

## AUTOMATION AND AIRPORT CAPACITY PROGRESS TO DATE

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Thank you. Good morning. This meeting seems like old home week. There is a feeling of *deja vu*, as Agam said. It is not the first time we have talked about this subject, nor is it likely the last.

I wondered on the way over what one might say that is new, that you or I have not talked about a hundred times. Perhaps it would make sense to talk a little about what workshops like this might be able to do. Let me just follow up on what Phil Klass said.

We are probably our own worst enemies. It is convenient to bash FAA--all of us want a scapegoat. FAA is handy, but certainly not the only villain. I remind you that some of our largest problems are characterized by the array of baby carriages some of you will remember across the end of a new runway which prevented its use for a long time after all the technology had been done, the money had been found, the runway built. That is reality.

There has been a lot of technology work done, but no major capacity breakthroughs have appeared. I hope in this next day and a half you will be able to find the keys to the magic kingdom, to find the big capacity gains. I doubt that you will. I have heard few really new ideas in a long time. We keep debating, or trying to execute ideas that are ten or twelve years old.

We need the new ideas badly, but technology ideas are only the beginning. They are fun to talk about because they are usually glamorous (at least glamorous to some), but the real question is how do we get them implemented?

Some of the ideas that have been around for 12 or 15 years or so are being attacked on second, third or fourth thought for a variety of reasons--some good, many not good--so the questions I ask you to consider in this meeting concern the priority of the doable.

It is not enough to say that automation is a great idea, that it is the direction we ought to take. The far more important question, if you believe the technology of automation is by no means overwhelming, is how do we make that innovation acceptable, doable? Creating a list of "new" technology things is of limited use--any of us can do that. What we need from you is the doability, that priority of the doable.

Let me talk a bit about what FAA believes are the keys to and the limitations of capacity. I will not talk about more runways per se, nor about management of the air space, the issues of peak hour pricing, and so on. I will talk about the things that can help improve intrinsic capacity, and those that permit us to utilize the existing capacity.

FAA, and certainly the current FAA Administrator, has demonstrated clearly that we are 1) well aware of the problem of airport capacity limitations and congestion, and 2) anxious to move out. You all know that the Administrator, some time ago, established the FAA Airport Capacity Program Office under Jim Smith, who is here, and whose primary task it is to make something happen. I am sure he is interested, as we all are, in the longer-term gains--and everything seems to be longer term. Jim, the FAA Administrator, and a number of us who have been there for a while would really like to make something happen soon.

There are only three ways to get airport capacity. They are to build new airports and new runways; to increase the intrinsic capacity of the system itself; and to manage the airspace-airport resources optimally, that is, to reduce the variability and exchange better information about the environment in which aircraft fly. These three things are always tied together. We have to work on all of them.

A thing we can do, and have been emphasizing for years, is to try to get safe reductions in minimum separation requirements. I list it first, because it is a big gainer--but it has also been tough to get. There are many reasons, but we have not been very successful. We have not been able to reduce separation standards in ways that are safe in the minds of all of the people who have to agree.

Perhaps more doable is a reduction in the variability of aircraft performance in the system by things that you do in the airplane, things that you do in the air traffic control system to permit optimal use of the resources we have.

Better understanding of, and information exchange about, the environment, wakes, wind shear, all of the things that affect the performance of the aircraft itself by external forces is an essential ingredient.

Optimal resource management, in the sense of providing the aids that a controller might be able to use to help him juggle the variables in achieving best use of the airport is important. If we look at a terminal area, a complex terminal situation, the job that a controller can do--the very best controller--is limited by the variables the human mind can juggle at the same time.

Finally, of course, more airports and more runways.

Malcolm Burgess will talk later about what we are trying to do in terminal automation and the prospects for success. You will see again how long it takes.

Let me try to draw a bottom line. If we want to get the most out of the system, one key--a very important one--is the interchange of information, better information flow. It can be characterized in a variety of ways. Many pilots want more information in the cockpit about their position within the air traffic control system, and data about what the air traffic control system is doing with him.

Better information, exchange about the environment, the winds, the shear, etc, would be valuable. If we want to achieve automation there is a requirement for almost instantaneous exchange of data. The communications flow improvement will have to come, through the use of data link. Data link is a unique innovation. RTCA SC-31 identified this need in about 1948. That is a long time ago--it is almost 40 years--and we may actually implement it for ATC some day. But information exchange is critical to most of what we are trying to do.

Malcolm will talk about some of the capacity improvement concepts that we have been talking about and working on for a long time--reduced in-trail separation, soon to get underway, I hope. Independent parallel IFR operations--we are still arguing about that after only about 10 years. On IFR approaches to converging runways some progress has been made. Triple IFR arrival streams and low-minimums use of separate short runways is still to come.

These are the things we think we can do, but are still not in full agreement.

Better analytical tools are a part of the need. There are longer-term things that can be done in the area of information flow improvements. The time is coming, after 20 years of sporadic development, for all-weather airport surface surveillance, guidance and control. If we want to efficiently move airplanes--not only in the airspace near the airport, but on the airport itself--the need exists to move out.

The Mode-S data link is clearly valuable if you believe in the importance of information flow.

Phil Klass talked about MLS. My opinion is that MLS, if exploited properly, is probably the most powerful tool we have in improving airport capacity and reducing the variability, both laterally and longitudinally. It will have a significant impact on IFR converging approaches to low minimums, triple IFR approaches, short runways, multiple airport environments. We started the MLS standardization activity in 1967, but as we move to implementation several influential groups are calling for delay. I do not understand the reasons for this view -- to me the benefits are obvious.

Improved surveillance for near-airport separation reduction is required, I believe, not only for closely-spaced parallels but also for converging approaches to low minimums, and, all important, for the missed approach procedure and precision departures.

ATC automation will be required to make full use of the 4-D RNAV capability in airplanes, of which we are seeing more and more.

Another area in the priority of the doable is the need for collection of accurate data on near-airport aircraft performance. We know less than we should, in my view, of how airplanes actually behave. We have some data, some not entirely believable, and little real information on aircraft behavior in actual missed approaches. In order to help in gathering community consensus--the critical part of doing something rather than just talking about it--we need better and accurate data on the behavior of large numbers of

airplanes to gather statistically believable numbers on how airplanes actually behave, especially in the missed approach.

There are other issues, but I want to close with the question of automation. Malcolm will talk to you about both the potential and the possibilities of introducing automation in the terminal area, of which there is none--zero--at this time.

There are questions you need to address. How automatic will we permit things to be? How about permitting the Air Traffic Control system on the ground to take hold of the throttles about 20 miles out and "flying" the airplane in precisely, manage the energy on the airport surface and automatically taxi it to the gate. A great idea, one that gets you a lot of capacity potentially. It sounds kind of nice until you think about a government computer built by the lowest bidder taking hold of the throttle. You say it's crazy to even bring it up. Yet I do so to get you to focus on how far we are willing to go. Are we willing to do any of it?

But do not get romantic notions about full automation either, because even that is not the whole answer. If you look at terminal automation, not in the funny example I gave, but at what might be achievable if we could, by some magic, reduce the variability dramatically (to maybe half of what it is), the capacity gain is not 100 percent.

We have just finished a piece of work with MITRE--John Lebron is here, and you should talk with him about it--to try to answer the question of what real automation would yield. If we could go from the notion to something real, what would we get? Does it really get you the 60, 70 percent capacity increases I have heard about?

We have only begun to look at the results--they have not been cleared or agreed on--but the numbers are interesting.

If you take a rational approach to what we might get, the capacity increase comes to an overall bottom line somewhere between 16 and 20 percent. That number is large compared to most of the other capacity-gaining schemes that we have talked about because most of them end up with three, four percent each. It is not the gigantic number one would hope for. Its impact becomes very large if you believe the multiplier that says that when you increase the capacity by one percent the cost of delay goes down by five.

Let me end where I began. The capacity problem is old; FAA is more than willing to move out. We are often our own worst enemy as a community because we can not agree on the doable. The gains are all small when viewed one at a time. The question I leave you with is the question I began with. In these two days, can you give us a priority of the doable and then help us make it happen?

Thank you.