GreenLandings® Real World Examples

Captain R. Michael Baiada

1. GreenLandings® Real World Examples

The following real-world examples of "day of" variance, were experienced by Captain R. Michael Baiada during his 35 years as an airline and business jet pilot. GreenLandings® is a real time arrival flow management solution that works to prevent these problems by optimizing aircraft landing times to the operator's business rules from a system perspective.

GreenLandings® pre-sequences the aircraft to a common reference point, thus reducing variance and point overloads (and underloads) on the ATC system, enroute, in the terminal area, and at the airport.

And while the following is written from an airline perspective, these events apply equally to all aircraft - Business jets, military, GA. Helicopters and drones.

1.1 What Time Should I Land?

Often, I asked the other pilot what time they want to land, something they never really consider, which is amazing since airlines sell time. After a short pause, they would answer on time, which is a good first answer.

But what if the inbound and outbound are full, with a minimum turn time? The airline might want to speed up the aircraft to land 10 minutes early to assure the next departure is on time.

Or what if the gate or ramp parking is occupied for 10 minutes after scheduled arrival? The airline might want to slow the aircraft enroute, save fuel, release the earlier landing slot, not congest the ramp, or anger the pax who see empty gates, just not theirs. Or what if the aircraft requires a one-hour maintenance action with only a 40-minute turn time? The airline might want to speed up the aircraft to land 20 minutes early, to allow the next departure to be on time.

So, the correct answer to what time should the aircraft land is "it depends," something only the airline/operator can decide from a business/system perspective since most changes will impact another flight (not ATC or the individual pilot).

1.2 The Worse it Gets, the Worse it Gets

Next, let's look at a flight which lands into San Francisco 30 minutes late because of fog. This is one of those times when weather is the first-tier cause of the delay. But because of airline crew scheduling practices, they schedule the aircraft, pilots and flight attendants separately, so when the aircraft lands into San Francisco, the pilots go one way, the flight attendants go another, while the aircraft sits and waits for pilots and flight attendants from two other flights.

Since the crews must switch aircraft, which means that by the time the new crew arrives at the aircraft, completes the aircraft preflight, and is ready to depart - they end up off the gate 45 minutes late.

The flight to Los Angeles is planned at normal speed and altitude since each flight is planned separately. But given the pressure to reduce fuel cost (yet another airline cost center), the crew slows

RMBaiada@ATHGrp.com, 303-521-6047

down to save fuel, so they land 49 minutes late. Since they were later than Los Angeles ramp people expected, no one was there to park the aircraft, so they arrive at the gate 52 minutes late.

The same process repeats itself on the flight back to San Francisco, and the aircraft is now one hour and four minutes late - and, again, on the next flight to Denver.

Now the aircraft is one hour and 19 minutes late, and on, and on, throughout the day, and only using the nighttime pause to reset the process.

Conversely, if the airline kept crews together with the aircraft and developed a "fast turn" process to service the aircraft at the gate, such that the 30-minute late arrival for fog departs SFO only 25 minutes late. Also, the flight plan could be calculated to give the pilots extra fuel to allow flying low and fast (best ground speed), so that it arrives at Los Angeles only 21 minutes late.

The ramp should always, yes always, always, always, park the aircraft when it arrives, the agent would always, yes always, always, always, immediately put the jetway up to the aircraft and open the door, do the "fast turn," and depart only 18 minutes late. Low and fast again, and now it is 14 minutes late into San Francisco. Repeat, and the flight is on time into Denver.

So, instead of three legs with the aircraft over an hour late, it could be three legs and the is aircraft back on time. But this takes a system and defect prevention process, something airlines have yet to understand.

1.3 "Draft Effect"

Another scenario: Consider two aircraft at the front of a tightly packed arrival queue of 30 aircraft.

By identifying/speeding up the first two aircraft, moving them forward two minutes, the entire arrival queue moves forward. In other words, moving two aircraft forward at the front end of a large arrival queue doesn't just save two minutes, but saves two minutes for every aircraft in the queue behind the first two flights, as the entire queue moves forward.

This creates what Dr. Clark of Georgia Tech labeled the “draft effect,” thus dropping 60 minutes of flight time and delay from this one arrival queue alone.

1.4 Huge Tail Winds

Another example is my flight from Portland, OR (PDX) to Chicago (ORD). That day, the tailwinds were in excess of 180 knots, which would and my flight into ORD 30 to 40 minutes early. Of course, the PDX agents wanted to shut the door 10 minutes early and “push” the aircraft to ORD, since everyone was on board the aircraft (local goal of “shutting the door” early to meet an “on time departure” or D0), which I prevented, and we left on time.

Next, I taxied very slowly, and cruised at a low speed for better fuel mileage, to the point ATC asked why I was flying so slowly. Apparently, the controller had never had an A320 cruising at .715 Mach.

When I arrived at ORD, I landed 16 minutes prior to schedule, instead of 30 to 40 minutes like all the other arriving aircraft which were “pushed” off their departure gates to meet D0 and wasted fuel going normal speed.

RMBaiada@ATHGrp.com, 303-521-6047

Of course, when so many aircraft land 30 to 40 minutes early at a hub airport, the gates are still full from the previous arrival bank. This forces ATC to temporarily park and manage aircraft everywhere and anywhere they can, to the point that - as I exited the runway - I couldn't talk with ATC as they were completely overloaded with D0 “pushed” aircraft parked everywhere waiting for their gate.

After a few minutes, I was able to break in on the radio, and received clearance to my gate, which was open. As I entered the alley, yes, my gate was open, but it was blocked by five other aircraft that had just left their gates, which were awaiting taxi clearance to depart.

The end result was that ORD devolved into a classic gridlock situation between the departures and D0 forced early arrivals, as the ATC system and airport were completely overwhelmed. I sat for 20 minutes looking at my empty gate 200 yards ahead but couldn't get to it. Of course, like everyone else who landed 30 to 40 minutes early, I was late to the gate (20 minutes), even though I landed 16 minutes early.

Could ATC and the airport have handled this better? Of course! But the real solution was for the airlines to manage their departures by “pulling” the right aircraft from their departure gates to not overload the ORD ATC system or the airport.

Clearly, if a simple line pilot recognized the problem hours prior (accurate ETA information hours in advance), an airline should have done the same, and prevented the problem from developing in the first place (Defect Prevention, ala W. Edwards Deming).

1.5 It's the Schedule?

We often hear the airline delay and congestion problem expressed in terms of the printed schedule, i.e., “You can't schedule 10 aircraft to land at 8 AM and expect everyone to be on time”. Of course, if all 10 aircraft showed up at exactly 8 AM, this would be true.

The answer to this riddle is twofold. First, airlines deliver upwards of 80 percent of their aircraft off schedule (early/late), so the potential of having all 10 aircraft arrive at 8 AM is very low.

But the real answer of how to schedule 10 aircraft to land at 8 AM and assure that all 10 are on schedule is for the airline to tactically manage the aircraft, day of", hours prior to landing so the first one lands at 7:51 AM (assuming a 60/hr. arrival rate), the second at 7:52, the third at 7:53, etc.

To do this requires a level of tactical, real-time, "day of" control that airlines currently have the data and tools available that are necessary to accomplish this, but choose not to do so.

1.6 The Airport is Full?

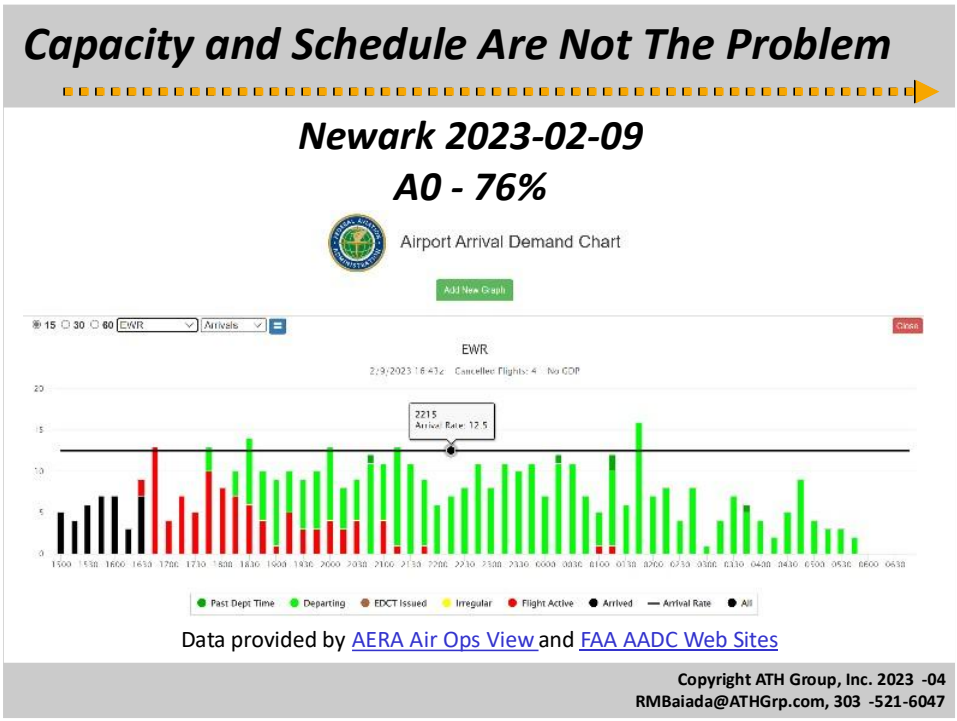
Next, airport capacity. First, let me state up front that in my 40 plus years as an Air Force and Airline pilot, I never landed at an airport that was “full”. Overloaded - yes, full - no. There is a difference.

Plenty of capacity is available, even at Chicago before their multi-Billion-dollar runway revamp - but, as the Figure Shows, the available capacity is mostly forward in time.

Of course, airports are over capacity at certain times of the day (even Boise is overcapacity when two aircraft want to land at the same time), but this doesn't preclude reducing delays, congestion and realizing a much improved on time arrival performance.

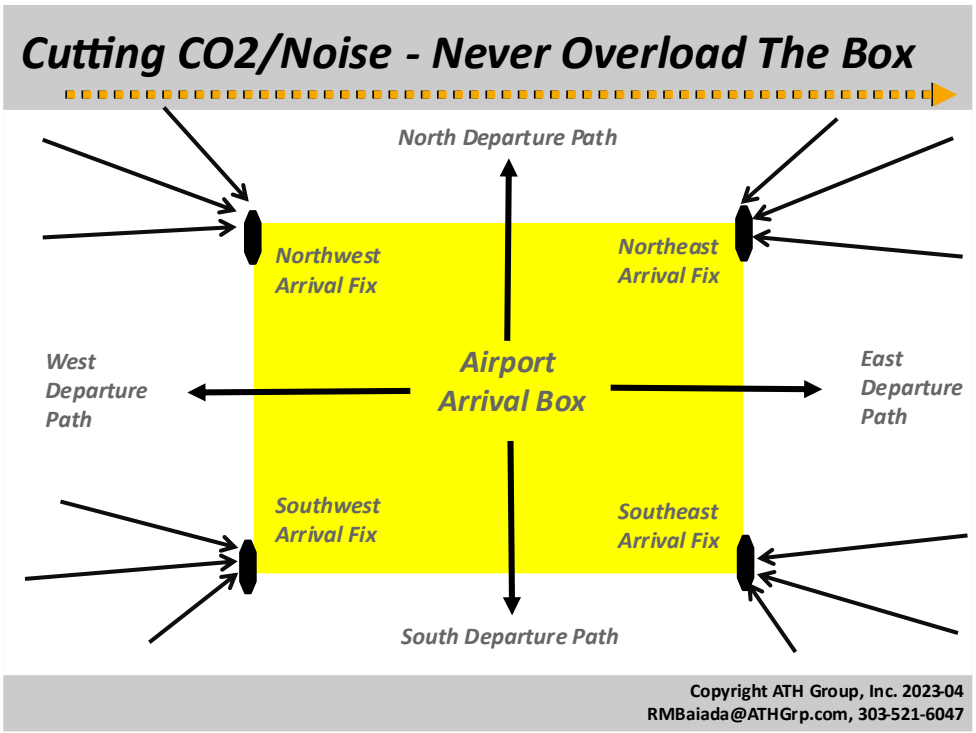
RMBaiada@ATHGrp.com, 303-521-6047

ATH simplifies the arrival flow problem by looking at the airport as a single entity, i.e., a box. If the box can hold 60 aircraft per hour, allowing a rate of 80 aircraft per hour (or 40 in 30 minutes) to enter the "box" assures a very expensive 30 NM final.



Newark (EWR) FAA AADC Arrivals

Control entry to the "box" and you mitigate much of the current arrival inefficiency and costs (block time, fuel, crew time, noise pollution, etc.).



Airport Arrival "Box"

To make this a reality, the solution is that, instead of waiting for ATC to de-peak the actual arrival flow backward in time at around 200 nautical miles (NM) from landing, an airline could proactively pull the “right” aircraft off the front end of the actual arrival queue (at 500 to 1,500 NM from landing, or more).

By speeding the “right” aircraft at the front of the arrival queue and pre-sequencing the aircraft inside the queue from a business perspective, hours prior to landing, provides ATH, the airport and ramp a consistent, manageable flow, which increases airport throughput and improves reliability. Further, an airline could speed up late aircraft, deal with aircraft maintenance issues or crew legality issues, and slow early aircraft or aircraft without a gate.

1.7 All Airlines Must Participate

A common misconception is that all airlines would have to participate in GreenLandings® to make it work.

I realize that this is what everyone believes, but it is simply not what the data and analysis shows, as proven with FAA Task J at CLT and MSP.

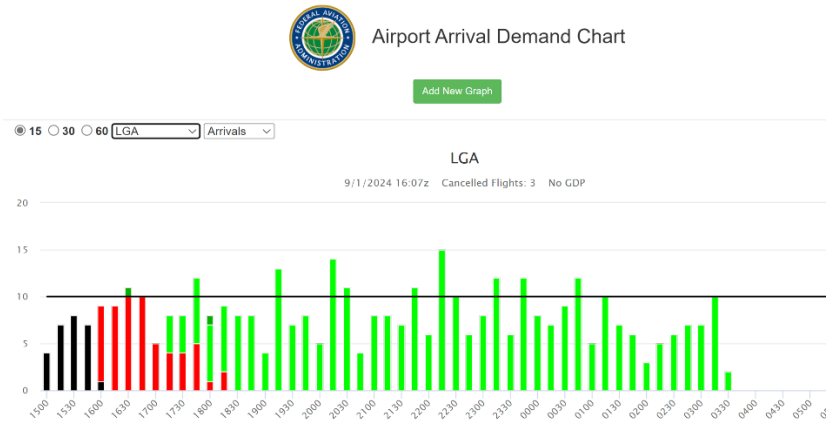
- GreenLandings® project provided evidence of system-wide and airline-specific benefits that can be attributed to the assessed systems
- $12.3 million system and $3.1 million airline (MSP, first year)
- $5.6 million system and $3.1 million (CLT, first year), annually, at modest levels of pilot compliance, which are easily improved
- 2,100 flight hours and 4,400 slots for a fuel savings of over $4M a year (ATL, steady state)
- **7.6% RTA Compliance** (benefits improve with more flights optimized and complied)

Of course, if all aircraft into an airport were participating through the GreenLandings® Exchange solution (which does not provide any internal business information to the competition), the benefits would be higher for everyone, but as proven by FAA’s Task J analysis and conclusion, not even most flights need to participate.

Further, the thinking that all users must participate assumes that there is limited capacity, and everyone wants the same thing. These are not valid.

As FAA’s chart below shows, there is plenty of capacity, both forward and backward in time, but we see random point overloads that lowers the stability of the system.

RMBaiada@ATHGrp.com, 303-521-6047



Also, once you move each aircraft in time based on the user's business needs (schedule, gate availability, capacity, maintenance, crew legality, etc.), analysis has shown that this tends to flatten the over demand events.

Next, consider 10 aircraft flying into a hub, with 8 aircraft belonging to the hub airline and managed and 2 aircraft owned by the competition that are not managed.

Using GreenLandings®, the hub airline could line its 8 aircraft all in a row, ignoring the 2 competing aircraft, but this is inefficient.

If the hub airline did this and ignored the competitor's aircraft in the 3rd and 6th arrival slots, ATC would simply do what they do today take one of the 2 aircraft in the 3rd arrival slot and move it backwards, and then delay aircraft 4 through 10 backwards in time as well. ATC would then do the same thing for the 2 aircraft in the 6th arrival slot.

A more profitable solution for the hub airlines would be to leave an open slot for the competition, since the hub airline's aircraft.

By doing this, GreenLandings® benefits all users into the hub.

1.8 No Gate?

Why fly fast enroute if your gate is not available? Not only does this waste fuel enroute, but it also congests the terminal airspace, delays other aircraft increases noise, takes up a valuable landing slot which should be used by a late aircraft, congests the ramp, and - as proven by ATH Group - leads to increased taxi times while early flights wait for their gate.

RMBaiada@ATHGrp.com, 303-521-6047

Teterboro (TEB) Ramp Congestion

Further, the airline has ramp workers, fuelers, and other secondary processes “standing by,” wasting time, and costing money. One action produces lower quality with numerous highly variant and costly effects. Nothing academic here - just well-understood supply chain and defect prevention tools from a system perspective.

Given the facts, one would think airlines would jump at the chance to internally implement an FAA-proven, independently validated, inexpensive solution that, within months, can improve on time performance, product quality, profits, and ATC - while cutting costs, fuel, CO2, noise, and daily defects, all with a return on investment measured in months, if not weeks.

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
Finally, below are a few articles outlining why ATH"s Operational Excellence solution (>%5 CO2 reduction, >85% A0, <3% day to day A0 Standard Deviation, >8 minute scheduled block/gate time reduction per flight), driven by GreenLandings®, is the achievable path forward to make airlines and ATC dramatically better and more profitable. Like Toyota did in the 1980s for the auto industry, all it takes is one airline, airport and/or ANSP to lead the way.

The first group of web links tells the GreenLandings® story, while the second group of web links provides additional information.

- *Aviation Needs a New Direction - Driven by Vision and Leadership* (MTS, Nov/Dec 2019)
- *Air Traffic Control is not the problem* (MTS, Spring 2022)
- *Russ Ackoff System Discussion Video* (YouTube, 1994, 12 minutes)

- *GreenLandings Benefit Summary* (2022-05)
- *GreenLandings® Briefing* (2022-12)
- *GreenLandings Summary Description* (2022-10)
- *GreenLandings® Heathrow Interview by Harold Goodwin - Responsible Tourism* (YouTube - 46:46, 2020-12-30)

RMBaiada@ATHGrp.com, 303-521-6047