

SPECIAL
POINTS OF
INTEREST:

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Workshop on Robust Airline Research

The snow-capped Rocky Mountains provided a spectacular backdrop as more than one hundred airline experts gathered this May for the 2007 AGIFORS Airline Operations meeting. [AGIFORS](#) (the Airline Group of the International Federation of Operational Research Societies) hosts several "study groups" each year—conferences at which members can share new technical developments and discuss evolving industry trends.

The Airline Operations meeting was particularly exciting this year, as it included for the first (but hopefully far from last) time almost two full days of technical sessions jointly hosted by the INFORMS Aviation Applications Section, and the [Industry Studies Program](#) of the Alfred P. Sloan Foundation. Organized by the AAS Vice-Chair, Amy Cohn, these sessions focused on the interface between airline planning and operations, especially during periods of disruption. As a group, we debated such important questions as: How do we measure robustness? What is the right trade-off between planned cost and operational flexibility? What characteristics of a schedule make it likely to perform well under system disruptions? How can the

propagation of delays be controlled?

The group of speakers represented a wide array of our membership—from the universities to the carriers to the airline vendors. Among these were three promising young scholars who seem poised to make a major impact in the future. Chunhua Gao is a new PhD from Georgia Tech (the student of Ellis Johnson) who joined Sabre Airline Solutions shortly after completing her degree. Oliver Weide is completing his dissertation with David Ryan at the University of Auckland, studying iterative airline scheduling. Geert de Maere of the University of Nottingham also presented his PhD research, which was awarded the meeting's "Best Innovation Award." We look forward to watching the progress of these three researchers in the years to come!

We hope that in the future, there will be even more interaction between these three groups, whose memberships and missions have substantial overlap. As conference organizer and AGIFORS President Michael Clarke reminded us all, "[Membership in AGIFORS is free!](#)" He also frequently reminded us of some of the key



perks of attending AGIFORS meetings—wonderful food, fun, and fellowship. From the opening reception's billiards and darts to the excursion to an old mining town (and nearby casino!) to more barbeque than you could ever eat at the local brewing company, there was plenty of opportunity to catch up with old friends, make some new ones, and do it all with a full plate and a full glass at hand!

We encourage all INFORMS AAS members to check out the AGIFORS and ISP web pages and to consider joining them both. We will be planning more joint events in the future and hope to see membership in all of these organizations continue to grow.

Hopefully, we'll see more of AGIFORS in Seattle in November, and that many more INFORMS members will join in the upcoming AGIFORS events in Seattle (August), Thailand (October), and many more exotic locations in the future!

*Amy Cohn, University of Michigan;
AAS Vice-Chair*



Promoting OR in Aviation: Read more at <http://www.orchampions.org/>

A Word from the Section Chair

Dear Colleagues,

I am very happy that we managed to publish another issue of the AAS Newsletter before the summer, and a big thank you to all contributors to this newsletter.

The front page article is a summary of the Working Meeting on Robust Airline Research that Amy Cohn, the AAS Vice-Chair, organized in conjunction with the 2007 AGIFORS Airline Operations Conference. I would like to thank Amy for initiating and organizing this successful event and all AAS members who participated

in the workshop and thereby promoted our section within AGIFORS. Thanks also to the AGIFORS Airline Operations Study Group for agreeing to hold yet another valuable joint meeting.

This newsletter also features an interview with the current AGIFORS President Michael Clarke. Michael talks to our former section chair, Diego Klabjan about the challenges of developing operations recovery solutions and why large airlines are still reluctant to use them. The interview runs on Pages 3 to 5.

On Page 7 you will find a list of upcoming conferences. I would like to invite you all to the INFORMS Fall Meeting in Seattle, November 4-7. Thanks to this year's cluster chair Thomas Vossen, we will have an exceptional Cluster on Aviation Applications with a record number of 19 sessions. Thomas provides highlights of the cluster on Page 5.

I encourage you to attend this year's business meeting in Seattle on Sunday, November 4. As I wrote in an earlier note, we intend to discuss whether AAS should become an "affiliated section" of the Transportation Science and Logistics Society (TSL) of INFORMS. As TSL and AAS both operate in the transportation and logistics

space, and we have, for several years, discussed and explored avenues to strengthen the ties between, and somehow integrate, the two entities. To ensure at the same time that they each maintain their own identity, we suggested the creation of an Affiliated Section concept to INFORMS, which is endorsed by the boards of TSL and AAS (for more details about this concept, please see the sidebar). Once accepted by INFORMS, the membership of AAS will discuss the proposal at the business meeting in Seattle and we plan to bring it up for a vote.

The call for entries for this year's Dissertation Prize can be found on Page 6. We are thankful to Barry Smith, Chief Scientist at Sabre Holdings, that he agreed to chair the Prize Committee.

Finally, we are always looking for new members and ask you to promote AAS among your colleagues and within your institutions. For inquiries concerning membership forms and fees, please contact Greg Coldren, the AAS Secretary and Treasurer.

As always, your input and feedback concerning section activities are very much appreciated.

Have a great summer,
Stefan

Proposal for Rules governing TSL Affiliated Sections:

- A Section can become a TSL Affiliated Section when mutually agreed upon by the Section and TSL.
- A TSL Affiliated Section will maintain its Section status within INFORMS, but the Section's members are considered to also be TSL members, and recognized as such by INFORMS, and they have all the standard rights and privileges of TSL members.
- A TSL Affiliated Section contributes a portion of the dues it collects (currently set to \$5 per member of the Section) to TSL. This contribution is used by TSL to support TSL activities (including prizes, business meetings, and providing financial support to SIGs and Affiliated Sections based on proposals received by TSL and available TSL resources). Other than the fee per member contribution to TSL, a TSL Affiliated Section has complete control over the dues it collects and will continue to provide its own accounting to INFORMS.
- The dues of a TSL Affiliated Section have to be at least as large as the TSL dues.

Interview with Michael Clarke, Sabre Holdings

Michael Clarke is Principal Research Scientist at Sabre Holdings, and currently serves as President of AGIFORS. He has over the years significantly influenced airline operations research.

Q. Can you briefly describe your career path?

I have always been fascinated by the global airline industry, and the complex problems faced by the major stakeholders, the airlines and the air traffic management entities. Originally, I was blown away by airplanes, and decided to study Aeronautics, and Astronautics (Aerospace Engineering) at MIT as an undergrad at the institute. During my junior year, I got introduced to the Flight Transportation Laboratory FTL (now the International Center for Air Transportation), and the rest is history. Even before I completed my undergraduate core engineering curriculum, I was busy taking classes at FTL in airport design, air traffic control, and airline management. When I entered graduate school, my focus gradually evolved from the traditional aerospace engineering perspective to a flight transportation view of the world. Fortunately for me, all the classes I wanted, and needed to take were available in the same department. As I took more and more classes at FTL, I realized that an important component of our research was concepts from the field of operations research. As such, I decided to complement my 'engineering' program with an additional master in operations research.

Q. Sabre has gone through many changes in the last decade, the most recent one the acquisition by a private equity firm. Have these changes had a significant impact on your working environment, culture within the organization, projects?

As the leadership team of Sabre Holdings often reminds us, one has to adapt

to change. Having said that, Sabre and all its predecessors are/is built on the notion of innovation, and the ability to solve business problems in the airline industry through the use of computer technology, advanced optimization techniques, and extensive industry knowledge.

As a member of the research group for my entire tenure at Sabre, I have had the special 'benefit' of independence, the freedom as an individual contributor to pursue whatever avenue is necessary to solve a given problem, and on my own timeline. If it means spending time with developers to help build out production code, if it means going on sales and marketing trips to promote new concepts to our key airline clients, if it means facilitating on-site training sessions with clients to educate about the benefits of our technology, it will be done, all in the name of achieving success. This has not changed, and has survived all the re-orgs, sales, acquisitions, mergers, and now privatization.

As we have evolved to being a globally focused company, we have had to adjust to distributed work teams, and all the benefits, and disadvantages that go with it. But one thing remains the same, as long as you are committed to your client, and understand their business needs, you will succeed in the project.

Q. You have devoted most of your career on airline recovery related problems. You are the lead developer behind Sabre's recovery solutions. What were the main challenges in developing the product and what are the main challenges in placing it on the market?

People often say that airline operations are the final frontier in the application of advanced operations research based solutions in the airline industry. For the past three decades, a lot of emphasis and research has been placed on the planning process, including advance-

ments in fleet assignment, crew scheduling, and revenue management. In all these cases, most of the data and information necessary to make a decision is known and/or can be determined with well established process and procedures. There is ample time available to spend to find the optimal decision, and airlines are comfortable with waiting for the right decision. In addition, there is room to re-work the output of the decision process if there is a problem. For example, if the revenue management systems is off, there is the ability for the airline to sell depressed inventory prior to departure.

In the airline operations arena, airlines have traditionally relied on the vast experience of seasoned airline controllers to make real-time decisions with the prevailing information. The key point here is real-time decisions. Although decisions made on the day of operations are far more complex, airlines demand quick decisions. Their complexity is driven by the close interaction of different aspects of the airline's operations, with little room for error. Because safety plays such an important (and validly so) role in decision making for airline operations, controllers and dispatchers are held accountable for all decisions they made. If they are not comfortable or don't fully understand how a given decision is made, they will be very wary to implement or deploy the proposed solution or suggestion. Another aspect to consider is that airline controllers often are not aware of the financial impacts of their decision. Again, they are driven first and foremost by safety, and then by what works best for their individual utility. The idea here is to change what they consider to be their utility - what's important to consider in making a schedule recovery decision.



The global airline industry's fuel bill grew by US\$21 billion to US\$111 billion in 2006 (accounting for 26% of operating expenses at US\$65/barrel Brent of oil). Air transport's contribution to climate change is small. It is responsible for 2% of CO2 emissions but supports 8% of the global GDP.

Source: iata.org

Featured Interview (from Page 3)



Airline Facts

As at the end of 2006:

- 2,092 airlines worldwide
- 23,000 aircraft
- 27.8 million departures per year (scheduled carriers)
- serving 3,754 airports
- 160 air navigation service providers

Source: iata.org

Q. Why are larger carriers reluctant in using more sophisticated recovery tools?

The traditional airline organization is built on the notion of divide and conquer. In that, each business role is separated into its own department with its own set of guidelines, metrics, and business objectives. As an airline grows in size, these departments only get big, and more and more isolated from each other. As a result, decisions made in one department don't make it across the dividing line in a timely fashion, and poor decisions are made from a global perspective. Within the airline operations control center, airlines often sub-divide their operations by hubs, or regions even though the schedule was planned and developed by equipment type. As a result, many sub-optimal decisions are made in the interest of getting a quick solution to prevailing problems.

Based on our past experiences, and research in the field, we (along with most of our competitors) have approached solving the schedule recovery problem from a global perspective. In many cases, airlines find it hard to understand and appreciate the benefit of this approach to the problem, and often will compare what's done with the recovery tool against what they would have done in the same scenario. Sometimes it's like comparing apples to oranges. On a more serious note though, I think that larger network carriers are often constrained by their contractual agreements with crew members, and established business processes which limit what can be

done in a dynamic state. If you compare this to newer value based and regional carriers, I would say that this is the biggest hurdle for acceptance of integrated schedule recovery tools at larger established carriers.

Q. We are only at the beginning of the busy summer travel period, yet the delays and cancellations are already mounting. In your opinion what should the airlines and FAA do in order to decrease them?

It may sound like a cliché, but one always has to learn from your past, and truly understand how your business operates. I am often amazed when I travel throughout the US domestic network how airlines create their own problems by poorly planning their operations. In the last couple of years, some carriers have started to appreciate this notion, and made some effort to incorporate 'robustness' into their operations. Why schedule tight aircraft turns on a summer afternoon in Atlanta (ATL) or Chicago (ORD) when the likelihood of an afternoon thunderstorm is almost 100%? Is the perceived time savings, and increased aircraft utilization worth the risk? Airlines need to better schedule their resources, and create opportunities to isolate problem areas in their network without compromising too much on profitability.

The impact of air traffic management decisions on airline operations is without question immense. The FAA has tried over the years to incorporate airlines into to the decision making process through programs such as the

'Collaborative Decision Making' initiative which has helped the cause. Last summer, they introduced and tested new flow restrictions at cruise which helped mitigate the congestion within the terminal area. A system-wide rollout of this concept should help airlines reduce unnecessary airborne delays, and fuel consumption.

Q. You have always been a firm believer in robustness. Based on the propagation of current delays and cancellations it seems that the airline schedules are very fragile. Why do airlines have a hard time grasping the concept of robustness?

Going back to the point about an airline's organization and structure, each department's business objective is usually driven by one dimension. In the case of the capacity planning department, that one dimension is perceived profitability based on assumptions of perfect blue sky operations, no crews calling in sick, no unplanned maintenance events, no disruptions to the schedule. Even though they have to live through these realities day, after day, the lessons learned from these experiences don't make their way back to the planning process. Airlines find it difficult to trade-off between profitability and reliability, when they see one a 'certain' and the other as 'probable'. In reality, they have a sense which one is wrong. In order to overcome this disconnect, we see the need to develop effective schedule evaluation tools which will enable an airline to truly understand the reliability and achieved profitability of a

Preview of Aviation Applications Cluster in Seattle



As the (extended) deadline has drawn to a close, this year's Annual Meeting promises to include another exciting collection of sessions and talks in the Aviation Applications Cluster. The number of sessions in our cluster has been increasing steadily over the last few years, and I am very pleased to announce that we will have what appears to be a record number of 19 sessions in our cluster this year.

These sessions cover the full spectrum of activities in our section, with contributors from academia,

industry, and government. In a joint event with the Alfred P. Sloan Industry Studies Program, for instance, our vice-chair Amy Cohn will chair a session on robustness and recovery in passenger aviation. Not to be outdone, section chair Stefan Karisch will lead a panel discussion on research challenges in aviation prior to our business meeting on Sunday evening. With participants from both industry and academia, this promises to be a "can't miss" event. These, however, are just a few of the many topics that will await you. From Air Traffic Management and Airport

Operations to Airline Optimization and Air Traveler Behavior, there is sure to be something of interest for everyone.

Overall, I would like to say that it has been very encouraging to see the overwhelming response to the solicitation for talks, and I thank the session chairs and presenters for their much-appreciated contributions. I look forward to seeing all of you in Seattle this fall!

Thomas Vossen, University of Colorado; 2007 AAS Cluster Chair.

This year's Aviation Applications Cluster will feature a record number of 19 sessions and will be a "can't miss" event!



Featured Interview (from Page 4)

given schedule. Only then will airlines buy into the notion of robust scheduling.

Q. You are the current AGIFORS president and the chair of the Operations Study Group. Your study group is nurturing an established interaction with AAS, however this seems not to be the case for the remaining study groups. Do you have any suggestions on how to establish a closer tie among the other study groups and AAS?

In life, interaction is based on relationships, and flourish when there is a strong personal relationship. The collaboration between the

AGIFORS Airline Operations Study Group and the INFORMS Aviation Applications Section dates back to 2004 when they were being run by the Clarkes. When John-Paul Clarke was the president of the AAS section, we thought of the idea to co-host sessions to better foster an interaction between the two groups, who share a common interest. AGIFORS has been traditionally airline folks with an interest in operations research, and INFORMS AAS has been operations researchers with an interest in the airline industry. Based on this simple difference, they have varying perspectives on a given problem. One is focused on optimality, the other is focused on practicality.

However, I should point out that both are equally important in ultimately solving the business problem.

The successful collaboration of the airline operations and aviation application section is based on each entity understanding and appreciating each other's perspective. As more and more individuals attend the 'other' meeting, they slowly realize that they are in the same chapter, just maybe not on the same page, at least not as yet.

Interview by Diego Klabjan, University of Illinois; AAS Past-Chair

Announcements



Air Transport Efficiency

- Aviation occupancy rates of 76% (2006 industry load factor) is more than double those of road and rail
- Air Transport entirely covers its infrastructure costs (\$43.5 billion/year)
- Modern aircraft achieve fuel efficiencies of 3.5 liters per 100 passenger kilometer or 67 passenger miles per gallon

Source: iata.org

2007 Dissertation Prize - Call for Entries

The Aviation Applications Section of INFORMS awards a prize for the best dissertation in any area related to aviation OR (air traffic management and airline). The winner will receive a plaque and an honorarium of \$500; other finalists will receive an honorable mention and a certificate.

Doctoral dissertations meeting the following criteria are eligible for consideration:

- The dissertation must be completed and submitted between June 1, 2006 and May 31, 2007
- The dissertation must be in an area relevant to aviation research or practice

Application Process

Submit the following documents in portable document format (PDF) via email to Barry Smith, the committee chair, before midnight July 31, 2007:

- The completed dissertation
- An extended abstract (4 to 5 pages) describing the work and its relevance
- A letter of nomination from the dissertation supervisor supporting the submission and highlighting the contribution of the research
- A short paper (20 to 25 pages, double spaced) that is

based on the dissertation (if such a paper is available).

Committee Chair

Barry C. Smith
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Other Committee Members: Amy Cohn, University of Michigan; Laurie Garrow, Georgia Institute of Technology; Milind Sohoni, Indian School of Business

For more details, please visit the AAS website at <http://www.informs.org/Prizes/>

2006 Dissertation Award

The recipient of the annual dissertation award for the outstanding Ph.D. dissertation related to aviation in 2006 is Mattias Grönkvist from Chalmers University of Technology, Gothenburg, Sweden. In his dissertation titled "The Tail Assignment Problem", under the supervision of Professor Dag Wedelin, Department of Computing Science at Chalmers, Mattias presented mathematical programming and constraint programming based approaches for the entire aircraft planning process, from fleet assignment to the day of operations. Com-

putational evidence on real-world tail assignment instances demonstrated the validity of these new approaches which are currently used at two medium-sized airlines.

We are thankful to the chair of the selection committee Professor Mark Hansen and all the committee members for their efforts and thorough job in selecting the best nomination among several candidates.

Stefan Karisch, Jeppesen; AAS Chair.



Mattias Grönkvist receives the award from the Prize Committee

Minutes from the Pittsburgh Business Meeting

November 5, 2006; 6:15pm

Approximately 30 were in attendance.

Secretary/Treasurer Amy Cohn began the meeting, welcoming everyone and "opening the bar."

Wine and good cheer were shared until Chair Diego Klabjan arrived, late due to flight delays.

The irony of this was duly noted.

Diego presented a slide show reviewing the year's highlights, including the newsletter, membership drive, and last year's

industry panel at the San Francisco INFORMS meeting.

Amy Cohn presented a summary of our financial situation.

Greg Coldren reviewed the sessions for this INFORMS meeting -- a record number of talks -- and thanked those organizing sessions.

The dissertation prize was awarded to Mattias Gronkvist for his thesis titled "The Tail Assignment Problem".

Elections were held, with no dangling chads or other voting irregularities. The new chair is Stefan Karisch. Vice-chair is

Amy Cohn. Secretary/Treasurer is Greg Coldren. Cluster chair is Thomas Vossen. Webmaster is Senay Solak.

The meeting concluded with a discussion of the issues associated with becoming a special interest group (SIG) in the Transportation Science and Logistics Society. Society President Cindy Barnhart was present to provide the TSL perspective.

Amy Cohn, University of Michigan; AAS Secretary & Treasurer (2005-2006).



Upcoming Meetings

- INFORMS: <http://meetings.informs.org>
 - International Meeting Puerto Rico, July 8-11, Rio Grande, Puerto Rico
 - Annual Meeting, November 4-7, Seattle, Washington, Seattle07
- AGIFORS: http://www.agifors.org/event_home.jsp
 - Crew Management Study Group, August 19-22, Seattle, Washington.
 - 47th Annual Symposium, September 30-October 5, Bangkok, Thailand.
- Other Events:
 - TRISTAN VI - Sixth Triennial Symposium on Transportation Analysis, June 10-15, Phuket, Thailand; <http://tristan.epfl.ch>
 - Eight Workshop on Models and Algorithms for Planning and Scheduling (MAPSP 2007), July 2-6, Istanbul, Turkey; <http://mapsp2007.ku.edu.tr>
 - EURO XXII—22nd European Conference on Operational Research, July 8-11, Prague, Czech Republic; <http://euro2007.vse.cz>



Aviation Applications Section

Aviation Applications Section

Institute for Operations Research and the
Management Sciences
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<http://aviation-appl.section.informs.org>

Exchange ideas in aviation.

AAS is a venue to promote the exchange of ideas, research, and accomplishments in aviation applications.

We invite interaction among industry professionals, educators, and students in areas including, but not limited to:

- the planning and operation of airports and airline companies
- air traffic control
- aviation financial, economic and policy analysis
- human factors
- the future of aviation.

Contact Stefan Karisch, Chair, for more information at stefan.karisch@jeppesen.com.

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