

# Cooperative approaches to managing air traffic efficiently—the airline perspective

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## Abstract

After decades of operating in a traditional customer–supplier relation, airlines and airports have started to discover the potential of cooperation strategies. Here we present an approach of how to identify possible fields for cooperation between the two players and give examples for proven successful joint development initiatives. In more detail we elaborate on two specific case studies, targeting at two entirely different kinds of actors. The field of air service development (ASD) enables airports to attract additional traffic in order to better utilize existing capacities. Collaborative decision making (CDM) on the other hand is an approach supporting the optimized utilization of congested airport infrastructure and air space. We conclude that even with low investment needs substantial benefits can be generated for the cooperating parties, opening room for further future cooperation projects.

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*Keywords:* Air service development; Collaborative decision making; On-time performance

## 1. Introduction

After decades of largely independent, solitary development strategies both, airlines and airports have started to rethink their traditional customer–supplier relationship. While traditionally airports have been considered as infrastructure providers for the airlines, today the situation is being seen as more one of an air transport system as a whole. With airports a vital link in it (Ashford et al., 1997; Meeder, 2000).

At the same time, liberalization and deregulation of the industry have led to increasing competition. New airlines and business models have emerged, former military airports have been converted and are now being used for civil aviation activities and traffic patterns and airline network structures have changed in a way that competition is more and more not between single carriers or limited on origin-and-destination-traffic, but more on air traffic systems and their global hubs (Koch, 2006). At the same time traffic volumes are increasing and travel behavior

changing, requiring flexible responses from all actors in the aviation industry.

A possible reaction on these developments is more cooperation with airlines and airports realizing that additional opportunities involving fewer risks can be realized by jointly developing entrepreneurial activities. The objective of these efforts is to create rent for each partner. This need not entail financial ties between the partners. Most cooperation is built upon contractual agreements. Regardless of the specific form or contents of cooperation between airline and airport, at its core is an attempt to jointly serve and cope with traffic demand in a profitable, efficient and sustainable way (Albers et al., 2005). This implies that cooperative approaches are targeted at a period with a defined scope.

Before entering into a cooperation agreement, it is necessary to identify appropriate potential activities for joining activities. An analysis of the value chains of both partners is a suitable approach to identify the common and different activities of partners. For this, we refer to the value chains developed by Albers et al. and derive from those a matrix of possible fields for cooperation. In general, cooperation between companies is possible at the level of the supporting activities. Such cooperation

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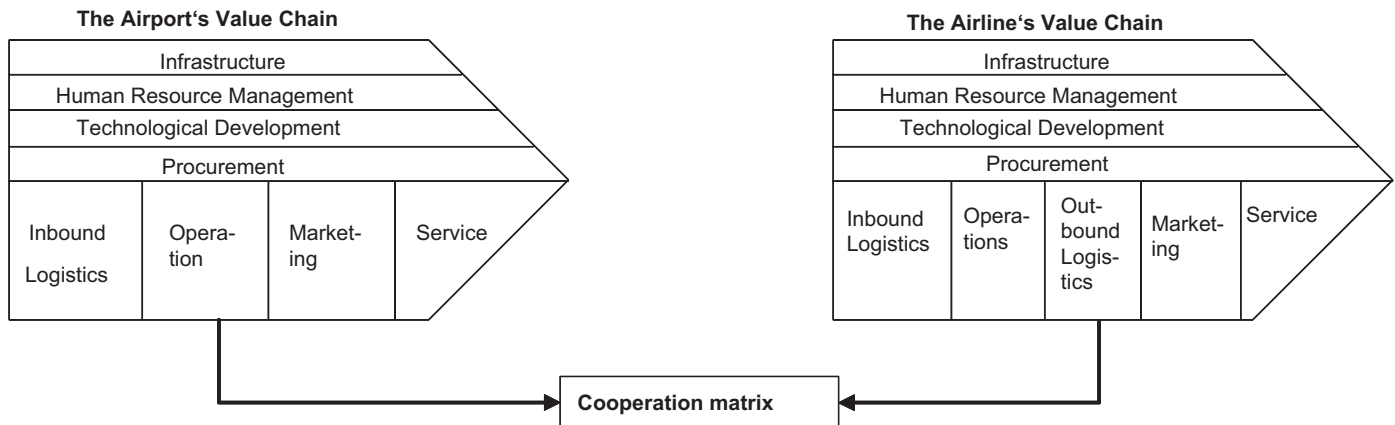


Fig. 1. Schematic illustration of deriving the airline-airport cooperation matrix.

Table 1  
Possible cooperation strategies between airlines and airports

Strategy	Landside example	Airside example
Marketing-oriented		
Air service development	Joint Development of additional Air Services (Case Study of Moscow Vnukovo Airport)	
Marketing	Joint Marketing initiatives (advertising, co-branding, joint exhibiting)	
Passenger well-being	Establishing a Passenger Well-being Program	
Capacity-oriented		
Expansion	Common Terminal Operation (e.g. Munich Terminal 2)	
Process re-design	Passenger Flow Management	
Process innovation	Check-in kiosks operated by airports on behalf of key carriers	Collaborative decision making (e.g. Case Study ZRH)
Security-oriented		
Co-operation more a legislative duty than a free, independent move		

is neither unique nor specific in the aviation industry. Cooperating in the field of primary activities, however, normally generates the most value for potential partners. Therefore, we focus on cooperation opportunities in these. These can be identified by merging the primary activities of airline and airport into a matrix (Fig. 1). We distinguish capacity-, marketing- and security-oriented kinds of cooperation. Exceeding this approach, we separate landside and airside related forms. Several examples are given in Table 1.

We turn to discuss two examples for cooperation strategies—air service development (ASD) and collaborative decision making (CDM)—based on the case studies of Moscow Vnukovo Airport and Zurich Airport. We focus on showing the benefits of both cooperation approaches to all actors involved. These examples represent a marketing- and a capacity-oriented cooperation, as well as one example of landside and airside cooperation. Since security-oriented strategies are more a legislative duty than a free and independent activity of any of the partners they are not considered.

## 2. Examples of successful co-operation between airline and airport

### 2.1. Air service development

An increasingly observed way of cooperation between airports and airlines is ASD. This term summarizes a large set of activities undertaken by airports as a means to attract new or additional flight services in close cooperation with an airline (Jarach, 2005). It is focused on sharing the route development risks, which formerly had been born only by the airlines.

While the introduction of routes traditionally has been the result of largely “isolated” decisions within airline network management departments, airports are now increasingly expected to take an active role. Due to the increasing number of civil airports competing for airline services, airlines take advantage of the airports’ own needs to actively foster their own development. They can save staff costs in doing this and reduce the risk of not identifying attractive destinations. Consequently, airports

now take a share of the costs of developing airline networks by providing services that in the past would have been the carriers' responsibility.

This leads to a rather diverse set of tasks and activities undertaken by the airport. The most effort is usually put into route profitability cases. These build upon a comprehensive examination of the airport's traffic potentials for serving a specific route, analyzing historic and current traffic streams, local economic, tourism and population structures, as well as current airline services. These analyses identify currently underserved demand such as the needs of large companies in the region, potential ethnic traffic, or flows going to competing airports, and allow to derive positions for future developments. The latter is strongly influenced by airlines' decisions regarding providing direct flights or not. Finally, the financial viability of flights is calculated based on either a specific airline's own cost and revenue structures or on typical, average data. In either case the result is a business case usable as basis for the airline's network decision-making. The airport draws a comprehensive picture of the potential demand for a particular service, allowing the airline to evaluate the route and to decide on its inauguration. ASD consequently mainly focuses on identifying and developing insufficiently served markets.

In many cases, ASD also includes supporting the new route by actively marketing its development or by granting financial incentives. Both strategies are means of sharing the financial risk of a new route development. An example for such a financial incentive scheme is given in Fig. 2. Vienna Airport of Austria has decided to follow a strategy of positioning itself as hub between Europe and Eastern countries. Accordingly, flights to Eastern Europe or Asia are supported by granting discounts on landing charges. The respective values increase with the number of flights introduced and decrease over the years. Furthermore, incentives are granted for each transfer passenger connecting at Vienna. These incentives allow the airlines to establish their business and still guarantee the airport rising revenues over the years.

As an example of how airports can benefit from ASD and therefore why ASD is beneficial to both airport partners and not only to airlines, we consider Moscow Vnukovo Airport. This municipally owned but commercially managed airport is the third and smallest airport serving the Russian capital. During the Soviet era, there was no competition between the three Moscow airports with traffic split regionally between Sheremetyevo (SVO-western, northern and especially international traffic), Domodedovo (DME-eastern) and Vnukovo (VKO-southern). Vnukovo was therefore the main Soviet airport for the Caucasus and Central Asian Republics and at the time the largest of Moscow's airports.

After the breakdown of the Soviet system, Vnukovo Airport lost almost all its traffic to Aeroflot's home base Sheremetyevo and the later on privately run Domodedovo Airport. Until 2004, the traffic pattern at Vnukovo followed that of former times, with a few services to other former Soviet countries and some domestic flights. It was only after the City of Moscow took over ownership of the airport that it started to seek to regain market position. A new international passenger terminal was built, but the still present focus on Community of Independent States (CIS) airlines and the limitation on Russian-built aircraft left VKO in the shadow of its competitors—from other

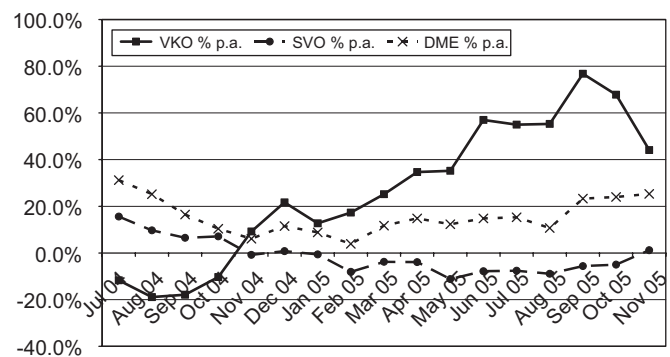


Fig. 3. Year-on-year traffic growth at the Moscow airports (July 2004–end-2005).

Transfer Incentives	Growth Incentives		
€8.21 for each departing passenger (connection within max. 6 hours)	Traffic growth incentives – only for Routes to Eastern Europe and Intercontinental destinations:		
	<b>Frequencies Incentives:</b> each additional frequency, added to the existing flight frequencies. Landing charges reduction: - Year 1: 60% - Year 2: 40%	<b>Dense Frequency Incentives:</b> Landing charges reduction: - 7 –13 frequencies: 20% - 14 –21 frequencies: 30% - > 21 frequencies: 40%	<b>Destination Incentives:</b> routes to new destinations. Landing charge reduction: - Year 1: 80% - Year 2: 60% - Year 3: 40%

Fig. 2. Incentive scheme of Vienna Airport, Austria.

Table 2  
Examples of planning periods for major European airport infrastructure developments

Airport	Project	Application for formal approval	Formal approval	Duration (yr)
London Heathrow	Construction of terminal 5	1993	2001	8
Frankfurt	Construction of terminal 3 and additional runway	2001	2007 (expected)	6
Berlin Brandenburg International	Major airport expansion	1994	2006	12
Munich	New airport	1969	1986	17

Source: Lufthansa (2005).

carriers' perspective. To improve its competitive situation, the airport chose to establish a comprehensive ASD aimed at bringing in more European airlines. The ASD strategy was to implement an entirely revised airport marketing concept. The approach was not only focused on the marketing mix, and thus the external dimension, but also on the internal dimension of comprehensive ASD involving the reorganization of its marketing department. This way the airport has changed enabling it to respond to the needs of airlines.

Given its historic focus on Russian carriers and a limited set of destinations, the overall target of the program was to attract new carriers. Various activities have been targeting at supporting this efforts. N initial focus was on increasing and widening training programs, especially catering for the specific requirements of potential new carriers. This included not only the establishment of handling capabilities, but also of different ways and philosophies for airline station management, sales and marketing. Secondly, route development concepts have been worked out in cooperation with targeted airlines. Thirdly, a comprehensive and targeted incentive program for new airlines, new routes and additional flight services has been designed.

These initiatives have significantly improved the competitive position of Vnukovo Airport in the Moscow market. An increasing number of airlines previously operating at Sheremetyevo or Domodedovo have switched operations to it. Additionally, several airlines new to the market have chosen it as their destination airport. The result has been reflected in the year-on-year growth rates after implementation of the ASD program, now making Vnukovo the fastest growing airport in Moscow (Fig. 3).

## 2.2. On-time performance and capacity enhancement

While ASD focuses on a co-operative approach for airlines and airports by using under-utilized airport infrastructure more efficiently, one can also enhance operational airport capacity by joint management of on-time performance. In particular, European infrastructure bottlenecks at congested hub airports adversely impact on the efficiency of the air transport supply chain. The continuing growth of air traffic, even in mature markets,

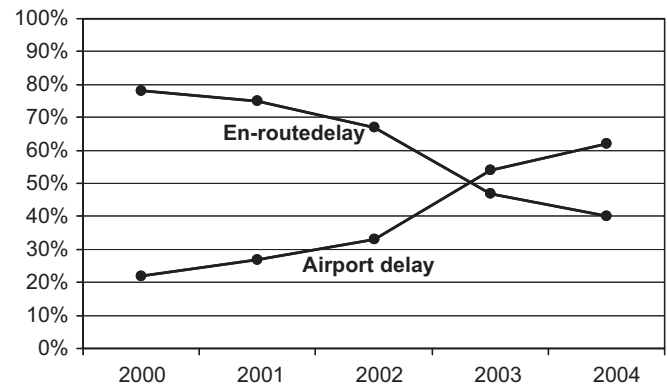


Fig. 4. Airport and En-Route delays 2000–2004. Source: Eurocontrol (2004).

and capacity shortages at airports require new approaches to efficiently manage the existing air- and landside infrastructure. Investment to expand airport infrastructure is an inevitable exercise, but time-consuming approval procedures usually delay projects by multiples of the actual construction time (Table 2).

Association of European Airports (Association of European Airlines, 2006) reports reveal that since 2000, punctuality of intra-European flights has improved from 74.5% to 80.7% while punctuality for intercontinental flights still remained 70.8%. The delays result from a variety of reasons and many parties are responsible for them. In 2003, Eurocontrol reported that European air traffic delays caused by shortages in airport capacity and/or inefficient airport operations have exceeded those caused by enroute air traffic management for the first time (Fig. 4).

Delays have financial implications for airlines and therefore airline managers increasingly seek to decrease them by improving their on-time performance (OTP). Recent studies show that for each percentage point improvement in OTP there is a €4–€16 million annual savings in costs (variable by airline size) (Eurocontrol Performance Review Commission, 2004). These findings are supported by the airlines. Hourly delay costs for intra-European flights for a major network carrier add up to €3500 and to more than €7000 for intercontinental flights. These costs include extra fuel due to holding, approach deviation, high-speed cruise, and maintenance expenses.

Delays also lead to higher station costs: passengers who are not able to connect to other flights due to arrival delays need to be compensated. These costs add up to more than €1700/h delay. Indirect costs even exceed this amount. Due to schedule delays airlines need contingency aircraft to serve the remaining routes in the network. Additionally, opportunity costs from not serving routes optimally bring indirect costs up to €2500/h delay (Fig. 5).

There are several reasons for the scale of delays and nearly all actors in the air transport system contribute. Airport operators make inefficient use of existing infrastructure, allocate airport slots poorly, and supply other parties with insufficient information about late stand and gate dispositions. Ground handling service providers may worsen the situation by providing poor service levels and by making poor use of their resources. They may also suffer from low turn-around predictability due to last minute changes. Air traffic control (ATC) service providers have to manage scarce air space and have to cope with traffic and frequency overload, as well as late incoming information that reduces pre-planning flexibility.

Airlines are not only the victims of these problems. Additional to last minute delays due to ground process inefficiencies and carry-on delays within a network, sub-optimal fleet utilization has an impact on the total delay. In particular for network carriers and hub airport operators, OTP has become a competitive factor. These carriers' business models requires a high level of punctuality because any delayed flight could result in knock-on effects on the departure of connecting flights or lower load factors. Although low-cost airlines' operations are not as sensitive to knock-on delays from single flights, OTP is crucial to achieving high aircraft utilization. Accordingly, on-time operation is considered to be a key performance indicator in the airline industry and is an important service differentiator, in particular for high-yield passengers. Consequently, many carriers have set up projects to realize cost saving potentials and service improvements. A precondition for a successful project is awareness that delay may result from many different but often inter-

dependent reasons. Thus, for an OTP improvement initiative to succeed, the project team needs to consist of representatives from the airline, airport, air traffic management and related parties (e.g. ground handling service providers). Collaborative decision making (CDM) is a means to cope with punctuality challenges at congested airports and could lead to an increase in operational capacity without huge investments in airport or air space infrastructure.

From an airline's perspective, CDM should be considered as allowing carriers to participate in air traffic decision-making (ATM) that affects them (Fig. 6). Theoretically, it applies to all kinds of decisions, from longer-term planning activities to short-term operations. A prerequisite is a spirit of cooperation among the players that can produce gains for all. Airlines are seeking a decrease in direct and indirect delay costs while airports and air traffic control are aiming at an optimal utilization of congested infrastructure resources.

The heavily congested European hub airports are natural environments for CDM, where the interaction between airport operators, ATC, airlines, ground handling service providers, and the Central Flow Management Unit (CFMU) often determines the efficiency of the air transport supply chain. Improving the efficiency of an airport requires a common understanding of problems and collaborative solutions. In the reality of the air transport industry, the optimization efforts of individual actors by improving individual operations is a more common approach than seeking a joint optimization driven by a team of airport users. However, unless pursuing OTP is a common objective and problems are addressed at a common level, the sum of individual actors' initiatives may not ensure a global optimum. For an efficient CDM process the sharing of information is required to attain an improvement in the reliability and predictability of arrivals and departures. Key information for instance is estimated time of arrival (ETA), estimated in-block time (EIBT), Estimated off-block time (EOBT), and estimated take-off time (ETOT).

Whilst initiatives exist for enhancing landing time accuracy and predictability, from an airline's perspective two main enablers should be addressed: the optimization of processes during the so-called in-block time at the aircraft stand and of those during the taxi time (periods between arrival and in-block-time and between off-block time and departure).

To better manage processes between in-block and off-block time, the implementation of a milestones approach is a crucial factor to achieve a high level of accuracy and predictability of OBT. Such a project, e.g. Lufthansa's Operational Excellence Project, addresses the turn-around process as a set of distinct activities and respective milestones (Klingenberg, 2005). Starting from a spoke airport, these milestones are the key information improving the situational awareness of all actors at the hub airport. It is information that triggers updates of the schedule of

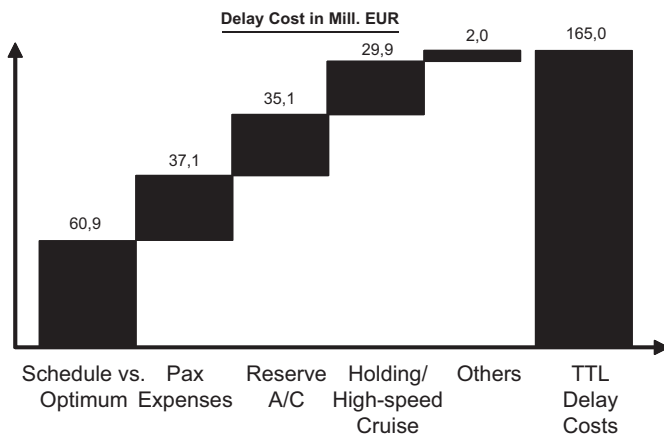


Fig. 5. Delay cost in Million Euros by category.

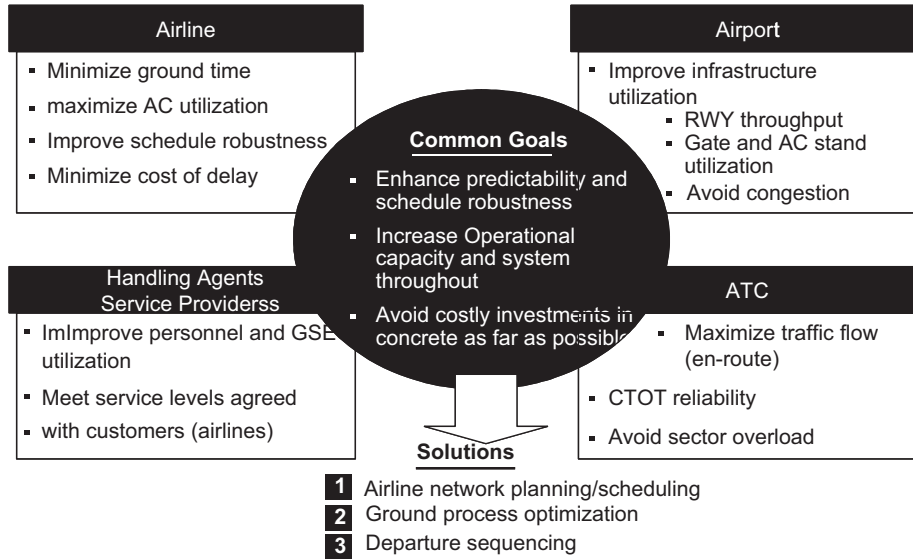


Fig. 6. CDM and its benefits for the involved parties.

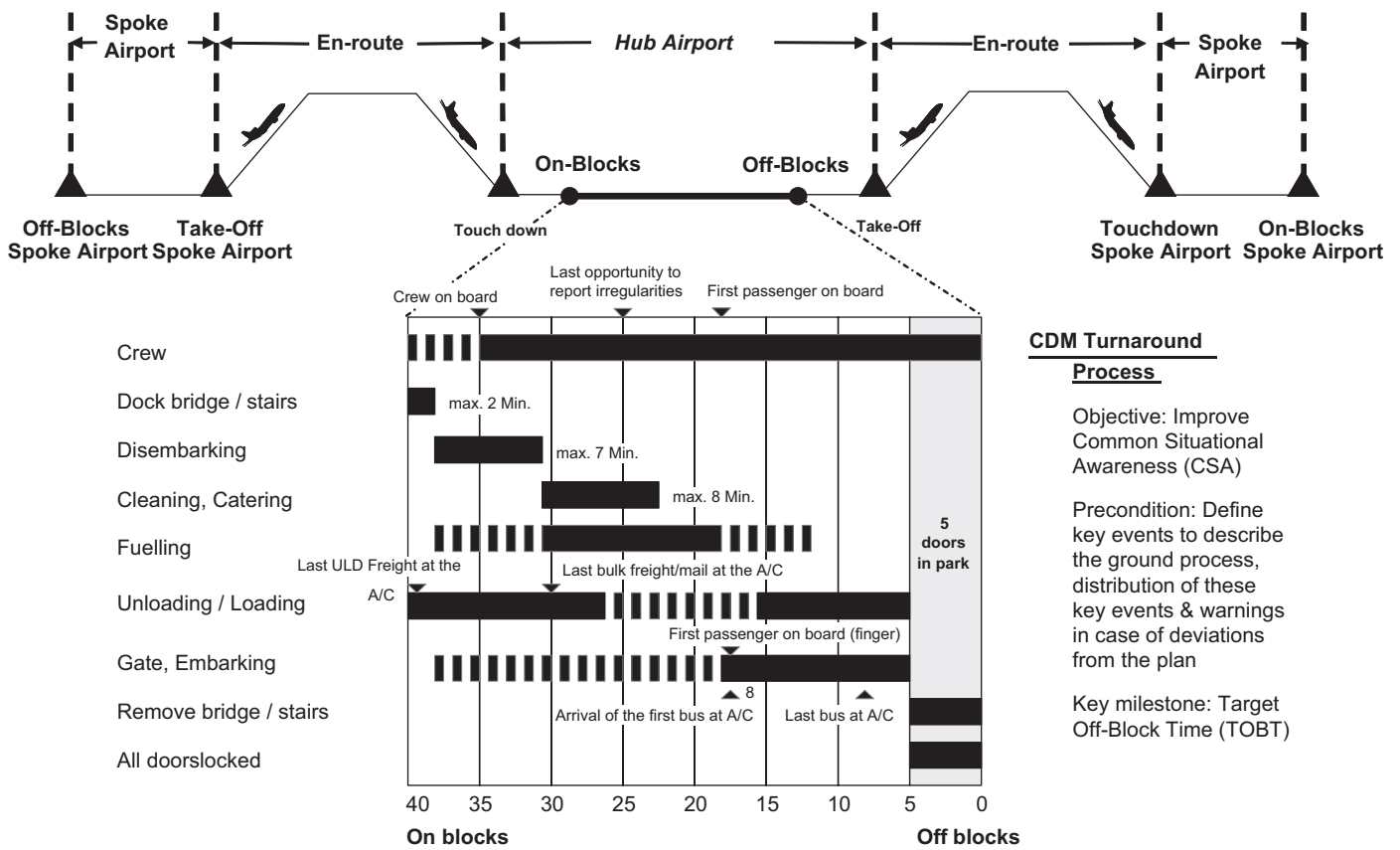


Fig. 7. Aircraft turnaround process within a milestone approach.

downstream activities and helps in identifying potential delays (Fig. 7). Eurocontrol in co-operation with Sabena, BIAC and Belgocontrol developed the milestones approach that has been repeated in the Barcelona CDM project (Eurocontrol Experimental Centre, 2002).

The second pillar of ground time optimization relies on predicting a reliable taxi time. Many European airports share the problem of considerable variability in aircraft taxi times. The problem that arises from high taxi times is illustrated in Fig. 8. Here the cockpit announces to the

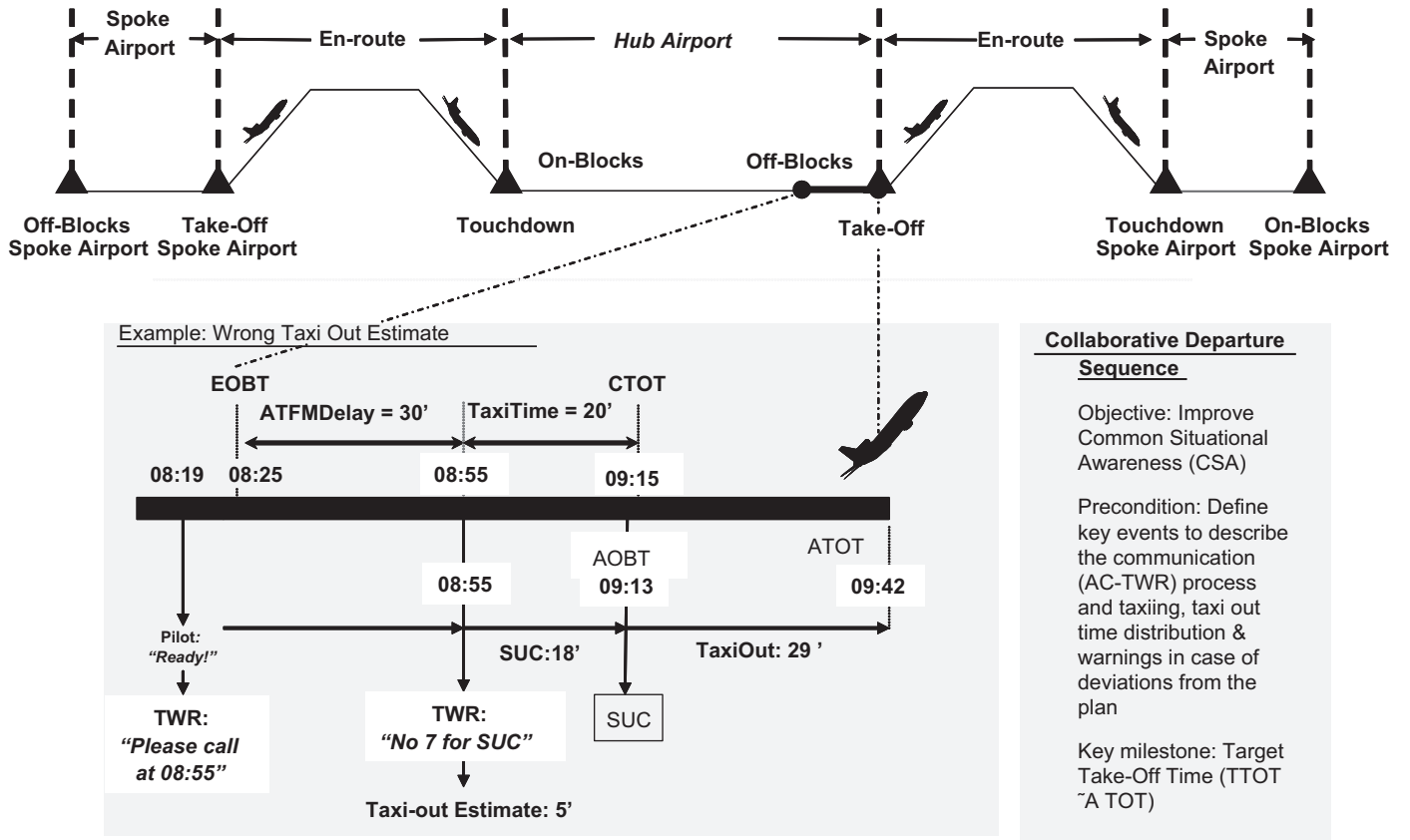


Fig. 8. Example for a collaborative management of a pre-departure sequence.

tower (TWR) at 8:19 that an aircraft is ready for push-back and the EOBT is 8:25. Due to an air traffic management delay of 30 min the pilot is asked by the tower to call again at 8:55. At that time the aircraft is number 7 in the departure sequence and will receive start-up clearance (SUC) in 18 min with a target take-off time (TTOT) of 9:13 assuming a taxi time of 5 min. Due to airport congestion the actual taxi time is 20 min and the aircraft will thus miss the departure slot by 2 min. A new departure slot is provided by the CFMU and the actual take-off time (ATOT) is 9:42. The wrong taxi-out estimate results in re-designing the departure sequence and sub-optimal use of airport infrastructure. In the winter season additional deicing procedures will increase inefficiencies.

Most of the information and data required to improve ground processes is available, but is not distributed among airlines, airport operators and ATM providers, because trade-offs between their operational or economic objectives do exist. Eurocontrol introduced Target Off-Block Time (TOBT) as a key indicator shared between airline, ATC, and airport operators to monitor quality. Once quality in the form of accuracy and timeliness is attained, airline's benefit through a reduction of, amongst other things, stand/gate changes.

A key driver for CDM is data quality to reduce uncertainty in operational planning (Wojcik, 2000), Indis-

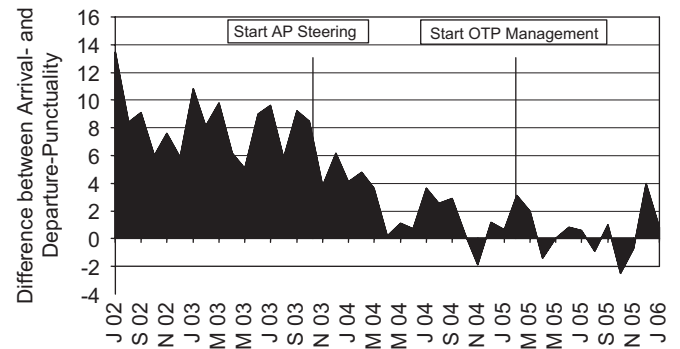


Fig. 9. Arrival and departure punctuality at Zurich Airport. Source: based on Baroni and Lonien (2006).

pensable enablers for departure management lie in the capacity for an airport to share between the actors more reliable data within a limited time-horizon about four critical moments: arrival time, in-block time, off-block time and take-off time. In 2005, the introduction of CDM at Zurich airport led to impressive results (Fig. 9). Departure punctuality improved by approximately 3%, passenger waiting time was reduced by 160,000 h, and improved coordination of ground processes led to an increase of 15% in landing capacity under bad weather conditions and an

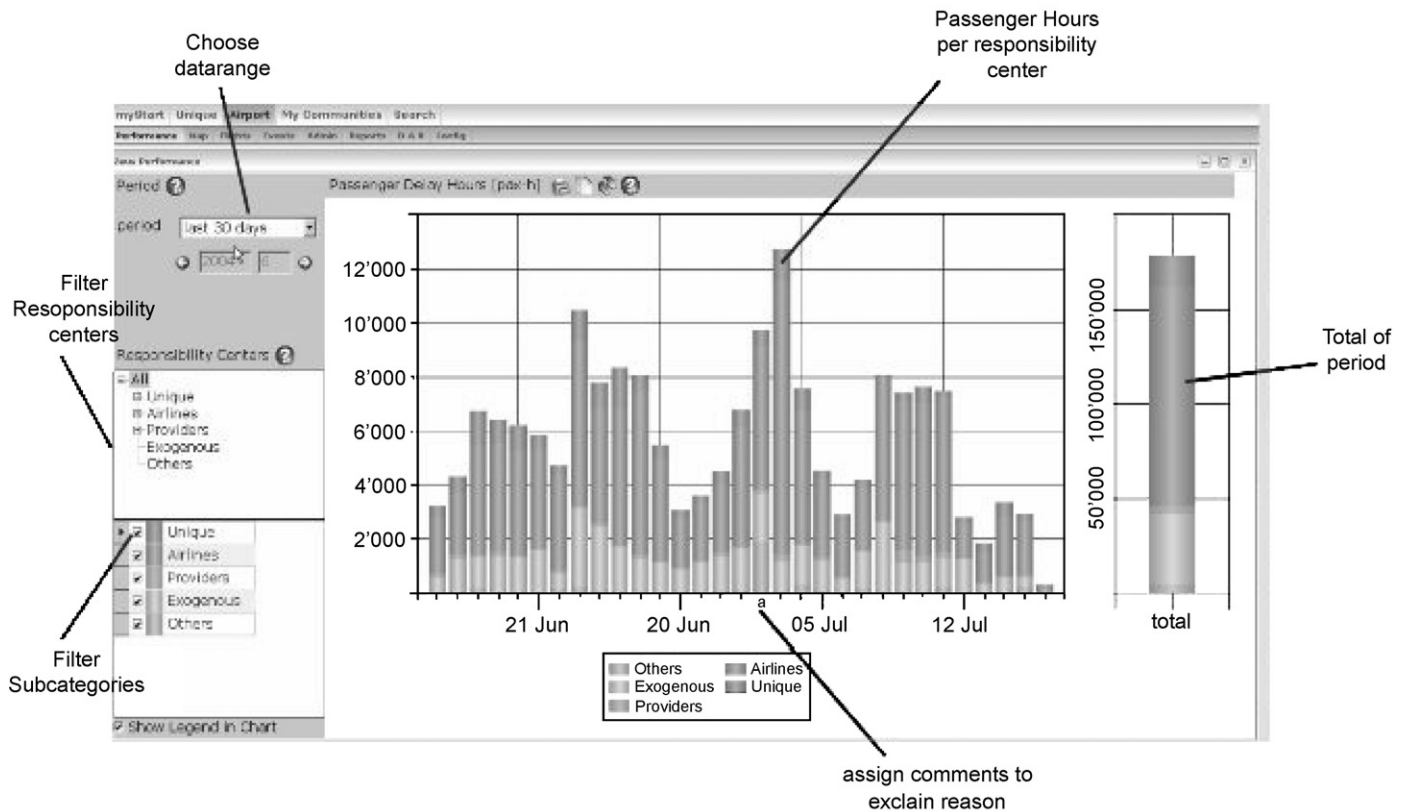


Fig. 10. ZEUS airport CDM at unique Zurich Airport. *Source:* based on Baroni and Lonien (2006).

improvement of all landing ratios by 3 flights/h. The ground times for an A320 of Swiss Air Lines on selected flights was reduced from 40 to 30 min. Finally, reserve ground support equipment capacity has been reduced. For 2006 the target is the improvement of the landing ratio by 1–2 additional movements per hour with a general ground time of maximum of 30 min for A320 aircraft.

It should be stressed that these achievements are not the result of sophisticated optimization algorithms rather than just sharing information among airlines, airport and ground handling service providers. It requires a clear definition of processes and the assignment of responsibilities. In the case of Zurich Airport, all this resulted in a decision support tool named ZEUS that enables all actors such as Zurich Airport, Swissport and Swiss to participate in CDM processes (Fig. 10).

### 3. Conclusion

In this paper we have discussed the potentials for and benefits of cooperation strategies between airlines and airports. Two case studies have shown that there is significant potential for cooperation between the two most important players in the air transport chain without the need for major investments. Nevertheless, cooperation between airports and airlines still lies in the cradle. Joint initiatives still are either at the embryonic stage or are limited on minor activities such as ASD.

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