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# AAS Newsletter

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## Fuel: Airline Industry Quo Vadis?

IATA has predicted airline losses of up to \$6.1 billion this year at current oil prices. At the 64th Annual General Meeting and World Air Transport Summit in Istanbul, IATA DG and CEO **Giovanni Bisignani** spoke about an "extraordinary crisis" faced by the world's airlines brought on by soaring fuel prices and slowing traffic growth.

Mr. Bisignani compared the airline industry to Sisyphus. "After a long uphill journey a giant boulder of bad news is driving us back down," he said, citing "the spreading impact of the US credit crunch" for hurting traffic growth. The industry's total 2008 fuel bill is expected to be \$176 billion, \$40 billion more than last year. "There are no easy answers," Mr. Bisignani said, stating, "There is no fat left" in airline budgets after six years of cost-cutting.

Is there anything that operations research can do? This is a question that we will try to answer during a panel discussion at the upcoming Annual Meeting in Washington, DC. Below are some initial thoughts from representatives of academia and the industry.

**Erik Andersson**, Cofounder of Carmen Systems and now Business Solution Architect at Jeppesen, considers high fuel prices a good thing. "A high fuel price is

not the problem. The problem is that we're running out of oil, and the high price is in fact the solution to that problem. The huge impact of fuel price on airline profitability is just a sign that the market does not work. If it worked properly, ticket prices would follow fuel prices upward and the market for air-travel would grow more slowly or even shrink a little. Since this needs to happen anyway for different reasons this is just good news."

Mr. Andersson wants OR professionals to help facilitate the transition to a more functional market. One way would be the design of new regulation mechanisms like slot exchanges or legislation that require passengers of all airlines to pay for their share of fuel separately. He argues that if futures markets have helped pump up fuel prices as some argue, then maybe some open market for trading air-travel can do wonders for ticket prices. OR tools could also facilitate more flexible crew contracts and aircraft leases to make the process of reducing capacity less painful. Good operations research tools and analysis are key to all these processes.

"The best news for OR," according to Mr. Andersson, "is that once the competitive airline environment works efficiently, the

### Aviation Applications



airline with the best operations research technology will gain a big advantage over those with less good technology. I am convinced that operations research work will command a much higher value in such an environment than it does today, so making the market work should be our first priority."

**Michael Ball**, Professor at the University of Maryland and currently on sabbatical at the University of Berkeley, sees an inevitable increase in airline costs due to rising fuel costs. He states, "I feel that airlines have pretty much squeezed out every ounce of efficiency within their current operational paradigm. There are two somewhat drastic changes that I think can help: consolidation within the industry and change in fleet composition with a corresponding change in how markets are served."

Prof. Ball feels that consolidation within the US domestic airline industry will be good both for the airlines and the consumers. However, he acknowledges that there are many opinions on this

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

## A Word from the Section Chair

Dear Colleagues,

Fuel is on everybody's mind these days and we dedicate the feature article of this newsletter to this topic. We asked representatives from academia and the industry what OR could do to help the airline industry during this time of record oil prices. We are going to follow up on this question with a panel discussion at the Fall Meeting.

Thanks to this year's cluster chair Anne Mercier, a new record number of 24 sessions will make up the Aviation Applications Cluster at the Fall Meeting in Washington D.C., October 12-15 – see the pre-

view on Page 5

Another highlight of this newsletter is an interview with John-Paul Clarke, AAS Chair from 2002 until 2004. Under his leadership, AAS transformed from a comatose state into a vibrant community and we are still reaping the benefits of his work.

We are thankful to Francois Soumis from École Polytechnique Montréal that he agreed to chair this year's Dissertation Prize Committee. An announcement for last year's winner can be found on Page 10.

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 Col-dren, the AAS Secretary and Treasurer.

Finally, we have adopted by-laws that now reflect the way our section has operated for quite a while. The new bylaws are included in this newsletter on Pages 10 and 11.

I would like to thank all who contributed to this newsletter and wish all readers a great summer!

Be safe,  
Stefan Karisch

### About Fuel



- Provisional estimates indicate that the global airline industry's fuel bill grew by US\$25 billion to US\$136 billion in 2007 (accounting for 29% of operating expenses at US\$73/barrel Brent of oil).
- This is an increase of more than 300% on 2003's fuel bill of US\$44 billion (that accounted for 14% of operating expenses at US\$28/barrel Brent).
- In 2008 the fuel bill is forecast to grow to US\$176 billion (accounting for 34% of operating expenses at US\$106.5 per barrel Brent) due to:
  - Traffic growth
  - Increase in oil price and the renewal of fuel hedging contracts at higher prices
  - An increase in refinery margins of \$18 billion (compared to 2003 level)
  - Offset, in part, by further efficiency gains in fuel use made by airlines

Source: [iata.org](http://iata.org)

## Fuel (from Page 1)

topic and any mergers will be greeted with significant government scrutiny. He continues to say that, from the government and passenger perspective, research is needed that projects the impact of mergers 1) on the markets served and the quality of that service, e.g. frequency, and 2) on ticket prices, and "while this research certainly will have an economics perspective to it, I feel OR can play a big role. From the airline perspective we need research on the best way to combine two very large airlines -- obviously there are many good OR problems here."

He views the US fleet mix to be pretty far away from the "sweet

spot" in terms of fuel usage per passenger mile. For a variety of reasons, there has been a trend toward higher frequency in city-pair markets and greater use of regional jets. This is not necessarily a strategy that minimizes fuel consumption. Prof. Ball suggests research to determine how airlines can adjust their presence in certain markets while employing a different fleet mix, e.g. change from 8 flights per day with regional jets to 4 flights per day with 737's (or even 787's). He acknowledges of course the huge costs involved in changing an airline fleet both in terms of capital investment and in pilot costs and the fact that fleet mix

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# Fuel (continued from Page 2)

changes do not happen quickly. However, the current crisis could be just what is necessary to spur changes in this area. He concludes that this is clearly a fertile area for OR models and problem-solving.

**Cynthia Barnhart**, Professor at the Massachusetts Institute of Technology and President of INFORMS, thinks that in response to soaring fuel costs, operations researchers, armed with optimization models and methods, can: 1) determine the best aircraft to be pulled from service and the associated timing for doing so; 2) redesign airline flight schedules and fleet assignments to maximize profit, given fewer available aircraft and rising fuel costs; 3) optimize flight paths and speeds to balance fuel costs and resource productivity; and 4) develop new operating paradigms to reduce fuel burn.

**James Bonn**, Operations Research Analyst at the Federal Aviation Administration, says: "From my perspective, what I can say is that OR can help the FAA help the airlines and consumers."

He sees OR being used more and more in the FAA to help identify which new air traffic control tools and procedures could make an impact and where they would make the largest impact. The Air Traffic Organization in the FAA has recently transitioned to become a performance-based organization with many of the performance measures related to helping their customers, namely, the airlines and consumers. He states, "It is in all of our interests to reduce the excesses in the system as it stands today, whether we are talking about excess distance, time, or fuel burn. That said, the FAA must also weigh the political aspects of the choices.

"Not all optimal solutions are politically implementable. As examples, building a new runway or implementing airspace design changes often have more political barriers than cost/benefit issues. At the FAA, it is our responsibility to take those politi-

cal issues into account."

He concludes, "While the phrase 'We're the government, we're here to help' often inspires terror in people, I like to think that we at the FAA are well intentioned and, with the help of OR, getting smarter in our actions. Hopefully we can really help."

**John-Paul Clarke**, Associate Professor at Georgia Institute of Technology, states: "The high cost of fuel has been a two-edged sword to the airline industry. One side of the sword has cut the tenuous hope of the airlines that profitability might be achieved in the near future. Simply put, the higher cost of fuel has caused massive increases in operating costs, precipitated an economic downturn which has reduced demand, and provided ample evidence that the traditional business model--where market share was aggressively pursued without regard to the consequences of excess capacity--was not tenable in the long term. The other side of the sword, has facilitated long overdue capacity rationalization that might ironically provide much needed relief from the dire straits in which airlines currently find themselves. Airline executives have known for a long time that there was too much 'seat capacity' in the system but they have been reticent to downsize their operations for fear that other carriers, especially low cost carriers, would utilize the airport capacity that they would be giving up. They are now able to downsize their operations because the high fuel cost has hit everyone, even those who have hedged their fuel at lower cost, thereby providing the impetus to overcome the 'tragedy of the commons' that existed up until recently."

**Michael Clarke**, Director of Optimization Solutions at Sabre Airline Solutions and President of AGIFORS, states: "In today's global airline industry, fuel costs account for almost 40% of the direct operating costs on a carrier. While fuel has always been one of the top operating expenses,

## Environmental Impact

Air transport's contribution to climate change is small: 2% of global CO2 emissions, forecast to grow to 3% by 2050 (IPCC).



All modes of transport combined account for 23% of CO2 emissions of which

- Road 74%
- Air transport 12%

The target fuel consumption for the Airbus A380 and Boeing 787 compares favorably with a small family car - less than 3 liters per 100 km

Source: iata.org

today it forces airlines to actively rethink their route structure, develop better processes and procedures for managing their daily operations, and adjust their flight planning objectives to conserve on fuel versus providing the 'fastest' route to a given destination."

He adds that over the years, the application of operations research techniques has played an active role in helping airlines better schedule their fleets, crew members, and ground resources, as well as been a key ingredient in revenue management. Opportunities have existed for OR practitioners to look at new areas of research such as schedule/network design and dynamic scheduling based on rapidly changing market conditions. Mr. Clarke argues that today, external factors (such as fuel costs, mergers and acquisitions, bankruptcies, and pending environmental policies) only magnify the need for the OR community to refocus energies on the next frontier. He acknowledges that some academic practitioners have started to look at some of these valuable concepts, but observes that the airline industry as a whole has been very slow to embrace, much less adopt, any of these beneficial ideas in their operations. He adds, "But with adversity, come opportunities."

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### Airline Facts

At the end of 2007:

- 3,256 airlines worldwide
- 23,913 aircraft
- 29.3 million departures in the year (scheduled carriers)
- Serving 3,797 airports
- 160 air navigation service providers

Source: [iata.org](http://iata.org)

## Fuel (continued from Page 3)

Mr. Clarke concludes, "Regardless of the future direction of fuel prices, and other external factors relative to the airline industry, one thing is blatantly clear, the airline industry of the future will be only operationally successful if the major players rely on more efficient network systems that can rapidly adapt to changing marketing/competitive forces. As OR practitioners in the aviation field, we need to rise to the occasion, and play a more active role in shaping the next generation of decision support tools that will enable these airlines to effectively compete, generate profits and provide a return on investment."

**James Diamond**, Managing Director of Operations Research and Decision Support at American Airlines describes the fuel situation as: "Every one-cent increase in the price of jet fuel costs American Airlines \$33 million annually. Over the past year, we have seen our fuel bill rise by more than \$3.5 billion dollars. Fuel now represents the largest single operating expense we have."

"We have been and will continue to look for every possible way to save a gallon here and a gallon there, because, for an airline our size, it quickly adds up. For each pound of extra weight removed from an aircraft, for example, AA saves about 20 gallons of fuel annually. That equates to 14,000 gallons of fuel annually for AA's fleet of 700 aircraft. If 100 pounds of unnecessary weight is taken off each aircraft, AA could save

almost \$2.8 million annually."

Mr. Diamond indicates what OR can do, "It's all about leverage, and doing everything we do just a little better. On the revenue side, that means improving our capacity planning and revenue management models and systems."

On the cost side, and specifically regarding fuel, it means improving load planning forecasts (weight), tweaking fuel ferry models, and improving flight planning capabilities so that American Airlines is consistently flying the most efficient routes and loading just the right amount of gas – not a gallon less, not a gallon more – to account for planned fuel burn as well as contingencies and FAA requirements. He believes that planning a robust schedule and running a dependable operation also helps keep costs down by reducing congestion on the ground and in the air, both of which contribute to unnecessary fuel burn. He thinks that OR can help in all of these areas, and more.

Mr. Diamond concludes, "We haven't found the silver bullet, and a lot of this is easier said than done, but I believe that there is still plenty of room for OR to help airlines close the gap (or at least slow the increase) between revenues and rapidly rising fuel costs. We just have to keep looking in the usual and not so usual places."

**Jody Hoffer Gittel**, Associate Professor at Brandeis University, states: "I agree that after years of cost cutting, there is

little fat left in the traditional sense. Labor in particular has been pushed to the limit, given that the primary cost-cutting focus of the legacy airlines has been on labor costs. Indeed, we see continued rises in total (non-fuel) costs even while there have been dramatic declines in labor costs. But there remains tremendous waste in certain key areas, such as off-schedule operations. As we know from the total quality literature, poor quality is costly, and the current high levels of off-schedule operations create additional costs that could be saved if airlines and their employees placed a greater focus on 'getting it right the first time'.

Prof. Hoffer Gittel adds two examples: "Returning recently from Caracas to Boston, one flight was cancelled and the other was delayed by an hour, both due to mechanical problems. In both cases, the entire flight was loaded and ready to push back before the problems were noticed. The resulting capital costs of underutilized aircraft and labor costs of re-booking people and re-loading baggage are costs that should be taken seriously given that there is little to no fat left. But to improve reliability will require a greater engagement of employees, and a renewed effort to build teamwork and coordination across functions. This is the path airlines should pursue to cut costs further -- the required investments of time, money and effort will yield more sustainable results than simply cutting wages and benefits."

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# Preview of Aviation Applications Cluster in Washington, DC



The next Annual Meeting in Washington D.C. promises to be another great year for aviation applications. The number of sessions in our cluster has increased again this year to a new record number of 24 sessions. This flourish of activity is a testimony to the lasting role played by OR & MS in the aviation sector.

Because of the great enthusiasm created by the panel discussion led by our section chair Stefan Karisch last year, the event will take place again this year right before our business meeting on

Sunday evening.

A greater number of co-sponsored sessions with the Transportation Science & Logistics (TSL) cluster will be seen in our cluster this year, showing the increased collaboration between the two entities. There will also be two joint sessions with the Revenue Management (RM) cluster on Passenger Choice Models and Pricing. Aviation is unquestionably a great field for RM applications. A joint event with the Alfred P. Sloan Industry Studies Program on Robustness in Airline Planning will again be chaired by our vice-chair Amy Cohn. Last year, it was a standing room event! Finally, the Quality, Statistics, and reliability (QSR) cluster will co-sponsor a session on Service Quality Improvements.

These joint sessions are just a few on top of all the regular sessions covering the full spectrum of activities related to aviation, with contributors from academia, industry and government.

I thank the session chairs and presenters for their much appreciated contributions. Their quick responses were especially appreciated this year since there was no extended deadline as in the past. I look forward to seeing you all in Washington D.C. in October.

Anne Mercier, *Ex-Pretio Technologies, 2008 AAS Cluster Chair*

***This year's Aviation Applications Cluster will feature a record number of 24 sessions and will again be a "can't miss" event!***



## Fuel (continued from Page 4)

**Lonny Hurwitz**, Manager of Network Scheduling at Southwest Airlines, states: "Our industry is more complicated, competitive and expensive than it's ever been. The survivors will likely be the few that can find clarity in the fog of conflicting information, and then be swift in taking the right actions. We live in an environment where small improvements pay off in large dividends when spread over thousands of operations. Effective operations research enables the discovery and execution of these small improvements, and perhaps even the occasional 'silver bullet'."

**Christoph Klingenberg**, Senior Vice President Direct Services at Lufthansa, states: "The first thing that comes to my mind when I think of fuel wasted is the fragmented air-space structure, especially in Europe, making

it necessary on many city pairs to fly significantly off the great circle. This sometimes can cost 20% more fuel than the minimum. So OR could help carving out a new air-space structure that minimizes deviation from great circle flying and takes political constraints into account."

He adds, "Secondly, especially on long haul flights, we are already investing a lot in software using state-of-the-art OR methods that calculates optimal speeds for a given schedule, but if the fuel price levels at above 100\$, I see the need for the general recalculation of scheduling premises taking all cost effects into account - probably leading to longer scheduled block times."

**Julian Pachon**, Director of Airline Operations at Navitaire, states: "With fuel now representing over 35% of airline costs, carriers

are looking for every opportunity to shave consumption. Many carriers are adopting a variety of operational measures to help accomplish this, such as: minimizing ground burn by reducing APU use; using a single engine to taxi; balancing aircraft passenger and cargo loads further aft of center for better efficiency; filling potable water to 75 percent full to reduce aircraft weight; and replacing aircraft components such as seats and cabinets with lighter weight materials."

Mr. Pachon adds that these operational savings have their limits, and that airlines need to continue to search for additional ways to trim total fuel cost. His answer is to use more optimization technology to augment operational measures. One such option for further consideration is fuel tanker-

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### Air Transport Efficiency

- Aviation occupancy rates of 77% (2007 industry load factor) are much better than those of road and rail
- Air Transport entirely covers its infrastructure costs (\$43.5 billion/year)
- Modern aircraft achieve fuel efficiencies of 3.5 litres per 100 passenger kilometre or 67 passenger miles per gallon

Source: [iata.org](http://iata.org)

## Fuel (continued from Page 5)

ing based on new optimization models. He believes that there is an opportunity to include tankering decisions in the aircraft routing planning phase to allow airlines to develop and assign aircraft routings based on the best cost tankering options. By initially assigning the aircraft routings based on potential tankering advantages during the planning phase, carriers can further optimize the tankering alternatives with fewer scheduling constraints as the departure date draws near.

He concludes, “Now that fuel costs have surpassed crew costs – and appear to be destined to continue to escalate– it is evident that the largest cost for the airlines is not being factored into the aircraft planning phase. An accurate tankering decision includes a lot of specific data that is only known close to departure. However, if the initial aircraft routings can be constructed to incorporate the right sequence of optimal fuel price stations, this can enable an airline to build in flexibility to allow the aircraft to be fueled in less expensive stations without schedule disruptions potentially even on the day-of-flight. We believe this can result in a substantial cost difference to deliver improved operational and financial performance.”

**Krishnan Saranathan**, Managing Director of Enterprise Optimization at United Airlines, states: “With crude oil price hovering around \$140/barrel and a weakening economy, there is enormous financial pressure on the airline indus-

try. The industry is focused on resizing the business – reducing fleet size and grounding old and less fuel efficient aircrafts, rationalizing capacity to eliminate unprofitable routes and bring pricing power back to this industry.”

Mr. Saranathan considers analytics and optimization as playing an important role in supporting this capacity rationalization effort. Modeling efforts drive expected changes in markets sizes and average fares that are critical to accurately estimate profitability at a route level. Specifically, elasticity models offer insights into expected fare changes and related market size changes; network optimization and simulation models predict the changes in demand mix, bid prices and resulting yield changes. He also believes that optimization models – Fleet Planning and Fleet Assignment in particular - continue to play a key role in planning airline networks for the future.

Mr. Saranathan sees flight planning also as a key area of focus with current fuel prices. He says: “Complex optimization algorithms are leveraged to determine optimal flight paths that minimize operating costs that take into account weather patterns, aeronautics of the aircraft, airspace congestion and constraints and navigational charges.”

**William Swelbar**, Research Engineer at MIT’s International Center for Air Transportation and one of the creators of the MIT Data Project states: “It is

absolutely true that there is little fat left in airline budgets. That being said, many processes and procedures in selling air transportation have been in place for decades. Over time inefficiencies can compound themselves and my guess is that there are any number of functions that could be transformed inside of any airline. In the coming years, global alliances will evolve and possibly global mergers will emerge. Today’s industry and business practices recognize borders. Tomorrow industry may not and that would also seem to present opportunities in OR. Simply, anything that can be done to improve the air travel proposition for the paying customer in the face of increased prices will prove necessary as airlines sell time savings.”

In Mr. Swelbar’s view, the opportunities for operations research are without boundaries given the fuel price headwind. Just as airlines are unbundling the services provided in the transport of people and goods, and charging for those services that contribute to the consumption of fuel, each successful company is being challenged to examine closely each and every function performed in the provision of air transportation. He concludes that, “the opportunities are not limited to airlines and airplanes. They must include the airport experience for passengers; the security aspects; and border control as well.”

*Amy Cohn, University of Michigan  
Stefan Karisch, Jeppesen*

# Interview with John-Paul Clarke, Past-Chair of AAS

John-Paul Clarke is an associate professor in the School of Aerospace Engineering and director of the Air Transportation Laboratory at Georgia Tech. His research and teaching focus on the development of new approaches to optimization and control, and system analysis and design; with the aim of maximizing the efficiency of the global air transportation system while simultaneously minimizing its societal impact (especially on the environment). He served as Chair of AAS from 2002 until 2004.



**Q. What made you decide to pursue a career in O.R.? In particular, what attracted you?**

A. I got into O.R. because of my brother, Michael Clarke. He and I lived together from the day my parents brought him home from the hospital through the end of graduate school, except for my freshman year when he was in his last year of high school. It was during graduate school, when he started taking classes at the MIT Operations Research Center, that I realized there was such a thing as O.R. I also quickly realized that there were lots of similarities to control theory, which I knew well and was using extensively for my own doctoral research, and I guess I just gravitated towards O.R. over time as I found myself tackling more and more discrete optimization problems. I was also attracted by the way we as operations researchers have to be creative when we develop our mathematical models of complex, real-world phenomena and when we leverage the structure of problems to reduce solution times. It's fun and challenging at the same time! And one of my rules of life is to always do the stuff that's both fun and challenging.

**Q. You are the Director of the Air Transportation Laboratory at Georgia**

**Tech. What is the mission of the laboratory and how is it organized?**

A. The mission of the lab is simple. To enable the future of air transportation by simultaneously maximizing the efficiency and minimizing the societal impact (especially on the environment) of the global air transportation through innovations in control, optimization, and system analysis and design. We jokingly say sometimes that this means that we are creating the future one algorithm, airline schedule, and flight procedure at a time.

We have a three dimensional matrix organization. On the first side we have the faculty. On the second side we have the staff. On the third side we have the students. For a given project you could find any combination of faculty, staff and students. People gravitate towards projects based on their interests and their expertise. My job as director is to facilitate this process and recruit really smart faculty, staff and students who have a passion for air transportation, work well in a team, like to have fun, and respond positively to a challenge.

**Q. What are some of the research areas you and your group are working in? Could you also talk about some of the challenges you face in trying to convince airlines to adopt new ideas resulting from this research?**

A. Methodologically, we work in the areas of control, optimization, and system analysis and design. From a domain perspective, we work in the areas of air traffic management, aircraft operations, and airline operations – three key elements of the air transportation system. Perhaps the greatest challenge we face in getting airlines and air traffic service providers to try new things is overcoming the natural tendency of humans to be cautious when they are operating in or running a large, complex organization and where a mistake can be costly both personally and organizationally. The

antidote is to develop even better mathematical models and tools that can be used to show the benefits and to facilitate implementation. It might take a long while but it does pay off. I recall when I started my work on the continuous descent arrival (CDA)--a flight procedure that reduces the fuel burn, flight time, emissions and noise of arriving aircraft. Many people said that it could not be done at major airports because you would have to increase the space between aircraft and thus lose capacity. I am happy to report that due to our research efforts, 40% of the arrivals at Los Angeles International Airport (100% of the flights from the direction for which we designed a procedure) are now performing a CDA and they have not lost any capacity. I guess it pays to do your homework!

**Q. What do you find most rewarding about your career in O.R.?**

A. I like the fact that when you do your job correctly, i.e. when you model the real world well and figure out efficient ways to solve tough mathematical problems, you get solutions that when applied can really make a difference to the bottom line, whether that is the economic bottom line or the environmental bottom line. Thankfully, I have the good fortune to have made a difference in a couple of key areas, and that is very satisfying.

**Q. What advice do you have for those just starting out in a career in O.R. in general, and those wanting to work on aviation topics in particular?**

A. Be bold in terms of the types of problems you tackle and how you go about tackling them. Don't just take the "classical problems" and try to be the person that makes the latest incremental contribution. Think about the problems that are of most importance to the world and then go about modeling and providing solution to these inevitably complex, real-world problems. My experience has been that the mathematical models and the solution techniques

# Interview (continued from Page 7)

that you must develop are usually on the cutting edge methodologically. After all, every classical problem in O.R. was at some stage motivated by a real-world problem. Don't forget the roots of O.R.

**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?**

A. The problem with the US air transportation system at this instant in time is that the capacity of the system is variable due in large part to the negative effects of convective weather, and the airlines schedule their operations as if the full capacity will be available all the time. So, whenever there is bad weather and a reduction in capacity, it isn't possible to accommodate all the flights that have been scheduled, and airlines must delay or cancel flight until the full capacity returns. The problem for airlines, and for passengers as well, is that airline schedules and passenger itineraries form a complex web which is difficult to change quickly so there is a lot of pain to absorb when the capacity changes quickly, which is usually the case. Some argue that the solution to the problem is to schedule flights as if the lowest capacity will be available. However, that would mean that much

of the capacity in good weather would go unused. The real answer, at least from my viewpoint, is to design schedules that are truly dynamic. So that when there is full capacity you can take full advantage of the capacity and when there is lower capacity you can quickly scale back your operations to match the reduced capacity. Of course, we also have to figure out a way to minimize the impact on passengers of these rapid changes in operations, but that's just another component of the challenge.

**Q. Along these lines, robustness is a hot research topic at the moment, and you have always been an advocate for robustness. Where and when can research in this area be applied?**

A. Robustness should be applied throughout the entire business life cycle. We should be thinking robustness when we are designing a product, whether that product is a aircraft or an airline schedule. We should be thinking robustness when we are buying a product. For example, the possible twists and turns in the airline industry must be factored into the number and type of aircraft an airline buys. We should be thinking robustness when we are operating a product. For example, we should be thinking about all the alternatives in case the weather gets bad during flight planning, or thinking about all the opportunities to

swap aircraft in case a flight is late and the aircraft or crew for other flights will not be available at their scheduled departure time. We should be thinking robustness even when we are disposing of a product.

**Q. You became very active in the Aviation Applications Section at the INFORMS Meeting in Miami in 2001, and served as Chair from the beginning of 2002 until the end of 2004. Under your leadership, new life was breathed into AAS after it had been in a comatose state. Thanks to your initial efforts seven years ago, AAS has become again a very vibrant section of INFORMS. As past-chair, what do you expect of AAS for the next seven years?**

A. I expect the section to continue to grow as I envision more and more O.R. being applied throughout the air transportation system in order to provide solutions to the very real challenges that we are facing. Someone has to figure out how to profitably operate an airline at \$200 per barrel. Similarly, someone has to figure out how to handle three times as much air traffic. The bottom line is that air transportation is an enabler of economy growth, thus the onus is on us to figure out more efficient ways to move people and cargo by air.

**Q. Thank you.**

## Upcoming Meetings

**AGIFORS:** [http://www.agifors.org/event\\_home.jsp](http://www.agifors.org/event_home.jsp)

- Crew Management Study Group, August 19-22, Paris, France.
- 48th Annual Symposium, September 21-26, Montreal, Canada.

### Other Events:

- Heuristic Methods for the Design, Deployment, and Reliability of Networks and Network Applications, July 28, 2008 - August 1, Turku, Finland; <http://heunet08.softcomputing.org/>
- The 7th International Conference on the Practice and Theory of Automated Timetabling (PATAT 2008), August 19, 2008 - 22, Montreal, Canada; <http://wl.cirrelt.umontreal.ca/patat2008/>
- Optimization and Logistics in Transportation and Communication Networks, September 8 - 11, Ischia, Italy; <http://www.airo2008.unina.it/>





# Minutes from the Seattle Business Meeting



**November 4, 2007; 6:15pm**

Approximately 50 were in attendance.

Attendees enjoyed an increased amount (from the 2006 meeting) of snacks and refreshments.

Stefan Karisch (AAS Section Chair) gave a "year in review". This included:

- An introduction of the other section officers/leaders
- The joint AGIFORS/Sloan/AAS Workshop on Robust Airline Research (organized by Amy Cohn (AAS Vice-Chair))
- The 3<sup>rd</sup> AAS newsletter
- 2007 INFORMS Annual Meeting Panel Discussion
- Membership outreach

Gregory Coldren (AAS secretary/treasurer) presented the AAS financial and membership reports.

Thomas Vossen (2007 AAS Cluster Chair) reviewed the sessions – a record 19! – of the cluster. He thanked those who organized sessions. Attendees thanked HIM for being cluster chair.

Stefan thanked the 2007 Dissertation Prize Committee (chaired by Barry Smith) for their hard work. The AAS Best Dissertation Prize was awarded to Anne Mercier. Attendees gave her a warm round of applause.

Stefan made a few announcements:

- There will be a symposium in honor of Ellis Johson's 70<sup>th</sup> birthday in July 2008 (on Grand Cayman Island)

The AAS internship program has been revived (led by Irina Ioachim)

A reminder that 2008 dues will be increased to \$15 (this rate applies to INFORMS members who are not students/retired)

Stefan explained to attendees that AAS intends to become an "affiliated section" of TSL (and detailed the implications of that). A short discussion ensued.

The meeting adjourned and many attendees headed off to an AAS group dinner.

*Minutes prepared by Gregory M. Coldren, Coldren Choice Consulting; AAS Secretary & Treasurer (2005-2006).*

## Call for Papers: 2008 AGIFORS Annual Symposium

### 2008 AGIFORS Annual Symposium with Joint AAS Sessions

The AGIFORS' 48<sup>th</sup> Annual Symposium and OR Managers study group meeting will be hosted by **Air Canada** in the historic city of Montreal, Canada. This year's conference has been scheduled for 21-26, September 2008 at the Hilton Hotel centrally located in downtown Montreal.

The Symposium offers the latest on innovation in airline operations research including airline operations, airline strategy, cargo logistics, crew scheduling, e-commerce, information technology, revenue management, robust planning, and scheduling planning. Representatives from airlines, air transport associations, universities, industrial research labs, and consultants will present technical papers and discuss new ideas. Come and share your ideas, thoughts, current trends, philosophies, and latest technological advances on any of the above or related topics.

This year, the INFORMS Aviation Applications Section and AGIFORS are teaming up to host a joint session at the symposium. If you are an INFORMS member working and interested in presenting a technical paper at the symposium, please complete the on-line submission form at: [www.agifors.org/symposium/2008/present.html](http://www.agifors.org/symposium/2008/present.html).

As always, talks are subject to approval, and time slots are available on a first-come, first-serve basis - so if you are interested, act now!

**Abstract Deadline: 10 August 2008**

For more information about the symposium, please contact Tim Jacobs at [tim.jacobs@aa.com](mailto:tim.jacobs@aa.com). For more information on the symposium, please visit our website at [www.agifors.org/symposium/2008](http://www.agifors.org/symposium/2008).

# Announcements

## 2007 Dissertation Award

The recipient of the annual dissertation award for the outstanding Ph.D. dissertation related to aviation in 2007 is Anne Mercier from University of Montreal. The title of her award winning thesis was "Decomposition Methods for the Integrated Aircraft Routing and Crew Scheduling Problem" and supervised by Professor Francois Soumis,

In this integrated problem, linking constraints impose minimum connection times for crews that depend on aircraft connections. Anne proposed a model incorporating robustness to handle these con-

straints and compare two Benders decomposition solution methods. She also considered an additional level of integration by adding flight scheduling decisions. To solve this extended problem, Anne proposed a compact formulation and a dynamic constraint generation procedure. She presented convincing computational results that underline the impact of this integrated approach.

We are thankful to the chair of the selection committee Dr. Barry Smith and all the committee members for their efforts and thorough job in

selecting the best nomination among several strong candidates.

*Stefan Karisch, Jeppesen*



*Anne Mercier receives the award from Prize Committee Chair, Dr. Barry Smith*

## New Section Bylaws

### Bylaws for the Aviation Applications Section of the Institute for Operations Research and The Management Sciences

#### ARTICLE I – NAME

This organization shall be named the Aviation Applications Section (AAS), hereinafter the Section, of the Institute for Operations Research and the Management Sciences, hereinafter the Institute.

#### ARTICLE II –PURPOSE

The purpose of the Section shall be to encourage the development and dissemination of applications and research in areas relating to aviation, including but not limited to airline operations, air traffic control, airport planning, aviation financial, economic, and policy analysis, aviation forecasting, and aviation human factors. Additionally, the Section shall promote communication and interaction among individuals from industry, government, and academia who share interests in these areas.

#### ARTICLE III – MEMBERSHIP

Any member of the Institute may become a Section Member by paying Section dues. Non members of the Institute may become Section members by paying the Special fee for non members. All members of the Section shall have equal rights and privileges except that only Institute members may hold Sections offices (see Article IV).

#### ARTICLE IV – COUNCIL AND OFFICERS

1. The officers of the Section shall be a Chair, a Vice Chair, and a Secretary/Treasurer.
2. The Chair shall be the chief administrative officer of the Section and shall be responsible for the development and execution of the Section's program. He/she shall (a) call and organize meetings of the Section, (b) appoint ad hoc committees as required, (c) appoint chairs and members of standing committees and (d) preside at Council and Membership meetings.
3. The Vice Chair shall be the principal assistant administrative officer of the Section, shall act as Chair in the absence of the Chair, and shall perform such other duties as the Section requires. He/she shall become the Chair of the Section for the term after his/her term of office as Vice Chair.
4. The Secretary/Treasurer shall conduct the correspondence of the Section, keep the minutes and records of the Section, maintain contact with the Institute, receive reports of activities from those Section Committees that may be established, conduct the annual election of officers for the Section, be responsible for the administration and disbursement of the Section funds, prepare and distribute reports of the financial condition of the Section, help prepare the annual budget of the Section for submission to the Institute, make arrangements for the orderly transfer of all the records to the Secretary/Treasurer succeeding him/her, and perform other duties usual to the office of an organization's Secretary/Treasurer.

## New Section Bylaws (continued from Page 10)

5. Any Section member accepting nomination for elective office in the Section is understood to have agreed to perform the duties of that office if elected, and in particular to have agreed to attend the Annual regular Section meetings during his/her tenure, except as his/her attendance is prevented by unusual circumstances. If a Section elected Officer must miss a meeting or be temporarily unable to carry out his/her responsibilities, he/she shall advise the Chair and make other arrangements for the discharge of his/her responsibilities. If a Section elected Officer should fail during his/her tenure to attend regular Section meetings and to carry out the responsibilities of the office, he/she can be removed from the office upon the initiative of a two-thirds vote of the Section membership present at a Section annual meeting.

6. The Section Council shall consist of the Officers described above, and the immediate past Section Chair in an advisory role.

### **ARTICLE V – ELECTIONS AND TENURE OF SECTION OFFICERS**

1. The Section shall bi-annually elect a Chair, Vice Chair and a Secretary/Treasurer to serve a term of two years.

2. The Vice Chair shall succeed to the Chair at the completion of his/her term. Exceptionally, if there is no current elected Vice Chair, or if the current elected Vice Chair declines to become Chair, the Section shall also elect a Chair.

3. No officer other than the Secretary/Treasurer, who has served a full term, shall be eligible for immediate reelection to the same office.

4. The immediate past Section Chair shall serve for a period of one term on the Section Council in an advisory role.

5. The Chair shall appoint a Nominating Committee at least six months before the Annual Institute meeting. The Nominating Committee, composed of a chair and at least two additional Section members, shall prepare a slate consisting of at least one nominee for each office to be filled. At least five months before the annual meeting of the Institute, the Nominating Committee will submit its nominations to the Secretary who will report these nominations immediately to the Section membership. Additional nominations for any office may be made by a petition signed by at least six Section members. Such petitions must reach the Secretary at least four months before the annual meeting.

6. Elections shall be held by secret ballot issued by one of the following media: a) letter mail ballot; b) electronic mail ballot; c) web-based ballot, or d) a combination of letter mail and electronic mail or web-based ballot.

7. The Secretary/Treasurer of the Section shall appoint tellers to receive ballots and to tally them at a pre-announced time at least two weeks before the annual Institute meeting. Tellers may not be Section officers or candidates for office. The winning candidate for each position shall be the candidate receiving the largest number of votes. In the event of a tie vote for any position, the members present at the next membership meeting of the Section shall choose between the tied candidates. Winning candidates shall attend the annual Section membership meeting. All terms of office shall begin on the first day of January following the election.

### **ARTICLE VI – DUES**

Dues for the Section shall be set by the Section Council. Dues will be based on a calendar year starting on January 1 and ending on December 31.

### **ARTICLE VII – SECTION COMMITTEES**

The Section Chair, with the approval of the Section Council, shall establish committees as required and shall appoint qualified chairs to head these committees. In all cases the terms of the chairs and the committee membership shall cease upon completion of the term of the Chair who appointed them.

### **ARTICLE VIII – RESPONSIBILITY TO THE INSTITUTE**

1. The Section shall operate in accordance with the Constitution and Bylaws of the Institute. Each year, normally after the annual Institute meeting, a Section report will be submitted to the Council of the Institute, setting forth the significant accomplishments and activities of the Section during the previous year and outlining a rationale for the budget projections for the following year. Additional reports shall be submitted to the Council upon request.

2. In the event of dissolution of the Section, its assets shall become the property of the Institute.

### **ARTICLE IX – AMENDMENTS**

1. Proposed amendments to these bylaws may be initiated either by action of the Section Council or by a petition to the Chair signed by 5% of the membership or 15 members of the Section, whichever is smaller. The Secretary/Treasurer shall distribute copies of the proposed change to all members of the Section by electronic or letter mail not less than three weeks before the annual membership meeting. An open discussion of the proposed amendment shall be carried out at the following membership meeting of the Section.

2. Not more than two months after the discussion of the proposed amendment, the Secretary/Treasurer shall distribute to all members copies of the proposed amendment along with ballot forms issued by one of the following media: a) letter mail ballot; b) electronic mail ballot; c) web-based ballot, and d) a combination of letter mail and electronic mail or web-based ballot..

3. The adoption of the proposed amendment shall require an affirmative vote by at least two-thirds of the members voting, as tallied by tellers appointed by the Chair. The result of the balloting shall be announced to the membership by the Section Secretary/Treasurer.

4. If approved by the Section membership, the proposed amendment to the Constitution shall become effective upon approval by the Institute.

### **ARTICLE X – MEETINGS**

The annual membership meeting of the Section shall be held when practical at the time and place of the annual meeting of the Institute with the schedule and site arranged by the Secretary/Treasurer of the Section. The time, place and agenda of each meeting shall be set by the Section Council and announced at least two months in advance by the Secretary/Treasurer. The quorum for action at the membership meetings shall be 5% of the membership or 15 members of the Section, whichever is smaller.

### **ARTICLE XI – RULES OF ORDER**

Robert's Rules of Order shall govern membership meetings, in all cases to which they are applicable and in which they are not inconsistent with the Bylaws.



## Aviation Applications Section

### Aviation Applications Section

Institute for Operations Research and the  
Management Sciences  
7240 Parkway Drive, Suite 310  
Hanover, MD 21076-1310 USA

<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](mailto:stefan.karisch@jeppesen.com).**

## Section Officers

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