

Airport CDM Munich

Results 2011



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For the present report "Airport CDM Munich – Results", these provisions do not apply to the operator of Munich Airport (Flughafen München GmbH).

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1 Management summary

On 7 June 2007, the one-year trial operations for "Airport CDM at Munich Airport" were completed and Airport CDM was integrated into regular operations on 7 June 2007, making Munich the first airport in Europe to implement it as a standard procedure. This report gives account of the experience gained and the measurements taken in 2011.

Airport CDM in Munich uses European Airport CDM as a basis which was jointly developed as a project within the European Airport Programme. The experience and findings gained from the preceding COB procedure in Munich were also taken into account.

The knowledge and experience gained from practical implementation of Airport CDM in Munich have been considered both in European developments, in particular the research programme SESAR, and in the initiative to harmonise Airport CDM in Germany.

Airport CDM aims at optimally using the available capacities and optimising the operational resources of all airport partners by increasing the efficiency of the individual steps of the turn-round process.

Key performance indicators (KPI) were developed by all process partners involved for measuring and monitoring Airport CDM. The results presented in this report are based on the monthly performance monitoring system evaluations (ProMUC), further measurements carried out by DFS and FMG, the monthly CDM report as well as evaluations by the CFMU.

Almost all measurements from the year 2011 showed a significant improvement compared to the previous year. The average quality level deviates only slightly from the very good results achieved in 2008 and 2009.

A particularly positive result was achieved for the indicator "waiting time on the runway" which is one of the most significant indicators because it is one that is easy to understand how the result was obtained. All the more reason to be pleased with the significant improvement over the previous year. In contrast, the months of January and November had a negative influence as a result of the prevailing influences of snow, fog and strong winds.

Another positive result the ratio between ASAT and TSAT. If one takes a look at the annual line chart, it is clear that measures were implemented in the middle of the year which had a clearly positive effect on the results. This facilitated a distinct improvement compared to the previous year.

Another important element in this annual report is the success of the parameter "ATFM slot adherence". The excellent results of the past two years could again be significantly improved. Not only was there an average growth of three percentage points compared to the previous years but also a peak value of 95% in the month of May. This continuing positive level is mainly due to the optimum information exchange between airport A-CDM and the persons responsible for the network, as well as to the improved plannability of local partners.

Unfortunately, some parameters have shown a less positive result than others.

One of these is the ratio between AOBT and TSAT. Compared to the year 2009, the difference in performance amounts to almost four percentage points. If you take a look at absolute numbers, the total of 15.45 percent corresponds to an average number of 5 processes per hour which did not reach the target.

The TOBT accuracy continues to be unsatisfactory. If you take a look at all three measuring times of the past three months of the annual process plan, there is a quality increase compared to the results of the rest of the year, which is due to a repeated local campaign. Independent of that, it must be noted that the targets were not achieved. It should be noted, however, that the term "completion of ground handling" is a virtual value and not a value actually measured. Therefore, the percentage of the actual TOBT inaccuracy cannot be determined exactly. In order to exclude this fact as far as possible in the future, a change of procedure was initiated a short time ago.

The OFF-block punctuality figures could not match the positive trend of the other figures either. If you consider the definition for the punctuality value SOBT (not the IATA definition), 48.25% of all flights were on time in the year under review. Although this means an improvement by four percentage points over the previous year, the target was missed by a large amount. The ratio between TOBT and AOBT reflects delays related to capacity, both in the airport system and in airspace. There was an improvement of almost four percentage points compared to the previous year but again, the target value could not be reached.

2 Purpose of the document

The one-year trial operations for "Airport CDM at Munich Airport" were integrated into regular operations on 7 June 2007, making Munich the first airport in Europe to implement Airport CDM as a standard procedure.

The A-CDM procedure and its processes are not explained in this document but are listed in the relevant procedural documents and publications concerning Airport CDM at Munich Airport.

This report gives an account of the experience gained and the measurements and results of 2011, based on regular evaluations and measurements. The results are based on the key performance indicators (KPI) for Airport CDM agreed upon between FMG and DFS.

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Erik Sinz for DFS

3 Description of Airport CDM

3.1 General

Airport CDM is an operational approach (idea/concept/process) to optimally handle the turn-round process at the airport. Airport CDM covers the period of time between EOBT minus 3hrs to take-off and is an end-to-end process from flight planning (ATC flight plan) to landing and the subsequent turn-round process on the ground before the next take-off.

Airports can be integrated into the European ATM network by exchanging estimated arrival and departure times between Airport CDM and the Central Flow Management Unit (CFMU).

Airport CDM optimises operational cooperation between the following partners:

- Airport operator
- Airlines
- Handling agencies
- Ground handling agencies
- Air navigation service provider
- European air traffic flow management (CFMU)

3.2 European Airport CDM

European Airport CDM forms part of the Airport Operations Programme of Eurocontrol (A-SMGCS; Airport Airside Capacity; Runway Safety; Airport CDM). Eurocontrol CND is responsible for the European Airport CDM project.

Airport CDM has been developed and upgraded together with the different Airport CDM partners. The "Coordination" and the "Procedure" working groups promote harmonisation and operational standardisation. The available documents include:

- Functional Requirements Document
- Operational Concept Document
- Airport CDM Implementation Manual

Technical standardisation of Airport CDM is based on the above-mentioned development by Eurocae (Working Group 69). Furthermore, a Community Specification (EN303212) combining the results of operational and technical standardisation was adopted on the basis of a mandate by the European Commission in 2011. In Germany, this Community Specification was published as DIN EN303212.

The programmes DMEAN, IATA Flight Efficiency Plan and SESAR have identified and classified Airport CDM as a key function for integrating airports into the European ATM network, and have therefore supported its implementation in Europe.

Based on the experience gained and the requirements of Airport CDM in Munich, DFS and the Munich airport operator FMG are supporting the development of European Airport CDM as well as the implementation at other German airports.

3.3 Airport CDM at Munich Airport

Airport CDM at Munich Airport is based on the developments of the European Airport CDM (Implementation Manual, FRD, OCD, etc) and the preceding COB procedure in Munich.

In Munich, the A-CDM procedure was fully implemented (local and ATM network) on 7 June 2007 and has since been operated on a regular basis without interruption.

3.4 Publication and communication

3.4.1 Aeronautical Information Publication

- The Airport CDM procedure is published in the German Aeronautical Information Publication, volume II, AD2-EEEM "Local Traffic Regulations":

3.4.2 Airport user regulations

The Airport CDM procedure has been incorporated in the airport user regulations, section 2.1.6:

3.4.3 Brief description

A brief description of the procedure is available in German and English. This document is a guideline for Airport CDM in Munich for all operational services of the different partners. The document is kept up-to-date on a continuous basis and takes all information in connection with German harmonisation into consideration.

3.4.4 Flight crew briefing

The flight crew briefing document for pilots deals with the major cockpit-related procedures. This document is also available in German and English.

3.4.5 Internet and other media

References to the AIP, presentations, reports and briefing documents can be found on the internet at European Airport CDM and on the homepage of Munich Airport:

- www.euro-cdm.org
- www.munich-airport.de/cdm

3.5 Contract

The MoU for Airport CDM and the current contract for the sequence planner have been combined into one contract for Airport CDM Munich in order to regulate the cooperation, the data exchange and the further development of Airport CDM at Munich Airport.

3.6 Total Airport Management - TAM

In 2010, FMG DFS and Lufthansa jointly initiated activities concerning Total Airport Management. A number of workshops taking place in 2011 focussed on the definition of the topic, the identification of basic contents of TAM and the coordination of the further course of action.

Total Airport Management is considered to be a further development or enhancement of Airport CDM.

Total Airport Management is a future-oriented turn-round and flow management process at airports. Its objective is to handle flight operations efficiently with regard to punctuality, stability and capacity, both under normal and restricted framework conditions.

TAM describes the joint decision-making process for handling determined airside and landside flight operations processes at the airport conducted by the partners involved at airports during the pre-tactical, the tactical and the post-analysis phase.

TAM provides information to the process partners which enables them to optimise their own processes while considering the overall system.

Under certain conditions, e.g. in exceptional situations (like capacity restrictions due to the weather) and for certain processes, TAM takes decisions concerning superordinate traffic handling.

In 2011, the activities to create a concept for Total Airport Management at Munich Airport were initiated and it is planned to conclude them in 2012. This concept is to serve as a basis for a subsequent TAM project.

Once the decision makers of the individual parties have given their agreement, the duration of the project until the implementation is planned to be at least three and a half years.

4 Results

4.1 Expected results

The expectations the partners have of Airport CDM are to a large extent identical, but they also have explicit requirements.

4.1.1 General

- Increased efficiency from improved punctuality
- Higher planning accuracy and planning reliability of operational processes
- Transparency concerning sequence for all users
- Reduced engine run times
- Optimised restart after interruptions
- Automated and timely data exchange
- Optimised use of available capacities in all conditions

4.1.2 Airlines/ground handling

- Reduced waiting times at the runway
- Minimised impact of delayed arrival on the punctuality of the subsequent departure
- More efficient use of airline and/or handling resources
- Optimised turn-round times
- Taking into account preferences and priorities (start-up sequence)
- Better predictability of deviations from the schedule

4.1.3 Airport

- Better utilisation of infrastructure, e.g. aircraft stand/gate management
- Improved adherence to airport slots
- Optimised consideration of customer wishes

4.1.4 Air navigation services and European ATFCM

- Improved adherence to ATFM slots and thus optimal utilisation of available ATC capacity
- Optimisation of pre-departure sequence and departure flows
- Improvement of the European ATFM network effect (forecast)
- Reduced frequency load

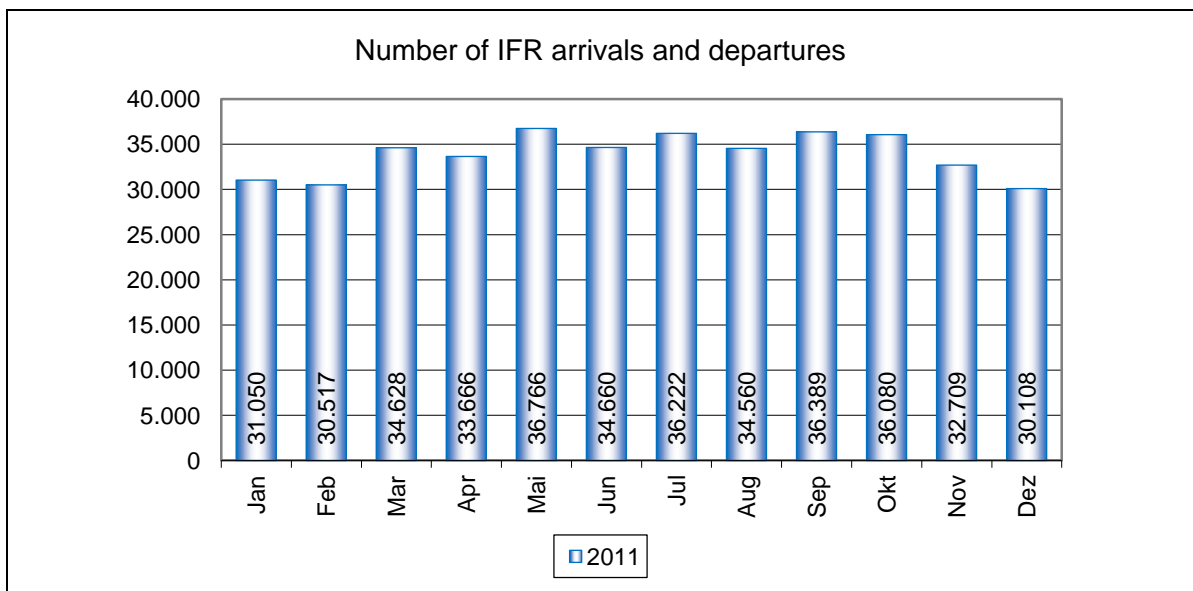
4.2 Results 2011

The results of 2011 are based on:

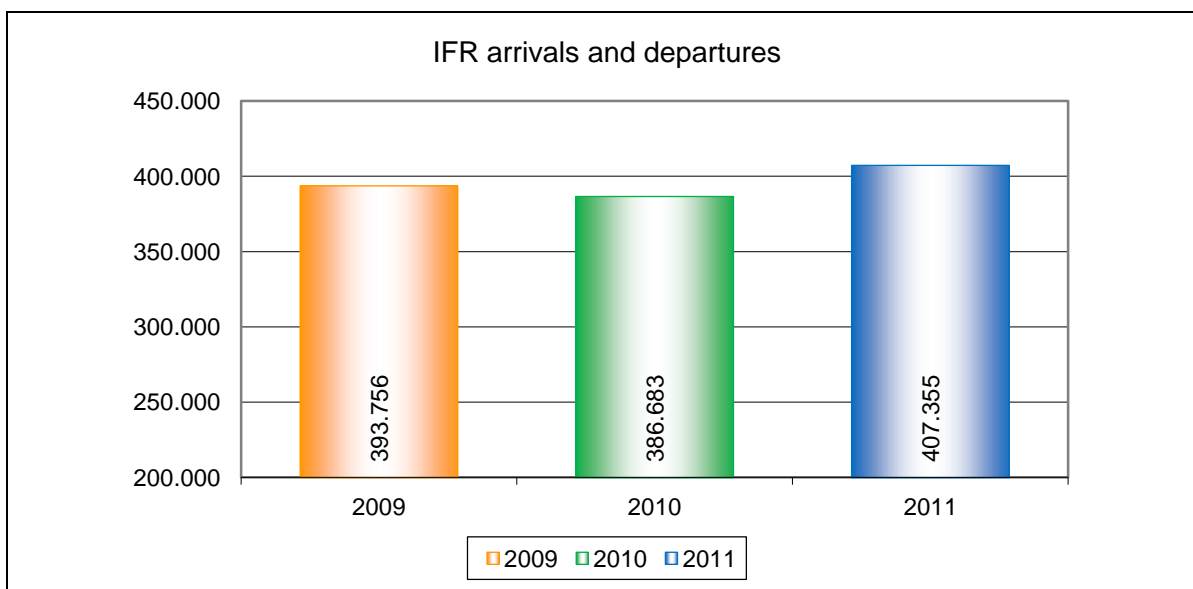
- Key performance indicators (KPI) Airport CDM Munich
- Monthly performance monitoring (PMS) evaluations (ProMUC)
- Monthly report on Airport CDM Munich
- Measurements by DFS (CC/FZ and TWR/M) and FMG
- Evaluations by the CFMU

4.3 Traffic figures

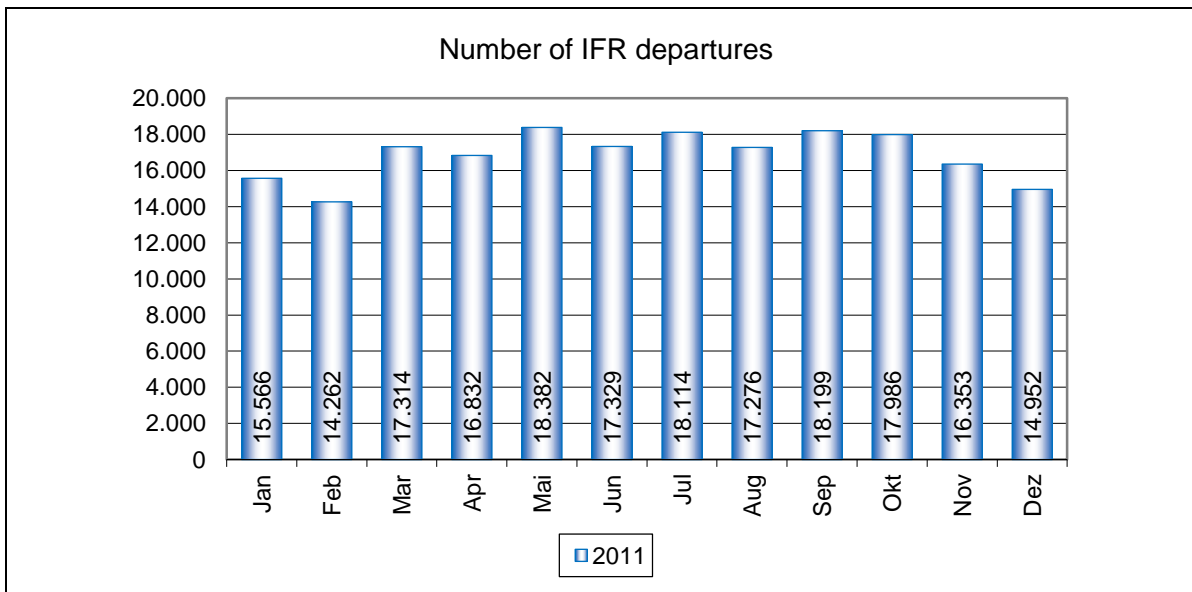
4.3.1 Total traffic figures (only IFR) – results 2011



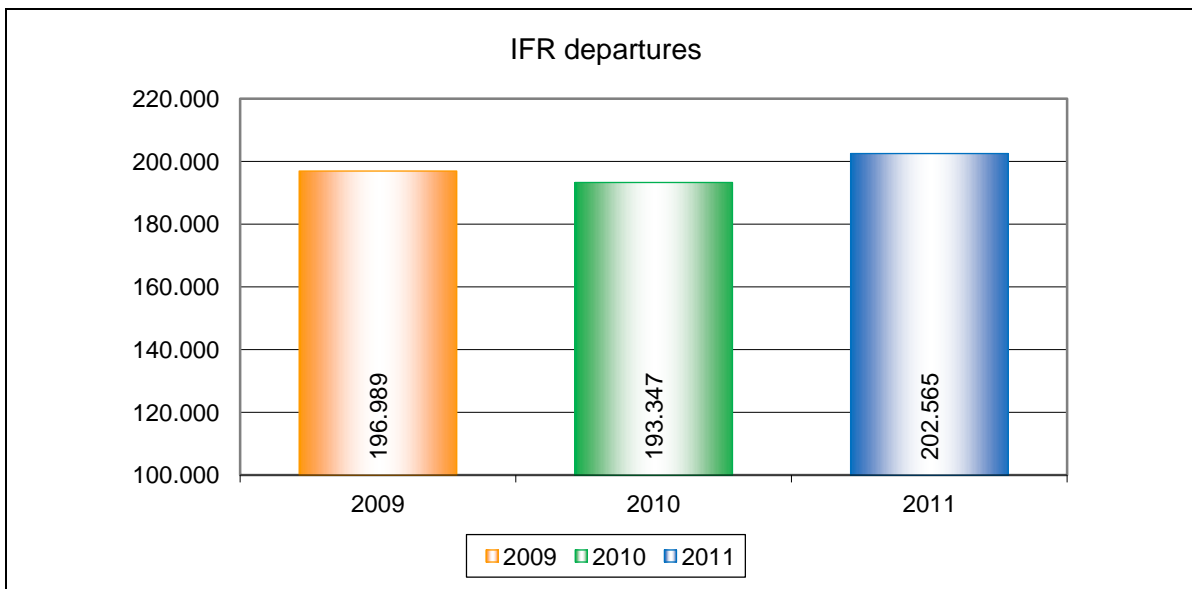
4.3.2 Total traffic figures (only IFR) – results of the past three years



4.3.3 Departures (only IFR) – result 2011



4.3.4 Departures (only IFR) – results of the past three years



4.3.5 Conclusions

Traffic figures had been declining since 2008. They became stable in the fourth quarter of 2010 and began to develop positively in 2011. The total number of IFR aircraft movements at Munich Airport increased by 5.35% in 2011 compared with the year before. The total number of departures is in the same range showing an increase by 4.77%.

4.4 Waiting time at the runway

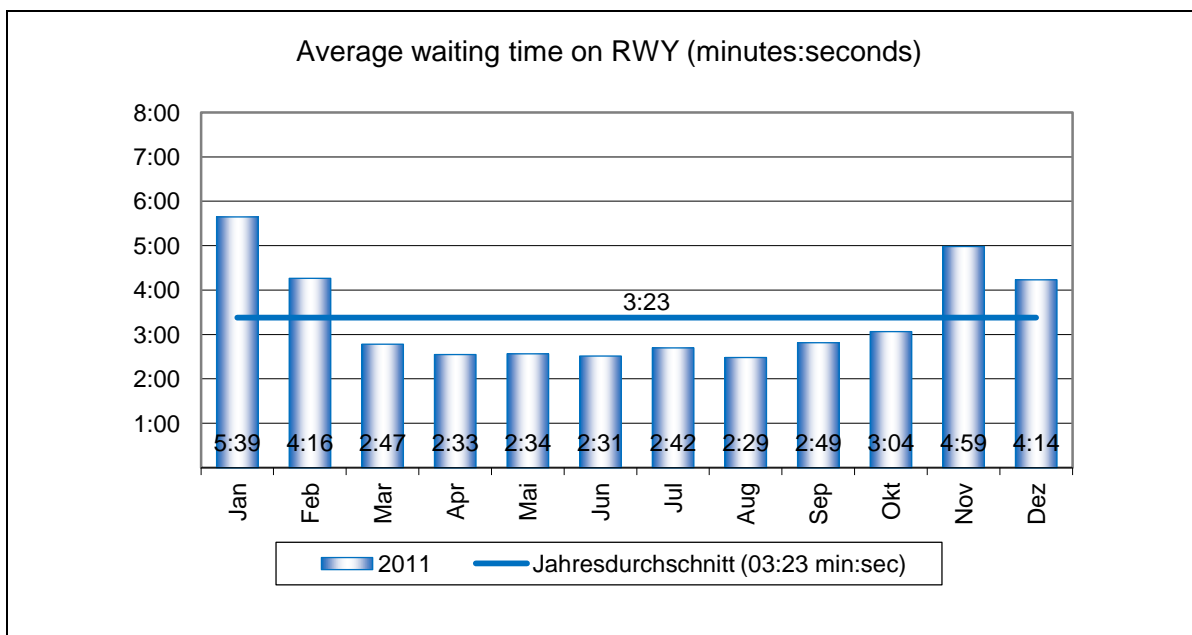
4.4.1 Description

The waiting time at the runway is the actual waiting time at the threshold of the runway. The difference between the actual take-off time and the time of crossing the bridge (transition from apron to manoeuvring area and/or transfer from apron management service of FMG to TWR-DFS) is reduced by a defined standard taxi time depending on the runway and bridge used.

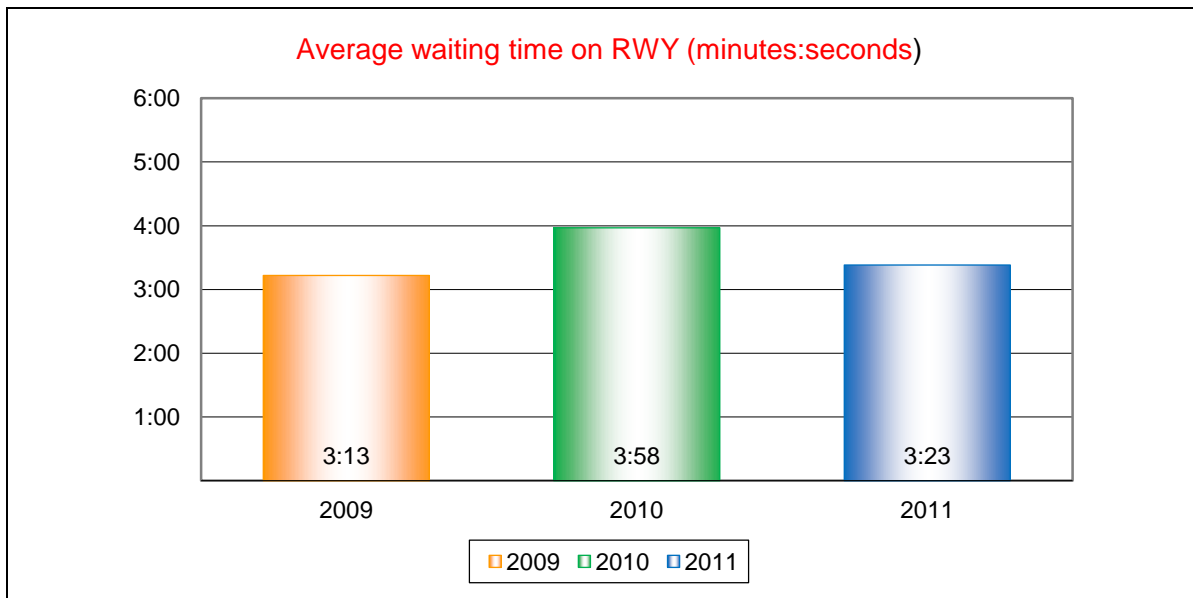
4.4.2 Objective

Improved prediction of target take-off times, taking into account variable taxi times, runway delay, operational runway capacity and de-icing times, enable precise planning of off-block times and thus shorter waiting times at the runway.

4.4.3 Results 2011



4.4.3.1 Results of the past three years



4.4.4 Conclusions

This is one of the most significant indicators because it is one that is easy to understand how the result was obtained. It is very positive that the result of the year under review again significantly improved over the previous year and is coming closer to the level of the period from 2007 to 2009. The results of January and November had a negative influence. In the first month of the year, the influences of snow and aircraft deicing were dramatic, whereas the results of November were exceptionally negative due to persistent strong fog and winds.

4.5 Impact of arrival delays on departure delays

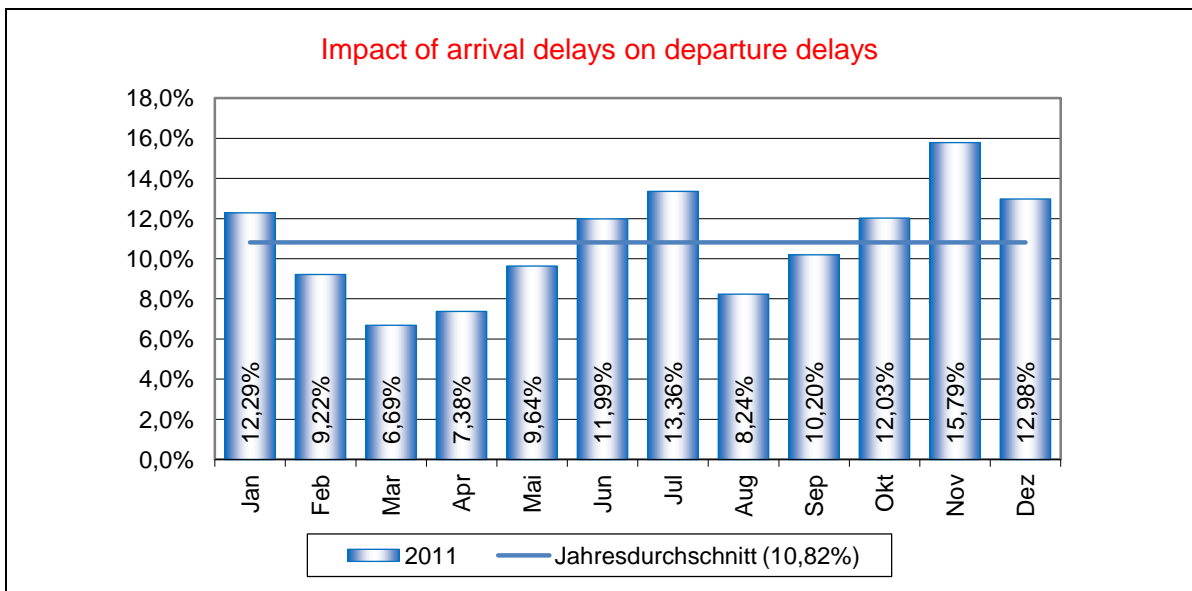
4.5.1 Description

This indicator describes the percentage of linked arrivals and departures (ARR/DEP), the departure delay being longer than the arrival delay. (Flight landed late and the delay continues to grow in the subsequent processes of the turn-round process).

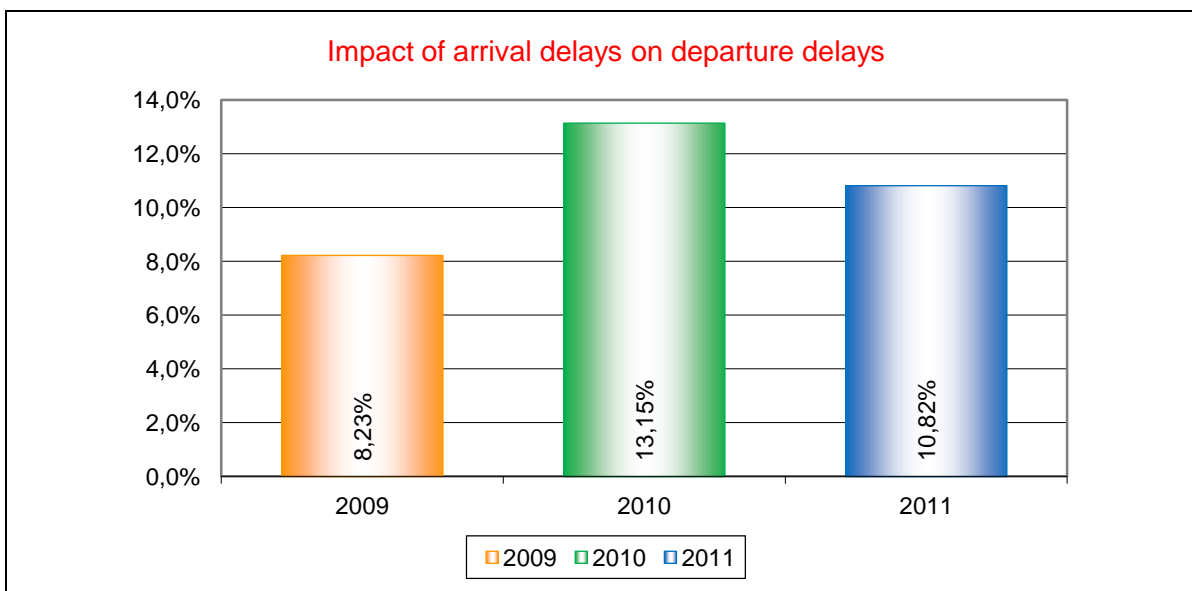
4.5.2 Objective

Timely information about arrival delays will ensure a better allocation of resources and help to minimise or make up for the arrival delay of the linked departure flight.

4.5.3 Results 2011



4.5.3.1 Results of the past three years



4.5.4 Conclusions

This indicator also significantly improved over the previous year and is approaching the level of the years 2007 to 2009. Without considering the adverse result of November which was due to external influences, more improvement than the actual 2.33 percentage points would have been possible.

4.6 TSAT accuracy

4.6.1 Description

These indicators describe the accuracy of and/or compliance with TSAT measured at different times during the process.

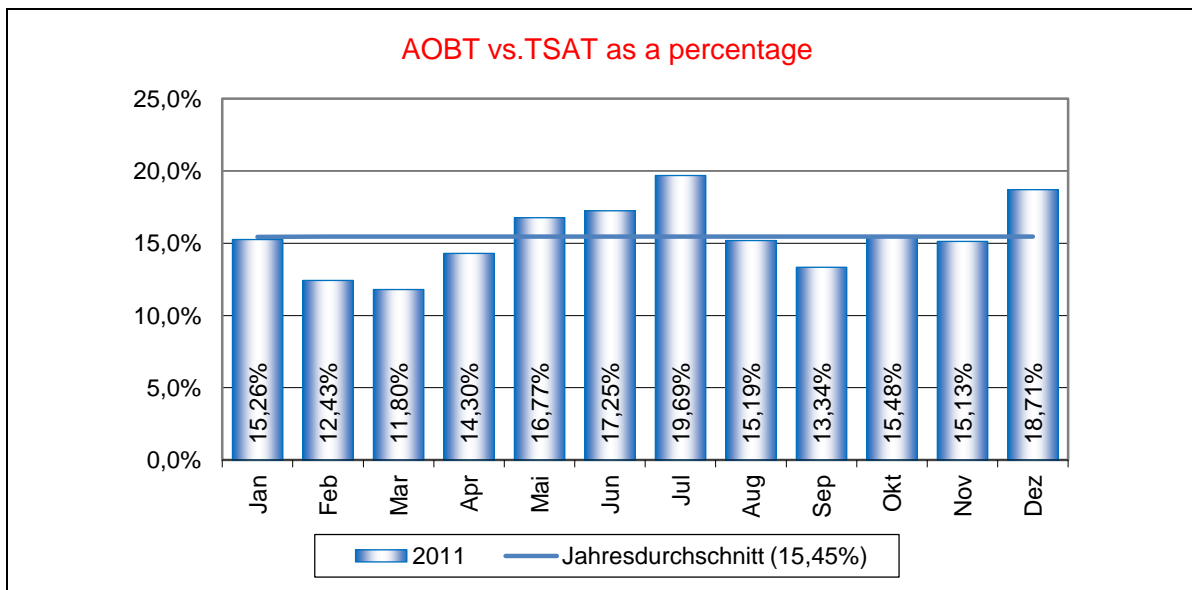
4.6.2 Objective

Compliance with TSAT is a prerequisite for an optimal position planning and handling of the subsequent processes up to take-off. The quality of the local target take-off times determined shall be ensured (e.g. as a basis for data exchange with the CFMU).

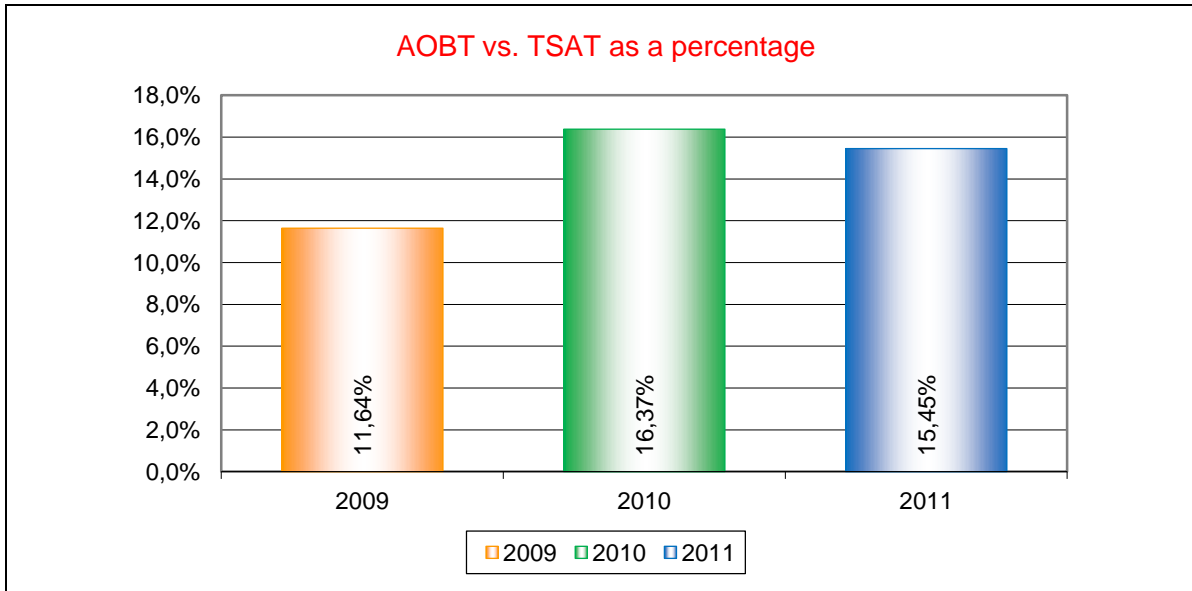
4.6.3 AOBT compared to TSAT

Percentage of flights which received start-up approval via data link and did not go off-block within the planned time slot (deviation of more than 5 minutes – plus or minus).

4.6.3.1 Results 2011



4.6.3.1.1 Results of the past three years



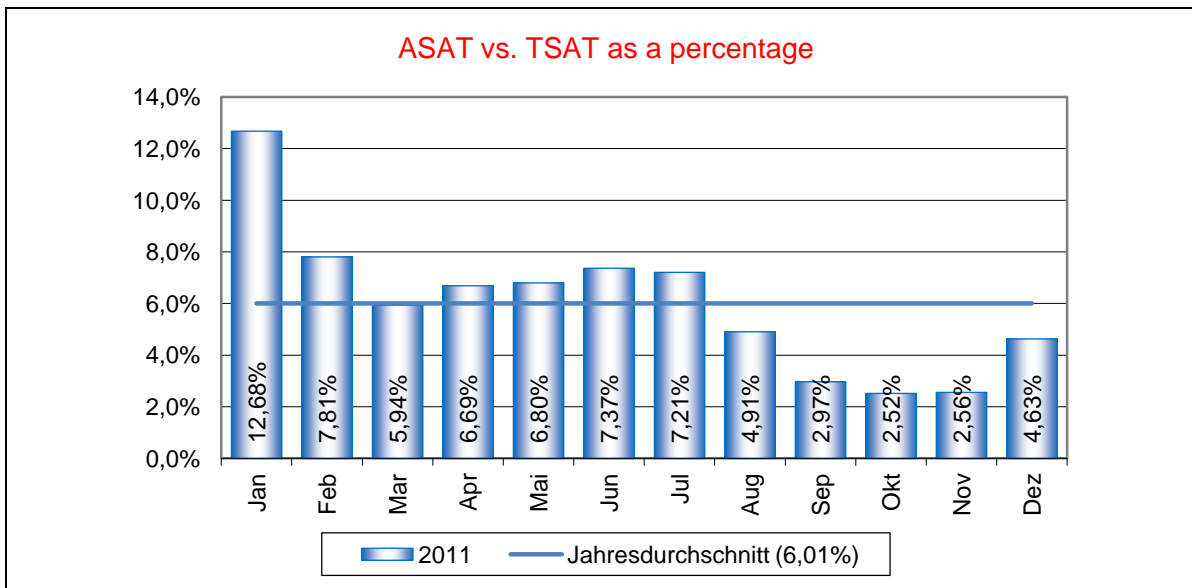
4.6.3.2 Conclusions

Unfortunately, this indicator did not show the same amount of improvement as the others as compared to the previous year . Compared to the year 2009, the difference amounts to almost four percentage points. If you take a look at absolute numbers, the total of 15,45 percent corresponds to an average number of 5 processes per hour which did not reach the quality objective.

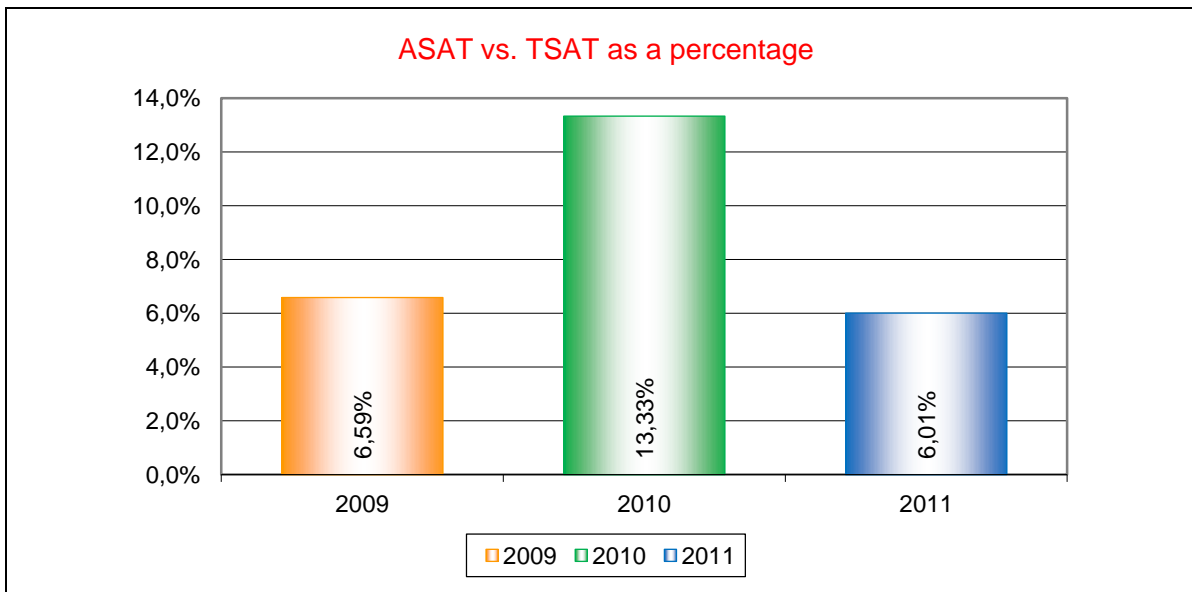
4.6.4 ASAT compared to TSAT (compliance with plan time of TWR)

Percentage of flights which did not receive a start-up approval by DFS TWR via radiotelephony within the time slot envisaged (deviation of more than 5 minutes – positive and negative).

4.6.4.1 Results 2011



4.6.4.1.1 Results of the past three years



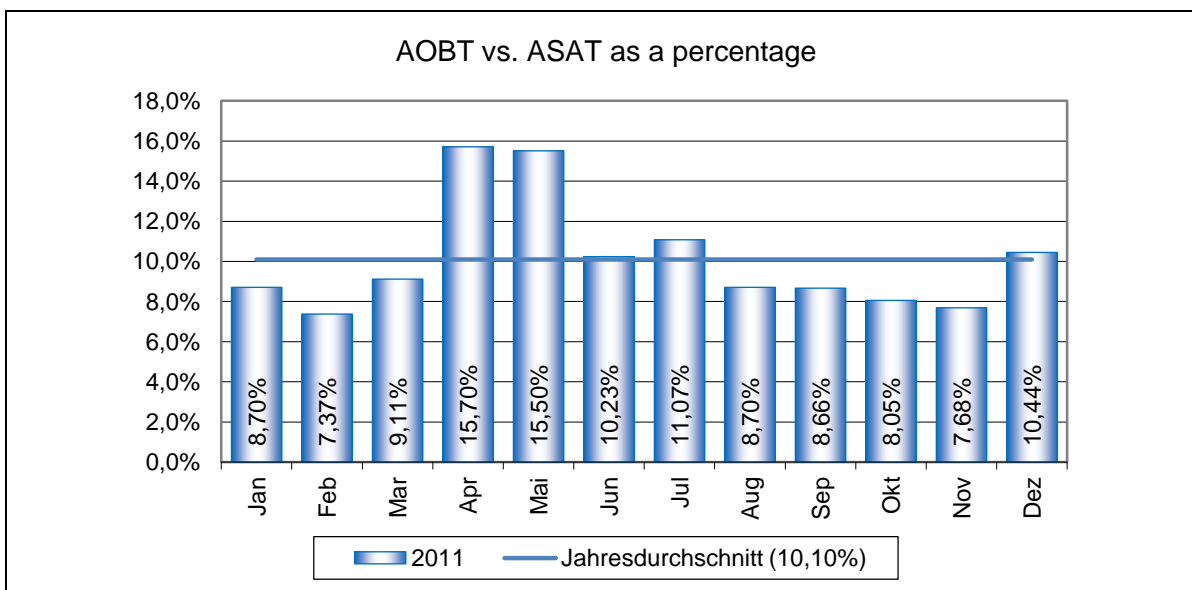
4.6.4.2 Conclusions

If you take a look at the annual line chart, it is clearly visible that measures were implemented in the middle of the year which had a significantly positive effect on the results. This led to an improvement by more than 50 percent compared to the previous year.

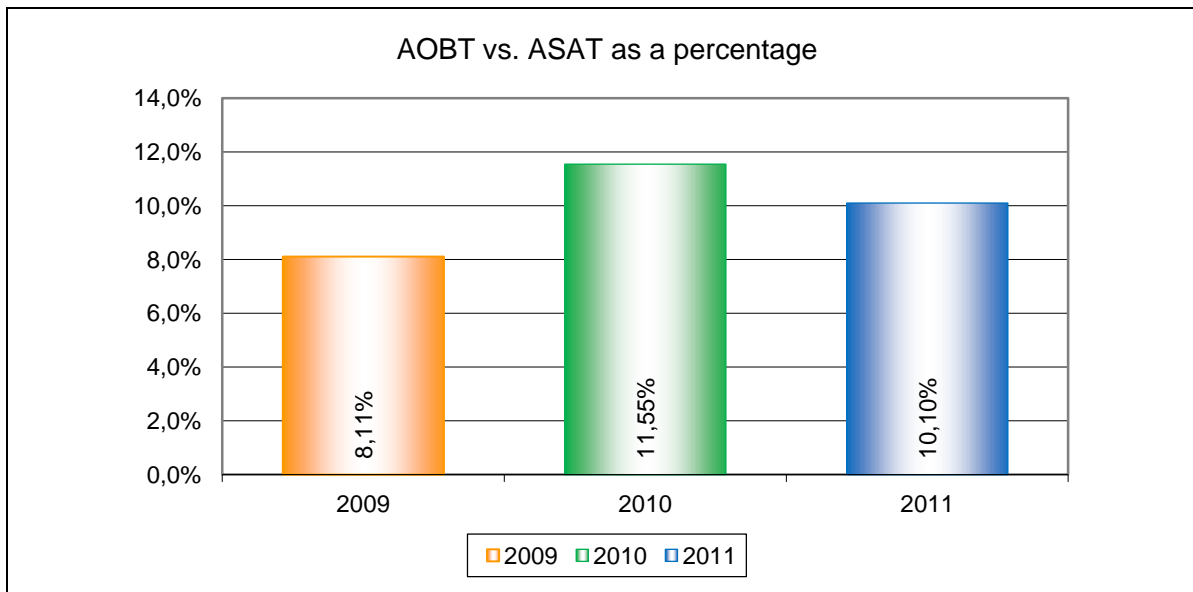
4.6.5 AOBT compared to ASAT

Percentage of flights which received a start-up approval via radiotelephony and did not go off-block within five minutes after start-up approval.

4.6.5.1 Results 2011



4.6.5.1.1 Results of the past three years



4.6.5.2 Conclusions

This indicator also showed a slight improvement compared to the previous year, whereas the desired quality target was clearly not achieved. It is almost impossible to exert a positive influence on part of the improvement potential because intersecting traffic flows lead to off-block delays. For the remaining potential, it is possible to initiate measures which will lead to an optimisation of the result because these measures increase adherence to procedures by pilots when keeping the maximum time difference between the process steps "start-up permission received" and "request for off-block clearance".

The results of the months of April and May, which were distinctly above the annual average, are clearly due to an incorrect determination of the indicators.

4.7 TOBT accuracy

4.7.1 Description

This indicator describes the TOBT accuracy at defined times (40 min, 10 min) prior to the completion of ground handling.

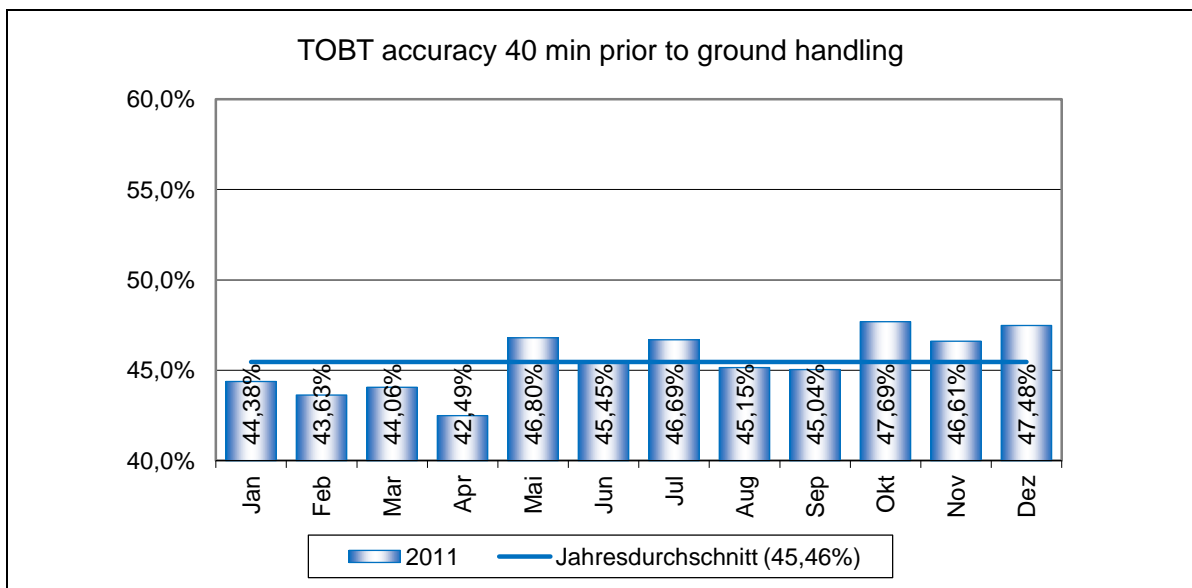
4.7.2 Objective

The objective is to ensure high TOBT accuracy as early as possible with respect to actual completion of ground handling. The TOBT quality has a major influence on start-up approval, push-back and the preparation of an optimal pre-departure sequence. The local target times transmitted on the basis of the TOBT serve as "no CTOT before" information for the CFMU.

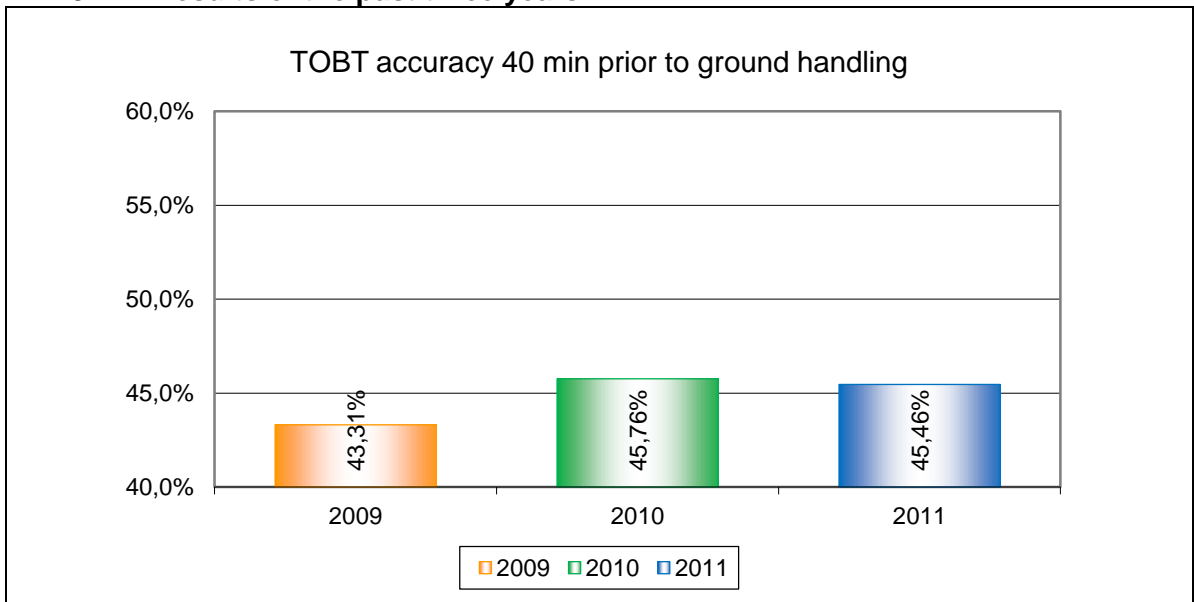
Note: The completion of ground handling within the Airport CDM process Munich corresponds to the time "end of boarding at gate + 5 min" or, in the case of flights at outside positions, "passengers got off last bus + 5 min".

4.7.3 40 minutes prior to completion of ground handling

4.7.3.1 Results 2011

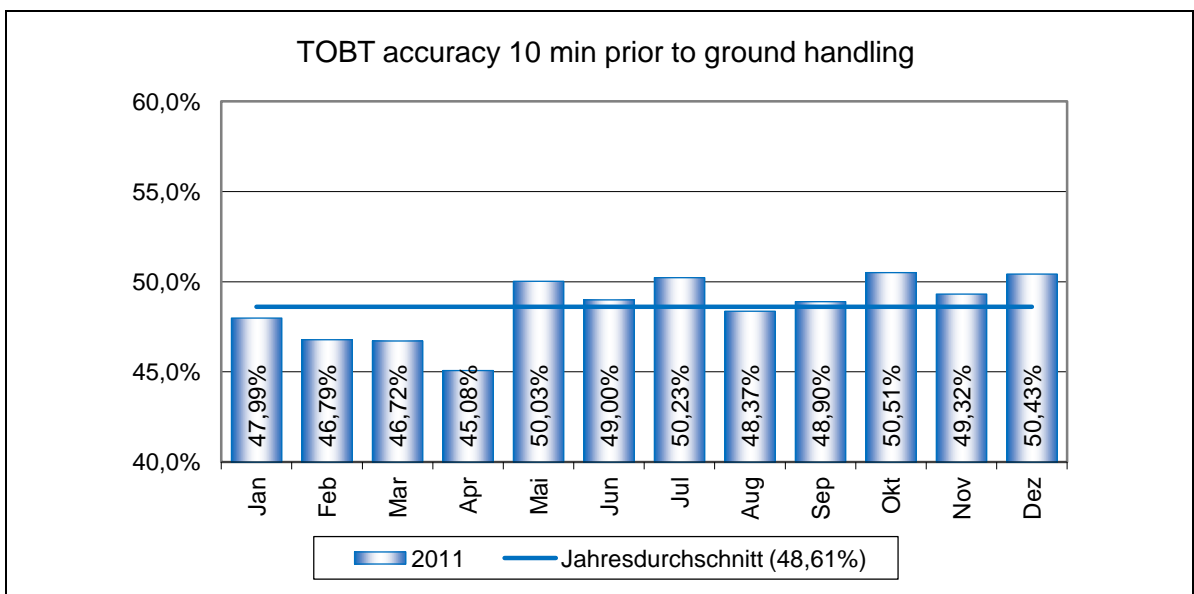


4.7.3.1.1 Results of the past three years

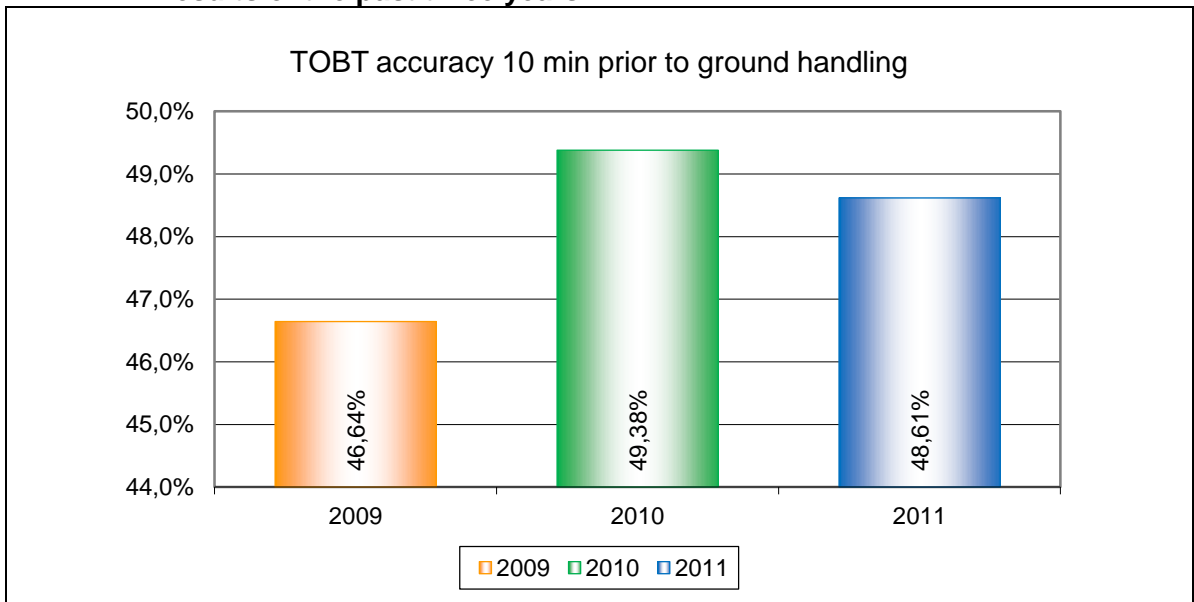


4.7.4 10 minutes prior to completion of ground handling

4.7.4.1 Results 2011

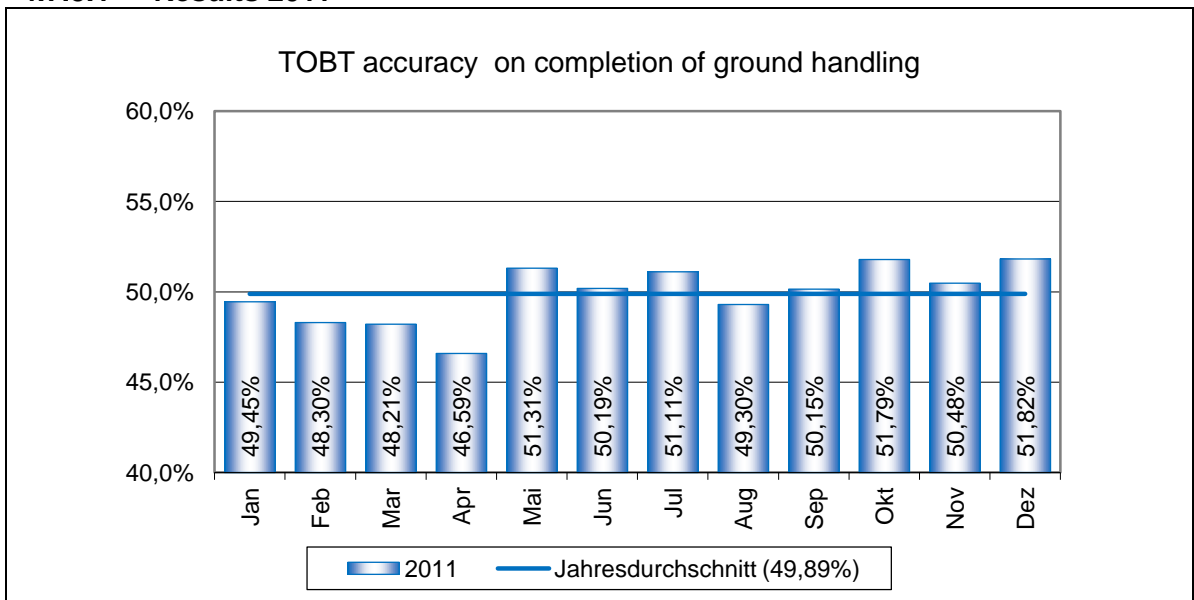


4.7.4.1.1 Results of the past three years

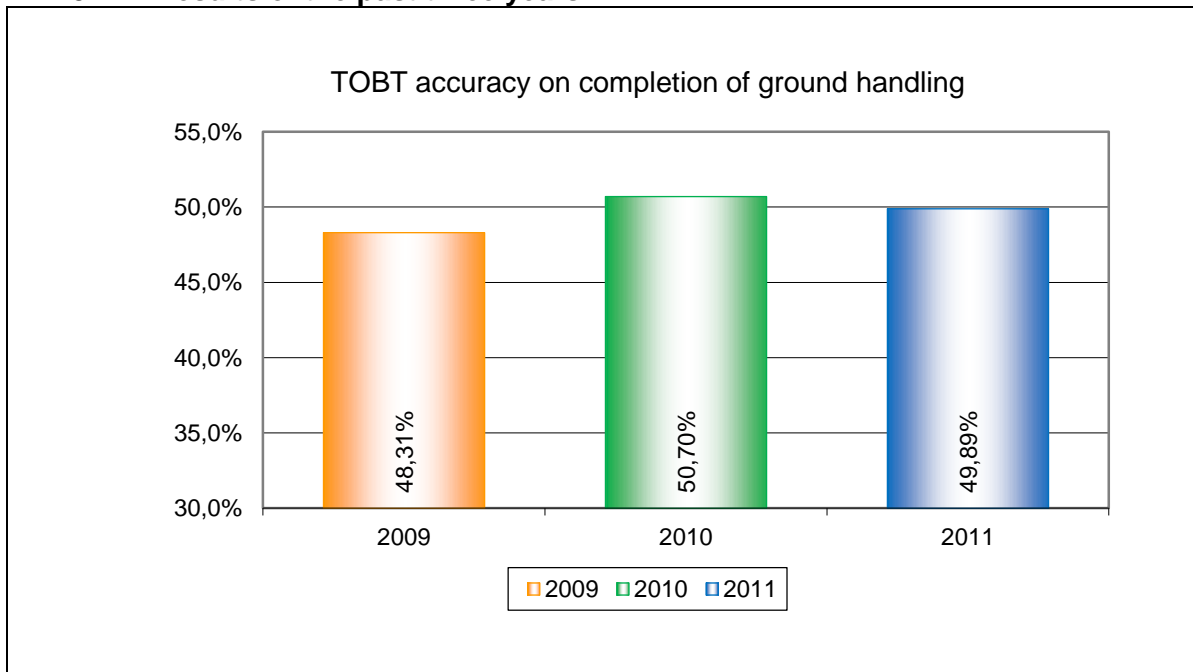


4.7.5 On completion of ground handling

4.7.5.1 Results 2011



4.7.5.1.1 Results of the past three years



4.7.6 Overall conclusions

Looking at all three times the measurements were taken of the last three months of the annual process plan, there is a quality increase compared to the results of the rest of the year, which is due to a campaign to this effect. Independently of that, it must be noted that the targets were again missed by far in the year under review.

It should be noted, however, that the term "completion of ground handling" is a virtual value and not a value actually measured. Therefore, the percentage of the actual TOBT inaccuracy cannot be exactly determined.

4.8 Position overlappings

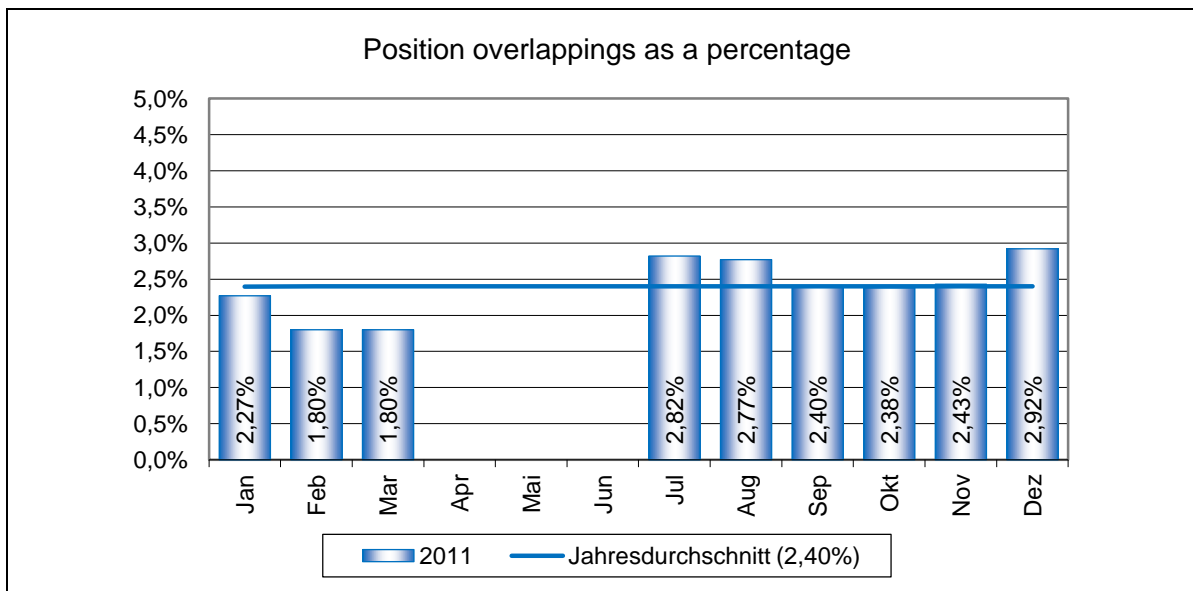
4.8.1 Description

Percentage of position overlappings among arrivals which trigger a waiting time for a free position.

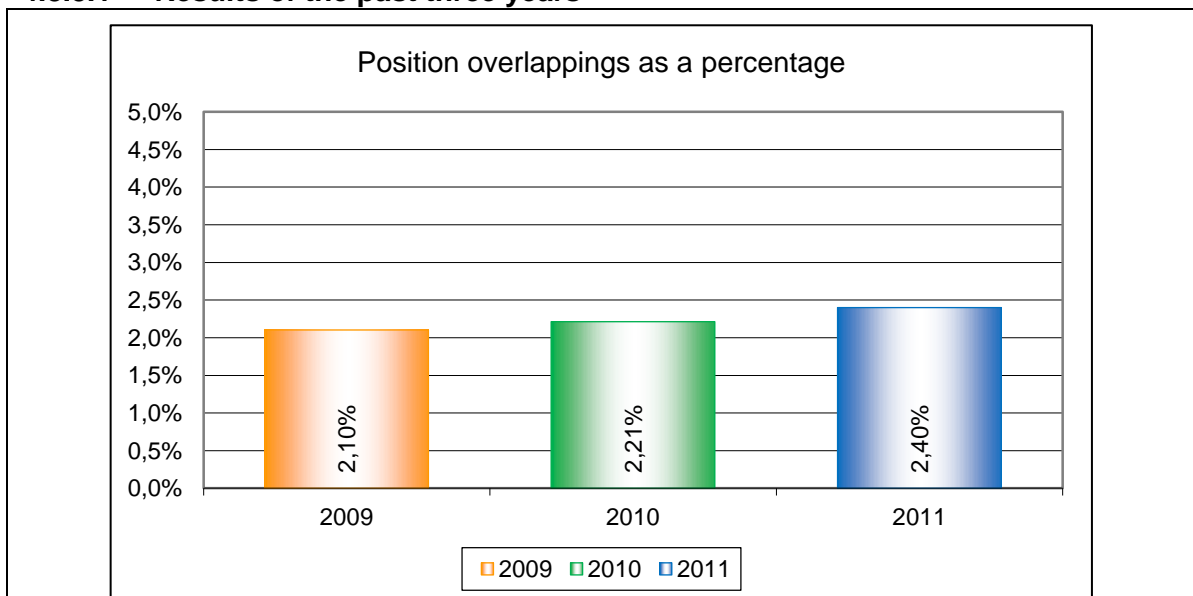
4.8.2 Objective

The number of position overlappings is to be reduced in order to further minimise waiting times for free positions.

4.8.3 Results 2011



4.8.3.1 Results of the past three years



4.8.4 Conclusions

With only 2.4%, the number of position overlappings and the related waiting times for free positions has further increased compared to the values from the previous years. Even if this corresponds to a true average value of only 13 processes per day, the continuing negative trend must be regarded as critical. Some improvement might be possible if the existing parameters imposed by some airlines to always use certain gates for the same destinations, if possible, could be handled in a more flexible manner.

4.9 Position changes at short notice

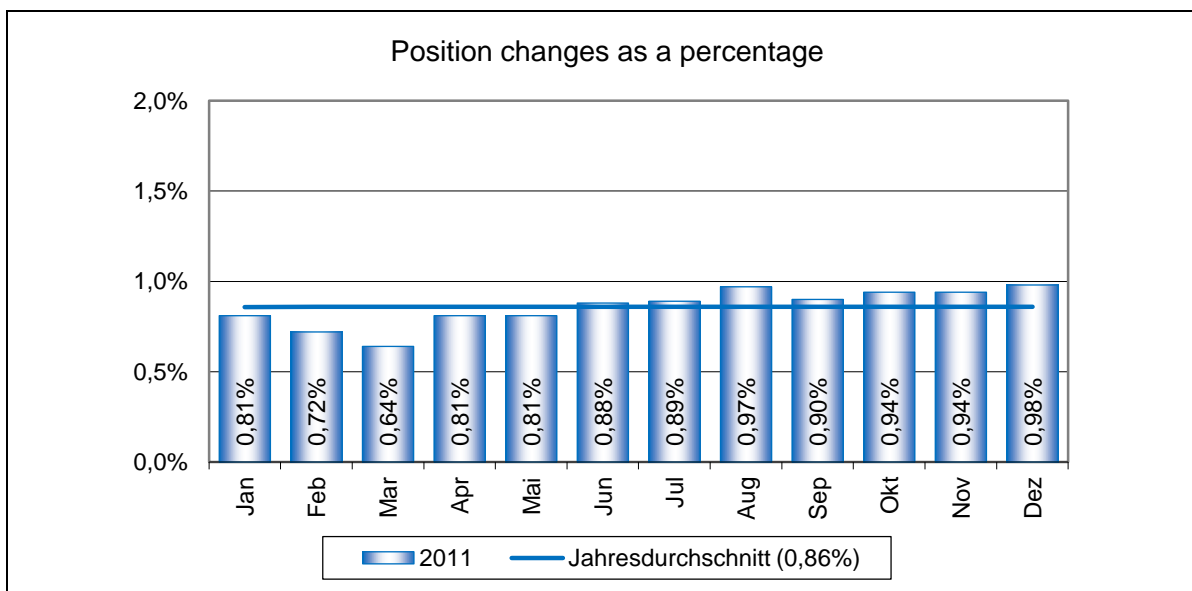
4.9.1 Description

Percentage of position changes of the arrivals affected at short notice between the actual landing time (ALDT) and the actual in-block time (AIBT).

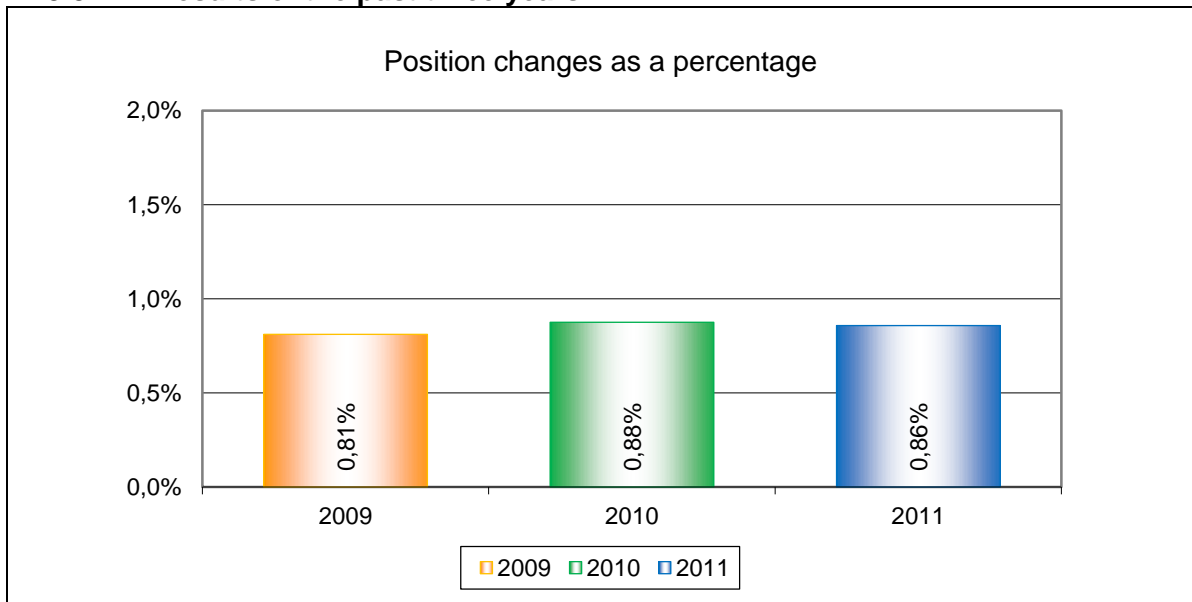
4.9.2 Objective

As position changes at short notice imply an increased need for resources in all ground handling processes, these values should be minimised as far as possible. Thus, early high-quality landing forecasts ensure an improved allocation of positions.

4.9.3 Results 2011



4.9.3.1 Results of the past three years



4.9.4 Conclusions

The share of position changes at short notice amounts to 0.86% which is a very positive figure and at the same level as in the previous years.

4.10 ATFM slot adherence

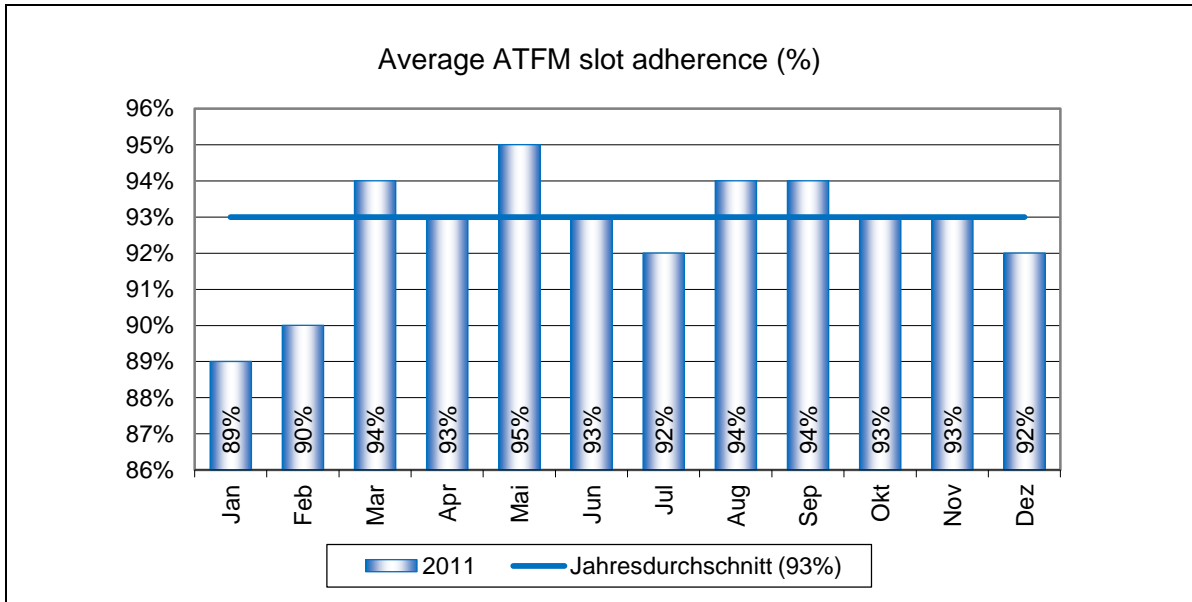
4.10.1 Description

The chart depicts the percentage of departures subject to an ATFM slot and taking off within a time slot of $-5/+10$ CTOT.

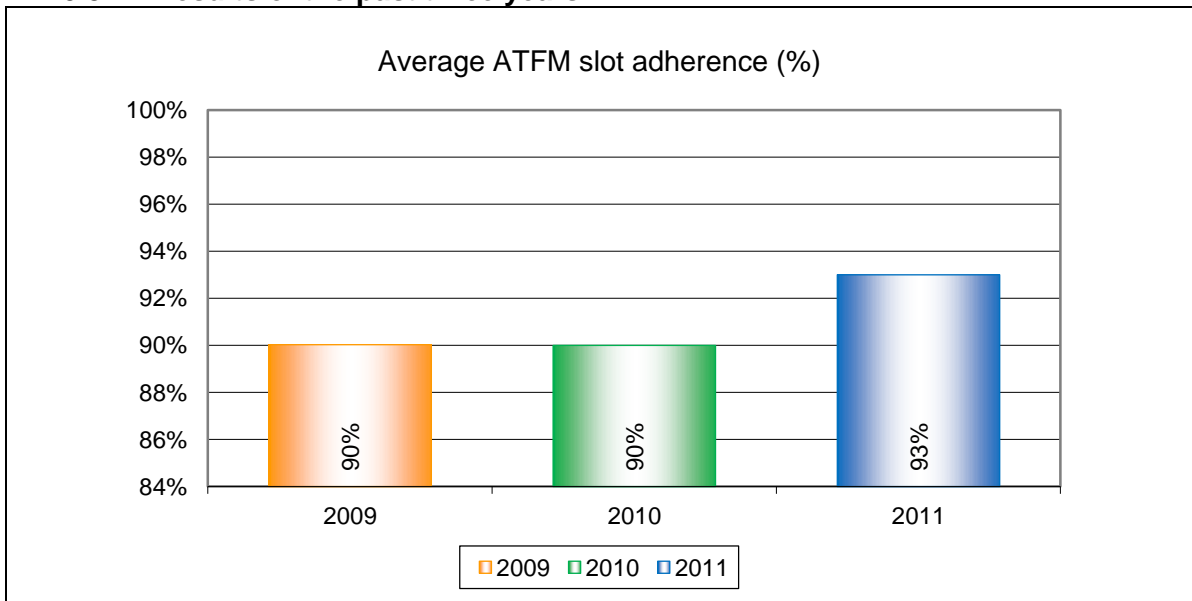
4.10.2 Target

ATFM slot adherence is enhanced by means of optimally adapting the CTOT to the local target take-off time within the A-CDM process, thus improving pre-departure sequence (high degree of procedure compliance).

4.10.3 Results 2011



4.10.3.1 Results of the past three years



4.10.4 Conclusions

The excellent results of the past two years could again be improved. This is shown by an average growth of three percentage points compared to the previous years and a peak value of 95% in the month of May. This continuing positive trend is mainly due to the optimum information exchange between airport A-CDM and the persons responsible for the network.

4.11 DFS take-off quality

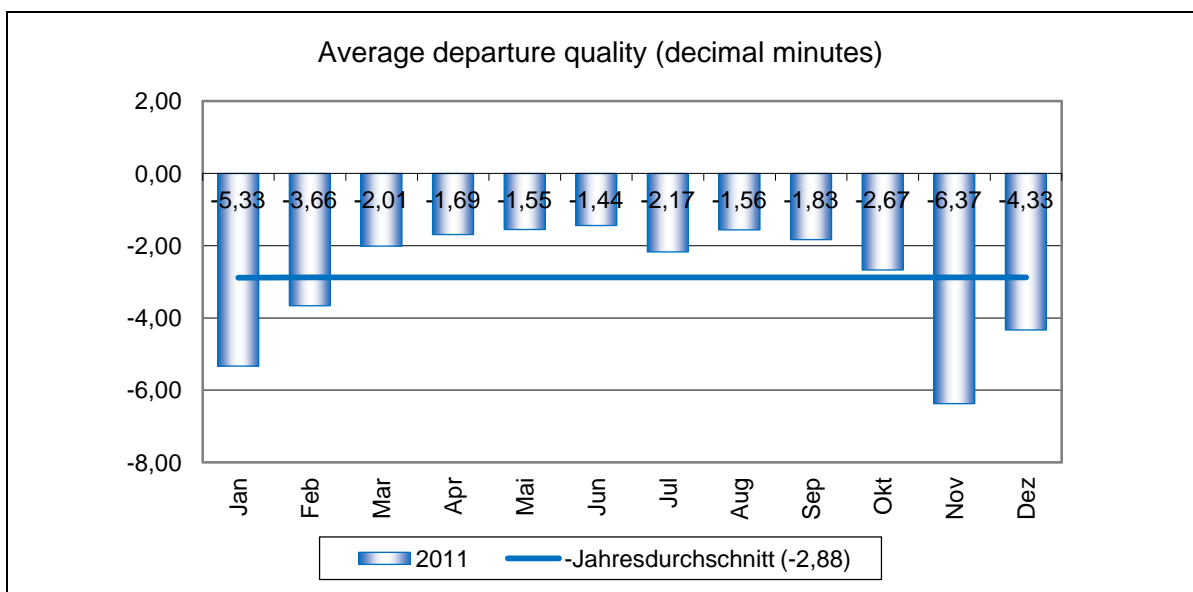
4.11.1 Description

The actual taxi time is compared with the standard taxi time (scheduled time including push-back procedure and taxi time to the expected take-off point at the runway) defined for the relevant runway. Taxi times which are longer than the standard taxi time trigger delays, shorter taxi times mean a bonus.

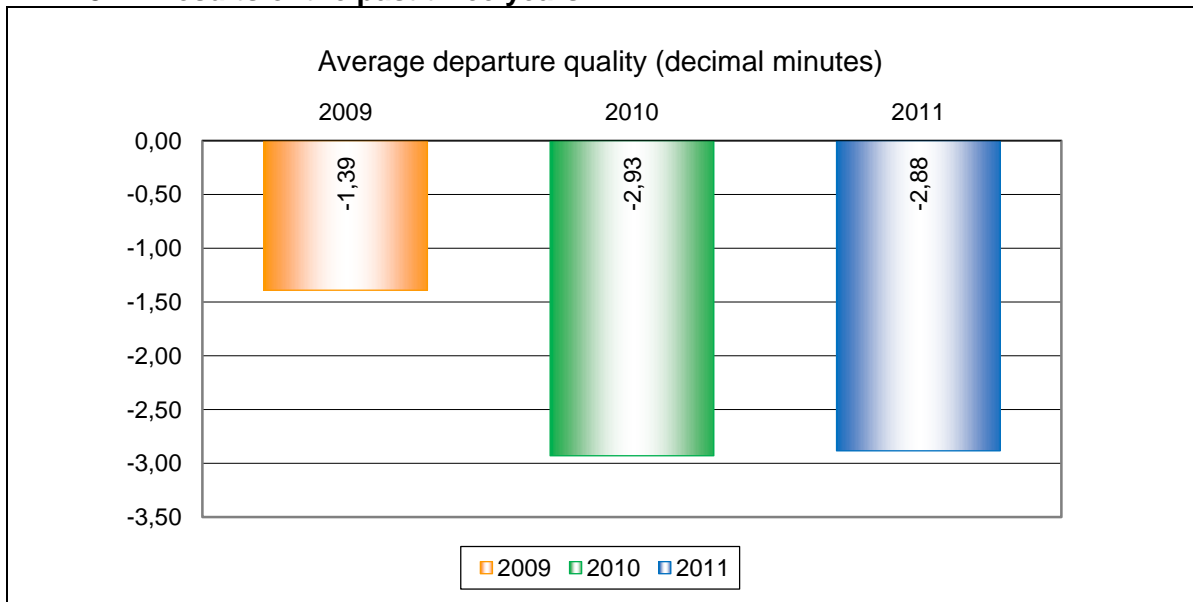
4.11.2 Objective

This indicator is used to monitor the procedure as it shows the procedure's effects.

4.11.3 Results 2011



4.11.3.1 Results of the past three years



*all results in decimal values

4.11.4 Conclusions

This indicator improved slightly over the previous year but is still twice as high as in the years 2008/2009. One of the reasons is the extraordinarily large number of aircraft de-icings in January. The duration of the de-icing process is not included in the standard taxi times which led to extreme discrepancies between actual times and reference times. A further reason was the limited visibility in November. This led to CATII/III operations for almost the entire month so that, among other things, the taxi times did not correspond to the standard times.

4.12 Off-block punctuality

Off-block punctuality is measured in different ways.

These include:

- Scheduled off-block time (SOBT) in comparison to actual off-block time (AOBT)
- Target off-block time (TOBT) in comparison to actual off-block time
- Scheduled off-block time in comparison to estimated off-block time (EOBT)

These measurements do not reflect IATA punctuality (SOBT +/- 15 min).

4.12.1 SOBT compared to AOBT

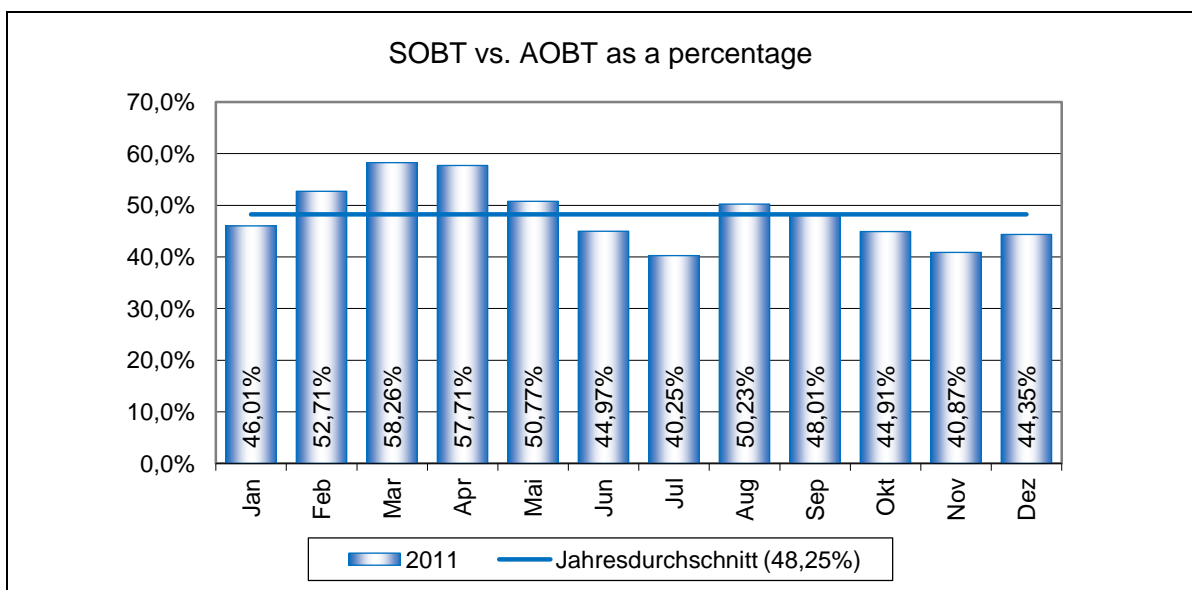
4.12.1.1 Description

This indicator describes the deviation of the actual off-block time (AOBT) from the scheduled off-block time (SOBT) submitted to the airport coordinator. If the AOBT deviates from the SOBT by less than 5 minutes, the flight shall be considered as punctual (Airport CDM MUC definition). All other flights, regardless of their actual deviation, shall be considered as not punctual and are depicted in the chart below. The time slot of 5 minutes was agreed upon in order to compare the values with the indicator of TOBT in relation to AOBT.

4.12.1.2 Objective

This value describes the punctuality of departures within the specified time slot. A comparison of this value with the indicator of TOBT in relation to AOBT shows a difference between season-related planning (SOBT) and planning on the day of operations (TOBT).

4.12.1.3 Results 2011



4.12.2 TOBT compared to AOBT

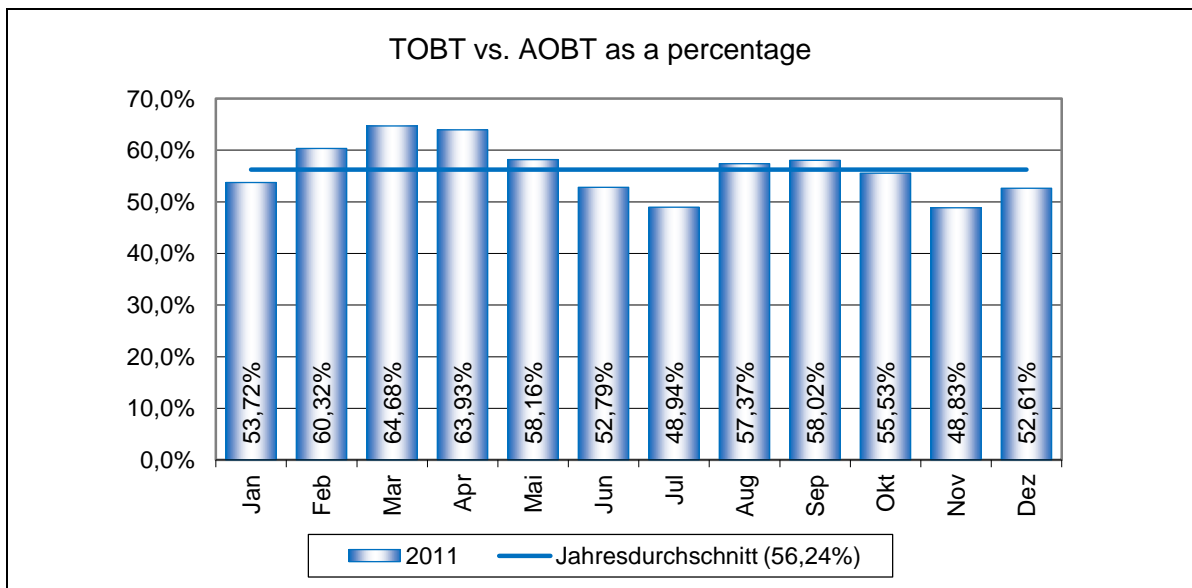
4.12.2.1 Description

This indicator describes the deviation of the actual off-block time from the target off-block time entered by the person responsible for the TOBT. If the AOBT deviates from the TOBT by less than 5 minutes, the flight shall be considered as punctual. All other flights, regardless of their actual deviation, shall be considered as not punctual and are depicted in the chart below. The time slot of 5 minutes was chosen for two reasons: firstly, in order to compare these values to the indicator of SOBT in relation to AOBT, and secondly, because the procedure allows for a deviation from the TOBT by 5 minutes.

4.12.2.2 Target

This value describes the punctuality of departures within the specified time slot. A comparison of this value with the indicator of TOBT in relation to AOBT shows a difference between season-related planning (SOBT) and planning on the day of operations (TOBT).

4.12.2.3 Results 2011



4.12.3 Deviations of SOBT from EOBT

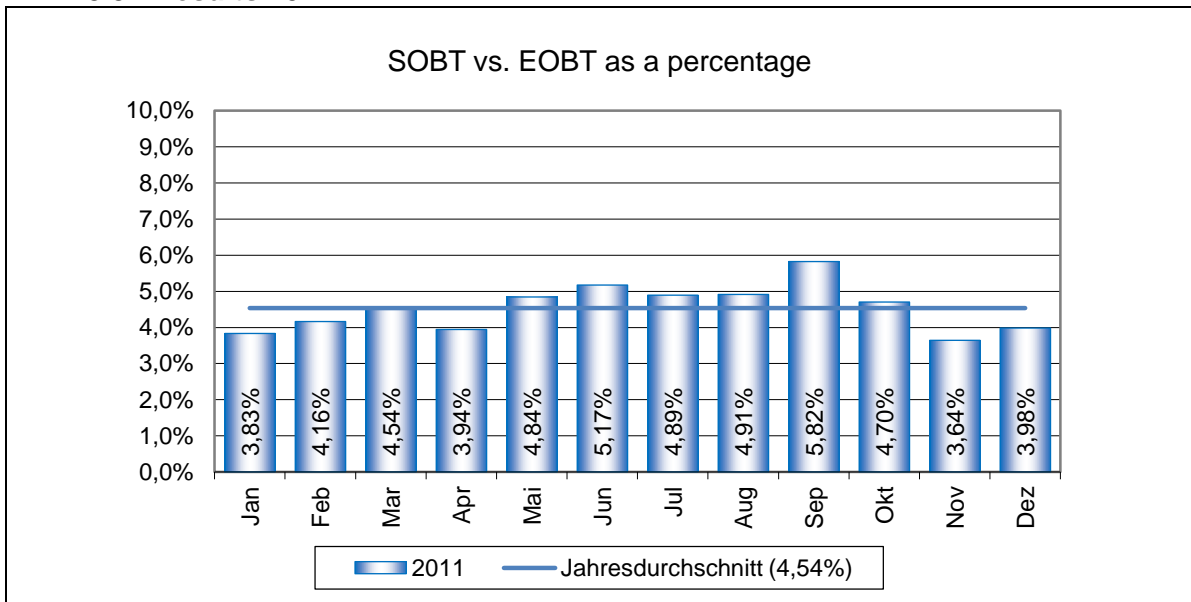
4.12.3.1 Description

This indicator (in per cent) describes the deviation of the first EOBT specified in the ATC flight plan from the SOBT submitted to the airport coordinator.

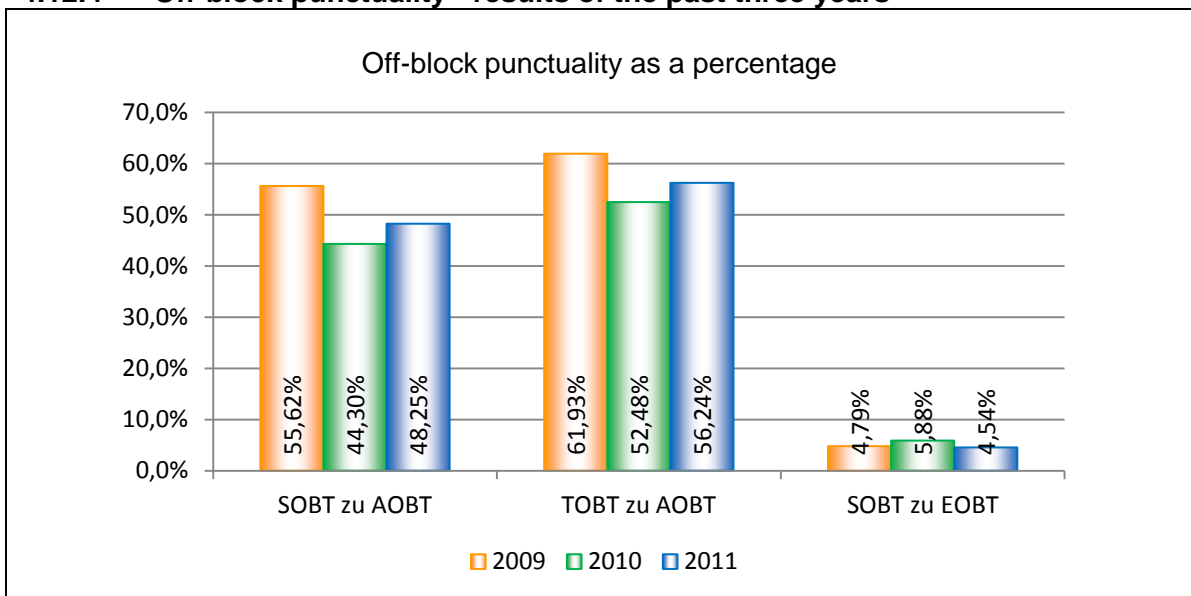
4.12.3.2 Target

Plan times are of particular importance to all partners, especially the SOBT, since it reflects the resource capacities mutually agreed upon. The indicated value is to be minimised by appropriate measures (Airport CDM information messages prior to the real event).

4.12.3.3 Results 2011



4.12.4 Off-block punctuality - results of the past three years



4.12.4.1 Conclusion off-block punctuality

Considering the definition for the punctuality value SOBT (not the IATA definition), 48.25% of all flights were on time in the year under review. Although this means an improvement by four percentage points compared to the previous year, the target was missed by far.

The indicator TOBT vs. AOBT reflects delays due to capacity, both in the airport system and in the airspace. There was an improvement of almost four percentage points compared to the previous year but again, the target value could not be reached.

For the indicator SOBT vs. EOBT, the best result was achieved since the beginning of recording, which confirms the increasing adherence to procedures by the airspace users.

However, similar to the previous year, the comparatively high values in the months from May to September are particularly remarkable when suitable SOBTs for additional charter flights planned at short notice were only available to a limited degree.

4.13 Flights without SOBT

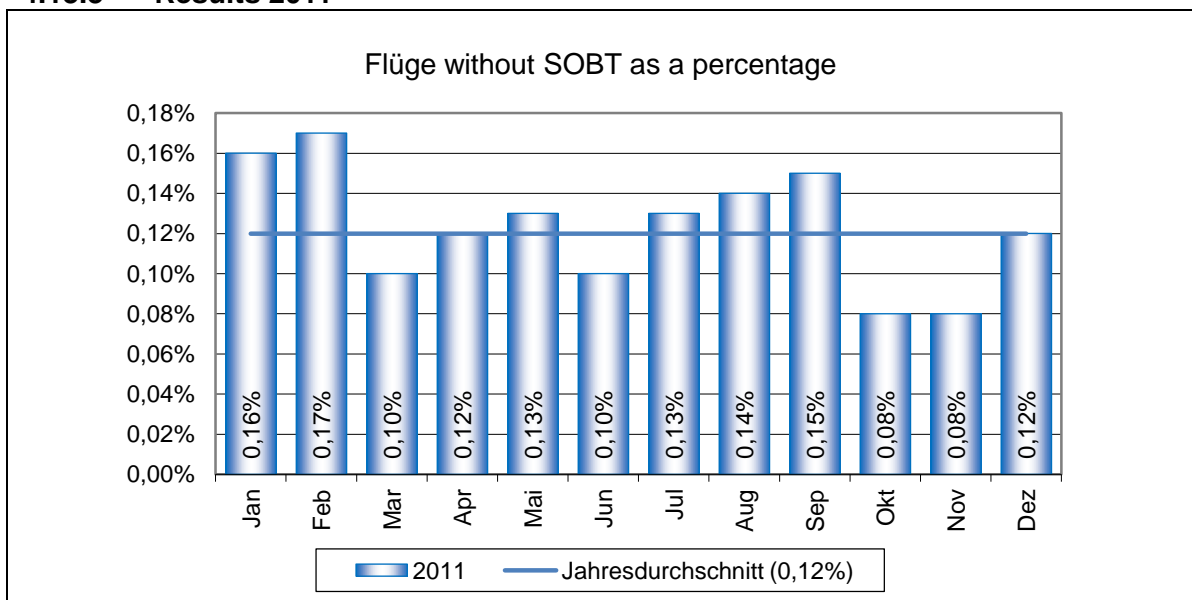
4.13.1 Description

The consolidation of the ATC flight plan, the airport slot and the flight data submitted to the airport is one of the major milestones of Airport CDM. This milestone facilitates the identification of so-called "ghost flight plans" (several ATC flight plans for one flight) and of further flight intentions without a coordinated airport slot.

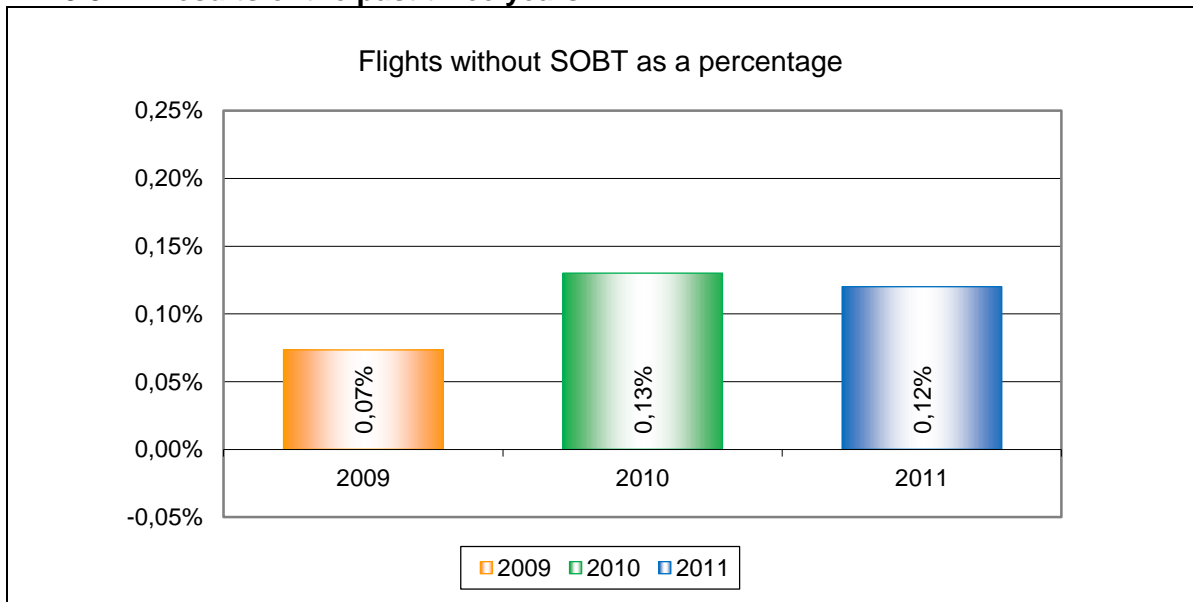
4.13.2 Target

Only one active flight plan should be available per actual flight intention. Furthermore, one airport slot must be coordinated for each departure. All other flights are to be identified and appropriate measures be taken.

4.13.3 Results 2011



4.13.3.1 Results of the past three years



4.13.4 Conclusions

Due to the early identification of "ghost flight plans" and the related operational measures of Airport CDM, the percentage of flights without SOBT could once again be kept at a very low level.

4.14 Flight update message quality

4.14.1 Description:

Flight update messages (FUM) were initiated together with the Airport CDM. An FUM is generated by DFS from CFMU data and comprises the estimated landing time (ELDT).

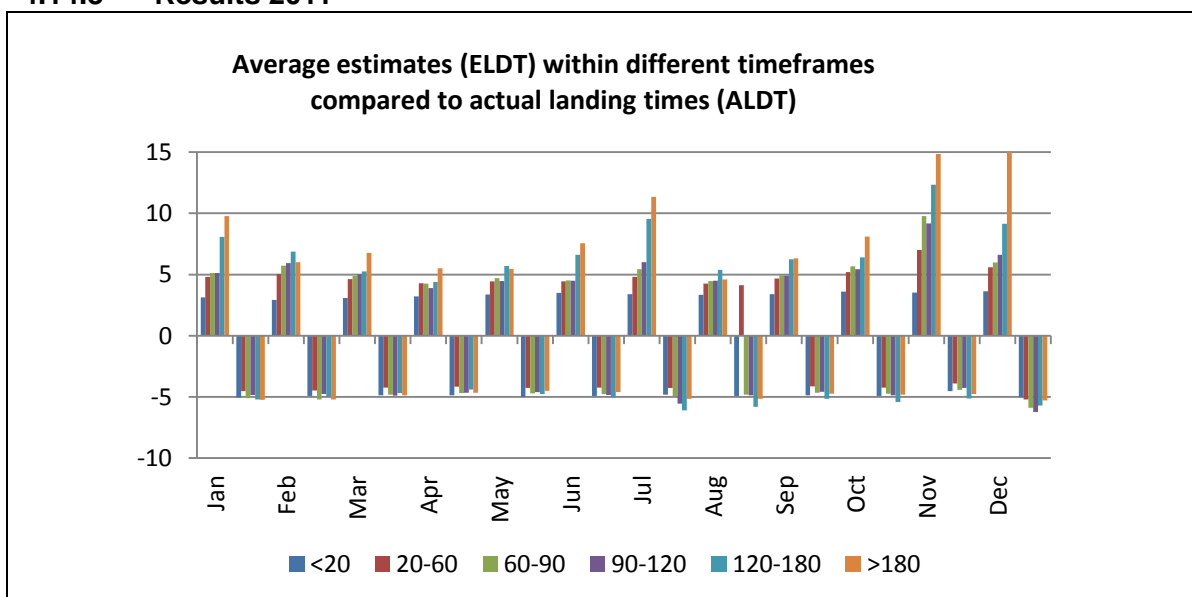
It is determined to what degree of accuracy the ELDT matches the actual landing time, regardless of the flight duration.

Note: As only sample measurements were carried out in the past, no chart with the results of the past three years has been drawn up.

4.14.2 Objective:

As an exact date, the ELDT from the FUM should help optimise the control of the subsequent airport processes (e.g. gate and positioning).

4.14.3 Results 2011



4.14.4 Conclusions

The results show that, regardless of the flight duration and any arrival regulation during a time period from 180 to less than 20 minutes before landing, the predicted ELDT matches the actual landing time (ALDT) with a maximum deviation of + 15 to - 6 minutes, which means that the quality is very high.

The average forecast accuracy shows a deviation from 5.15 minutes from the real landing time and improved over the previous year by roughly 38 seconds.

4.15 ATFM delay development (CFMU)

4.15.1 Description:

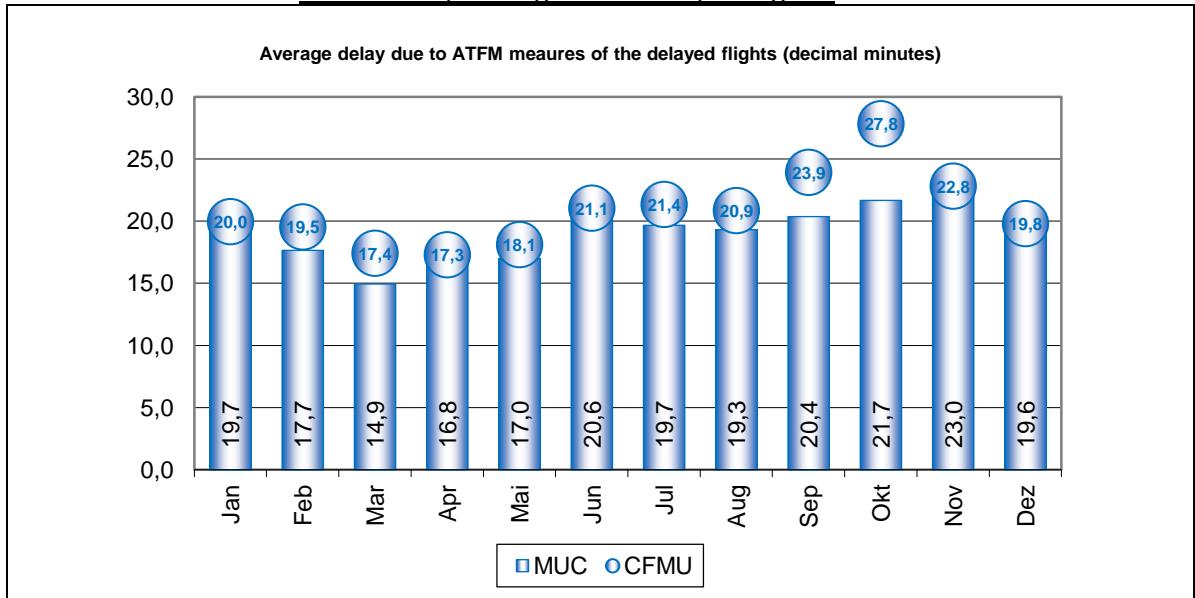
The ATFM delay values are determined on the basis of the target take-off times (TOTT) reported in the ETFMS system of the CFMU. The values for the CDM at Munich Airport are compared with the values for the entire CFMU area.

4.15.2 Target:

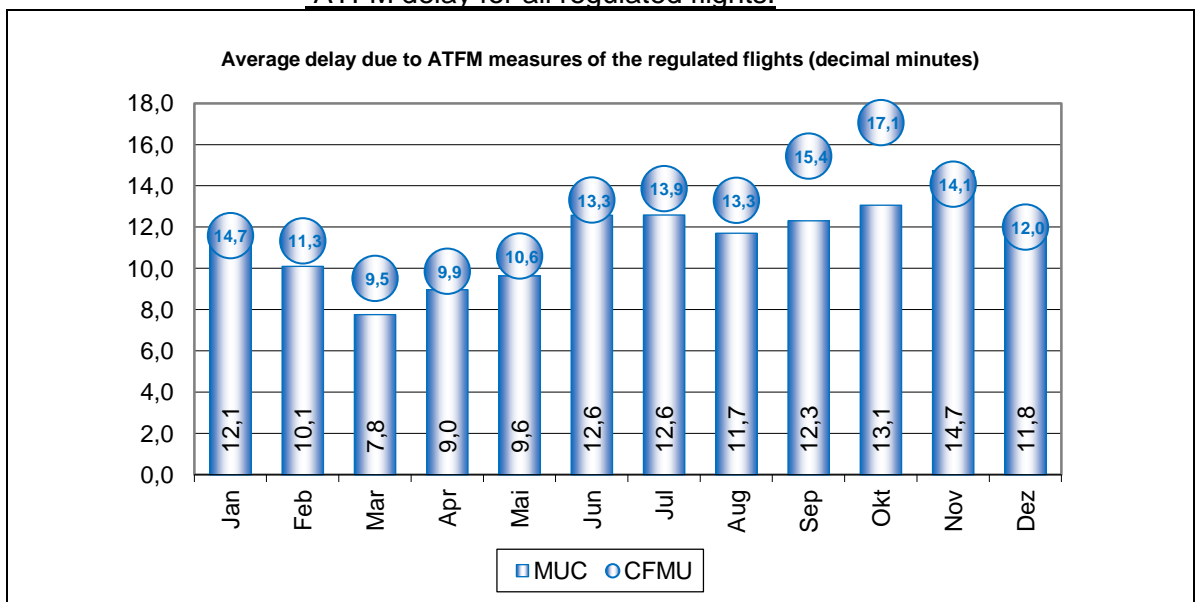
The local target take-off times ensure an optimum CTOT assignment and thus the minimum possible delay (ATFM delay) in the case of air traffic flow management measures.

4.15.3 Results2011

ATFM delay for regulated delayed flights:

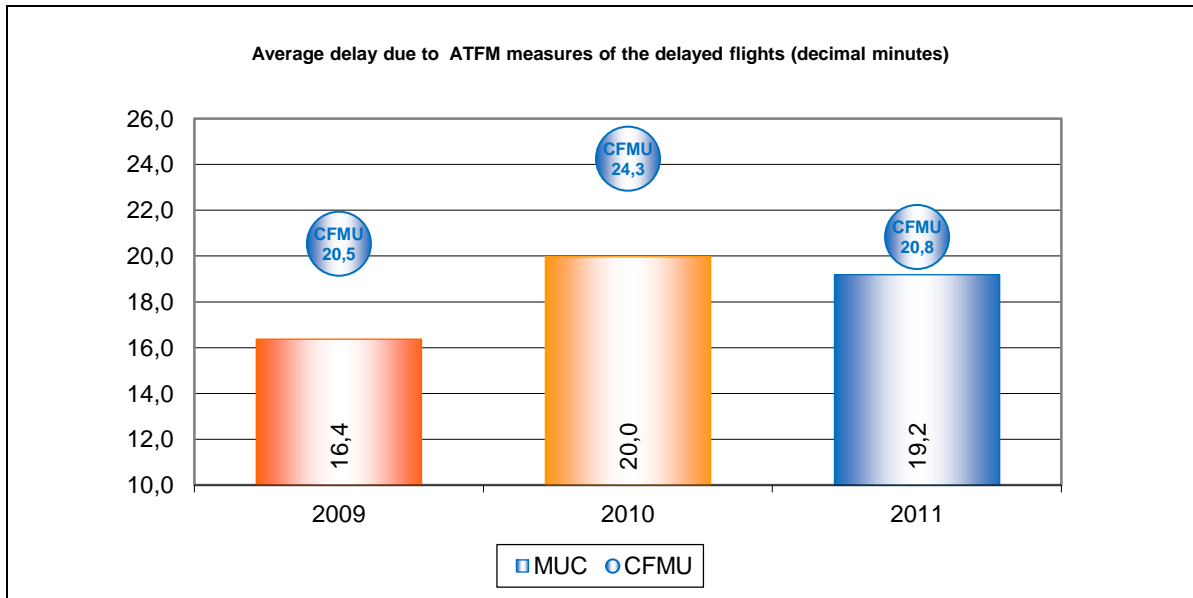


ATFM delay for all regulated flights:

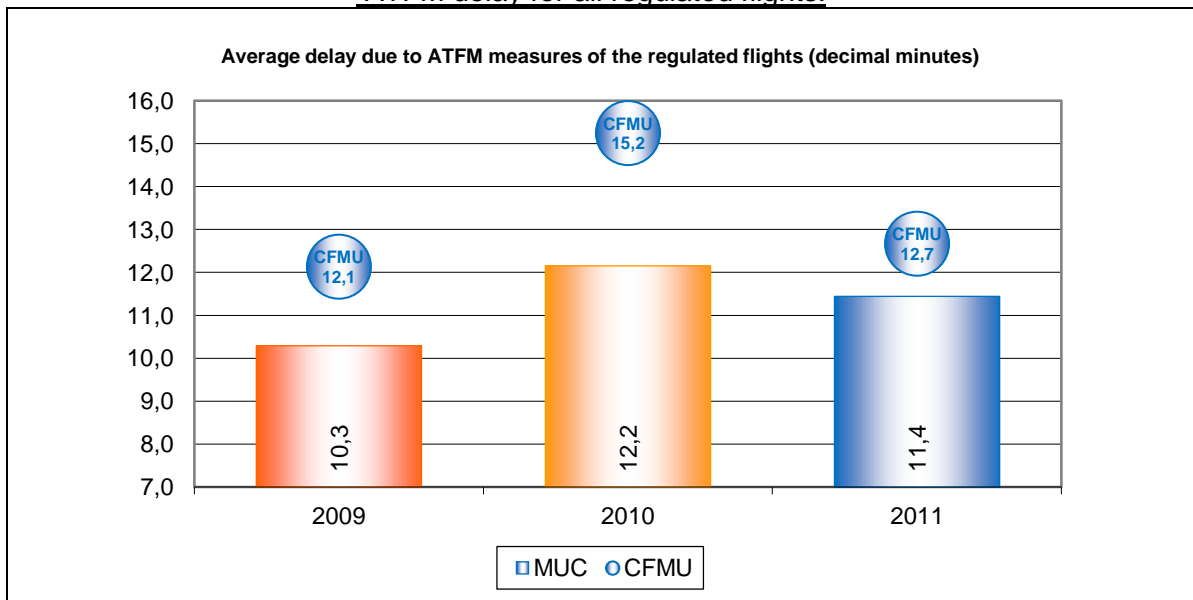


4.15.3.1 Results of the past three years

ATFM delay for regulated delayed flights:



ATFM delay for all regulated flights:



*all results in decimal values

4.15.4 Conclusions

Similar to the previous years, the ATFM delay for departures from the CDM airport Munich was significantly lower. This has been the case since the introduction of data exchange with the CFMU. However, the difference is no longer as significant as in the previous years, compared to departures from airports without A-CDM.

4.16 Participation assessments of partners

During and after the project phase, the Airport CDM project team in Munich set out not only to collect data, but also to raise awareness of the purpose of Airport CDM among the different partners. Airport CDM development has always focused on ongoing communication with the partners and staff members. Below you can find some extracts from statements made by Airport CDM partners:

Carl Seifert, Head of Munich Tower

The airport CDM procedure has proven successful in practice. For more than five years, it has formed an integral part of routine activities at Munich airport. Data exchange at a local level and in the Europe-wide air navigation services network is technically stable and generates a high-quality basis for planning.

Procedures and systems are continuously enhanced; this is made easier by the enlarged A-CDM community after introducing the procedure in Paris, Frankfurt and Brussels.

A medium-term objective is that as many European airports as possible introduce A-CDM. Networking these data considerably improves the A-CDM process.

In the short term, we are focusing mainly on the enhancement of the sequence planner to ensure valid planning data, even under extreme weather conditions.

In the medium term, we are working together with FMG on the enhancement of airport CDM towards total airport management.

Michael Witt, Head of traffic operation centre, Munich Airport

In the opinion of the traffic operation centre, the overall airport CDM system is very stable. On the whole, data consistency for arrivals has been and is becoming even better due to the growing number of participating airports. In addition, it turns out that airlines and ground handling services meanwhile use the processes and responsibilities of A-CDM very diligently. This can mainly be seen from the fact that we hardly receive any requests concerning individual process steps or general understanding. We see some improvement potential in reducing the few periods when Airport CDM is not used due to adverse conditions to zero.

4.17 Future A-CDM developments at Munich Airport**4.17.1 3. Third runway**

FMG and DFS place a high priority on continuously enhancing the Airport CDM product, in particular with regard to the new third runway and additional apron areas.

4.17.2 Technical redesign sequence planner

The sequence planner will be transferred to a new platform using state-of-the-art technologies.

In addition to the technical basis (data persistency, middleware, operating system), the internal system architecture of the sequence planner will be upgraded to meet up-to-date and common standards.

In addition, it was decided to have the calculation mode to determine the series for start-up permission reprogrammed, in particular under consideration of aircraft de-icing processes and while including the latest insights.

The implementation is planned to take place in October 2013.