis to multiple event analysis. To do this, a flight event is created (at an entry point) and is allowed to run through the flight process (arrival, ground procedures, and departure). An analysis based on simulation can reveal:

1. Resource dependencies
2. Dependencies caused by process synchronization
3. Delays caused by high transport times of information
4. Bottlenecks caused by limited resources.

A second aspect of JANE is the dynamic analysis functionality. This allows users to modify parameters within a simulation to model specific scenarios. This calibrated model can then be analyzed with respect to:

- 1 Detecting capacity bottlenecks of resources
- 2 Detecting dependencies between resources and capacities
- 3 Detecting delays due to resource unavailability
- 4 Detecting the upper capacity limit (ceiling) of the analyzed ATM environment.

After using JANE, the authors present several areas for short and long term improvement. See table 1 for breakdown.

Table 1: Potential Improvement Areas

Type of Improvement	Description
Start-up Given and Push-back Requested (short term)	Automate/optimize the process in which the flight crew and tower exchange information pertaining to <i>when</i> the plane will be pushing back. Also include apron controller in information loop.
Actual Slot Usage (short term)	Eliminate penalty for carriers who cannot make their arrival slot

Actual Position and Gate Allocation (long term)	Create closer positioning of flights with high flow of transfer passengers
Arrival and Departure Management (long term)	Integrate and coordinate arrival and departure management to ensure punctuality and account for flow management, departure and arrival control and other variables which can change normal procedures

In closing, the paper looks ahead towards process improvements. Collaborative Decision Making (CDM), agent-oriented programming, and replanning and proactive control are all mentioned. To the authors' credit, each of these, in some capacity has seen great activity in the years since their paper was published. It is not yet known if the projections of their model will prove as proficient as they look ahead.

Personal Remarks

For a paper written in 1998, this paper was astoundingly accurate in its remarks about ATM. However, it seemed that their main premise of optimizing ground activities is more of an operations research question than a technological one. While they do make excellent points in terms of identifying *who* should be involved in decision-making efforts, they overstate the obvious by claiming that planes with a passenger volumes should be given gates closer to the terminal. This sounds utopian to me. Their comments coupled with CDM would probably yield marked results. However, taken alone, it is hard to find much to get excited about. Finally, as a measure of legibility, the lack of punctuation in the paper, made me reread several sentences looking for a clearer understanding. While the authors are European-based, if the paper has an english-speaking target audience, this should be corrected.

