

What s different about a CDM GDP?

Introduction

In January 1998, the FAA has implemented a new process of conducting ground delay programs (GDPs) referred to as Collaborative Decision Making (CDM). CDM is a joint FAA/industry initiative aimed at improving Traffic Flow Management through increased information exchange and improved collaboration.

There are two central tenants to the CDM

1. Better information will lead to better decision making
2. Tools and procedures need to be in place to enable the Air Traffic Control System Command Center (ATCSCC) and the National Airspace System (NAS) users to more easily respond to the changing conditions at airports with capacity constraints

The rest of this paper attempts to explain some of the key differences between CDM GDPs and GDPs run under the current enhanced traffic management system (ETMS). At present, the ATCSCC is implementing CDM GDPs at all airports (within the contiguous USA) when needed.

Data exchange

At the core of CDM is a data exchange between the FAA and the airlines. The participating CDM members send in operational schedules and changes to the schedules on a continuous basis to the FAA. Changes include, but are not limited to, delays, cancellations, and newly created flights. Every five minutes the FAA consolidates this information into an Aggregate Demand List (ADL), and sends it to the ATCSCC and the participating CDM member airlines.

Both the ATCSCC and the airlines use a software package called Flight Schedule Monitor (FSM) to view the ADLs giving them a common shared picture of the demand. The ATCSCC uses the demand information to determine if a capacity/demand imbalance exists and if it warrants some type of ground hold strategy. The users see how their flights fit into the total demand, which allows them to plan more effectively (e.g., flight cancellations, extra hold fuel, etc.).

Using the updated demand information to make GDP decisions is a significant improvement over the current system. In ETMS the FAA projects the demand on an airport based primarily on OAG schedule information and airline filed flight plans. Unfortunately, the information in the flight plans is usually not available when a GDP decision is made (usually 3-4 hours ahead of time) because they are typically filed by the airlines 60-90 minutes prior to departure. Thus, using the current system the ATCSCC bases most of its GDP decisions on OAG data, which does not reflect any significant schedule changes that an airline may make in response to changing conditions at a particular airport.

While only the participating CDM members are currently sending in updated schedule information, this data exchange benefits all users by giving the ATCSCC a more accurate—but not perfect—picture of the projected demand allowing them to make more informed decisions. For example, on 2/4/98 conditions were such that a GDP would be needed for EWR based on the demand projected by ETMS. Continental Airlines, however, cancelled a large fraction of their flights resulting in the actual demand more closely matching the available capacity. Because these cancellations were accurately reflected by the CDM system the ATCSCC decided not to run a GDP.

Ration by Schedule

In the current traffic management system, if an airline reports cancellations in advance of a GDP, those flights would simply be dropped from the database. The airline would not be able to use their assigned arrival slots for substitution. If an airline reports a mechanical delay on a flight, the system will re-project its arrival time. If a GDP were run at that time, that flight would likely receive an additional delay on top of its mechanical delay. These effects have become known as the "Double Penalty" issue, which represented a barrier to implementing the data exchange. The airlines would simply not send in information that would produce clear adverse economical consequences. Ration by Schedule (RBS) removes this disincentive.

The concept of RBS is very simple. When arrival capacity is reduced, the limited arrival resources must be rationed. For scheduled carriers, the rationing is based upon the original schedule, and not the current arrival time projections for CDM GDPs. This allows participating airlines to send in delay information without incurring a double penalty.

It is important to note that there are several observable differences in the execution of a CDM GDP due to the use of RBS.

- Canceled flights are assigned arrival slots and are issued EDCTs. This allows the airline—regardless of CDM member status—to retain control over that slot and substitute another flight into that open slot if desired/possible.
- Active (airborne) flights are also assigned arrival slots and issued EDCTs. This insures that all flights arriving during the period of the GDP have slots, and gives the airlines flexibility with the usage of these slots. For example, an airline that diverts an airborne long-haul flight can substitute a shorter flight that can make use of the open slot. Note, in these cases the EDCT should be the actual departure time as known by the FAA database.
- Flights filed to arrive at a different time than schedule will still receive arrival slots (and delays) based on the original schedule time. In the case of an airline-reported delay this avoids the double penalty. In cases where a flight is filed to arrive (significantly) earlier than schedule time, assigned delay may appear to be disproportionately large.

Compression

When an airline cancels a flight the current substitution rules allow them to substitute another delayed flight into the first flight's slot, thus, reducing the second flight's overall delay. The airline can then substitute a third flight into the slot vacated by the second flight, and so on. This process continues until all of that airline's delayed flights are moved up, or as usually happens, a point is reached where none of the airline's other flights can make use of the open slot because it is earlier than the flight's original arrival time before the GDP.

Compression, also known as bridging substitutions, is a process whereby unusable arrival slots are shifted in time so the owner can again use that slot. Say, for example, an airline has 2 flights scheduled to arrive in EWR: flight 1 at 1300 and flight 2 at 1500. After a GDP is run, flight 1 is assigned a 1400 arrival slot and flight 2 receives a 1700 arrival slot. If flight 1 is canceled, flight 2 cannot make use of the 1400 arrival slot because it occurs before its scheduled arrival time of 1500. Compression prevents this slot from being wasted by moving up another airline's flight that can use the slot, and then subsequently filling the newly vacated slot until the open slot is at 1500 or later where flight 2 can use it.

Current procedures for CDM GDPs is that the ATCSCC will run compression approximately a half-hour after a GDP or GDP revision (see next section) and then approximately hourly or as needed. Note, the compression process generates a new EDCT list that is sent out to everyone.

Originally, the compression was performed on all flights, CDM members' flights and non-members' flights. However, because the compression process was new and had caused some confusion among airlines that are not CDM members, compression was set to act only on member's open slots, and only member's flights are used as bridge substitutions. The result was that non-members were not affected by compression, and their EDCTs would not change when the new EDCTs list was issued. On August 29, 1998, ATL GDP was issued. In this GDP, all CDM member flights were compressed as much as possible, yet, in some hours, the arrival demands were lower than the Arrival Acceptance Rates (AARs). It became apparent that non-CDM members needed to be compressed to fully utilize the precious airport resource.

Revision

In order to hold flights on the ground the ATCSCC needs to make decisions concerning GDP parameters (start & end times, airport arrival rate (AAR), centers included, etc.) based on forecasted capacity/demand information. This information is dynamic and conditions do change during the course of a GDP that require adjustment in order to continue to balance demand with capacity. In the current ETMS the ATCSCC has a limited ability to adjust a GDP. Their options include

1. Issuing a blanket delay increase/decrease which adjusts all flight's EDCTs by the same amount
2. Release select groups of flights from their EDCTs
3. Extending a GDP, which is essentially running a second GDP beginning at the end of the first one.
4. Canceling the GDP and issuing a new one

The blanket delay is a very course traffic management tool that cannot effectively smooth out spikes or gaps in the projected demand. In long running GDPs when the demand and capacity get too far out of balance the ATCSCC often has to issue a ground stop to prevent airborne holding from reaching an unacceptable level.

FSM gives the ATCSCC the ability to revise any or all of the parameters of CDM GDP to adapt to changing capacity or demand. For example, they can increase the AAR for select hours if predicted weather doesn't materialize, or they can reduce the AAR and extend the duration of the GDP if the weather does not move off as expected. In some cases when a surge in the projected arrival demand occurs as a result of new or shifting demand (e.g., pop-ups, "white hats", internationals operating off schedule, controlled flights not departing on their EDCT, etc.) the ATCSCC can also revise the GDP using the same parameters to smooth the flow back out.

In the revision process the available arrival slots are recomputed using the revised GDP parameters, and then flights are reassigned to the slots based on their exempt status and previous position in the GDP. New EDCTs are then issued. Depending on the nature of the revision delays on previously controlled flights can increase (lower AAR) or decrease (higher AAR). This point is illustrated in the following example:

- At 1000 a GDP is run at a 20 rate (i.e., one arrival every 3 minutes) resulting in the CTAs in the second column of the table below
- At 1200 a pop up flight (#5) is added to the demand and Flight 3 is airborne which exempts it from revision
- The forth and fifth columns show the resulting CTAs if the GDP were revised down to a 15 rate or up to a 30 rate, respectively.

Flight	Original CTA (AAR = 20)	Demand before revision	CTA if revised to AAR=15	CTA if revised to AAR=30
Flight 1	1400	1400	1400	1400
Flight 2	1403	1403	1404	1402
<i>Flight 5</i>		1404 (pop up)	1412	1404
Flight 3	1406	1406 (active)	1406 (1408 slot)	1406

Conclusion

The FAA is now implementing CDM GDPs at all airports (within the contiguous USA) when conditions warrant it. This new process for conducting GDP is a significant improvement over the current ETMS, and benefits both the participating CDM members and non-members.

It is important to note that there are several observable differences in the execution of a CDM GDP versus the current ETMS. The differences include:

- Control times (and delays) are now based on scheduled time of arrival instead of current ETA to avoid the double penalty.
- The EDCT lists now include control times for both active (airborne) and canceled flights to give the user more control over their slots and the ability to substitute for these flights.
- GDPs can now be compressed and/or revised which results in new EDCTs being issued more frequently. Note, EDCTs for non-CDM members do not change with compression. With revision delays can either increase or decrease depending of the nature of the revision.
- CDM results in a more efficient utilization of arrival resources, so there is less slop in the system which may reduce the ability of the ATCSCC to give selective delay relief to individual flights (i.e., “white hats”).

Finally, the concerning the issue of fairness with the new CDM GDPs consider the following:

- Arrival slots are allocated in CDM GDPs and GDP revisions based on original schedule regardless of a user’s CDM member status.
- The data exchange between CDM member airlines and the FAA benefits all users by giving the ATCSCC a more accurate picture of the projected demand letting them make better decisions regarding GDPs.
- The delay reductions attained through the process of substituting flights into open slots vacated by flight cancellations have always been there, but now the process is more visible in CDM GDPs
- NAS users who are not currently CDM members are welcome to join. Check out the CDM web site (<http://www.metsci.com/faa/faa.html>) for more details and contact information