CHECKList
Delta Issues Update
Issue 32 September 1, 2007

Confessions of an Attila™ Doubter

By Captain Tom Hendricks, general manager, Line Operations – Flight Operations

Attila™ Okay, I'm convinced. After nearly two years of fits, starts, analysis and re-analysis, I feel confident in telling you that Attila™ RTAs are something we need to get on board with and do it in a big way. It's important to understand why a healthy amount of skepticism surrounding this initiative was prevalent in Flight Operations. It's even more important to explain how and why that skepticism has been addressed.

What does that mean to Delta line pilots? Effective September 1, all Atlanta-bound flights began receiving RTA messages whether or not a change in speed is required. This helps highlight the importance of arriving at the goalposts as close as possible to the RTA. Also, the window of time adjustment is currently set at plus or minus one minute (based on forecast winds – more on that later). Also, Flight Operations opened up this window to plus or minus two minutes. These two changes should lead to much better operational results.

Some Perspective on How We Got Here

ATH Group approached Delta in January of 2005 with their concept of time-based metering in the Atlanta airspace. Many people within Delta were intrigued about the concept and thought it showed great potential. A decision was needed on whether or not to proceed with a business arrangement with ATH. This took place in August and September of 2005 – just a few other things going on in that time frame. Within Flight Operations, most of the leadership was in the "show us" mode and we decided to approve some limited testing of the concept in Atlanta.

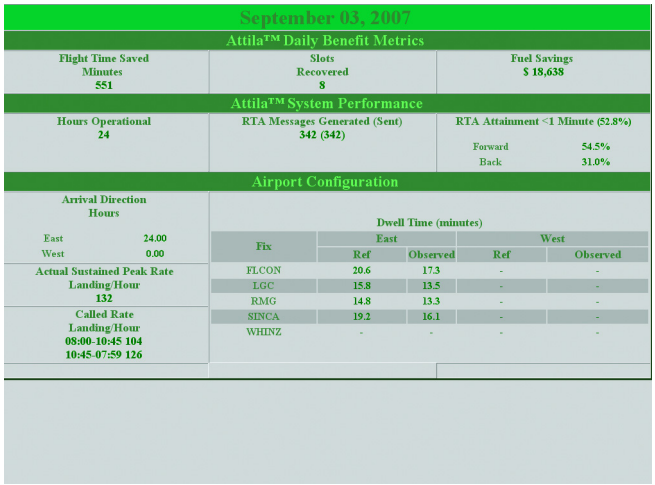
By the time all the contracts were signed and bulletins were published, it was nearing the end of the year.

ATH moved some expertise on to the Delta campus and into the OCC. Much integration with Delta's suite of operational systems occurred and a limited turn-on occurred in April of 2006. As with any new program, after these initial RTA messages were sent out, some unintended problems arose. Flight Ops received feedback from line pilots about these problems and we decided to take down the program for a few weeks to re-program some parameters in the system.

Late in the spring of 2006, those bugs were fixed and a limited use of Attila™ began again. During this time frame, the Atlanta Airport Construction Project was in full swing and runway 10/28 opened up at the end of May. All the time, Attila™ was running and the data collection started to show positive signs.

Flight Operations had made a conscious decision to support the testing of the Attila™ project, but frankly, we weren't convinced it would work. It was during the summer of 2006 that we saw some promising indications and decided to do some further analysis. We felt our credibility was at stake and before we completely endorsed such a new notion, we needed to be as sure as we could that this would benefit the Atlanta operation.

How did we start to move down that path? We contracted with Dr. John Paul Clarke from Georgia Tech to come in and do an independent statistical analysis of what the Attila™ data was indicating. This took several months and Dr Clarke's methods are insightful into why we're convinced that Attila™ is a good thing.



September 03, 2007

Attila™ Daily Benefit Metrics

Flight Time Saved Minutes	Slots Recovered	Fuel Savings
551	8	$ 18,638

Attila™ System Performance

Hours Operational	RTA Messages Generated (Sent)	RTA Attainment <1 Minute (52.8%)	
24	342 (342)	Forward	54.5%
		Back	31.0%

Airport Configuration

Arrival Direction Hours

East	24.00
West	0.00

Actual Sustained Peak Rate Landing/Hour: 132

Called Rate Landing/Hour: 08:00-10:45 104; 10:45-07:59 126

Dwell Time (minutes)

Fix	East		West	
	Ref	Observed	Ref	Observed
FLCON	20.6	17.3	-	-
LGC	15.8	13.5	-	-
RMG	14.8	13.3	-	-
SINCA	19.2	16.1	-	-
WHINZ	-	-	-	-

Dr. Clarke's Analysis

The two primary parameters for measuring success with Attila™ are **dwell time** and **recovered** or **unused slots**. Dwell time measures the time from the forty mile corner-posts in Atlanta to touchdown. Recovered slots measures the number of times additional aircraft are placed forward in the queue to unused slots for a particular arrival. Both of these measures started to look promising in Dr. Clarke's analysis.

Recall that in the fall of 2006 we took down runway 26L in Atlanta for resurfacing. This made any analysis very difficult. Dr. Clarke was able to complete his analysis (using much more conservative assumptions than ATH) in November of 2006. His findings pointed to even greater potential savings than that predicted by ATH. Armed with this, Attila™ was again implemented in January 2007. Runway 26L was then open and taxiway Victor was close to opening. As the year progressed, signs that Attila™ was effective were increasing.

Signs of Life

After receiving another briefing on the data in late winter, Flight Operations asked ATH to go back to provide "apples to apples" comparisons on the Attila™ data. What we were looking for was Attila™-ON versus Attila™-OFF data for comparable day of week, time of day, weather and runway configuration. When that information was received, it was very compelling and Flight Operations decided to move forward.

At this point, we wanted to get a "fresh look" at the entire program from a line pilot. Being "headquarters types," one thing we are leery of is developing an "ivory tower" view of the operation. After our long history with Attila™, we wanted an unbiased view of the program before we spent precious communication capital on such a new program. This is when Atlanta 737-800 LCP Captain Ron Baker was invited to provide some perspective. Ron's marching orders were, "let us know what you think." Ron recently completed his analysis, briefed Flight Operations leadership. His findings provided the final impetus for us to proceed with the program and are the basis for this special edition of "The *CHECKList*."

Here's an important "bottom line" to understand. The apples-to-apples comparison showed that whether with compliance with RTA requests or just plain magic, Delta's overall ATL operation runs more efficiently when Attila™ is running than when it isn't. Now, we know from anecdotal line feedback that that individual compliance rates are probably much higher for messages that require an aircraft to speed up than to slow down, but we still are getting some benefits. We think that once we convince all of you to regularly comply with all RTAs we will receive even more benefits.

It's Not About You…It's About an Aircraft You Don't See (Or Hear)

When Attila™ began its limited rollout, we began to receive feedback that the RTA solutions seemed to work against the aims of a particular flight. For example, "My flight was late and I got an RTA message to slow down!" and, "I was given an RTA message to speed up and was put into holding!" The critical piece to remember about Attila™ is that it is a **system solution, not an individual flight solution.** What is transparent to a crew faced with situations like these is the recovery of unused slots in the queue that might be fifteen aircraft ahead of or behind you (and possibly on a different frequency). The data that ATH provided convincingly shows that when Attila™ is operating, we are recovering unused slots. This means a much more efficient flow of aircraft into Atlanta.

How about those times when you've not been given an RTA and were asked by Atlanta TRACON to speed up? There's a good chance that Attila™ is the reason. So, when things don't necessarily add up for your flight, remember that the overall system is benefiting from aircraft flying Attila™ RTAs.

Dwell Time Explained

This is the time from crossing the corner-post to touchdown in Atlanta. The analysis of this data provided the most compelling argument to support Attila™. Again, using "apples to apples" comparisons, the reduction in dwell time when Attila™ is active is significant. Ron Baker explains more detail on how much time and money this saves later in this "*CHECKList.*"

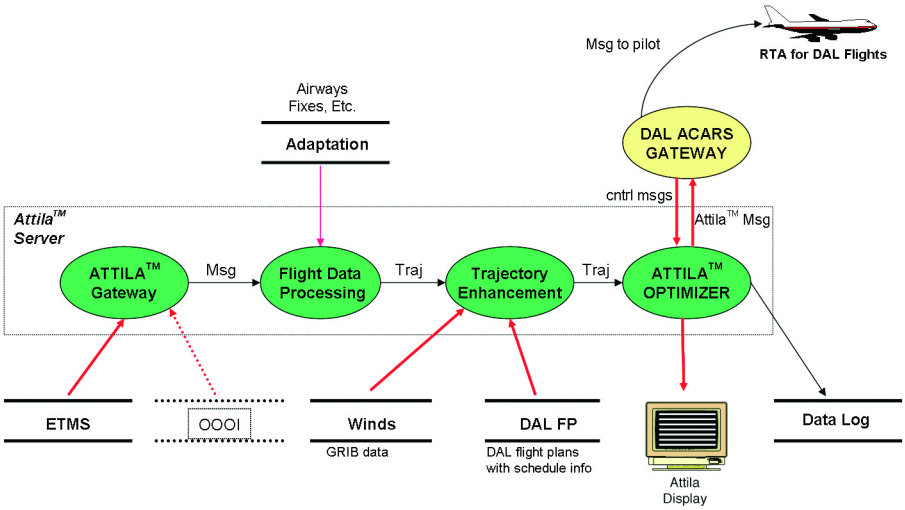
Wait a Minute…Aren't Brand X and Brand Y Benefiting Too?

Yes they are. But Delta is such a big gorilla in Atlanta, the scope of our improvements make the incremental improvements for our competitors worth it. Again, think about the enormity of our presence in Atlanta. As the tide rises through total airspace improvement, so do the fortunes of Delta in that airspace.

I Got an RTA that Required a Five Minute Change at the Goalpost!

Attila™ does have limitations. Until we can transmit continuous real time wind data, Attila™ is stuck using forecast winds. Generally speaking, the wind model used for flight planning is pretty accurate. That is the only solution available for the Attila™ computations. One way to keep your FMC synced- up with an Attila™ RTA is to keep the enroute winds updated with abeam points after receiving a direct to a waypoint. When faced with one of these situations, just do the best you can while remaining within the 10KTS/5% TAS FAR limit. A key assumption of the entire program is that it should be fairly transparent to ATC, so any discussions of RTAs with controllers will likely be greeted with a, "huh?"

Delta Attila™ Processes & Interfaces



Time Based Metering…The Future

Attila™ is our first glimpse at one important feature of the Next Generation Air Traffic System (NEXTGEN). As we begin the transition from ground-based to satellite-based navigation, four dimensional air traffic control will begin to evolve. One important feature of NEXTGEN is time based metering. With precise vertical and horizontal path control, ATC, in the future, will use timing to squeeze more capacity out of the total airspace system. This will provide for very predictable vertical and horizontal paths culminating in RNAV RNP arrivals and approaches. This future system will finally allow us to truly optimize how we fly our jets while at the same time safely increasing capacity in the domestic system. Attila™ is just a small version of this larger concept and many of the lessons we learn with Attila™ will be applied to future time based metering indicatives.

So There It Is…I'm In

I was very skeptical of this initiative from the onset. But as we conducted further and further analysis on the program, I'm now a strong advocate for incorporating Attila™ into our daily operation in Atlanta and elsewhere. We're still going to learn some lessons as we make tweaks to the system, but overall, I'm convinced the benefits are real and significant. I'm asking for your support on this project. I too realize there's skepticism on the line, but as we become more and more familiar with Attila's™ benefits, those benefits will overcome that skepticism.

Please do your best to comply with RTAs. If your flight is overcome by other events, then that's obviously where the priority needs to be. But if given an RTA, making Atlanta more efficient is worth the effort.

Getting "Attila'd"—The Big Picture

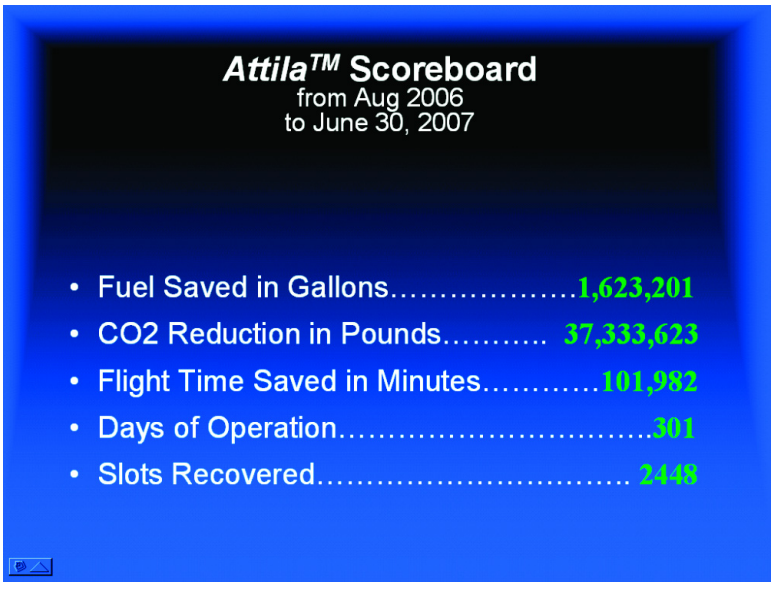
By Neil Stronach, vice president – Operations Reliability and Control

Hopefully, this *CHECKList* will provide some perspective on the benefits of Attila. Unfortunately, when Delta first started using the Attila program, we did a poor job of communicating the concept, requirements and benefits so we never got buy in from THE people who were critical to Attila's success…the Delta pilot. Even the Flight Ops management team was skeptical (see the lead article from chief skeptic, Captain Tom Hendricks).

As this *CHECKList* illustrates, our operation benefits immensely from Attila through a variety of factors including increased arrival rate, decreased flight time, and improved fuel burn. The bottom line… Attila helps Delta's bottom line. For example, we can expect to save approximately $4 million this year if we can achieve just a 42% compliance rate. Additional savings are possible with higher program compliance rates.

As we move forward, we are striving to achieve even greater operational efficiencies through new technologies and ultimately, hope to expand Attila's time based metering concept into other airports. For those of you familiar with Continuous Descent Approaches (CDAs) it is a procedure that optimizes the aircraft approach from the beginning of its descent to touch-down, dramatically reducing noise and emission levels. The key to a CDA is a feasible time based metering program such as Attila. And, since CDAs are a key technological piece of the FAA's "Next Generation Air Transportation System", we can expect the air traffic control system to implement time based metering (like Attila) for all aircraft handling in the near future. It is not often that Delta Air Lines is on the leading edge of aviation technology but we have been involved with the time based metering concept from the very beginning.

This issue of *CHECKList* is the first step in converting Delta's skeptics into true believers, or at least willing participants, by providing "The Big Picture." Operational efficiencies and improvements are only possible if everyone participates. Thank you for supporting this initiative and for everything you do to keep our operation on track.



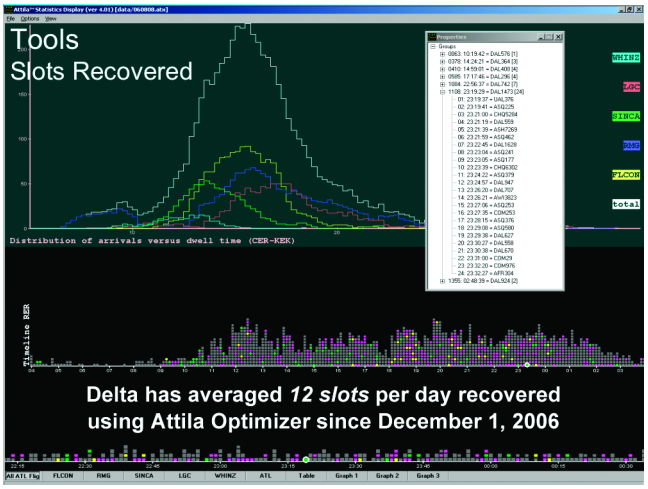
Coming to More Delta Flights Soon: Attila™ Corner-Post RTAs

By Captain Ron Baker, 73N line check airmen – Flight Operations

The due diligence has been done. This portion of the analysis is complete. ATH Group out of Lanham, MD is the designer of Attila™, the company-managed arrival sequencing system, designed to improve the efficiency and profitability of an airline's daily operation. Our data shows slots recovered and decreased dwell time. This has been cross-checked through independent research completed by Dr. John-Paul Clarke of GA Tech and the FAA's ARMT (airport resource management tool). All data shows the same facts with only minor variations. Attila™ RTA's are saving time and fuel through reduced dwell time and recovered slots in Atlanta.

Dwell Time

Atlanta has five arrival gates or Corner Posts (CPs). Each CP has an average "dwell time" for east or west arrivals and landings. Dwell time is the time from the CP to touchdown. Attila™ RTAs reduce that dwell by optimally spacing Delta aircraft over the CP's for minimum time to touchdown on the runway. The greatest reduction in dwell time is for aircraft that must fly a downwind arrival but it also reduces time for aircraft flying straight-in approaches.



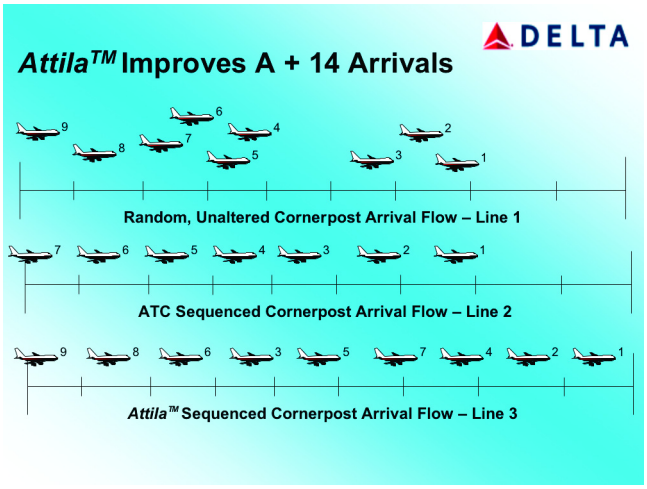
Recovered Slots

Attila™ also recovers slots at a major hub operation. Delta Air Lines has stringently defined what constitutes a "slot recovered." First it must be an identified flight that has been "sent an RTA message and moved forward to a slot that would not have otherwise been utilized." There also must be another available slot forward of the slot being recovered. Furthermore, all aircraft in the sequence must also be pulled forward until the next break in the queue. Only then can a slot be identified as "recovered" for tracking purposes. Slots recovered mean less enroute time, less dwell time and less holding in Atlanta.

Draft Effect

Dr. John-Paul Clarke, Associate Professor of the School of Aerospace Engineering and the Director of the Air Transportation Laboratory at Georgia Institute of Technology coined "the Draft Effect" to describe the overall improvement in the arrival sequence to KATL. As aircraft are moved forward to recover slots, subsequent aircraft are pulled forward whether they receive an Attila™ RTA message or not. Analysis of over 17,000 non-participating flights (i.e.,

flights that did not receive an Attila™ message) on days that Attila™ was operational, showed that all aircraft in the arrival queue are pulled forward by upwards of 40 seconds. In other words, when Attila™ is operational, all inbound ATL Delta and Delta Express flights benefit, even though they did not receive an Attila™ message. While 40 seconds does not sound like much, when combined for an entire day, month and year, the savings are substantial.

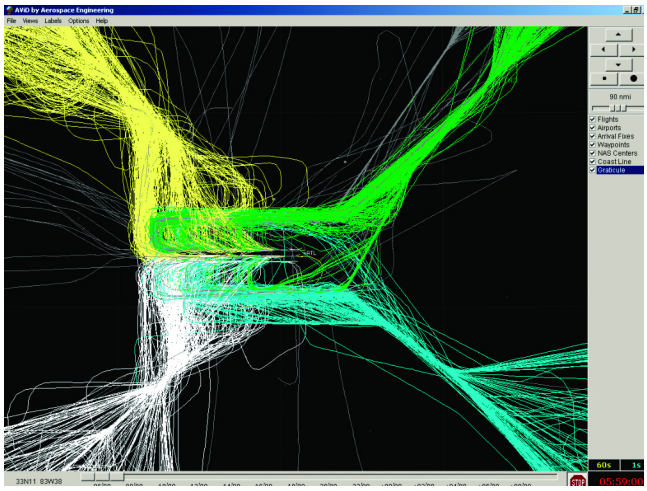


Sequencing for DOT's Arrival + 14

Another key item that Attila™ accomplishes is a change in aircraft sequencing to improve our DOT on-time statistics. Attila™ give a higher weight to Delta flights that are in or just outside of the DOT arrival criteria to make Arrival + 14 minutes for an on-time arrival. Unlike the ATC sequenced arrival flow, Attila™ adjusts the sequencing to pull those flights forward that can make A +14; and conversely drops back other "early arriving or late beyond recovery aircraft" to free up a slot. Attila™ improves DOT On-Time- Statistics.

Delta Goes Green While Maximizing Airspace Capacity

Attila™ is making Delta "green" by reducing the dwell time in the Atlanta airspace thus reducing CO2 emissions and noise. Delta Force for Global Good is currently planting a tree for every employee and all customers who sign up making a one-time contribution on Delta.com with our partnership with the Conservation Fund's "Go Zero Program." This Program begins the process of planting trees to help offset or "zero out" the carbon footprint of air travel. Attila™ concurrently improves the quality of the air in the Atlanta area with CO2 reductions as it maximizes airspace capacity.



Cost Savings

Conservative in-house tracking since December, 2006 has shown significant financial benefits for Delta. A daily average reduction in flight time of 5.75 hours due to reduced dwell times and 12 recovered slots translate into saving approximately $11,000 per day. And this savings is calculated with less than full participation during the beta testing and is based solely on Atlanta operations.

Annualized, this is close to 2,100 flight hours and 4,400 slots for a fuel savings of over $4M a year at $2.00 per gallon.

Attila™ Optimizer Recap:

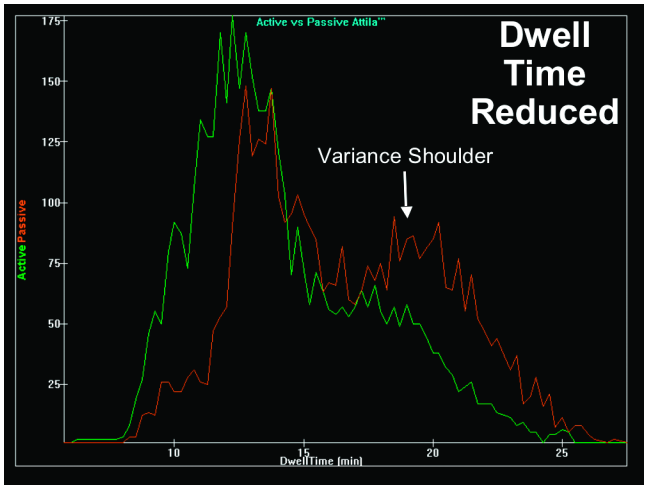
Allow me to recap here. Attila™ RTA's are currently pulling aircraft forward due to the "Draft Effect" saving upwards of 40 seconds per flight as it recovers approximately 12 slots per day. It is changing the sequencing of aircraft to improve A + 14 arrival time and decreasing dwell time by an average of over 1 minute per flight by the most conservative estimates. All the while, Delta is maximizing airspace capacity and at the same time reducing CO2 emissions. Think about the possibilities as we raise the awareness and compliance amongst Delta crewmembers and potentially utilize Attila™ at other hub airports.

Coming to Your Flight Soon

Due to an initial healthy skepticism from Flight Operations Department, fairly tight parameters were put on the RTA messages that have been sent subsequent to the start-up hiccups associated with the program. On days that weather conditions allowed the Optimizer to operate, messages were only sent to aircraft that were moved forward or back with a +/- 1 minute change at the CP from the predicted ETA. That has now changed. Beginning September 1st, Delta Air Lines began sending all RTA messages to Delta "optimized aircraft," i.e., where Corner-Post RTA ~ ETA. Concurrently they will open up the window incrementally to +/- 2 minutes and measure the results of those changes to see if further adjustments are appropriate. Speed changes will not exceed the FAR maximums for required reporting and Attila™ RTA's will remain transparent to ATC. As participation increases, flight crews should see less vectoring and speed changes under optimal conditions coming into the terminal area and an increase in the benefits associated with Attila™ RTA's.

What Does an Attila™ Do For Me?

So you may ask; what will Attila™ do for me. If the person asking is in Flight Operations, my answer is that Attila™ saves time and fuel and the benefits associated with higher participation and its use system wide are exponentially bigger. For those in Delta Air Lines' Accounting, Customer Service, Finance, Fuel Management, In-Flight, Marketing or Scheduling Departments; my answer would be quite similar. While the particulars are slightly different for each department, the facts are that the benefits in optimizing the airspace while we minimize the arrival sequence and fuel usage are significant. It is time that we take advantage of one of many stepping stones to continue the transition from the Twentieth-Century Air Traffic Control system into the Twenty-First. It is one of many steps in the right direction to control some of the variances in our production costs of delivering our passengers and cargo from point A to B. As we remove the variance and deliver the product as promised and on time, we will be able to maximize the yield for our services from our customers.



Your Participation is Needed

Fly Attila™ RTAs to the CP like you would a military aircraft with a payload to a Time-On-Target where Osama Bin Laden is stopping for a one-minute coffee break or a charter flight with a load of revolutionary iPhones that are going to be free to every Delta employee if you arrive on time to the minute. Attila™ is a state of the art software system our competitors currently do not have. It saves time, fuel, and money while helping Delta become environment friendly and "green." Combine that with reduced enroute times and more on-time arrivals and Delta Air Lines offers our customers a better product.

Want More Information?

For even more information on this exciting new technology, visit: http://www.athgrp.com/

This link will take you to ATH Group's website where you'll see answers to Frequently Asked Questions, view the latest Attila Scoreboard, and articles outlining why pilots are the key to Attila's success. Check it out!