European Observatory on Airport Capacity & Quality

Final Report of TASK FORCE

'Delays to air transport in Europe:

Methods of measuring, reporting and analysing'

May 2015

Executive Summary

This report outlines the work of the Task Force of the European Observatory on Airport Capacity & quality charged with "assessing any gaps in understanding the sources of airport delays in Europe".

The Task Force comprised representatives from Member States, European organisations from the aviation sector as well as associations representing the views of airlines, airports and air navigation services providers. In the meetings presentations were given by Eurocontrol (CODA), a Member State (France), Düsseldorf airport and ETTSA (European Technology and Travel Services Association) and a total of 5 meetings were hosted.

Finally, to cover the largest possible number of national experiences, the Task Force issued a questionnaire to all EU Member States that addressed the type of reporting that exists and how it relates to the "baseline" requirements of Regulation No 390/2013. A total of nine responses were received.

Following an initial 'fact finding' phase the Task Force quickly drew that conclusion that the most appropriate course of action would be to focus on improving the existing Central Office for Delay Analysis (CODA) system, rather than creating something new, making improvements to ensure that it meets the needs of today's aviation. This would make best use of a trusted and effective mechanism that has more than 120 airlines and 55 airports contributing flight-by-flight data (covering more than 70% of traffic), who in return are getting monthly performance reports and anonymised benchmarks.

Specific consolidated recommendations are:

1. *Based upon the existing mechanisms, ensure quality in delay recording and reporting are understood and promulgated through:*
    a. *Improving standardisation (interpretation, assigning, validation etc.) through:*
        i. *Guidance/explanatory material.*
        ii. *Application of a "no blame" culture.*
    b. *Improved automation of collection and attribution mechanisms.*
    c. *Development of an awareness package for CODA (and associated elements such as delay codes).*
    d. *Development of a training package for CODA (and associated elements such as delay codes).*
2. *Refine the current IATA delay codes and associated Performance Indicators (PI) to ensure they remain fit for purpose (making use of existing mechanisms as appropriate):*
    a. *Confirm that the current delay codes and associated PIs are sufficient to enable the analysis of causal factors (e.g. more focus on arrival phase).*
    b. *Confirm that current CODA public reports and dashboards are adequate (and are aligned with the refined delay codes). Ensure delay code review and maintenance process fully engages all stakeholders (where Europe should continue to work through the existing mechanisms of LCAM and EDAG) and that the process:*
        i. *Supports European industry, encouraging participation to these processes.*
        ii. *Includes a revision to the baseline "ECAC Guidelines on Monitoring and Analysis of Delays at Airports" as appropriate.*
        iii. *Investigate further the possible extension and alignment of multi-modal delay code assignment.*

3. *Add a cost factor to delay, addressing perspectives of different stakeholders (where not all delay generates the same cost, e.g. first rotation delay).*

Introduction

This report describes the work carried out by the Task Force of the European Observatory on airport capacity and quality 'Delays to air transport in Europe – methods of measuring, reporting and analysing'.

Background

A Community Observatory on airport capacity was first set up by the Commission, as part of its 2007 Action Plan on airports[1]. This plan emerged at a time of very strong growth in air travel and highlighted the issue of future airport capacity shortages. The risk of future airport capacity shortages was subsequently identified in EUROCONTROL's 'Challenges of Growth 2008' study[2].

Whilst the Observatory did examine the issues of airport capacity assessment and planning, the Commission did not proceed with a legislative proposal to harmonise practice in the Member States in this field as it was not clear at that time that such a proposal would have helped to overcome the barriers to airport capacity expansion. In addition the sharp slowdown in traffic from 2008 appeared to remove the urgency from this debate, at least in the short term.

Nonetheless, EUROCONTROL published the latest 'Challenges of Growth 2013' (CG13) study[3] in 2013. This confirmed and reiterated the capacity challenge identified in previous studies. In the most-likely (capacity constrained) scenario, there will be 50% more flights in 2035 than in 2012. Nearly two million flights will not be accommodated (12% of total demand for travel) because of reduced airport expansion plans. That is equivalent to an estimated 120 million passengers unable to make their return flights (in total, 240 million passengers per year). In addition, by 2035, more than 20 airports will be running at or close to capacity, compared to just three in 2012 causing difficulties for managing the network (so called 'hotspot airports').

On this basis, in early 2014 the European Commission decided to re-launch the Community Observatory on airport capacity – but re-named the European Observatory on airport capacity and quality, so as to better focus on where Europe could add value to national efforts on airport capacity and quality. A new mandate was drawn up based on the Commission's 2011 Communication accompanying the Airport package[4] and EUROCONTROL's 'Challenges of Growth 2013' study , which had drawn attention to and quantified, respectively, the problem of capacity shortages at major EU airports.

Three priority tasks were identified for action in 2014-2015:

- Learning from national, regional and local strategies on airport capacity;
- Assessing any gaps in understanding the sources of airport delays in Europe; and
- Quantifying the economic impact of unaccommodated demand due to airport capacity constraints and exploring the environmental variables influencing airport capacity.

[1] COM(2006)819
[2] Challenges of Growth 2008, Summary Report, EUROCONTROL, November 2008
[3] www.eurocontrol.int/articles/challenges-growth
[4] COM(2011)823

Regarding the second task, the aim has been for the Observatory to concentrate mainly on the analysis of the (airline and airport provided data) EUROCONTROL CODA (Central Office for Delay Analysis) database, which is the main instrument at the disposal of the aviation community for measuring, reporting and analysing delays in Europe.

This report is the findings of the Task Force set up to work on the second task. It contains information collected during five working group meetings held between June 2014 and April 2015. These meetings gathered representatives from Member States, European organisations from the aviation sector as well as associations representing the views of airlines, airports and air navigation services providers[5]. In the meetings presentations were given by EUROCONTROL (CODA), a Member State (France), Düsseldorf airport and ETTSA[6]. The fourth meeting was held at the Düsseldorf airport and it allowed the Task Force to visit the Delay 'Clearing House' operating in the Airport Control Centre of the Düsseldorf Airport. This Delay 'Clearing House' is a good example of airports getting directly involved in the analysis of the delays and most importantly in the assignment of the causes.

Finally, in order to cover the largest possible number of national experiences, the task force issued a questionnaire to all EU Member States to help the Task Force (and the Observatory) understand the type of reporting that exists and how it relates to the "baseline" requirements of Regulation No 390/2013. A total of nine responses were received.

Expectations

The task assigned to task force 2 was to promote a better understanding of the delays from all causes. It was requested to look into the delay issue by focussing as a first step on how delays to air transport in Europe and the reasons for those delays are currently recorded. Following that it needed to identify any gaps in the current processes and then recommend ways in which these gaps could be filled if any are identified. It shall complete its task by providing this report to the full observatory.

Regulatory/EC/Other Standards and requirements

The main piece of legislation covering the issue of delay reporting is Commission Implementing Regulation (EU) No 390/2013 of 3 May 2013 laying down a performance scheme for air navigation services and network functions which lays down the requirements for performance reporting in RP2.

Introduction to Delay

What is delay?

Delay is the time lapse which occurs when a planned event does not happen at the planned time.

Delay and related punctuality figures are measured and published in an aggregated format by all major airports and airlines. These delay and punctuality figures are easy to understand yet it often remains unclear how the delay was calculated (which events were compared, which definition of the

5 Reference to the members of the task force 2 at Annex1.
6 European Technology & Travel Services Association.

event was used, automated vs. manual time recording), which punctuality threshold was applied, if the delay relates to the departure or arrival phase, etc.

Airlines and airports are mostly interested in the passenger experienced delay or 'all-causes delay' whereas Air Navigation Service providers (ANSPs) and the Network Manager (NM) measure a part of all-causes delay: Air Traffic Flow Management (ATFM) delay.

Within this context, it is important to differ between delay caused by operational constraints and experienced by the air transport operator, and regulations imposed in coordination between the local flow management positions and the Network Management Operations Centre (NMOC) to avoid a misbalance of demand and capacity on a network level (i.e. ATFM regulation).

Task Force Agreement: Promote understanding of delay and relevance for each stakeholder.

How is delay measured?

'All-causes departure delay' is calculated as the difference between the scheduled time of departure (STD) as communicated to the passenger and the actual off-block time (AOBT). In Europe, delay cause assignment takes places on the ramp on departure with many airlines applying the IATA delay codes and sub-codes published in the IATA Airport Handling Manual 730 and 731.

All-causes delays can be split between primary and reactionary delays. Reactionary delays are delays that are caused by the late arrival of aircraft, crew, passengers or loads from a previous journey. Primary delays are all other delays and occur during the turnaround process of the aircraft.

The 'arrival delay' which is calculated as the difference between the scheduled time of arrival (STA) and the actual on-block time (AIBT, literally 'in-block') at the destination airport has always been important for passenger connectivity (and crew and aircraft connectivity) and is now increasingly important because of the costs of passenger compensation in case of long delays (on arrival). Nevertheless, there is no delay cause assignment taking place on arrival.

An ATFM take-off slot (time window) is assigned to a flight in order to avoid an overload (too many aircraft arriving relative to capacity), allocated by the Network Manager following an ATFM regulation communicated by the FMP, in relation to an airport (airport ATFM delay) or sector (en-route ATFM delay) location. ATFM delay is calculated as the duration between the last take-off time requested by the aircraft operator in the flight plan and the Calculated Take-Off Time (CTOT) allocated by the Network Manager. The delay cause assignment of an ATFM delays relates to the relevant ATFM Regulation cause and location. See the Annex for a graphical representation of the difference in the delay calculation method between delays all-causes (Actual Off-Block Time vs. Scheduled Time of Departure) and ATFM delays (Calculated Take-Off Time vs Estimated Take-Off Time).

Examples of the difference between the ATFM delay and delay all-causes calculation method are illustrated through the examples below.

Flight ABC123 from airport XXX to airport YYY has an STD (Scheduled Time of Departure as communicated to the passengers) at 1000h. This is aligned with the departure airport slot obtained for 1000h.

Situation 1: The airline does not anticipate a departure delay and has filed the ICAO flight plan with an EOBT (Estimated Off-Block Time) at 1000h. The Network Manager will calculate an Estimated Take-Off Time (ETOT) at 1015h based on the EOBT taking a 15 minutes taxi-out time into account. The capacity in one of the en-route sectors is reduced due to a technical problems at that ACC. This results in an ATFM en-route delay of 60 minutes to avoid overdeliveries in that sector. The 1015h ETOT of flight ABC123 will become a CTOT at 1115h, resulting in an ATFM delay of 60 minutes. At 1000H (at the scheduled time of departure) not all passengers have boarded the aircraft due to a problem at immigration. All aircraft doors were finally closed at 1015h but the aircraft was still delayed due to the ATFM Regulation. At 1058h aircraft departed from the gate after start-up was given.

The total ATFM delay as calculated by NM remained unchanged at 60 minutes (CTOT-ETOT).

The delay all-causes as reported by the airline is driven by the ATFM delay but has another delay absorbed within the ATFM delay. The airline will report an actual departure delay of 58 minutes (AOBT-STD) split between 43 minutes en-route ATFM delay (IATA delay code 81) and 15 minutes due the issues at immigration (IATA delay code 86).

Situation 2: The airline anticipates a departure delay of 90 minutes due to the late arrival of the aircraft from a previous flight. The airline has filed the ICAO flight plan with an EOBT (Estimated Off-Block Time) at 1130h with the STD remaining unchanged at 1000h. The Network Manager will calculate an Estimated Take-Off Time (ETOT) at 1145h based on the EOBT taking a 15 minutes taxi-out time into account. The capacity in one of the en-route sectors is reduced due to a technical problems at that ACC. This results in an ATFM en-route delay of 10 minutes to avoid overdeliveries in that sector. The 1145h ETOT of flight ABC123 will become a CTOT at 1155h, resulting in an ATFM delay of 10 minutes. At 1130h (at the scheduled time of departure) all passengers have boarded the aircraft and all doors are closed. At 1140 the aircraft departed the gate after start-up was given.

For NM the total ATFM delay of flight ABC123 was 10 minutes (CTOT-ETOT). For the airline, the departure delay all-causes was 1h40 (AOBT-STD) split between 90 minutes reactionary delay (IATA delay code 93) and 10 minutes due the en-route ATFM delay (IATA delay code 81).

Task Force Agreement: Promote standardisation in delay recording and reporting.

Why measure delay?

Airlines, airports, handling agents, ANSPs, etc. record and report delays as an input to improve their own processes and procedures with the aim of keeping the operational and financial impact of delays as low as possible. The cost of one minute of tactical delay varies by size of aircraft, but on average is estimated at €79/minute (Ref: University of Westminster for EUROCONTROL PRC, 2004, for EUROCONTROL PRU, 2011). This includes crew costs, passenger compensation, passenger loyalty, etc. Airlines may decide to offset these tactical costs by applying schedule buffers (strategic delay cost) which are estimated to cost €27/minute. There is a level of uncertainty with tactical delay costs, compared to strategic delay costs which apply to every flight with a schedule buffer. Airlines are constantly balancing between very expensive (but uncertain) tactical costs and relatively low (but applicable to all flights) strategic costs in an effort to keep operational costs as low as possible. For

example, a five minute tactical delay that arises by chance say twice a month would cost €5,500 over the seven months of the Summer schedule period, while a five minute schedule buffer applies every day without fail so would cost €28,000 over the same period.

Peer benchmarking is an important part in delay measurement but requires the availability of standardised high quality data.

Ultimately, delay has an impact on passengers, where (in common with other modes of transport) we know that an increase in delay reduction in punctuality will have a negative impact on passenger experience.

Task Force Agreement: Develop a cost factor to delay (not all delay generates the same cost).

Historical context of the CODA data collection

In 1994, as a political decision, the ECAC Ministers of transport decided to "set up an overall system to monitor delays and identify their causes based on existing systems used by EUROCONTROL and Airline systems supplemented by available airport delay data". Emanating from APATSI[7] the CODA system began in 1997 capturing data relating to Air Traffic Management (ATM) delays which solely focused on punctuality statistics by collecting aggregated data on causes of delays provided by the airlines through their trade associations.

From 2003 a voluntary flight-by-flight data collection directly supplied by airlines (& airports from 2009) allowed a detailed reporting on all-causes delay relating to the turnaround including passenger handling, ATC, security and baggage. By 2011, 120 airlines and 55 airports were providing flight-by-flight data under the CODA voluntary reporting scheme (covering 70% of IFR movements) and in return getting monthly performance reports and anonymised benchmarks.

SES Performance Scheme (Reporting Period [RP] 1 & 2)

From 2011 onwards the mandatory data collection as per Annex IV of IR691 (RP1) from 40 airlines and 78 airports to the Commission was set up. The data collection from airlines and airports under the SES Performance Scheme is managed by CODA with the PRU responsible for the monitoring and regular performance reporting. For RP2 the number of airports obliged to report data (as per Annex V of IR390) increases to 177 with no major change in the number of airlines. A new tool for data submission is being deployed with data providers now uploading their files to the EUROCONTROL Data Warehouse allowing for an initial assessment of the data quality (syntax & content) and completeness as part of the data submission process.

Beyond the SES data reporting

There are currently more than 55 airports and 120 airlines providing data on a voluntary basis to CODA. The number of voluntary data providers is still increasing. The voluntary and mandatory data specifications have been merged into one document with existing voluntary data providers being invited to align with these data specifications. Data suppliers are requested to use the IATA delay codes published in the IATA Airport Handling Manual (AHM) AHM730 and AHM731. Experience

[7] The ECAC Airport/Air Traffic System Interface (APATSI) project of the 1990's was aimed at improving the throughput of European Airports and their surrounding airspace as a complement to EUROCONTROL's en-route programme (known as EATCHIP).

gained during the implementation of the data specification shows that a higher level of harmonisation of the delay code reporting and associated validation is required.

CODA – Central Office for Delay Analysis

What is CODA

The Central Office for Delay Analysis (CODA) within EUROCONTROL Network Manager provides policy makers and managers of the ECAC Air Transport System with timely, consistent and comprehensive information on the air traffic delay situation in Europe, and makes these available to anyone with an interest in delay performance. Ensuring timely performance delivery of the European ATM system is the result of performance monitoring, performance driven planning, timely identification, development and deployment of best practices and operational improvements and above all strong collaboration between all Stakeholders. The main tasks of CODA are:

- Flight-by-flight data collection from a wide variety of data providers, including airports and airlines under the voluntary or mandatory SES Performance Scheme;
- Promote standardisation in delay recording and measuring;
- Database loading applying validity checks such as syntax, completeness and consistency of the data compared to what is already in CODA;
- Software supported delay analysis through protected dashboards;
- Report generation (public and tailored for stakeholders) allowing benchmark and in-depth analysis with an aim to improve the performance. This includes:
    - Benchmark delays by creating a user defined virtual airline;
    - Detailed taxi-time reports for improved planning;
    - CODA scheduling indicators for optimised scheduling.
- Promotion of the use of IATA Delay Codes (AHM730) and Sub-Codes (AHM731).

Reporting and Analysis

CODA collects almost the same flight-by-flight data items (see Annex for an overview) from airports and airlines. Whereas the data provided by airports will create a complete picture at that airport, data provided by airlines provides better insight in the network as it covers the complete flight including non-European departures or arrivals.

The airport and airline data received by CODA is fed into the PRISME data warehouse which contains sufficient high quality data to enable the reporting of specific performance indicators. Historically CODA has focused on delay, punctuality and cause reporting. The use of standard IATA delay codes across the industry enables CODA to report on delay causes across the Network.

In addition to delay reporting, which are based on the 'ECAC Guidelines on Monitoring and Analysis of Delays at Airports (Edition 2.0; October 1996)', CODA developed scheduling indicators to assist airlines optimise their scheduling. The CODA performance reports now also includes operational

cancellations, delay propagation indicators and an assessment of the impact of Air Traffic Flow Management (ATFM) regulations[8] on delays all-causes.

Task Force Agreement: Confirm that current Performance Indicators sufficient, considering needs for additional (new) indicators e.g. more focus on the arrival phase.

Promote standardisation and good practice

CODA is actively involved in promoting the standardisation of delay recording through the development of integrated data specifications for data reporting and the participation in IATA's Load Control and Messaging Task Force (IATA LCAM). In 2010, based on CODA's proposal IATA agreed to introduce a new delay code (19/PW Reduced Mobility, boarding/de-boarding of passengers with reduced mobility) to address the specific European legislation on air passenger rights. Currently CODA is consulting with the Industry to draft a proposal for an update of the IATA delay sub-codes (which were introduced in 2011 following CODA's proposal) to improve the reporting of ATC pre-departure delays during the SES Performance Scheme Reference Period 2 (2015-2019).

On the reporting side CODA cooperates closely with ACI-Europe EAPN and airline trade associations (AEA, IACA, ERAA, ELFAA) by offering tailored dashboards for performance analysis and delay benchmarking. Based on a unique data supply, users can make use of the analysis tools using the same thresholds and definitions across all users. Previously stakeholders had to trust that each individual data provider was applying the same filters when preparing aggregated data sets which were used for these benchmarking reports. These benchmark reports are now based on raw data and generated by the same application.

Task Force Agreement: Assess if the IATA delay codes are (or will) remain relevant and/or sufficient, using existing mechanisms or processes.

Reporting through dashboards

Public CODA reports are available on the CODA portal (http://www.eurocontrol.int/articles/coda-publications). More detailed reports are made available on the CODA dashboard which access managed through EUROCONTROL's OneSkyOnline. The reports on the dashboard range from aggregated reports, detailed analysis for an individual airlines/airport to benchmark reports between peers. Tailored dashboards were developed for ACI-Europe's European Airport Punctuality Network (EAPN) and the airlines trade associations.

Task Force Agreement: Confirm that current CODA public reports and dashboards adequate.

Role of the PRU

The Performance Review Unit within EUROCONTROL supports the mission of the Performance Review Commission (PRC) and the Single European Sky Performance Review Body (PRB) and is

[8] Regulation in this context means the management of air traffic by Air Traffic Flow Management to avoid exceeding airport or air traffic control capacity in handling traffic, and to ensure that available capacity is used efficiently.

responsible for the regular monitoring and reviewing of the performance of the European ANS System.

The main tasks of the PRU include to:

a) evaluate, monitor and report on ATM System including the Agency, from a gate-to-gate perspective in regard to agreed and defined parameters which could include productivity (e.g. traffic handled); standards of safety performance; efficiency (e.g. cost per flight); operational performance (e.g. delays, additional route mileage, costs); relevant military requirements; system enhancement (e.g. implementation projects and programmes); and other related factors; a balanced approach is essential;
b) propose, monitor and report on ATM related performance parameters which could include compliance with ATM procedures, airline slot usage (e.g. multiple flight planning); airlines ATM delay inducement (e.g. near simultaneous flight scheduling for same route(s)); airports (e.g. inadequacy of airside facilities); and other related factors;
c) work with ATM service providers, the Agency, airports, individual users, and representative organisations of airspace users and airports in cases of ATM related activities, in setting performance targets for achievement in areas under (a), (b) and (c);
d) develop guidelines for economic regulation of ATM service providers by national administrations, and monitor their application; and
e) make recommendations to its sponsor bodies, on the basis of its analyses, for performance improvements of the European ATM System relating to and supporting ATM service provision, the EUROCONTROL Agency and representative organisations of airspace users and airports, or individual users and airports where appropriate.

PRU - Reporting and Analysis

Within its remit, the PRU performs the performance monitoring, reviewing, and reporting on the basis of the established data flows. As concerns the operational performance monitoring and reporting, the decision was taken to make use of existing synergies and entrust CODA with the collection of the respective operational data from airports and airlines. The PRU assumes responsibility for the quality assurance of the operational data flows through the establishment of targeted data item specifications and associated quality assurance procedures within the data processing chain (i.e. data collection through performance metric reporting) under the umbrella of the PRC and PRB performance monitoring products (e.g. PRC: Performance Review Report, Case Studies, PRB: Annual Performance Monitoring Report).

Next to the aforementioned performance data products, PRU is charged with the maintenance and update of the public dashboard of the Single European Sky (http://www.eurocontrol.int/prudata/dashboard/eur_view_2014.html). The dashboard provides a performance metric oriented online reporting tool for the respective ANS performance indicators on an EU-wide, local (i.e. national), and airport-level (i.e. airports subject to IR691/2010 [RP1], now complemented by IR390/2013 [RP2]).

With the launch of the 2nd Reference Period of the Performance Scheme, this includes reporting on pre-departure delay, an IATA code 89 based metric. Activities have been launched to identify and monitor validation bounds for reported delays.

PRU – Further Developments and Support to Standardisation

As part of the preparatory action for the 3rd Reference Period, PRU is reviewing and refining the current European ANS Performance framework. Within the airport context, this will entail a trajectory based approach to the arrival, ground, and departure phase (i.e. gate-to-gate including turnaround).

In terms of standardisation, the PRU - on behalf of its sponsor bodies - is strongly supporting harmonisation activities (e.g. promotion of changes to the IATA delay codes through CODA, harmonised interpretation of delay code validation through EAPN) through reporting (i.e. problem identification) and active collaboration.

Ensure Awareness and Training

To ensure best use is made of any system or procedure the user needs to be aware of the purpose, capabilities and limitations. Also, the customer has to be identified and made aware of the facility afforded to him and perhaps trained to make best use of it. To this end there is a need for both training and awareness. As concerns performance measurement and reporting there is also the need to consider the needs and expectations of those to whom the reporting is being made and under which scheme (e.g. peer benchmarking, regulatory reporting).

In our context we should also consider that not all airports and airlines are embraced (and hence bound by) the performance scheme. Any awareness and training should take this into consideration. Language needs should also be considered.

Awareness

Considering that an overall objective is to improve the reporting of delay in terms of scope, granularity and quality (including standardisation) an awareness of CODA will be increasingly important.

Awareness in this context means ensuring that potential users are aware of the existence of the tool, its context and capabilities. Such awareness should precede training and could be achieved through:

- Marketing (publicity, articles etc.);
- Documentation (user guides, leaflets etc.);
- Web sites (both dedicated and also links through web sites of other organisations etc.).

As with all such campaigns, the activity needs to be able to maintain awareness over a period of time so would need to be continued, perhaps using updates to CODA as a vehicle or catalyst.

Task Force Agreement: Develop and maintain an awareness package for CODA.

Training

CODA provides a powerful toolset of data and indicators. But this means that users need to invest some time to learn how best to use it to improve their own performance. This will become even more so should it be developed to address a wider set of delay data from a wider set of data sources, which is in turn used by a wider set of operators and customers.

To date training has been informal, performed on the basis of briefings and presentations. This has been satisfactory in a voluntary environment. However, with the more regulated environment

involving more stakeholders there is an obvious need to ensure data quality both as an input and output.

It is therefore recommended that the informal approach used to date be replaced by widely available training that gives an overview of the purpose concept and functions of delay management and reporting and of CODA. Following the training the attendee should be able to understand the principles and also be to input and manage data using CODA (including an awareness of the associated lexicon). They should also be able to generate reports.

The objectives could be achieved through:

- Computer-based training (offering a cost effective means of delivering training at the pace determined by the student);
- A classroom course (available through training establishments such as IANS or provided locally).

Such courses should be aimed at participants without previous knowledge or experience (though the classroom course could be preceded by the computer based course, as an introduction).

Task Force Agreement: Develop and maintain a training package addressing delay reporting and management principles and the use of CODA.

Formal Performance Management Role

With the advent of the Single European Sky Performance Scheme, the European Commission has established a mechanism to monitor and improve ANS Performance in Europe at both the Union-wide and national/FAB-level. The Performance Scheme is organised by Reference Periods (RPs); the 1st period running from 2012 to 2014, the 2nd now running from 2015 to 2019. The current scheme covers the performance in four KPAs: Safety, Environment, Capacity, and Cost-Efficiency.

The European Commission has established the Performance Review Body to assist in the implementation of the performance scheme, its monitoring, and setting of Union-wide performance targets (c.f. IR390/2013, Article 3 for more details).

Based on the regular monitoring, the Commission and national supervisory authorities shall monitor the achievement of performance, possible deviations from the performance plans and or targets. Given the level of achievement or significance of deviation, measures to improve the performance may be triggered.

Accountability

The performance of these tasks is based on the collection, validation, and dissemination of performance related data. From that perspective, data quality assurance, including quality of delay reporting, is an essential part of the performance regulation (c.f. Article 21, IR390/2013).

In principle, the data providers (e.g. air transport operators, airport operators) are accountable for the quality of the reported data.

To support stakeholders in meeting their data quality requirements, PRU has established a data quality assurance process governing the data collection and processing of operational data used for the calculation of the indicators of the Performance Scheme. PRU monitors and coordinates through

CODA the implementation of data quality related actions plans when imperfections or imminent non-compliances with the data specifications prevail.

The task force has confirmed that CODA is the most appropriate mechanism to provide timely, consistent and comprehensive information on the air traffic delay in Europe, and to make these available to anyone with an interest in delay performance. It is a natural and valuable part of the Network Manager functions. It has also agreed that it is both desirable and feasible to further develop CODA to meet future needs (which may include an extended scope in terms of data providers and services).

Adequate awareness and training relating to CODA is an important element in ensuring that data providers, data users and of course the service providers are aware of their respective accountabilities (i.e. responsibilities).

Quality

The quality of data is a key to the acceptability and success of the data collection and processing (CODA), particularly as the measurement, awareness and assurance of performance becomes increasingly important through RP2 and RP3.

There are a number of significant factors which combine to reduce the quality of delay reporting:

- The tendency to use delay reporting not (only) for analysis of causes, but for contractual, personal or regulatory performance management, producing perverse incentives to mis-record – blame the weather because the weather does not have a bonus to lose;
- Recording of delay times and causes is done on the ramp, by thousands of personnel across Europe who have received different levels of training – some timings may be recorded automatically, others from someone's watch;
- Lack of explanatory material for the coding of delay causes, in English or native language – e.g. ATC capacity might include ATC industrial action, whereas the codes are separate;
- Those recording the delay are not those analysing the delay – lack of the feedback which improves statistics.

None of these factors can be eliminated and delay coding will always to some extent be an 'art' rather than a 'science', but they can be mitigated:

- Automation, first of time recording and later perhaps of causes, takes some of the variability and judgement out of the loop;
- Airport operating centres, to agree the coding of delays at the airport between all operational actors, before use;
- Focus on use of delay codes for analysis of causes, not pointing the finger of blame;
- Avoid setting performance management targets that create incentives to use one code rather than another – instead keep to the more aggregated levels for target-setting (e.g. on-time performance);
- Improved guidance material to accompany the delay coding standards;
- Improved training on CODA and other aspects of delay management;
- Regular feedback to those who record delay, and analysis of differences in recording patterns between airports, between shifts etc.

Task Force Agreement: Ensure that quality requirements are clearly described and promulgated (e.g. through CODA documentation, training and awareness material).

Note: To support the mission of the European Performance Scheme, PRU monitors and reports on required quality assurance activities, and will successively implement changes to the underlying data specifications and data processing.

Conclusions

Availability of high quality data on the delays from all causes is an important contributor to overall network performance. Europe is already well served with delay data reported by airlines and airports, though the framework for analysing understanding and responding is not fully harmonised, hindering the ability to fully exploit its value, in particular the ability to evaluate the true causes of delay in detail.

Other factors which may reduce the quality of this data, such as the use of codes to assign blame and penalties rather than to investigate causes, was also a concern.

These matters cannot be fully eliminated but could be mitigated through the Task Force agreements, which have been consolidated into the recommendations below.

The link between delay reporting/analysis and the overall desire for predictability (leading to confidence and ultimately best use of existing airport infrastructure) was also recognized, as was the move towards Target Times of Arrival (TTA), bringing a need to better evaluate delay from the arrival perspective.

The overarching conclusion was that the current mechanisms have served the industry well and should continue to do so, but that there is scope to review and make improvements.

Recommendations

The recommendations below are a consolidation of the agreements made within the task force and are drafted for the purpose of the Observatory, to help in defining its future work programme.

1. *Based upon the existing mechanisms, ensure quality in delay recording and reporting are understood and promulgated through:*
    a. *Improving standardisation (interpretation, assigning, validation etc.) through:*
        i. *Guidance/explanatory material.*
        ii. *Application of a "no blame" culture.*
    b. *Improved automation of collection and attribution mechanisms.*
    c. *Development of an awareness package for CODA (and associated elements such as delay codes).*
    d. *Development of a training package for CODA (and associated elements such as delay codes).*
2. *Refine the current IATA delay codes and associated Performance Indicators (PI) to ensure they remain fit for purpose (making use of existing mechanisms as appropriate):*

a. *Confirm that the current delay codes and associated PIs are sufficient to enable the analysis of causal factors (e.g. more focus on arrival phase).*
b. *Confirm that current CODA public reports and dashboards are adequate (and are aligned with the refined delay codes).*
c. *Ensure delay code review and maintenance process fully engages all stakeholders (where Europe should continue to work through the existing mechanisms of LCAM and EDAG) and that the process:*
    i. *Supports European industry, encouraging participation to these processes.*
    ii. *Includes a revision to the baseline "ECAC Guidelines on Monitoring and Analysis of Delays at Airports" as appropriate.*
    iii. *Investigate further the possible extension and alignment of multi-modal[9] delay code assignment.*

3. *Add a cost factor to delay, addressing perspectives of different stakeholders (where not all delay generates the same cost, e.g. first rotation delay).*

[9] Multi-modal in this context refers to when one or more transport type connects with an airline i.e. rail operator, bus operator etc.

Annex A: Standard IATA Delay Sub-Codes (AHM731)

73 (WR) **WEATHER: EN ROUTE OR ALTERNATE**

Z OUTSIDE AIRCRAFT LIMITS

Y OUTSIDE CREW LIMITS

X ETOPS

81 (AT) **ATFM DUE TO ATC EN-ROUTE DEMAND/CAPACITY, standard demand/capacity problems**

Z ATC ROUTEINGS

Y HIGH DEMAND OR CAPACITY

82 (AX) **ATFM DUE TO ATC STAFF/EQUIPMENT EN-ROUTE, reduced capacity caused by industrial action or shortage or equipment failure, extraordinary demand due to capacity reduction in neighbouring area**

Z INDUSTRIAL ACTION

Y EQUIPMENT FAILURE

X STAFF SHORTAGE

W MILITARY ACTIVITY

V SPECIAL EVENT

83 (AE) **ATFM DUE TO RESTRICTION AT DESTINATION AIRPORT, airport and/or runway closed due to obstruction, industrial action, staff shortage, political unrest, noise abatement, night curfew, special flights**

Z HIGH DEMAND / ATC CAPACITY

Y INDUSTRIAL ACTION

X EQUIPMENT FAILURE

W STAFF SHORTAGE

V ACCIDENT / INCIDENT

U MILITARY ACTIVITY

T SPECIAL EVENT

S NOISE ABATEMENT/NIGHT CURFEW

R OTHER

87 (AF) **AIRPORT FACILITIES, parking stands, ramp congestion, lighting, buildings, gate limitations, etc.**

Z LACK OF PARKING STANDS

Y RAMP CONGESTION

X LIGHTING OR BUILDINGS

W GATE LIMITATION / NO GATE AVAILABLE

V BAGGAGE SORTING SYSTEM DOWN / SLOW

U NO PUSH BACK CLEARANCE DUE TO INFRASTRUCTURE

T JET BRIDGE INOPERATIVE

S LACK OF CHECK IN COUNTERS

R ELECTRICAL SYSTEM FAILURE

P PASSENGER TRANSPORT SYSTEM FAILURE

N PUBLIC ADDRESS/FLIGHT INFORMATION DISPLAY SYSTEM FAILURE

M INSUFFICIENT FIRE COVER

L GROUND COMMUNICATION SYSTEM FAILURE

K NO PUSH BACK CLEARANCE DUE TO CONSTRUCTION

J BREAKDOWN OF AIRPORT FUELLING SYSTEM

H LATE OR LACK OF FOLLOW ME FOR PUSH-BACK

G ANY OF THE ABOVE AT THE DESTINATION AIRPORT

89 (AM) **RESTRICTIONS AT AIRPORT OF DEPARTURE WITH OR WITHOUT ATFM RESTRICTIONS, including Air Traffic Services, start-up and pushback, airport and/or runway closed due to obstruction or weather.**

Z ATC CAPACITY

Y ATC INDUSTRIAL ACTION

X ATC STAFFING

W ATC EQUIPMENT

V ATC ACCIDENT/INCIDENT

U ATC DUE TO DE-ICING

T ATC SPECIAL EVENT

S ATC WEATHER

R ATC RESTRICTIONS DUE TO CURFEW

P ATC POLITICAL UNREST

N ATC ENVIRONMENTAL

M AIRPORT CLOSURE

L RUNWAY CLOSURE

K START-UP/PUSHBACK CLEARENCE DELAY (LOCAL ATC)

J LOST FLIGHT PLAN BY ATC

H CONSTRUCTION WORK/MAINTENENCE

G OTHER

93 (RA) **AIRCRAFT ROTATION, late arrival of aircraft from another flight**

Z LATE ARRIVAL DUE DEPARTURE DELAY AT PREVIOUS STATION

Y LATE ARRIVAL DUE ENROUTE DELAY

X LATE ARRIVAL DUE DELAY AFTER LANDING

W LATE ARRIVAL DUE TO HIGH DEMAND FOR DESTINATION STATION

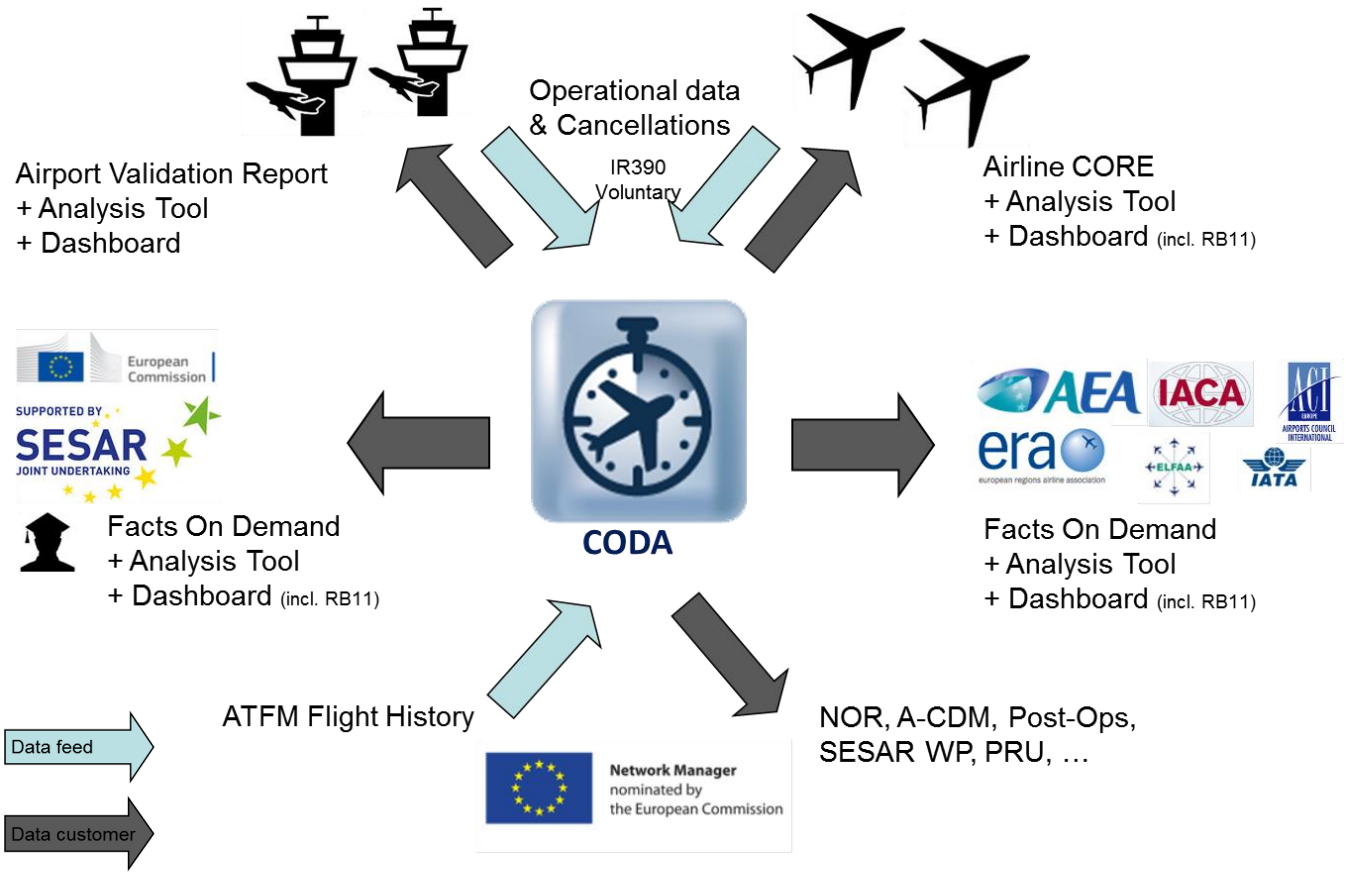
V LATE ARRIVAL DUE TO WEATHER AT DESTINATION

U LATE ARRIVAL DUE TO TECHNICAL REASONS

Annex B: CODA IATA Delay code grouping

	CODA CAUSE	Description	IATA Code
Primary Delay Causes	**Airline**	Passenger and Baggage	11-19
		Cargo and Mail	21-29
		Aircraft and Ramp Handling	31-39
		Technical and Aircraft Equipment	41-49
		Damage to Aircraft & EDP/Automated Equipment Failure	51-58
		Flight Operations and Crewing	61-69
		Other Airline Related Causes	Others
	Airport	ATFM due to Restriction at Destination Airport	83
		Airport Facilities	87
		Restrictions at Airport of Destination	88
		Restrictions at Airport of Departure	89
	En-Route	ATFM due to ATC En-Route Demand / Capacity	81
		ATFM due to ATC Staff / Equipment En-Route	82
	Governmental	Security and Immigration	85-86
	Weather	Weather (other than ATFM)	71-79
		ATFM due to Weather at Destination	84
	Miscellaneous	Miscellaneous	98-99
	Reactionary	Late Arrival of Aircraft, Crew, Passengers or Load	91-96

Annex C: CODA data sources and data customers



Annex D: Delay calculation: ATFM delay and delay all-causes

Annex E: Flight-by-flight data items collected from airlines and airports

ACRONYM	EC Regulation 390/2013 definitions/ APDF definition
REG	'aircraft registration' means the alphanumerical characters corresponding to the actual registration of the aircraft
ARCTYP	'aircraft type' means an aircraft type designator (up to four characters) as indicated in ICAO Doc 8643
FLTID	'flight identifier' means a group of alphanumeric characters used to identify a flight. Item 7 of the ICAO flight plan
ADEP_ICAO	'encoded aerodrome of departure' means the code of the airport using the ICAO four-letter airport designator
ADEP_IATA	'encoded aerodrome of departure' means the code of the airport using the IATA three-letter airport designator
ADES_ICAO	'encoded aerodrome of destination' means the code of the airport using the ICAO four-letter airport designator
ADES_IATA	'encoded aerodrome of destination' means the code of the airport using the IATA three-letter airport designator
STD_UTC	'scheduled time of departure (off-block)' means date and time when a flight is scheduled to depart from the departure stand
STD_LT	
STA_UTC	'scheduled time of arrival (on-block)' means date and time when a flight is scheduled to arrive at the arrival stand
STA_LT	
AOBT_UTC	'actual off-block time' means the date and time the aircraft has vacated the parking position (pushed back or on its own power)
AOBT_LT	
ATOT_UTC	'actual take off time' means the date and time that an aircraft has taken off from the runway (wheels-up)
ATOT_LT	
ALDT_UTC	'actual landing time' means the actual date and time when the aircraft has landed (touch down)
ALDT_LT	
AIBT_UTC	'actual on-block time' means the date and time when the parking brakes have been engaged at the arrival stand
AIBT_LT	
FLTRUL	'flight rules' means the rules used in conducting the flight. 'IFR' for aircraft flying according to instrument flight rules, as defined in Annex 2 of the Chicago Convention or 'VFR' for aircraft flying according to visual flight rules as defined in the same Annex. 'Operational Air Traffic (OAT)' refers to State aircraft not following the rules defined in Annex 2 of the Chicago Convention. (Item 8 of the ICAO flight plan)
FLTTYP	'flight type' means the type of flight as defined in Appendix 2 of ICAO Doc 4444 (15th Edition — June 2007); **S**—Scheduled air service, **N**—Non-scheduled air transport operation, **G**—General aviation, **M**—Military, **X**—Other types (Classification according to Flight Plan)
SOBT_UTC / SIBT_UTC	'airport departure/arrival slot' means an airport slot assigned either to an arrival or departure flight as defined in

ACRONYM	EC Regulation 390/2013 definitions/ APDF definition
	Regulation (EEC) No 95/93
SOBT_LT / SIBT_LT	'airport departure/arrival slot' means an airport slot assigned either to an arrival or departure flight as defined in Regulation (EEC) No 95/93
DRWY / ARWY	'departure/arrival runway designator' mean the ICAO designator of the runway used for landing and for take-off (e.g. 10L)
DSTND / ASTND	'departure/arrival stand' means the designator of the last parking position where the aircraft was parked before departing from the airport
DLY1	'delay causes' means the standard IATA delay codes as defined in Section F of CODA Digest Annual 2011 'Delays to Air Transport in Europe' (1) with the duration of the delay. Where several causes may be attributable to flight delays, a list of those causes shall be provided
TIME1	
DLY2	
TIME2	
DLY3	
TIME3	
DLY4	
TIME4	
DLY5	
TIME5	
DE-ANTI-ICING	'de-icing or anti-icing information' means indications as to whether de-icing or anti-icing operations occurred and, if so, where (before leaving the departure stand or in a remote position after departing the stand, i.e. after off-block)
STATUS	'operational cancellation' means an arrival or departure of a scheduled flight to which the following conditions apply: — the flight received an airport slot, and — the flight was confirmed by the air carrier the day before operations and/or it appeared in the daily list of flight schedules produced by the airport operator the day before operations; but — the actual landing or take-off never occurred
RCNL	Reason for cancellation
ATOC_UTC	actual time of cancellation' means the actual date and time when an arrival or departure of a scheduled flight was cancelled
ATOC_LT	
SVCTYP	IATA service type
IFPLID	IFPS Flight Plan ID

APDF-DataSpecificati
on.v00-11.pdf

Annex F: Example of Best Practice: Delay clearing procedure at Düsseldorf Airport

In the past all the delay minutes between “all doors closed” and “Actual Off Block Time” (AOBT) were assigned to the delay code 89 by the airlines and ground handlers. Considering the monitoring of the performance indicator “ATC Pre Departure Delay” since Reference Period 2 and the relating IR390/2013 data collection has started, this fact could lead to a false measurement due to misuse of the delay code 89. Additionally there is a need of translating the airline internal delay information into the IATA standard to enable a correct benchmark concerning the delay reasons among the different airlines. These were some of the reasons why DUS airport decided to implement a delay clearing procedure taking into account the airport related IATA standard delay codes (AHM 730/731):

19	Reduced mobility, boarding/ de-boarding of passengers with reduced mobility
85	Mandatory security
86	Immigration, customs, health
87	Airport facilities
89	Restrictions at airport of destination

Due to the fact that the initial IATA standard delay code list does not include sub delay codes for the delay codes 19, 85 and 86 DUS airport defined internal sub-codes as more delay reasons needed to be specified.

After the aircraft is airborne the airline MVTs is read by the airport data base which triggers the start of the delay clearing procedure done by the air to air process manager in the DUS Airport Control Centre. Thereby only departures are taken into account on the day of operation. Standardization of the Delay Clearing procedure is given by implementing special guidelines for the relevant airport delay codes and duration. By the means of these guidelines the air-to-air process manager is able to define an appropriate delay reason (delay code/ sub-code) and check the given delay minutes.

The first step is to match the delay duration given in the MVT with the calculated delay minutes from following airport timestamps: scheduled time of departure (STD) to actual off-block time (AOBT). If an inbound delay has been indicated this will be verified as well.

In the next step the received airport related delay code is verified taking into account the agreed interpretation of the delay codes, the airline specific sub delay code (if given), the delay duration and the additional information in the special information line.

In case of agreement with the given delay code, an appropriate IATA standard /DUS specific sub-code needs to be allocated. In regards to the duration the total amount of all given delay codes except 81, 82, 83, 84, 89 and 87U/K only minutes from STD to push back request are applicable. For the delay code 89 several DUS internal agreements with the other stakeholders were reached, resulting in different rules to verify this delay code. In case of disagreement or insufficient information about the received delay reason the person in charge will contact the airline/handlings agent by phone. Either an agreement could be achieved, namely in both systems are the same delay codes recorded, or the proposed delay code of the airport has been denied by the airline and therefore the status in the airport data base will be not agreed. Airport-CDM milestone timestamps and turnaround timestamps are essential data requirements to monitor the duration of the sub processes, flight delays, early

arrivals & delays in turnaround processes. Without those timestamps it's hardly possible to find out the details delay reason including sub-code information. Also there is a requirement, that the Airport Operator needs additional information about the reason, if there is an outbound capacity reduction in place by local ATC in order to assign sub-codes to the delay code 89. The biggest amounts of minutes declined by the airport are especially delay code 89 delay minutes coming from the reasons described above as this code was used in the past as a kind of "gap filler" if non assignable delay minutes were left.

Annex G: Composition of the Task Force

Chair: Eurocontrol & International Air Transport Association (IATA)

Secretariat: European Commission, Dg MOVE

Organisation
AEA - Association of European Airlines
ACI- Airport Council International, Dusseldorf Airport & Manchester Airport
CANSO - Civil Air Navigation Services Organisation & DFS - Deutsche Flugsicherung
DGAC - Direction Générale de l'Aviation Civile - France
ETTSA - European Technology and Travel Services Association & Travelport
EC - European Commission
EUACA - European Union Airport Coordinators Association
EUROCONTROL
Federale Overheidsdienst Mobiliteit en Vervoer - Service public fédéral Mobilité et Transports - Belgium
IATA - International Air Transport Association