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ATC system delay solution? Business Based Flow Management the answer?

From time to time, the Journal receives an article from someone outside the firm and recently, an interesting analysis by R. Michael Baiada, president of ATH Group Inc.

The company's goal is summed up by Professor Michael Levine of the NYU School of Law - *"production engineering in the ongoing Deming era*" as applied to the airline industry. ATH's purpose is to assure more aircraft, and therefore more smiling passengers, arrive defect free at the destination, on time, faster, better and more profitably - much more profitably.

In summary, it is not the network peaked schedule, the lack of runway capacity, or too little technology that drives up costs, decreases utilization and limits revenues through poor quality, but the network operation as currently operated, which represents a relatively simple, and solvable logistics problem.

There is a Readily Available Solution for Airline Delays/Congestion, Which Increases Safety

By R. Michael Baiada
December 9, 2019

A solution exists today to reduce airline delays, congestion, emissions, and even noise, while increasing safety, **starting within months**. FAA and Embry-Riddle proved this[i], GE Aviation proved this[ii], Georgia Tech proved this[iii]. No grandiose, hugely expensive, highly complex plan. No new technology. No more studies. No decades more waiting for ATC.

The bad news is that, even with annual losses of $10s of Billions, airlines, ATC and the financial community are not interested.

Further, contrary to conventional and the decades old assumptions, the problem with airline delays and emissions is not one of ATC, weather, airport capacity, etc. No, the core problem with airline delays/congestion/emissions is much simpler and more basic - variance and logistics. Too much of the first and not enough of the second.

Decades Old Assumptions

But before we look at the proven solution, let's look at just a few of the decades old, no longer valid, "*it can't be done*" assumptions everyone takes for granted when discussing delays/congestion/emissions.[iv] Of course, there will be external factors which still impact operations (i.e., weather), but these represent around 15% of "*day of*" airline operations and are not the primary constraint to dramatically reducing delays/congestion/emissions.

Only ATC can solve delays/congestion: During my 40+ years as a pilot, working on airline operations, ATC, and logistics issues, ATC literally spent $100s of billions of tax dollars during decades of efforts chasing technology[v] to fix delays/congestion - and failed. Is safety better - yes. Are delays or efficiency better - no.

This alone should convince everyone ATC will never fix delays/congestion. But there's an even bigger reason ATC can't efficiently fix delays - it's not ATC's job to make business decisions. Airline delays are just that - **AIRLINE DELAYS**.

For example, in a queue of 10 tightly packed aircraft from the same airline approaching the hub, which aircraft should go first? Factors to consider include schedule, connections, gate availability, ramp assets, fuel, weather, diversion possibility, crew legality, maintenance, etc. Only airlines already have the data to determine which is the "*right*" aircraft to move forward in the queue and which is the "*right*" aircraft to move backward, especially when balancing the goals of 10 to 20 other aircraft trying to land around the same time.

In fact, with the exact same data, different airlines will probably make different business decisions, so how can ATC ever make an informed, efficient decision? The answer is that ATC can't.

There are too many variables: Yes, there are many variables days or weeks prior, but "*day of*", two to five hours prior to landing, the situation changes dramatically. What most see as "*day of*" variables are available, but unacted upon data.

For example, shortly after takeoff from Hong Kong to San Francisco - with limited access to data, I could accurately determine my landing time, landing runway, the weather, and have an educated guess about the landing queue.

In fact, the next time you fly, consider the variables for your flight and you'll find very few. Of course, we can't know everything, like a blown tire closing a runway, but these are rare events.

Airports are full: Simply because you're on a 25 mile final doesn't mean the airport is full. All a 25 mile final means is the airport is overloaded at that time. Consider that even Boise, which no one would call full, is overloaded when two aircraft want to land at the same time.

As seen at Newark, efficient, on-time capacity exists, but it's forward in time.

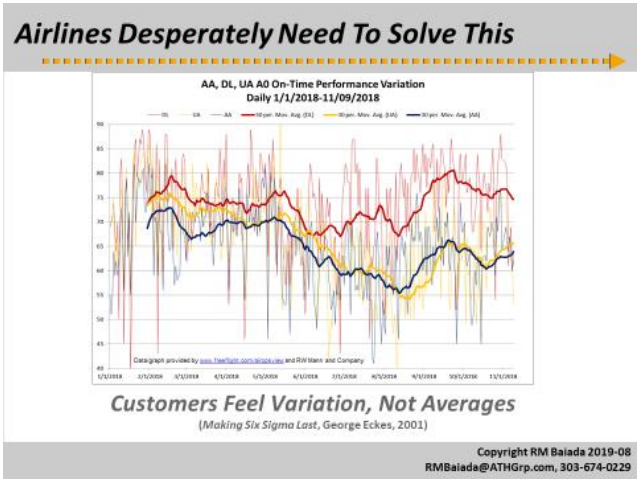
And this is Newark, one of the most delayed airports in the US. No weather, no capacity problem, but Newark's on time zero arrival (A0) was 71% that day. This shows a systemic delay bias (variance) in arrivals not attributable to weather, schedule, or capacity.

In fact, most congestion around airports is a symptom of unmanaged, highly random aircraft arrival flow, obvious hours prior to landing, when it can be prevented (defect prevention). Currently, by the time the delay symptom is manifest (200 miles from landing), the only answer available to ATC is delay. ATC takes the first aircraft and leaves it alone; the second is moved back a little, the third back a little more, and so on (defect correction).

Variance

Variance - not a word we hear much in aviation, yet it is the root cause of most airline delays/congestion we see in our airspace and at our airports.

As seen in the graph, the airlines "*day of*" product quality is all over the map. One day the flight is 20 minutes early, the next that same flight is 20 minutes late, but all we hear are averages (which are not great).



But, as described at Shmula.com, *It's important to always remember that it* ***is Variation that people feel, not the average****. Managing the variability in your process takes work and some knowledge of tools that are pragmatic and helpful. The "average" is an inadequate measure and is not descriptive of what the customer is feeling. If the customer is to benefit, we must take action against variation through reducing it or eliminating it and then managing it.*[vi]

Further, and as well understood in manufacturing, when variation increases, time in queue grows exponentially (i.e., delay).

Of course, the question always arises of how can we solve this quickly and inexpensively when ATC has been very expensively trying ($100s of Billions), and failing to do for over 40 years?

The answer is simple - perspective. Instead of simply accepting the decades old, ***invalid assumptions of what causes delays/congestion***, as an engineer, pilot and

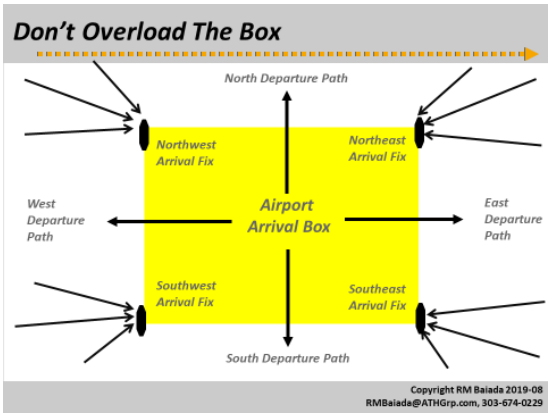
operations/ATC/logistics expert (40 years), I have stepped back, looked at the problem, and concluded that the primary cause of most delays is ***variance***, and, once understood, a very fixable problem. Unfortunately, the cause and effect of operational variance is not a problem aviation understands.

Solution

So if ATC and governments can't fix this, what can? The answer - airlines must drastically reduce their "*day of*" variance and unforced errors.

More specifically, as the first step, airlines must tactically control their aircraft (starting within months) in real time, "*day of*", so as to deliver a more rational, efficient, stable arrival flow to ATC near the airport. This alone will reduce many of the problems we accept as normal (delays, congestion, ATC structure, noise, etc.). In other words, don't overload the box (defect prevention).

For example, consider the example of a single airport, with 4 arrival fixes. If this airport can handle 60 arrivals per hour, 1 per minute, and the airlines randomly throw 45 aircraft at the airport in 30 minutes, the airport is overloaded, ATC very predictably queues up the arrivals backwards in time, first come first served, on a 20 to 30 mile final (defect correction). Conversely, with the tools available today, the airline can easily predict this negative outcome and efficiently act to prevent it hours prior to landing (defect prevention).



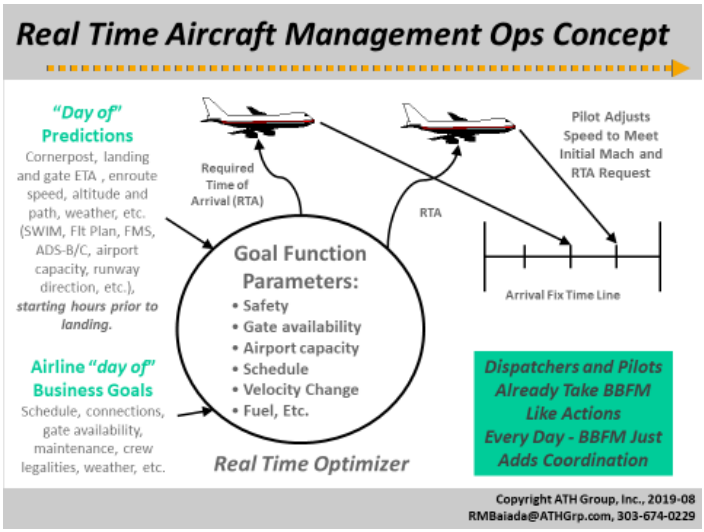
To that end, Business Based Flow Management (BBFM) is the only low cost, COTS, real time, independently validated, system optimized, "*day-of*", aircraft flow management solution, based on the airline's business needs and airport demand/capacity, which can be coordinated with ATC and the airport in real time.

Further, the BBFM solution uses a stepped implementation and current equipage (**no new technology required**), starting at a single airline/airport, for a single airline, available **within months**, thus simplifying the path forward, which then can be rapidly expanded system wide.

The BBFM solution identifies each and every arrival to an airport, continuously tracks its position, speed and altitude in real time, as well as intent and real time winds to accurately predict the arrival fix, runway and gate Estimated Time of Arrival (ETA). BBFM then evaluates the "*goodness*" of the outcome of the predicted gate arrival time for each aircraft at that airport from a system perspective (schedule, gate availability, ramp, fuel, capacity, demand, maintenance, crew legality, etc., for all of the airline's

arrivals). Then, within seconds, BBFM literally evaluates 1,000s of iterations of speeding up some aircraft, slowing down others to find a better "*system*" outcome.

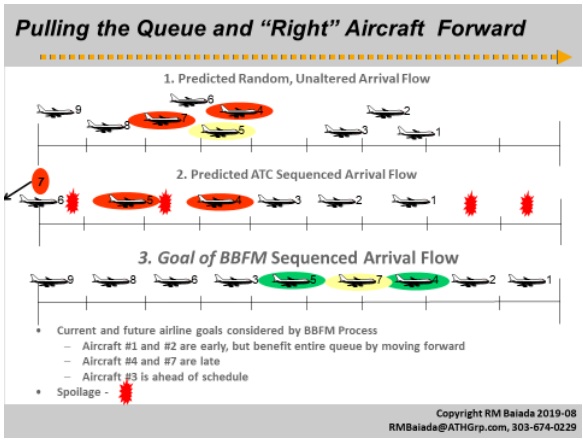
Once a "*better*" system outcome has been determined, a Required Time of Arrival (RTA) message is automatically sent to each pilot via ACARS[vii], 2 to 3 hours (or more) prior to landing to be at the airport arrival fix at a specified time. The pilot then adjusts speed to be at the arrival fix at the specified RTA. The speed change is typically 10 to 20 mph, under the speed change that necessitates notifying ATC (10 mph or 5% of filed True Airspeed, whichever is higher).



Another unique benefit of an airline/aircraft centric solution is that it easily crosses sovereign airspace (FIR) and ATC sector boundaries. This is an absolute necessity for any successful real time, "*day of*" flow management solution and a huge political/technical limitation inherent in any current and proposed ATC centric program.

But you might ask, while great for the hubbing airline, doesn't this disenfranchise the other airlines? The answer is no, since, "*pulling*" the entire queue forward benefits everyone.

The fact is that every independent analysis of actual, real time, tactical aircraft management operations (not simulations) by an airline has shown that a system based, airline/aircraft centric flow management solution, can, and does work, with a Return on Investment (ROI) measured in months, with no analysis to the contrary.



Of course, this is just a short description of BBFM, which leads to other questions, all of which have been asked, and answered in full, but space does not allow a fuller answer here.[viii]

But real time, tactical aircraft management is only the first, critical step necessary to reach Airline Operational Excellence (85% A0, <3% day to day A0 Standard Deviation, 8 to 10 minute scheduled block/gate time reduction per flight).

With a stable, predictable aircraft flow, driven to a higher quality outcome (pax where promised, when promised), the airline must manage its gates in real time (3 to 5 hours prior to landing) to increase gate utilization/availability and limit gate changes.

Once the airline has a stable, predictable aircraft/gate package, the third level optimization must manage all of the ramp, gate and other assets to the aircraft/gate package.

Real time, tactical aircraft management has been independently validated by FAA and Embry-Riddle University (Dr. Vitaly Guzhva and Dr. Ahmed Abdelghany, Task J), Georgia Tech (Dr. John-Paul Clark, Atlanta) and GE Aviation (Dubai) proving that the airline/aircraft centric flow sequencing solution works and is profitable, with an ROI measured in months, with zero analysis to the contrary.

Proven benefits include;

- Improved on time performance
- Reduced costs, fuel burn and emissions
- Less airspace/ATC complexity and airport/controller overload (i.e., increased safety)
- Improvement of current terminal area ATC programs

Unfortunately, airlines and ATC are so invested in their 1950s process (complexity and structure), it is difficult to step out of their comfort zone. This needs to change, something real time aircraft flow management can quickly facilitate.

Finally, everyone need to stop saying what can't be done, and start asking ***what can be done now?***

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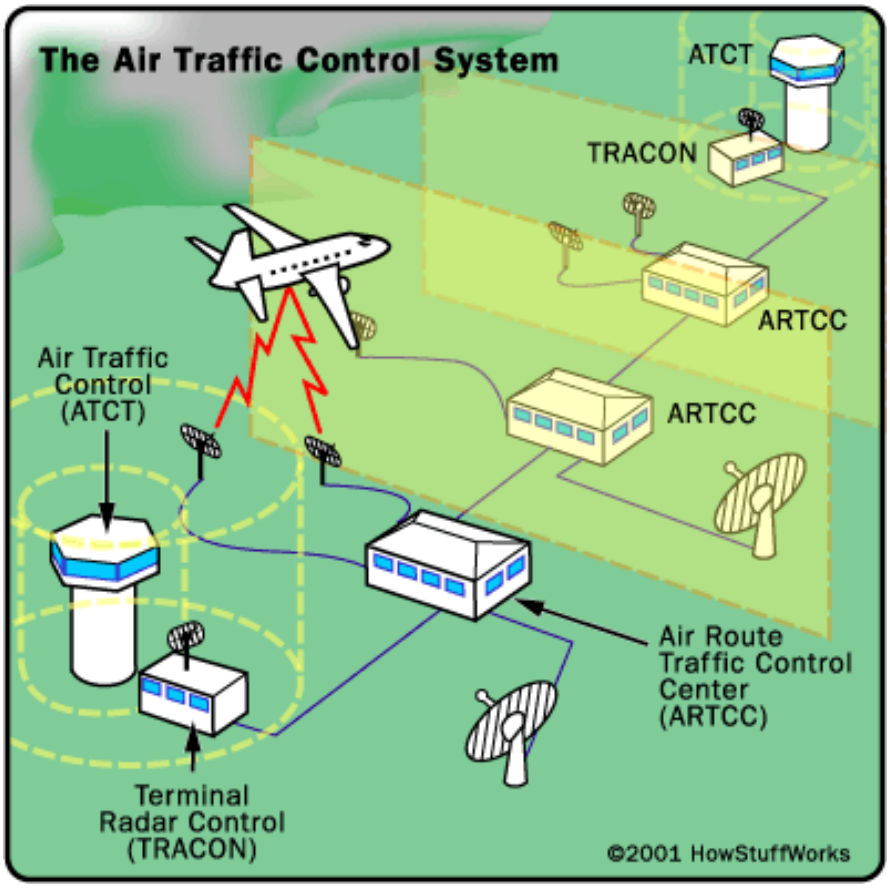
[i] 2012 FAA Task J program, validated by Embry Riddle University.
[ii] 2013 analysis of a real time, airline managed, tactical aircraft management solution at Dubai.
[iii] Delta Air Lines 2006 analysis of actual BBFM operations at Atlanta.
[iv] *Aviation Needs a New Direction - Driven by Vision and Leadership* (Managing the Skies, Nov/Dec 2019).
[v] MLS, RNAV, AAS, ISSS, GPS, TCAS, FANS, RNP, ADS-B/C, CPDLC, ATC Modernization, NextGen, Sesar
[vi] https://www.shmula.com/the-variability-tree/437/
[vii] Aircraft Communications Addressing and Reporting System - Aircraft to ground data link communication process in place since the 1980s.
[viii] See: *Air Traffic Control Is Not The Real Cause Of Airline Delays (Forbes.com, 2017-03-23), Why Airlines Make Flight Longer on Purpose (BBC Capital Smart Travel, 2019-04-09) and Parked Planes Cost Airlines Billions (Forbes.com, 2017-08-15)*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