CDM PROCEDURES FOR THE BELGRADE AIRPORT

Milan Milunović – Juraj Vagner

Due to continuous increase of a number of flight operations, airports have to invest in their infrastructure, in order to keep providing its services smoothly and without causing delay. Post is divided in four sections. First two sections describe airport CDM, EUROCONTROL's project, which is aimed to improve punctuality and decrease delay caused by airports. Third section brings brief description of implementation of A-CDM on „Nikola Tesla - Belgrade" airport and forth describes benefits of its implementation.

K e y w o r d s: airport collaborative decision making, Nikola Tesla Belgrade airport, airport management, delay, airport procedures

1 INTRODUCTION

Number of flight operations in Europe grows each day, but surprisingly during the last decade En Route delays are decreasing. This is caused because of a vast implementation of new methods and equipment for traffic regulation in this area. On the other side, delay caused on the airports increases each year. Ideally for airports, airlines and passengers is that everything runs smoothly and by schedule. The airport CDM project has been lunched with an aim to increase airport efficiency and performance, by eliminating delay caused by inexistence of information sharing. Airport collaborative decision making insures that on the one side, airport operators have the latest and most accurate information related to their own area of operation, and on the other, that those information would be shared with other partners in right time. These kinds of management approach will inshore that airport operators receive accurate aircraft states information, CFMU gets accurate state information regarding future flights, and aircraft operators receive accurate operational data that may affect the flight of their aircrafts.

2 AIRPORT CDM HYSTORY

Whole concept of CDM started in US and it was formed by the group of airlines with the goal to visit several airports with traffic flow problems and analyze the reasons. That first CDM group established three of the most basic rules which remain valid to this day. Those rules which, unfortunately, in some cases are being ignored are:

- Most problems have simple causes with simple solutions
- Better information sharing eliminates a very large proportion of the problems,
- CDM can only be successful if trust is established between the partners as the first step.

The CDM concept was brought to Europe by experts of IATA and at first it was treated as a research topic and as such, assigned to the EUROCONTROL experimental centre. After a few years of researching and improving of US version of CDM, EUROCONTROL made whole new concept by linking a CDM airports to „CDM islands" and by making a complex network involving a Central Flow Management Unit.

The first European airport which believed in the Airport CDM was Munich airport. Full CDM implementation was completed in June 2007. Very soon the first positive results came out such as better ATFM slot adherence and reduced taxi times.

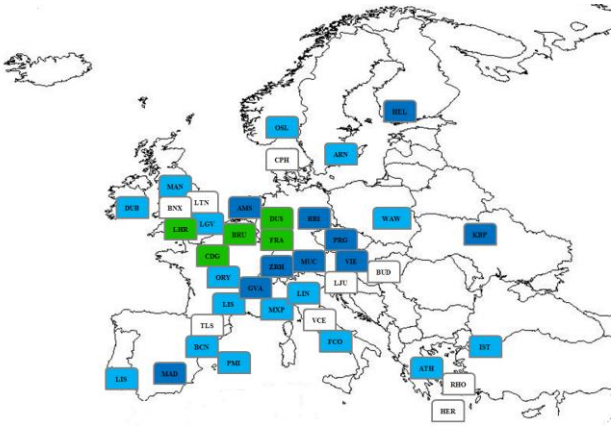

Figure 1 CDM airports

Soon the club of CDM believers started growing and by the year of 2013, 36 airports started implementation of A-CDM, and 5 airports completed it (Munich, Brussels, Heathrow, Paris CDG and Dusseldorf). Figure 1 shows European CDM airports. Green color represents airports which fully implemented CDM procedures, dark blue those which will complete implementation process by the end of the year, light blue those which will complete implementation in 2 years, and white those which implementation will be completed in more than 3 years.

3 AIRPORT CDM

Airport Collaborative Decision Making (A-CDM) is a project which is improving the predictability of events and optimizing the utilization of resources by reducing delays. The decision making by the Airport CDM Partners is facilitated by the sharing of accurate and timely information and by adapted procedures, mechanisms and tools. Whole concept consists of 6 main elements:

- **Airport CDM Information Sharing** - improves traffic predictability and common situational awareness by sharing of accurate and timely information between the Airport CDM Partners,

- **Milestones Approach** - improves punctuality and predictability by monitoring each flight in events defined as significant,
- **Variable Taxi Time** - brings more accurate estimates of taxi-in and taxi-out times in order to improve the traffic predictability,
- **Collaborative management of Flight Updates** - brings possibility of exchanging information between airport and CFMU (FUM and DPI messages),
- **Collaborative Pre-departure Sequence** - gives information about right time for start-up clearances, so that airplane can taxi and take-off without waiting in line behind other aircrafts.
- **CDM in Adverse Conditions** - consists of a collaborative management of airport capacity during periods of a predicted or unpredicted capacity reduction.

3 A-CDM NIKOLA TESLA AIRPORT

3.1 Project partners

Airport CDM allows an airport partners to make the right decision in collaboration even with other airport partners, knowing their preferences and constraints, in regard to the actual and predicted situation.

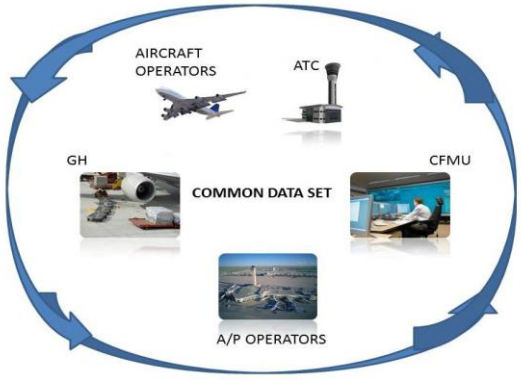

Figure 2 A-CDM project partners

Remain partners of A-CDM project at "Nikola Tesla Belgrade" airport are (figure 2):

- Serbian and Montenegro Air Traffic Service Agency (SMATSA),
- Nikola Tesla - Belgrade airport,
- NTB handling agency,
- JAT handling agency,
- The central flow management unit,
- Aircraft operators.

3.1 Implementation of A-CDM

EUROCONTROL recommends the implementation of airport CDM procedures in stages. The methodology which I would apply at "Nikola Tesla - Belgrade"airport is four phases implementation:

- Stage 1 - A-CDM information sharing,
- Stage 2 - Setting milestones,
- Stage 3 - TSAT time calculation,
- Stage 4 - Airport operations in accordance with A-CDM procedures.

3.1.1 Stage 1 - A-CDM information sharing

The successful implementation of airport CDM element „information sharing" is necessary for creating of secure communicational network. To insure reliability, it is necessary to add communication devices (which would support data inputting to the central system), and to establish a connection between central airport database and CFMU. The new network suited to the requirements of A-CDM procedures should consist of four channels:

- Channel A - the main channel,
- Channel B - backup channel,
- Channel C - backup channel,
- Channel D - Emergency channel.

In the case of great system failure in which all of these channels would be out of service, airport CDM procedures are stopped until problem is resolved.

3.1.2 Stage 2 - Setting milestones

Timely information sharing helps each partner to respond properly to the upcoming situation. In order to get beater acquisition of information, I would apply solution of 16 milestones setting. In those milestones (figure 3) needed information will be collected and coordinated as following:

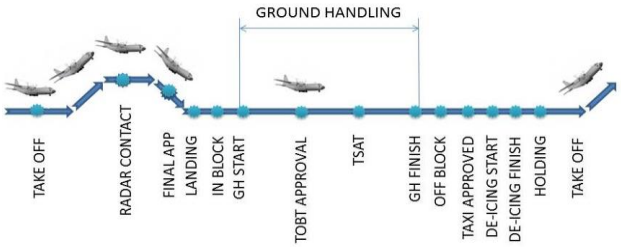

Figure 3 Significant events during the flight

Milestone 1 - This event brings to the CDM first specific information about time of arrival at "Nikola Tesla - Belgrade" Airport. CDM receives data in central database (CAODB) and makes first calculations and refinements as: Estimated time of arrival (Estimated Landing Time ELTD), Time when handling will be finished (Calculated Ground Handling Finish, CGHF).

Milestone 2 - When mentioned aircraft enters the area covered by surveillance system SMATSA it is possible to perform a new and more accurate calculation times listed in milestone 1.

Milestone 3 - If arrival is delayed at Nikola Tesla - Belgrade Airport, handling agent may choose to use

Express mode of handling, so to eliminate whole delay or at least part of it.

Milestone 4 - Landing will automatically record the actual time of arrival (Actual Landing Time, ALT). According to this time, CIBT and CGHF will be rechecked and refinished.

Milestone 5 - Parking the aircraft at aircraft stand will automatically initiate the creation of the actual time of arrival to stand (AIBT). According to this time, CGHF time will be rechecked and refinished.

Milestone 6 - Ground handling usually begins immediately after the aircraft stops at appropriate stand. If it's required by internal regulations of handling company, start of handling operation is recorded via PDA application CWI which give us information on Ground Handling Start time, AGHS.

Milestone 7 - Ramp agent responsibility is to insert/report first time TOBT not later than 25 minutes before scheduled departure (Time EOBT in the flight plan). With TOBT ramp agent confirms the completion of handling of the aircraft and this time is sent to the ATC systems/TWR, and it will be used for schedule of further operations. Ramp agent needs to report crew requirement for deicing procedure at least 25 minutes before the TOBT value. System will allow later entry of requirement for deicing, but it can mean disadvantage in the order for this procedure.

Milestone 8 - Target time of permit to start engines (Target Start-Up Approval Time, TSAT) occurs in the system Start-up Manager (SUM) TWR when controlling the aircraft movements to the departure sequence. SUM calculates the optimal time to start engines (TSAT), so that aircraft can taxi to the runway holding point smoothly as possible and without delay.

Milestone 9 - Completion of aircraft ground handling means completion of all activities associated with loading and unloading of passengers, cargo, mail, provision of technical handling, etc. At this point displace vehicle should be attached; wedges and cones removed, and the flight crew should be on DELEVERY frequency. By entering the Actual Ground Handling Finish time AGHF, ramp agent is confirming that aircraft is ready to startup engines/ for pullback.

Milestone 10 - In TSAT time (tolerance -3 to +3 minutes from TSAT), the flight crew have to request to start up engines. TSAT is sent through GHA crew at least 10 minutes before TSAT time. In case that fright crew didn't send a request for a permit in the interval TSAT, new TSAT is recalculated, which may cause a delay.

Milestone 11 - After getting a clearance to taxi, aircraft is taxing on the runway holding position, respectively deicing stand (if deicing is required by flight crew).

Milestone 12 - If the flight crew requires deicing, the plane stops at deicing stand.

Milestone 13 - When deicing begins, according to standard procedures for deicing of actual type of the aircraft, supervisor enter/report the Actual Deicing Start time, ADIS

Milestone 14 - After deicing procedure is successfully finished supervisor is moving mobile deicing equipment to safe distance.

Milestone 15 - When deicing is completed crew will follow instructions for taxing to the runway holding point.

Milestone 16 - After getting clearance aircraft is taking off and whole process is repeated.

3.1.3 Stage 3 - TSAT time calculation

Calculation of optimal TSAT (Target Start-up Time) is performed by a local airport ATC. Calculation is performed so that aircraft could, after getting start-up and taxi clearance, taxi smoothly to runway holding position and if possible without stopping proceed for take-off. Calculated TSAT time depends of TOBT time, variable taxi time, de-icing requirements, and time CTOT (if it's assigned).

Variable taxi time is new and more precise way for calculation of time needed to aircraft for taxi from aircraft stand to runway, or in opposite direction. This calculation method includes factors like type of an aircraft, weather conditions, used taxiways, aircraft carrier etc.

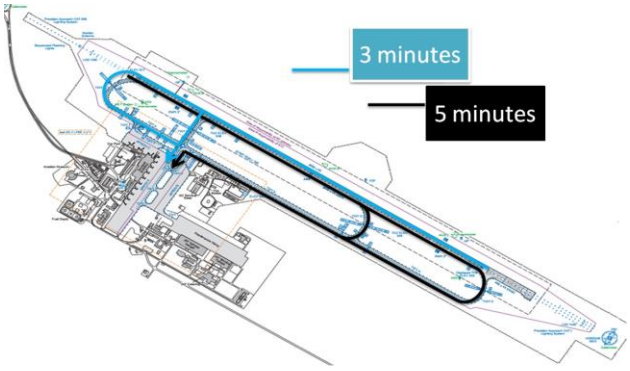

Figure 4 Standardized taxi times

For implementing this A-CDM element 2 years research is needed. After the research is done, the old way of calculation with standardized values would be replaced / updated.

De-icing of aircraft is another important element in determent of TSAT value. By using current procedures it is hard to discuss about possibility of estimating the time required for the de-icing at Nikola Tesla - Belgrade airport. Required de-icing time depends of the size of the aircraft, weather, pilot requirements (type of fluid, whole airplane or leading edges, esc.), and the number of available de-icing vehicles. Number of de-icing vehicles which would be used for a specific aircraft is unknown until the last moment, and it depends of dispatcher's decision.

The problem of estimating the time required for aircraft de-icing will be solved by setting a specific aircraft stand, where would the fixed de-icing equipment be installed.

In addition major savings would be achieved by capturing of de-icing and anti-icing fluid. Anti-icing fluid could be used again for a de-icing procedure, and de-icing fluid could be recycled (3 litres of old fluid for 1 litre of new).

Figure 5 De-icing stand

Changing the procedures under which the handling company would be the one to decide about aircraft de-icing would largely affect the accuracy for estimation of needed de-icing time.

3.1.4 Stage 4 - Airport operations in accordance with A-CDM procedures

After implementation of all A-CDM elements, it is necessary to verify their accuracy and quality of their implementation. Only when it was found, and in practice confirmed that the whole system is running smoothly, airport CDM enters the global network. To enable this, the final step of airport CDM implementation should be taken, which is connection of airport central database with CFMU.

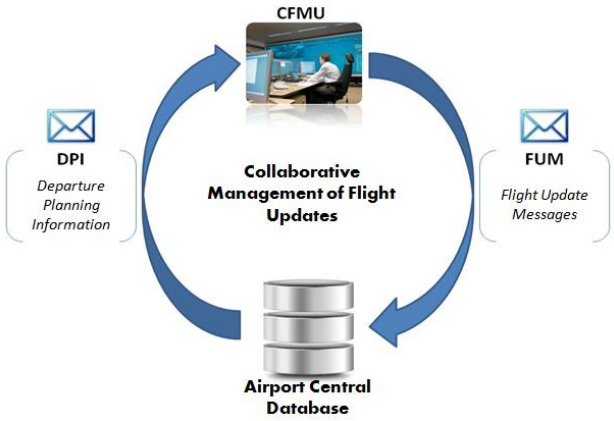

Figure 6 DPI and FUM messages circulation

By sending DPI messages (Departure Plan Information) airport insures that CFMU has the newest information about significant changes for the aircrafts departing from the airport. Receiving of FUM messages (Flight Update Messages) will provide all airport CDM partners with information about arrivals, according to which they can make more accurate planning of material and human resources.

4. BENEFITS OF A-CDM

Airport Collaborative Decision Making (A-CDM) optimizes the aircraft turn-round process by improving operational efficiency. It is based on an information exchange between operational users and suppliers of services at aerodromes. The benefits of participating in A-CDM start with improved accuracy and predictability of arrival and departure information. Punctuality improves as airport partners work together as an aircraft turn around team and become aware of the possibilities presented by A-CDM.

The idea of implementing CDM into Airport is to establish common situational awareness, to enhance positive understanding and collaboration between the main partners. EUROCONTROL CDM information sharing search should promote beater awareness amongst partners about the progress of flights and create easier information links concern all the inbound and outbound traffic. The other part of the foundation step is the CDM turn around process, otherwise known as the milestone approach. This process encourages and prompts all of the main partners to react quickly to incoming information at an early stage and to reschedule quickly as soon as any initial plan looks like being unpractical. Implementing the Airport CDM project has an almost immediate benefit and increase of inbound and outbound traffic flow predictability. Overall efficiency gains are available for all airport partners working with A-CDM. European aerodromes already benefit from their participation in A-CDM. Some examples are shown below:

Brussels airport - Absorption of delay at the gate and no longer at the runway resulted in annual savings of:

- 17022 tones of CO2,
- 22 tones of NOX,
- 5400 tones of fuel - 2,7M €/year in fuel saving,
- Average reduction of taxi time outbound: 3 minutes.

Munich airport

- Average ATFM slot adherence 93% in 2011,
- 10% average reduction in taxi time,
- 2,65M €/year in fuel saving.

Paris Charles de Gaulle airport

- Average taxi out time reduction by 2 minutes and 4 minutes in Adverse Conditions,
- Reduced fuel consumption: 14 t /day,
- Reduced emissions: 44 t CO2 /day.

Frankfurt airport

- Improved runway usage and take-off flow,
- Reduction of the impact of arrival delay leading to a more punctual departure and stable TOBT process,
- Reduction of ATFM delay due to better CTOT allocation and adherence as a result of the DPI exchange with the Network Manager.

5. CONCLUSION

The main role of each airport is to ensure safe, smooth and efficient conduction of flight operations. EUROCONTROL's project named „Airport CDM" ensures the achievement of those three key factors. The implementation of A-CDM procedures on the „Nikola Tesla Belgrade" airport would lead to better use of existing airport capacity. It would also mean saving funds for a future financially more ambitious project that would enable further development of airport capacity (such as a parallel take-off runway, new aprons, or a new terminal). Accept clear benefits in the operational and economical fields, CDM brings important step forward in the field of environmentalism. Huge fuel savings achieved by reducing the total taxi time, means a reduction in amount of harmful emissions at the airport.

In addition to these local benefits, this project offers significant improvements at the global level. With beater and more accurate information sharing, optimum use of airspace and improved ATFM slot allocation are reached.

BIBLIOGRAPHY

[1] EUROCONTROL: Implementation CDM manual 4. 25-April-2012. Available on the internet: http://www.eurocontrol.int/documents/
[2] EUROCONTROL, CDM Benefits flyer. 2012. Available on the internet: www.euro-cdm.org/library/eurocontrol/cdm_benefits_flyer.pdf
[3] CDM guideline LKPR, valid from 25.08.2011 IN: 28244532
[4] Kurzweil Libor: Postupy CDM na letisku Praha Ruzyně, 25-08-2011, IN: LP-PP-030/2011
[5] Practical training experience at the „Nikola Tesla Belgrade" aiport from 25.02.2013 to 03.03.2013

AUTHORS ADDRESS

Milunovic Milan, Bc.
Katedra letovej prípravy, Letecká fakulta TUKE, Rampová 7, 04121 Košice,
e-mail: milan_milunovic@hotmail.com

Juraj Vagner, Ing.
Katedra letovej prípravy, Letecká fakulta TUKE, Rampová 7, 04121 Košice,
e-mail: juraj.vagner@tuke.sk