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Possibilities for the Better Use of Airport Slots in Germany and the EU

A Practical Approach

- Short Version -

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A study commissioned by:
HOCHTIEF AirPort GmbH, Essen

Berlin, January 2001

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A. EXECUTIVE SUMMARY

Issues and Objective of the Study

About one fourth of all flights on the European continent is delayed. In most cases the reason for this is capacity bottlenecks at airports. The high costs of an estimated 10 billion Euro per year resulting from these late arrivals are not only a burden on the economy but also on passengers and the environment. The positive growth rates of air traffic projected for the coming years will exacerbate this problem further. It is still unclear how the European air traffic system will be able to accommodate the increasing demand.

In view of this development and in the context of the airline liberalisation introduced within the EU in 1993, the issue regarding the allocation of slots for takeoffs and landings at EU-airports increasingly gains momentum. The study carried out by the Technical University Berlin analyses the current practice of slot allocation and proposes how in future slots could be distributed in a manner which is fairer and more efficient - to the benefit of all parties.

Present Allocation Practice

At present, slots in the EU are held mainly by a relatively small group of airlines. Slots are primarily allocated in accordance with the *grandfather principle*, i.e. that the allocation is made to that airline which had made use of the slot in the previous period. The basis of slot-allocation is the IATA-Guidelines.[1] The most important allocation IATA criteria are:

- Principally, commercial traffic takes precedence over non-commercial, military, and non-regular flights,
- Grandfather rights as historical priorities also apply to flying schedule changes by airlines,
- longer service times, i.e. whole-year traffic is preferred

Even though the procedure of slot co-ordination functions smoothly and may be conclusive in itself, as a system, which is based mainly on administrative allocation criteria and here again on the grandfather principle, it has serious inherent inefficiencies from an economic point of view:

- Slots do not fall to those (airlines) which express the greatest willingness to pay for them and therefore produce the greatest benefit for the overall economy (*allocative inefficiency*).
- The system prevents newcomers (airlines) access to the market at attractive airports and thus also reduces the competitive pressure on long-established providers in the long term (*competitive inefficiency*).

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[1] For an explanation of IATA and additional terms, see the glossary in Appendix.

- The proceeds from the scarcity of slots do not fall to those having the means at their disposal to eliminate it in the short or long term (*infrastructural inefficiency*), namely the airports.

As a result of the present slot-allocation system, scarce infrastructure capacities of airports are not used as efficiently as they could be. Principally, this refers to the question whether planned slots are used or not (*no shows*) and to the productivity of allocated slots (number of passengers per slot). Additionally, under the current regulation the airlines are not able to set effective incentives to adjust existing airport capacities to their needs and have little influence on the planning and realisation of new or better airport capacities.

Approaches to a New Allocation Practice

In theory and practice, numerous approaches have been developed world-wide to improve slot allocation in accordance with the IATA system which is also the basis of the corresponding EU-Regulation 95/93. In practice, the following are of interest:

- Within the European Union, the IATA-Rules were not only adopted but also supplemented with the 95/93 Regulation. An airport-specific slot pool was established at all airports; slots which are either not used intensively enough (the *Use It or Lose It Rule* of the EU stipulates that 80% of the allocated slots must actually be used) or which were newly created as a result of capacity increases fall into this pool. Half of the slots in the pool are reserved for newcomer airlines.

- The claims of airlines on the slots used by airlines were recognised as grandfather rights in 1986 at four U.S. American high-density-airports. Airlines were allowed to unrestrictedly sell or lease out slots to third parties. By way of *sale and lease-back,* some slots were sold to financial enterprises; leasing slots became the dominant form of transaction among airlines. In the course of time, the intensity of slot trading decreased.

- Before 1986, the *first come first served principle* was the common practice at all airports in the U.S.A. and is expected to apply again after 2007. Then slots will not be allocated for a total flight schedule period but *real time* in accordance with the *queue principle*. In view of capacity bottlenecks in Europe, this principle would presumably lead to considerable problems and further waiting costs.

- A difference in prices in accordance with *peak* and *off peak* periods has existed at London airports since the 70s. *Peak load pricing* led to a smoothing of demand as well as to freezing out flights with low slot productivity.

- Presently, the EU-Commission is also working on a revision of the EU-Regulation 95/93. It is being contemplated that slots allocated from the pool should have a limited validity duration. Slots which have been allocated by auction should no longer establish permanent grandfather rights. The draft also provides for the introduction of slot trading. Airlines so willing will be able to sell slots for which they possess rights in some sort of public auction. These slots would also receive a limited validity duration.

Recommendations of the Study

Two prominent recommendations from a wide range of transportation economic studies on the optimal method of slot allocation are:

- scarce slots are allocated with the help of auction mechanisms,
- slots are allocated with the help of scarcity-oriented takeoff and landing charges at airports. The IATA system remains formally unaffected but grandfather rights lose value because of higher charges at airports.

Both solutions aim to improve the allocation of scarce takeoff and landing capacity by means of introducing scarcity value into pricing. Neither concept has yet been accepted. It is, therefore, the objective of this study to go beyond theoretical approaches and to develop a proposal that can realistically be implemented, takes the current political discussion within the EU into consideration and integrates it into the proposal. In this context the focus has been placed on the one hand, on legal feasibility and on the other hand, on political practicability.

The study arrives at the following recommendations:

1. Introduction of a scarcity or capacity surcharge at overloaded airports on condition that the airport operator proves that he re-invests such additional revenues in the expansion of airport capacity. If he can not prove this within a specified period of time, e.g. in five years, he either has to refund the surcharge-related revenue or transfer it to the state. Even though under present law in Germany and within the EU the opportunity cost, i.e. the lost profit by a better use of a slot (an economic cost component without which the real value of a slot is understated) is not accepted by the authorities as a cost which can be integrated into prices, the following can be accepted:
    - The costs of structural expansions
    - Costs for the preliminary planning (mediation procedures, etc.)
    - Costs ranging from the compensation of affected local residents to the resettlement of whole districts; compensation for real estate value losses caused by aircraft noise, measures for the protection against harmful effects on the environment through emissions and vibrations, landscape conservation measures, active and passive sound protection; substitution investments for the preservation of social amenities (recreational and fitness facilities, etc.)
    - Costs for research, development, and application of technological and organisational innovations to increase of the slot productivity,
    - Improvement of intermodal links.
2. The charging of a “stand-by” takeoff and landing fee component to cover fixed costs: this price component similar to a hotel reservation fee, has to be paid by the airlines in advance as a reservation fee. The remaining variable parts of takeoff and landing fees will be adjusted by the fixed portions and lowered so as to cover variable costs alone.

3. Setting a validity duration for all slots, of about five to eight years by way of *earmarking*, which can be done by airlines themselves within certain slot categories to be created for all relevant airports of the Community (x%-rule). After expiration slots fall to the pool and are auctioned from it. The auction proceeds are to serve the expansion of the respective airports' infrastructure and should in this way replace the capacity surcharge which would become obsolete.

4. Introduction of slot trading elements: this means limited slot trading imposing obligatory use of slots by the lessor (by a strengthened *Use It or Lose It Rule*). Slot trading provides the required intra-temporal and inter-temporal flexibility to airlines. With options and futures airlines can acquire rights to slots which have not yet fallen back to the pool within future flight schedule periods.

In the long term, this recommended gradual approach aims at the abolition of the present grandfather rights and at the allocation of slots by auction. Already today, changes in airport pricing are possible within the current EU legal framework. However, the legislation would have to be modified to enable all of the foregoing proposed measures.

Benefits of the proposed measures

In the end, all market participants and airport stakeholders will be the winners of a market-based slot allocation system:

- Airline travellers will profit from increased competition between airlines through increased efficiency of slot use leading to lower air fares and a more demand-driven supply of airline services.

- All airlines will profit from the abandonment of grandfather rights and a liberalisation of access to airports in the long term:

    - new business opportunities will open up for airlines within all EU member states; formerly unassailable bastions of grandfather airlines will now be accessible to newcomer airlines.

    - even though the incumbent airlines could suffer losses in the short to medium term under certain circumstances, these will be kept to a minimum because of the gradual procedure. Additionally, also incumbent airlines will profit from the new opportunities of competition at all EU airports.

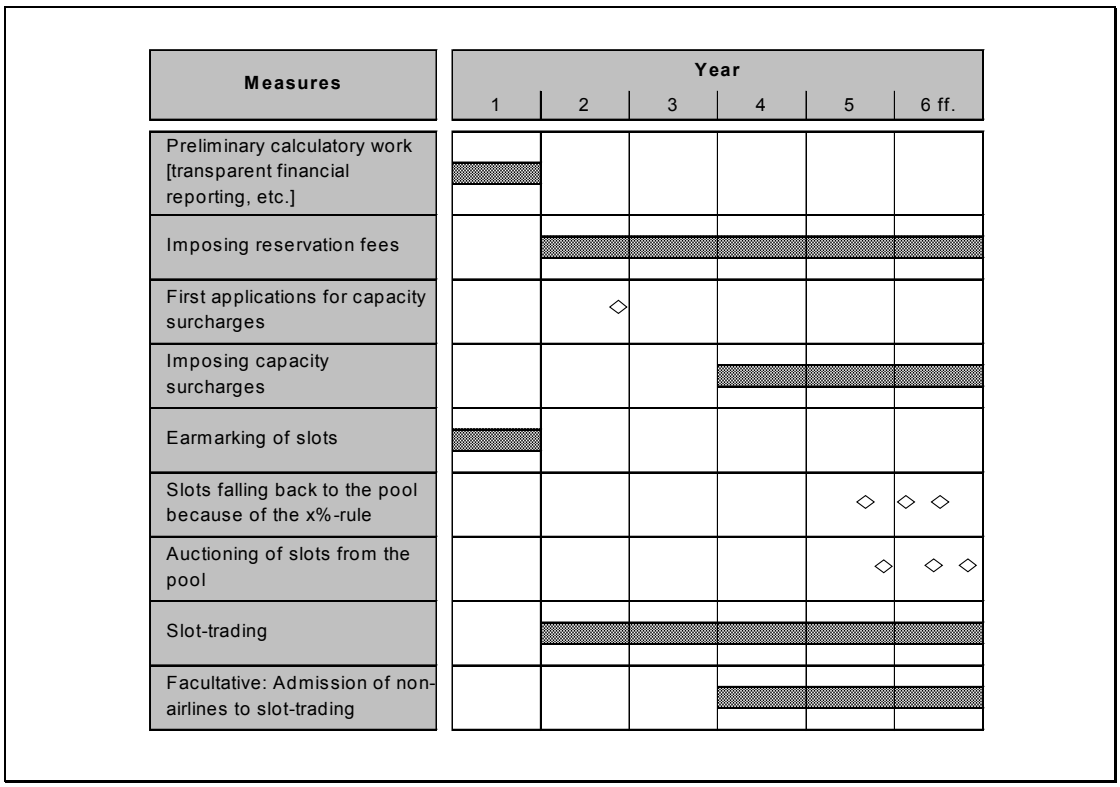
- Airport environments and local residents profit from a less resource-intensive and more efficient use of scarce airport capacities. With increased traffic density at c.p. the same airport capacities, growth impulses will be transmitted to the local economy and the labour market.

- Airports will see significant increases in their productivity.

Implementation Time Schedule

A goal-oriented and tight time schedule should be chosen for the implementation of the proposed measures at the European level:

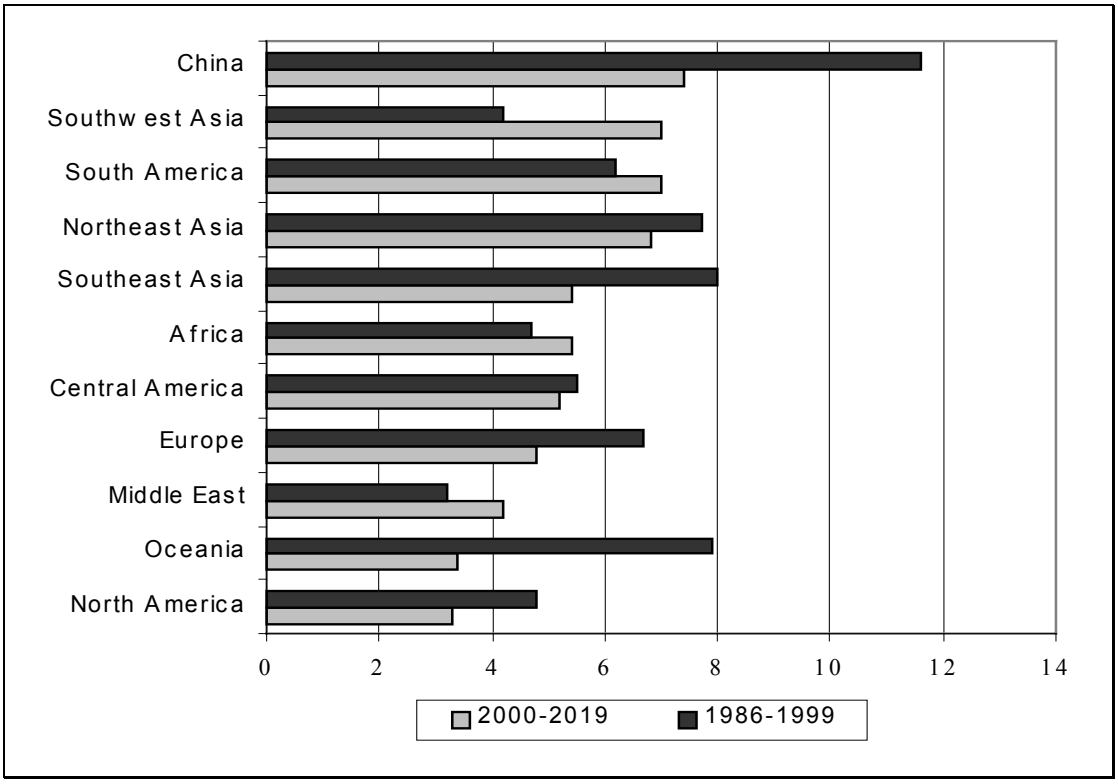
Table 1 Time Schedule



B. THE PROBLEM

Air traffic in Europe (and world-wide) has been growing steadily. For the next 10 to 15 years average growth rates of approximately five percent are being predicted (see Figure 1). Growing income of end users, a growing and increasingly interconnected world economy, as well as attractive vacation package offers have unleashed a demand, that promises to bring the airlines strong growth. On the supply side, numerous improvements in transportation policies, as well as organisational, technical, and ecological aviation industry improvements have made flying more accessible and affordable for the general public.

Figure 1 Growth forecasts of the most important flight routes* for the period between 2000 to 2019



* in % annually, measured in RPK (Revenue Passenger Kilometres); Source: Boeing (2000).

In view of these optimistic forecasts, the question arises as to whether the European aviation industry is even capable of the trouble-free absorption of these future growth rates. In 1998 almost one quarter of all flights was delayed, which resulted in immense costs for passengers, the economy, and the environment – the societal costs are estimated to be approximately 10 billion Euro annually.

There have been various attempts to find the causes of the increasingly pressing problem of delays in the aviation industry. Industry experts have indicated, for example, that approximately half of the problems are due to inadequate co-ordination of European air space, a quarter are

due to airport capacity constraints, and another quarter to the airlines themselves.[2] In the context of the diverse interdependencies, however, such presumptions should be treated with care – one can merely surmise that trouble-free aviation operations, as well as the growth of air traffic, are influenced by organisational and physical capacity restrictions:

- Organisational capacity restrictions arise because air traffic management (ATM) is not optimally organised; for example, organisational improvements would contribute to the realisation of untapped capacity reserves.

- Physical capacity restrictions can only be relaxed by infrastructure expansion measures. In this sense, they are hard restrictions in the short term. In the longer term, however, they can be overcome.

Organisational and physical capacity restrictions are dependent upon one another. Organisational bottlenecks can motivate the expansion of physical capacities, but these efforts can also fail in light of the observable inefficiencies in the management of existing capacities and the insufficient support by investors, politicians, and special interest groups. Conversely, transportation and economic policy instruments that aim to achieve a more efficient management of existing capacities often create incentives for and send out signals that trigger physical capacity expansion.

One area in which there is potential for an increase in capacity is the system for the allocation of takeoff and landing rights at airports (slots). The study on which this report is based aims to identify possibilities for a more efficient allocation of slots and to design a methodology to make these politically viable and implementable.

In the current system of slot allocation, slots are allocated primarily according to the grandfather principle, i.e., a slot is allocated to the airline that has been able to use it in the previous period. Slot allocation is conducted according to the IATA guidelines.[3] The most important allocation criteria are (see also the overview in Figure 2):

- In principle, commercial traffic has priority over non-commercial traffic, military traffic and irregular flights.

- Grandfather rights, as historical priorities, are also valid in the event of airline flight plan changes.

- Longer service time, i.e., year-round traffic, has priority.

With Regulation 95/93 of the Committee on Common Regulations for the Allocation of Slots in the European Union the EU has, in principle, adopted the IATA rules. Since then the regulation has been in effect in the member states.[4] It reaffirms the grandfather principle as the most

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[2] See IBRÜGGER (2000). On quantified approaches, see DOGANIS (1985), p. 73 ff. and THOMPSON (1998).

[3] The IATA (International Air Transport Association) was founded in 1945 as an independent interest group of airline companies. Its main goal is the promotion of the world-wide air traffic business.

[4] With the amendment of the air traffic law on 1 March 1999, the German legislator has referred to the Council

important priority rule for the European Union's co-ordinating airports.[5] Furthermore, it allows slots to be exchanged, but not to be traded and establishes a *Use It or Lose It Rule*: in the following flight plan period, airlines can only reclaim a certain slot for themselves if they have used it at least 80% of the time in the former flight plan period. If they cannot prove this to be the case the slots are put into the so-called *slot pool* of the respective airport, which also includes slots that are created through capacity expansion. Half of the free slots in the pools are reserved for newcomers. The interpretation and application of the *Use It or Lose It Rule* varies in the different member states. In Great Britain, the airlines are requested to announce the slots that they cannot use as soon as possible, so that they can be used by other companies. Sanctions are only imposed against companies that behave irresponsibly under the terms of the regulation.[6]

Figure 2 IATA Scheduling Procedures Guide Priority Rules

Primary Criteria

- Commercial traffic has priority over general air traffic and military traffic
- Slots that have been used in the past shall be granted again
- The use of a slot that has been used in the past has priority over an entierely new request
- The expansion of an existing service to a year-round service, or the respective longer actual servicer period in the co-ordinated half year, has priority

Secondary Criteria

- Balancing out the ratio of short and long range flights, as well as of national and international flights
- Support competition between airline companies
- Help in the circumvention of a ban on night flights
- Minimising of passengers' transfer times

Source: Own description, based on IATA 1997.

In practice, the *Use It or Lose It Rule* is hardly ever applied for diverse reasons. First, the slot co-ordinator has considerable room for judgement in determining if the non-use of a slot was due to negligence or to force majeure (e.g., unfavourable weather conditions); second, the slot co-ordinator is not completely independent in some member states[7] and third, the airlines can

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Regulation.

[5] Those airports to be deemed co-ordinated are determined by the member states. In Germany, these are: Berlin, Bremen, Dresden, Düsseldorf, Erfurt, Frankfurt/Main, Hamburg, Hanover, Cologne/Bonn, Leipzig/Halle, Munich, Münster/Osnabrück, Nuremberg, Saarbrücken and Stuttgart.

[6] A respective regulation at Gatwick airport, which is used, to a large extent, by charter traffic, has led to significant improvements in slot use.

[7] See COOPERS&LYBRAND (1995).

protect themselves against slot withdrawal by, in borderline cases, also flying in slots that are temporarily uneconomic.

Practical Example 1: Slot co-ordination

The slot co-ordination procedure is organised in two stages. The flight plan co-ordinator for Germany has a sovereign function, he is charged with specific functions in the public interest. The first stage of the procedure is for the purpose of national flight plan co-ordination. All airlines have to announce their planned flights at a defined time. Then the priorities of the flight requests are determined in several computer runs. After that, the co-ordinator prepares a list of the provisionally allocated slots. The second stage is for the purpose of co-ordinating the international slot allocation. It takes place at the IATA Flight Planning Conference, which is held twice a year. At the conference, the slot allocation, which has been prepared on a national level, is internationally co-ordinated and optimised. If an agreement cannot be achieved through negotiation, slot allocation criteria similar to those of the national flight plan co-ordinators are fallen back upon. Airlines need to hand in their slot applications for the flight plan period of 1st April to 31st October by 1st November of the previous year. The IATA Flight Planning Conference is held that same month.

The slot co-ordination procedure may be practicable and consistent in principle since it is a system that is essentially based on administrative allocation criteria, however, it contains serious inefficiencies from an economic point of view:

- slots are not allocated to those (airlines) that express the greatest willingness to pay for them (*allocative inefficiency*),

- the system restricts market access of newcomers (airlines) to attractive airports and thereby diminishes, in the long term, the incentive of the established suppliers to operate efficiently (*competitive inefficiency*),

- the proceeds from the scarcity of slots do not go to those that, in the short or long term, have the means to eliminate them (*infrastructural inefficiency*), namely the airports.[8]

Background information: To whom do slots belong?

The question of ownership can be answered in legal and in economic terms. According to an in-depth juridical analysis by Wolfrum (1999), slots belong to neither the airlines nor the airports in all of the examined member states of the European Union. Also, EU law does not recognise any ownership position in slots that could not be revised . A cancellation of the previous regulations without a period of transition would, however, according to the judicial decisions of the Court of Justice of the European Communities [ECJ], violate the principle of fiducial protection. According to the ECJ, fiducial protection is normally only provisional. It does not go so far as to say that the status quo is inviolable. Revisions of slot allocation are permissible if corresponding transitional periods are observed and if sufficient compensation is paid. The financial proceeds that can arise during a revision of slot allocation can always be assigned to three possible participants:

- The airlines, as slot users: financial compensation for the slot withdrawal is—depending on the solution chosen—required in part for reasons of fiducial protection; further legal or economic reasons do not exist.[9]

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[8] See KNIEPS (1990).

[9] Moreover, slots exist independently of individual airlines; if one airline leaves the airport concerned, then the free slot can be used by another airline.

- The general public, i.e., the state, which has predominantly initiated and co-financed the building up of capacities up to now. If proceeds are obtained and transferred to the government in the course of a revision, then this should take place according to *the principle of fiscal equivalence*; i.e., proceeds should be used for the expansion of the aviation system, for its users are those who, in the end, bear the costs in all feasible situations. The possibility that a transfer of proceeds to the government could give rise to political claims on the money that could cause the funds to be diverted from their intended use, which would thereby constitute an offence against equivalency principle, must be excluded. Beyond this, it should be taken into consideration that the management of funds by the government will always give rise to administrative losses.
- The airports: from an economic (normative) point of view, slots, which are scarce property rights,10 should always be allocated to the party that possesses the effective incentives, the best information and the capability to eliminate scarcity. These are in principle the airports, who are uniquely positioned to eliminate scarcities in the long term with a whole set of potential expansion options. An appropriation of functionless surplus income by the government (see point number 2) is, in the end, legitimate if the airports are not able to expand their capacities.

The creation of a slot is necessary only when the capacity at an airport is employed to a degree that a schedule of arrivals and departures needs to be implemented to ensure order in the sky and on the airfield at the airport in question. This may be necessary at an airport for only part of a day or season. In this case the airport is said to be co-ordinated. Under the conditions of serious capacity problems an airport is fully co-ordinated.

The slot is defined as a unit of space and time in which an aircraft can arrive or depart at or from an airport. The entire arrival and departure capacity of an airport for a day is divided into potential slots. The number of potential slots at any airport is finite in the short term. At fully co-ordinated airports the incumbent airlines juggle and exchange slots amongst one another to cope with timing differences and other disturbances in the system but they cannot directly influence the expansion of capacity. The slot, as an expression of capacity, in the hands of airlines and without inherent value is a useless instrument with regard to alleviating capacity constraints. This is the root of the slot problem.

This problem leads to the following economic inefficiencies:

- capacity expansion is rarely ever accomplished on time—either too late or too early,
- there is no direct link between demand and supply meaning that often either too much (or too little) capacity or the wrong kind of capacity is created,
- the customer normally plays only a peripheral role in capacity expansion despite the fact that he is to be the beneficiary of it.

The economic consequences of the above have not yet been estimated. Nevertheless, any aviation stakeholder, especially the airlines, must concur that there is often a mismatch be-

[10] Economic theory defines *Property Rights* as rights of disposal for goods or services. Rights of disposal often also exist when the holder of the rights is not the owner of the object in question, as, for example, the tenant of an apart-

tween what they as clients need and what is available from airports and that this is frequently an enduring problem.

The elimination of these inefficiencies through alternative practices and instruments would lead to increased efficiency gains in general (if one disregards political, legal and other restrictions). For this reason, it is necessary to make use of additional political-economic criteria to arrive at an assessment of the different suggestions for a solution:

- *Implementation costs*, that are in no way allowed to exceed the potential efficiency gains. The implementation costs also contain a time component: if the implementation of solutions takes a long time, then *time costs* arise from the delayed implementation of potentially efficient solutions. For this reason, it can be advisable in individual cases to implement less ambitious solutions, if they succeed in realising efficiency potential quickly.

- *Transaction costs,* that accompany the operation of a newly introduced system and arise from administrative actions and necessary contractual arrangements. The rule of thumb is that the transaction costs of a system are lower the more simple and more transparent it is.

- *Political acceptance*, without which the suggested political-economic measures cannot be realised in any manner.

- *The principle of fiducial protection (Vertrauensschutz)*.[11] It is presumed that every withdrawal of grandfather rights (GFR) that is carried out ad hoc and without compensation would be in violation of the principle of fiducial protection, which is indicated in constitutional and Community law. *A withdrawal of grandfather rights from the airlines can, therefore, only occur in stages (i.e., over a period of time) and/or against compensation.*

Up to now there have been a number of serious economic analyses published on slot allocation; these arrive at two different, but related solutions:

- the allocation of scarce slots with the help of auction mechanisms (see, e.g., WOLF 1995),

- the allocation of slots with the help of scarcity-oriented takeoff and landing fees at the airports (see, e.g., JONES/VIEHOFF 1993).

Both strategies aim to improve the allocation of scarce takeoff and landing capacities with the help of scarcity prices, they reflect the accepted way that economics deals with scarcities. Nonetheless, it is a fact that the suggestions of the economists have, to date, hardly been realised in practice.

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ment.

[11] See the remarks on the theoretical background on p. 9 and 10.

It is, therefore, the goal of this study to go beyond these theoretically-oriented solutions and to develop suggestions that can be implemented and that takes the current political discussion in the EU into account.

C. SCOPE OF THE STUDY

In order to improve the efficiency of slot use, without relaxation of the political-economic constraints, the following strategies are examined, each comprised of different measures, bundles of measures and/or modifications of measures:

2.1) The Big Bang, i.e., the auction of all slots at once.

2.2) The Gradual Approach, i.e., the gradual withdrawal of grandfather rights and the improvement of the allocation of slots that have fallen back into the pool.

2.3) A More Complete Pricing Policy, i.e., the improvement of slot allocation through a treatment of cost-relatedness of takeoff and landing fees closely in accordance with economic principles.

2.4) Slot Trading, i.e., permitting slots an inherent value as well as their trading for money.

I. The Big Bang

The Big Bang is the most radical solution for the improvement of slot allocation. Nevertheless, it is examined in this study to identify and to analyse the problems that are connected with it systematically. Additionally, the Big Bang is a reference model for the 'softer solutions'.

In the Big Bang model, all existing grandfather rights are withdrawn from the established airlines on a certain reference date and then, in a market-based procedure, sold to the companies that express the greatest willingness to pay for them. Prior to enacting such regulation, four important questions of detail need to be clarified. These concern:

- the compensation of the owners of grandfather rights,
- the form of the allocation procedure,
- the frequency of reallocation or the period of validity of slot rights,
- the use of the scarcity revenues.

1. The Compensation Problem

According to the prevailing understanding, the airlines, as current holders of grandfather rights, enjoy fiducial protection. It follows that, in principle, every ad hoc withdrawal of grandfather rights requires the payment of compensation.

A politically enforceable solution for the financing of compensation payments to the airlines that hold grandfather rights consists of compensating them with the revenue generated by slot auctions (see also LANGNER 1996, 176). The advantage of this solution is that it is self-financing. Its disadvantage is that the auction revenues are, at least in part, no longer available for the expansion of airport capacities.[12]

2. The Allocation Procedure

To bring about allocative efficiency in slot distribution, market-based procedures are indicated. However, the problem of *slot pairing* must be taken into consideration with these procedures (also called the complementarity problem in the specialist literature). It implies that slots for airlines can always only possess an operational and economic value as a combination of one takeoff and one landing right (or, for two-way flights, as a combination of two pairs of two takeoff and landing rights). With respect to this problem of slot pairing, which receives much more consideration in the theoretical literature than in practice,[13] auctions that are held by one central authority promise to be more efficient than other forms. It is, however, also feasible to organise decentralised and simultaneous auctions among the airports and to link these through information technology in such a way that the bidders can also submit bids for slot bundles that go beyond just one airport; this would involve higher costs. It would put the airlines in a position of being able to bid for routes or even for entire networks. Similar to the stock exchange, the auction authority would take on the task of realising the solution that guarantees slot market clearing.[14] In view of the comparably low number of market participants, it would improve the efficiency of the procedure to allow each airline to hand in several alternative bids. Depending on the previous network size, a grading of offers could even be introduced in such a way that the large network companies can hand in more bids than the smaller regional airline companies, for example.

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[12] Gradual strategies that posit a longer term of withdrawal of grandfather rights (GFR) have the advantage over the Big Bang that they give the airlines enough time to adapt and thereby per se protect the principle of the protection of confidence. Compensation is then not required.

[13] In practice, the argument is made that slots are not bound to special routes; for this reason, an airline can decide freely which routes it wants to use its slot for; this offers it high flexibility. For this, a certain minimum size is undoubtedly required, for the flexibility only arises when a slot portfolio of an airline has a sufficient size.

[14] The planning process is considerably more difficult for the airlines if the slots are auctioned off by the airports in a direct auction and if they are auctioned off non-simultaneously and not auctioned off in networks. In this case, the airline cannot be sure if it will actually receive the suitable slot pairs in which the takeoff as well as the landing rights are scarce. In the extreme case, it may receive a slot **b** that is highly valued in connection with a slot **a**, but slot **a** is

3. The Frequency of Reallocation

The question of the frequency with which a reallocation is carried out is also essential for the efficiency of slot allocation. The criterion of competitive efficiency demands that reallocations are carried out as often as possible since with an increase in frequency, the chances for newcomers to purchase slots also rise. However, questions of competitive efficiency and of planning security, as well as of the economic handling of administrative and transaction costs demand a careful use of the reallocation instrument. It would not be tolerable for an airline to have to construct a completely new network and to implement it, given the associated transaction costs, every year or every flight plan period. On the other hand, the administrative expense that is connected with an annual Big Bang could also be prohibitively high. Therefore, realistic concepts proposed for optimising slot allocation assume that a complete reallocation of slots, be it through a Big Bang or through gradual withdrawal of grandfather rights, could take up to ten years (WILLEKE/HOLZ 1991, 73 ff.).[15]

For reasons of planning security, the optimisation of transaction costs and the management of the complexity of the co-ordination effort, all procedures that are directed at a gradual withdrawal of grandfather rights are clearly superior.

Practical Example 2: Energy Industry

The **energy industry** has already had several years of experience with auction-like procedures. In this respect, it is also interesting that, despite short-term price formation, medium- and long-term supply can be guaranteed. Great Britain introduced a reform of electricity production and distribution in 1990. All producers were given equal rights to access the network. Deliveries (and purchases) are effected through a central pool of the National Grid Company, at which the wholesale electricity prices are auctioned off on a half-hourly basis. A reliability standard for electricity production was introduced that ensures that sufficient reserve capacity is maintained in order to compensate for breakdowns. The regional supply companies implement this standard by using a part of the electricity price that they earn and that is determined every half hour for the purchase of available reserve blocks [SRU 2000, Tz. 1448 ff.].

4. The Use of the Scarcity Proceeds

As has already been explained, the criterion of allocative efficiency demands that the proceeds[16] from the scarcity of slots be allocated to those, who can best eliminate the scarcity in the medium to long term. In our case, these are the airports, because they

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taken by a competitor. The original bid for slot **b** thereby becomes obsolete; slot **b** can foreseeably only be sold off at a loss. As a result, the allocation uncertainty at a decentralised auction will, in part, lead to stochastic demand behaviour by the airlines and the criterion of allocative efficiency could be damaged by it. This reservation is, indeed only partially valid if a route is flown that begins or ends at an airport that operates more or less under capacity.

[15] WOLF 1997, p. 78, generally expresses the opinion that the time limit should be oriented according to the amortisation period for airports.

[16] In a strict economic sense, the term quasi-rents is used. In economics, quasi-rents are the additional income that an economic subject obtains due to its market or non-market leading position, i.e. the scarcity of its product or service.

- can realise a higher incoming and outgoing flight density in their operative business with the help of technological and organisational measures,

- can work towards an expansion of the airport as this is integral to their business strategy[17] in so far as they receive sufficient funds to finance the direct investments, as well as to finance the compensation of the affected residents who suffer welfare losses as a result of the expansion (TEGNER 1999, 134 f).

Nevertheless, the allocation of scarcity proceeds from the slot auctions is connected with problems that must be solved in each individual case, provided that they do not adversely affect the basic principle of allocation:

- *How will the value of an individual slot be determined if a pair of slots is auctioned off?* The addition of the scarcity charges according to the principle of allocative efficiency would be simple if the auction of slots were carried out by the airports. However, the problem of pairing would not receive enough consideration at a decentralised auction of slots. At least in the specialist literature, this problem receives considerable attention; in practice, however, there are fewer reservations. In particular, the point is made that the decentralised auction of slots by the airports can be held simultaneously with the help of modern IT solutions in such a way as to have them appear as one central auction to the bidders. If, however, one wants to solve the pairing problem by adhering to one central auction that is carried out by one central auctioneer, then the auction process itself may be simplified, however, problems could arise with the distribution of revenues between the airports if slots that belong to more than one airport were auctioned off in packages.

- *What happens if scarcity charges are functionless, i.e., if an airport is awarded scarcity charges even if it cannot eliminate the scarcity? A*rrangements are conceivable under which scarcity charges would be awarded to the airport owner in a functionless manner:[18] He might obtain revenue from the scarcity of slots, even though he would hardly be able to make expansion investments. London-Heathrow, as well as Düsseldorf airport are seen as typical examples of such a situation. To intensify the argument, it is occasionally stated that the airports will lose all interest in investing in the expansion of their capacities if they receive the scarcity revenues because they would thereby be withdrawing the basis for an essential part of their income. As plausible as this fear may initially appear, it is questionable from an economic standpoint. It is correct that the airports, which, at least in part, are competing with one another, have no interest in artificially making slots scarcer (and thereby also reducing their revenue basis for the *non-aviation sector*, for example[19]). Independent

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[17] We define expansion as being all measures to fully utilise the given capacity through organisational and technological measures, as well as the expansion of the capacity.

[18] This does not apply to the central fund solution outlined above.

[19] See Glossary (Appendix).

of the respective intensity of competition, however, forms of regulation are possible that effectively limit the thinkable monopolistic behaviour of airports. The conventional forms of price regulation can, however, quickly fail since the handicap of upper price limits for scarce slots would cancel the price as an adjustment mechanism between supply and demand, so that the slots would need to be allocated according to administrative criteria.[20] Then, there would be little advantage gained over the initial situation. It is therefore better to legally identify the intended utilisation and the window of time in which the scarcity charges would have to be invested.[21] *Identification* in this sense, means that the revenue from scarcity charges is reinvested in the development or the expansion of capacities and the *window of time* is meant to ensure that this occurs within a defined period.

- *How can it be ensured that the airlines do not pay for scarce takeoff and landing capacities two times, namely once with the slot purchase and a second time when they pay the airports takeoff and landing fees?* Without a transparent pricing procedure it would be possible that airports charge twice for one and the same scarcity, e.g., during the auction of scarce slots and with airport charges. If, however, airport charges are fixed for the next flight plan period, then the airlines will adjust their bids for scarce slots accordingly (i.e., downwards), since they are aware of airport charges. An efficient regulation must therefore, as it has in the past, provide that the raising of airport charges occur transparently and, in the medium term, predictably.

In summary one can emphasise that functionless scarcity proceeds need not be feared if they are invested in measures to eliminate the scarcity of slots, reimbursed or paid to the government (on this, see the remarks on scarcity-oriented fees).

II. The Gradual Approach

If one wishes to do without the Big Bang for reasons of political acceptance or for better control over the ostensible complexity of the procedure, then numerous approaches are thinkable. An essential advantage of gradual instruments is that the problem of planning security, as well as the compensation problem, no longer exist if the appropriate time schedule for implementation is chosen because:

- the airlines can adapt their plans on a gradual basis,

- an intervention that requires compensation in certain jurisdictions does, as a rule, not exist if the intervention is foreseeable and calculable or if it allows sunk investments to be written off and thus an adaptation to the new conditions to be made.

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[20] The British regulatory authority, the Civil Aviation Authority (CAA), sees this as an elementary weakness of the price cap regulation, see CAA (2000), p. 7 ff.

[21] WOLF 1997, p. 79, states that this earmarking shall be ensured with the help of a special taxation of scarcity

A possible *instrument for the recycling of slots/grandfather rights* is the setting of a time limitation for their validity. It is, however, not advisable to assign all existing slots with a uniform period of validity ad hoc, because the result would simply be a postponed Big Bang. It is useful to assign existing slots different validity periods, for example, between three and ten years (earmarking). Earmarking is defined here as the specific marking of every individual slot according to its remaining duration of validity. The question of who should do the earmarking is not trivial – the administration or the airlines themselves. If the administration determines the validity period, the danger of 'discrimination through ignorance' exists, as well as the danger of bureaucratic administrative action. If, however, the airlines can choose which slots receive which validity period, they will keep the best slots the longest. It does not follow from this, however, that the slots will also be managed to ensure optimal use for the economy as a whole. If, consequently, one wants to limit the possibilities of choice of the airlines, then one will not be able to avoid the formation of slot classes, for example slots at fully co-ordinated airports at peak times, slots at fully co-ordinated airports at low traffic volume times and slots at co-ordinated airports at peak times. This ensures that every slot class is completely turned over once within the maximum period of validity.

A rule very similar to duration limitation is the *x% rule*, according to which the slot stock of an airline is reduced by a fixed rate of x% per year or per flight plan period. If an airline, for example, has 50 slots, then it would, at an x of 20, need to put ten slots in the pool every year. The introduction of an *earmarking* in connection of the x% rule would have the effect that all slots would be turned over at least one time after (1/x)*100 years or flight plan periods, analogous to the procedure of duration limitation (i.e., in the example given above, no slot may remain in the stock for longer than five years). If one does without the earmarking, then airlines can keep the slots they subjectively consider to be the most valuable ones with no time limitation. In order to avoid a hoarding of all particularly scarce slots, the introduction of slot classes (see above) is strongly recommended if one decides to do without earmarking.

The *allocation of slots from the pool*,[22] which simply contains newly created slots, slots that have fallen back into the pool, and slots that are returned to the pool, should be based on criteria that are clearly different from the traditional grandfather rights:

- With a *lottery system*, the available slots are randomly distributed among all airlines that file an application. Although the lottery procedure is fair in principle, it leads, on the whole, to inefficient solutions.

- The principle of *allocative efficiency*, auction procedures used to distribute the slots to the airlines that file an application would be sufficient.

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charges. The efficient use of the tax revenue, however, needs to be ensured technically and administratively.

[22] According to the EU Regulation 95/93, the pools are set up at the airports. There is no provision for central pools.

- A typical *qualitative procedure* for the recovery of slots is OPUS light (Optimisation Program for Using Slots), which was developed by Düsseldorf airport.[23] The central idea of OPUS is to increase slot productivity through setting technical specifications for the aircraft that are used. The concept creates a connection between the route volume and the average aircraft size. The decisive characteristic is the relationship of aircraft size and frequency (Size-Frequency-Ratio SFR). OPUS light sets a minimum value for the SFR; falling below this minimum value is only tolerated for a short period of time. If an airline company follows the OPUS demand for larger equipment with sustained demand and when maintaining the previously offered frequencies, the rate of utilisation will decline. If one assumes that the airline companies' behaviour is rational, then the frequencies will be reduced until an economic rate of utilisation is reached. (HÜSCHELRATH 1998, 405). Slots are freed up for other uses, even though this does not mean that they will actually be returned. The problem of qualitative demands on the aircraft is the fact that– more strongly than quantitative or price-oriented solutions – they have a greater direct impact on the airline company's operational decisions, with all of the inefficiencies that arise therefrom, according to all previous experiences. Beyond this, OPUS does not have a neutral stance regarding the competition of such regional airline companies that only have smaller aircraft and thus reject the system. Finally, OPUS applied at hubs can also lead to the suppression of commuter air traffic and thereby interfere with the network formation of the large airline companies. This also shows that the setting of qualitative specifications has considerable disadvantages in comparison to price-based instruments because with the latter, the decision of if and how commuter air traffic should be conducted remains entirely with the airline company. Compared to this, the medium-term implementability of OPUS light can be classified as positive. The concept is not covered by the current version of the *EU Regulation 95/93 Concerning the Allocation of Slots at Airports of the Community*, but the EU Commission is currently working towards an amendment regulation that should foreseeably also allow for the use of OPUS, among other instruments.

Practical Example 3: Qualitative allocation criteria in Japan

In conjunction with 20,000 new slots that are expected to be created with the completion of a new runway and with an improved tower management at the Tokyo Haneda airport, the transport ministry has employed a commission of experts to develop criteria for the allocation of these additional slots. Important political goals are an increase of competition between the airlines and relieving pressure on the main routes. The aim is to facilitate access to slots for newcomers with the help of the slot allocation criteria punctuality, security, flight prices and seat-load factor. The criteria are also meant to be used at Osaka-Kansai, Sapporo and Fukuoka airports. The background of the criteria formation was, among other things, the expectation that newcomers have an advantage in comparison to old, established airlines concerning their cost effectiveness on selected routes. For example, the newcomer Skymark Airlines Co. operates at low flight prices with a seat-load factor of 76%, while All Nippon Airways Co. on average only achieves a seat-load factor of 53,5% [NIKKEI WEEKLY of 8 February 1999 and of 14 June 2000].

[23] For a similar argumentation, see ACI (1992).

The gradual withdrawal of grandfather rights ensures that the airline companies can adapt to the new framework conditions and that the constitutional obligation of the fiducial protection is not violated. For the reallocation of slots from the pool (so-called primary market allocation) the instrument of auctioning off slots takes priority—compared to this, qualitative allotment criteria always contain an element of arbitrariness and can never be completely efficient. In the case of the auctioning of slots, a central auction is, in principle, more suitable than a decentralised one as it avoids the problem of slot complementarity. However, the problem of the pairing of slots receives more consideration in theory than in practice; this is probably also the case because, as of yet, hardly any auctions have been held. Concerning the use of the auction revenue, one must, in any case, ensure that the auction revenue is *identified*, i.e., that it is used for the benefit of the aviation industry or of the respective airport.[24]

III. A More Complete Pricing Policy

1. Pricing Scarcity at Airports in Competition

The problem of slot allocation can also be overcome indirectly by an adaptation of the takeoff and landing fees at the airports. If airport charges are adapted to the respective scarcity situation, then slot grandfather rights proportionately lose value for the airlines. They will return these to the pool or, if slot trading is allowed, sell them to another company if a slot no longer contributes a positive net result after the airport charge is subtracted. In this way, slot supply and demand can be balanced.

As a rule, airport charges are not sufficient to balance slot supply and demand. This holds true even for the British airports Heathrow and Gatwick, which have introduced *peak load prices* at times of congestion (see Practical Example 5).[25] The British *Civil Aviation Authority* has ascertained the following:

"At current airport charges, demand for access to Heathrow and Gatwick airports is greater than existing capacity. (…) There is, therefore, a need for a slot allocation mechanism that equates airline demand with available capacity. The value of a slot then reflects the premium in ticket prices over costs which an airline is able to earn by using it. This premium also reflects the scarcity rent, which is necessary to bring the final demand in line with the maximum throughput of the constrained airport. [...] An increase in fees at a capacity constrained airport would reduce the airlines' premium in ticket prices over costs."[26]

The reason that airport charges are, as a rule, not sufficient to achieve a balance of slot supply and demand can be found in the definition of costs on which they are based. The background of this definition is the notion of *cost-relatedness* for airport charges that is based on ICAO resolutions and ECAC recommendations and that is used world-wide; it is also a part of the EU

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[24] The concrete use of auction revenue is dependent upon the total solution that is, in the end, implemented – on this, see Section E, in particular part 1 and 3.

[25] In this sense, see also JONES/VIEHOFF (1993).

[26] CIVIL AVIATION AUTHORITY (2000), p. 8.

draft of guidelines for airport charges and a part of the approval practice of the member states.[27] This implies that airport charges should be based on the costs of facilities and services provided by the airport, allowing for a reasonable return on capital, the proper depreciation of assets, as well as the efficient management of capacity. *Cost-relatedness* means that, above all, an accounting (as opposed to an economic) cost concept should be used in order to calculate airport charges; according to it, the "airport charges should be based on the cost of facilities and services provided by the airport, allowing for a reasonable return on capital, the proper depreciation of assets, as well as the efficient management of capacity."[28]

A scarcity-oriented pricing for takeoffs and landings would however have to take into account the further reaching term of *value-related costs*, which include the economic opportunity costs (or, in the somewhat unsuitably chosen EU vocabulary, the marginal social costs). The EU also came to this conclusion in its white paper 'Fair Prices for Infrastructure Use': "Complementing this approach (of cost relatedness), consideration will have to be given to improving the slot allocation process. The Commission therefore intends to revise the current Regulation on slot allocation. In the longer term a further alignment with the general charging principles set out in this White Paper would be desirable.".[29] Completing the approach, consideration will have to be given to improving the slot allocation process. The Commission therefore intends to revise the current Regulation on slot allocation. In the longer term a further alignment with the general charging principles set out in this White Paper would be desirable. According to these general principles, fair prices must also cover the costs of infrastructure overload and infrastructure scarcity, which can among other things result as "one transport operator's use of infrastructure may prevent another operator from using it (e.g. an airport runway)."[30]

If airports are in competition with one another and if they have the possibility to set their prices for takeoff and landing fees freely, i.e., without a regulatory or supervising authority, then they would develop mechanisms on their own that would balance supply and demand with the help of scarcity-oriented prices; for this reason, TOMS (1994) also describes scarcity-oriented fees as a "bedrock of pricing in truly competitive industries". Numerous economic studies have shown that in the case of sinking average costs, as is the case with the infrastructural assets of airports, a certain price structure emerges[31] that in diverse ways reflects the typical cost structure of airports and the scarcity problem. The structure comprises:[32]

- A component independent of the actual use (*reservation fee*), to cover the fixed costs that are payable at certain intervals, i.e., for practical purposes, once per flight plan period to the

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[27] On this, see the explanation of the EU Commission suggestion of 23.4.1997 (KOM (97) 154 final), margin numbers 29 ff., with reference to article 86 and 90 European Community agreement (present art. 82 and 86) – improper utilisation of a dominating position. See also the explanation in SCHWENK, Handbuch des Luftverkehrsrechts, 2nd ed. 1996, p. 719 ff. and 419 ff., who in reference to the services for the public, §315 art. 3 BGB and to the general principle decree of the BGH ZLW 1979, 144 demonstrates that the airline companies need to observe the general principles of administrative action. See also WITTEN (1995), p. 149.

[28] COMMISSION OF THE EUROPEAN COMMUNITIES (1998), section 5(e).

[29] ibid.

[30] COMMISSION OF THE EUROPEAN COMMUNITIES (1998), p. 8.

[31] For railway traffic, see, for example, RODI (1996), For highway traffic, EWERS/RODI (1995).

[32] On contemporary fee structures and levels, see the detailed study of DOGANIS ET AL. (1997). Services that can be provided by third parties, as well as by the airports, are not a part of the fee components listed here.

airports like membership dues. Its assessment is determined by the number of slots that are registered with and allocated by the flight plan co-ordinator; it is, however, payable regardless of whether the slot is actually used or not.

- *Charges* that are dependent on usage to cover the variable costs that arise from the takeoff or the landing of an aircraft. Since the variable costs arise above all from wear on the runways and this, in turn, depends on the weight of the aircraft, this fee will be primarily determined by weight and will only be charged for actually effected takeoffs and landings.

- The *passenger fees*, which cover the costs of checking in passengers; as a rule these include the costs of transporting luggage and the safety fee and are charged directly to the passengers.

- *Special fees* that are fees for special services of the airport operator and that are not directly related to or inseparable from the aircraft or passenger-related fees. These are primarily fees for the use of the central infrastructure facilities in accordance with the EU Guidelines for the Ground Traffic Services at Airports in the Community,[33] insofar as they are not part of the takeoff, landing or passenger fees: de-icing areas, container facilities and storage areas, parking of an aircraft for longer than three hours, etc.[34] Beyond this, noise surcharges can also be identified separately as special aircraft-specific fees.

- A *scarcity surcharge*, which is to balance slot supply and demand.[35] While it is true that there are no visible costs, it covers *opportunity costs*. Opportunity costs arise when there is competition for a scarce resource. If an opportunity is uneconomically priced, i.e. below the value offerable by the most committed buyer, an economic loss representing the difference is incurred. Only the principle of the maximum willingness to pay ensures that the customer who has the highest economic interest can acquire the desired slot and that in this way the overall economic opportunity costs are minimised. If scarcity surcharges cannot be reinvested in expansion measures, then they should be transferred to the government or reimbursed to the users, preferably without signalling incentives.[36]

The use of congestion pricing structures varies at non-congested, partially congested and congested airports (see Table 2).

Practical Example 4: The Use of Scarcity charges for Infrastructure – the Example of Telecommunication

For the management of bottlenecks in infrastructure, congestion or prices are a tried and proven measure. The critical prerequisite is that the decisive bottleneck needs to be identified and priced so that supply and demand are balanced in the short term and so that the system operator receives an incentive to eliminate the bottleneck. Such time-period-adjusted rates are not only known in the electricity industry (differentiation according to daytime and night-time

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[33] EU Guideline 96/67/EG of 15 October 1996 on the access to the market for ground traffic services at airports of the community; in Germany it has been implemented through the regulation ground dispatch services at airports (BADV), here §6.

[34] The non-central ground services (refuelling, catering, aircraft cleaning etc.) can be carried out in competition by third parties, but also by the airports themselves.

[35] See, for example, KNIEPS (1996), p. 100 ff.

[36] On this, see GROSSEKETTLER (1995), p. 499.

electricity), but they are also used in the **telecommunications** sector. After the liberalisation of the telecommunications market, the prices for telephoning in the conventional telephone network fell by 92% in two and a half years,[37] however, the prices for telephoning during business hours and at night or on the weekend still vary by a minimum of 100%. The causes of this are bottlenecks that occur during data transmission in the daytime in the local telephone network (at switches, i.e., the last mile) and that can only be removed with a considerable investment effort. With the help of time-oriented pricing, the network operator Telekom (and other companies that use its network) is attempting to smooth demand by forcing out the more price-sensitive private users to use the system during the evening and night hours. From the point of view of the telephone companies that are competing with the local network monopoly of Telekom, a differentiation of the prices according to the time of day does not yet go far enough, rather it must be possible to orient the prices according to the actual capacity load [WELFENS/GRAACK 1996, S. 204].

Table 2 Fee structures at airports with different capacity utilisation

	non-congested airports	partially congested	congested
fixed costs	X	X	X[1]
aircraft-related variable costs	X	X	(X)[2]
passenger fees	X	X	X
scarcity surcharge	–	X[3]	X[3(+4)]
special fees	X	X	(X)[2]

1 = May already include a general scarcity surcharge.
2 = May already be covered by the general scarcity surcharge.
3 = A differentiated *peak load pricing* applies to different time periods.
4 = A scarcity surcharge, if it has not already been charged in connection with the reservation fee for the coverage of fixed costs (1).

2. Scarcity Prices in the Price-Regulated Airport System

In the specialist literature, the question of whether airports are in genuine competition with one another or with other means of transportation is not clearly answered. However, there are reliable indications that hub airports[38] are in competition insofar as that the airlines can plausibly threaten to transfer one, several or all hub functions to another airport. The plausibility of this threat is only limited by the fact that the airline has made large investments in the expansion of a hub (sunk costs), which it cannot surrender at short notice.[39] In the short term, the airline and the airport could therefore find themselves in a situation of a bilateral monopoly.[40] In the medium to long term, the airport must, however, reckon with the fact that the airline will evacuate its hub functions as soon as the location-specific investments are written off. The airport can-

[37] See SCHATZ (2000). The number of providers of telecommunication services more than tripled between 1992 and 2000 to more than 1,700 in Germany; the same is true for the number of people employed in the mobile phone sector. The impressive numbers prove that considerable competition, and with it noticeable efficiency gains, can be realised with the liberalisation of the access to infrastructure.

[38] See the Glossary (Appendix).

[39] So also HÜSCHELRATH (1998), p. 227.

[40] In any case, LANGNER (1996), p. 138 f. arrives at a similar result.

not counter this with any plausible threat. From game theory, it is now known that the future possible situation (the transfer of hub functions) has reverse effects on the short term situation with the result that the airport and the airline are not in a bilateral monopoly, but rather the airport is confronted with a virtual monopsony. Thus, there is no question of the airport's exploitation of the hub airline.[41]

The situation for regional flight traffic is less clear. Concerning this, JAKUBOWSKI expresses the assumption that most end users develop strong preferences for the closest airport. This results in the creation of a certain price-setting margin for the involved airports that casts doubt upon the optimistic assumption that airports are in strong competition with one another. In contrast, BUTTON ET AL. (1998, S. 291) report that there is considerable substitution competition between airports and high speed railway traffic. This makes price regulation at airports a problem that deserves particular scrutiny.

In practice, different instruments are used in the member states in order to regulate the price policies of the airports. The introduction of scarcity prices can always be integrated into this current system. In connection with this, it is important to reveal airport charges and their components (transparency) and to increase fees only with advance notification, i.e., not within a flight plan period that has already begun. The latter is already current practice; the transparency rule still needs to be more strongly enforced in some member states,[42]for this reason, the proposal for a European guideline concerning airport charges includes the requirement for more transparency (97/0127). The required adaptations of the regulation in Germany are marginal so that nothing obstructs a short-term introduction of scarcity prices.[43]

Practical example 5: Scarcity charges in London

The British Airports Authority (BAA) introduced a form of congestion pricing for the use of Heathrow, Gatwick and Stansted airports in the 1970s. The goal was the introduction of marginal cost prices in order to show the costs of building the new terminal 4. The structure of the fees has undergone several fundamental changes to date, but the peak-load pricing principle has, in essence, always been maintained. Today, a fee differentiation only exists for landing and parking fees; the initially introduced peaks for passenger fees were done away with in the middle of the 1990s in the wake of a bilateral conciliation procedure between Great Britain and the US, in particular due to their low acceptance.[44] At Gatwick, the current peak fees partially exceed the off-peak fees by more than 300%, at Heathrow, they are somewhat lower with 230%.

IV. Slot Trading

The possibility of buying and selling slots was introduced in the US in 1986 at the country's four high-density airports. The goal of trading is, more strongly than previously was the case,to

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[41] It will, if need be, discriminate against other airlines and in favour of the hub airline; this is, however, prohibited in Germany (and the EU) by the general law on competition.

[42] See STOCKMAN (1998).

[43] On the legal restrictions and their conclusions see Section E.

confront the owners of grandfather rights with the opportunity costs of slot ownership. Behind this lies the hope that the airlines will give up the grandfather rights for which they have little use and collect sales proceeds from a buyer who has a more productive use for them. This would undoubtedly satisfy the criterion of allocative efficiency because the slot would go to where the highest value is recognised and the commensurate willingness to pay exists. In practice, different forms of slot trading are used or are being discussed:

- With real slot trading, slots can be freely transferred. The current interpretation of European law merely allows for payments to be effected in order to compensate for value differences between exchanged slots. If an airline wants to exchange a less valuable slot A for a more valuable slot B, it may make an additional payment in order to compensate for the difference.

Practical Example 6: The Guernsey Decision

British Airways exchanged slots at London-Heathrow against Heathrow slots of KLM UK, which used these slots for a Guernsey connection. In order to compensate for the value difference, BA paid 24 million US dollars to KLM UK. The European Commission designated this transaction as a feigned exchange or as an concealed slot trade. A British court had allowed for compensation side payments to accompany the exchange of slots of unequal value between airlines in March 1999, even though EU Regulation 95/93 forbids slot trading.

- In the case of leasing, one airline leases the right to use a slot to another airline; however, it retains the grandfather right. In this sense, leasing fulfils the criterion of allocative efficiency but it violates competitive efficiency, because the lessee who operates at lower cost has no possibility to permanently enter the market. A feasible compromise consists of applying a *modified Use It or Lose It Rule* to leased slots, viz., the airlines could be bound to use a minimum of 60% of their slots within five flight plan periods themselves (leasing would hereby be limited to a maximum of two flight plan periods, for example). Leasing would thereby merely fulfil a bridging function and could not establish itself as a permanent solution that impedes competition.

- The EU Commission is pursuing ideas by which slot trading should be administered: according to these, an airline that is willing to sell a slot would have to turn to the flight plan co-ordinator with its specified desire to sell, who would invite bids for the slot. This would enable the administration to put its own criteria into effect, for example, to offer the slot to newcomers first. For the airlines, however, this raises their transaction costs, because the possibility of assembling more complex, and potentially more valuable trading, buying and selling bundles themselves is taken away from them.

- A further question is if the group of persons that is allowed to participate in slot trading should be limited or not. As an argument against slot trading in the US, it is often objected that a portion of the slots have become unproductive, i.e., they have, for example, become

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[44] See TOMS (1994), p. 82.

the property of banks, insurance companies and so on. For reasons of *intertemporal efficiency*, there can be no principle objection to such developments; for, when someone purchases a slot and sets it aside, they apparently expect to be able to cover the lost profits from the non-use of the slot with future scarcity proceeds. It can be shown that, in this way, slot trading makes a contribution towards anticipating future scarcities (and, correspondingly, rising prices) today. If one nevertheless wants to work towards the use of hoarded slots, one should also allow leasing. Beyond this, the application of the *Use It or Lose It Rule* precludes a hoarding with no use. Allowing third parties (= non-airlines) access to slot trading also enables the formation of spot and futures markets. With these, airlines would, in the event of a functional primary market for slots, be in a position to order slots that today are not yet up for sale. Similar to a futures market at stock exchanges, a market participant would need to purchase the ordered slot in the desired time window at their own cost and risk. Due to the narrowness of the market, it can be assumed that relatively high risk premiums will be required on slot futures initially.

To consider the effectiveness of slot trading with respect to slot allocation, the decision criteria of the airline that is giving up a slot needs to be examined: from the airline's point of view, the sale of one, two or four slots from the liquidation of a less lucrative connection is connected with a basic risk; the airline has to reckon with the fact that the new owner can give up the uneconomic connection, let the slot at the other airport expire and then operate a connection instead that directly attacks the airline that has given up its slot. Slot trading would therefore, in this case, contradict the particular economic interests of the seller, i.e., it would also contradict the criterion of allocative efficiency.

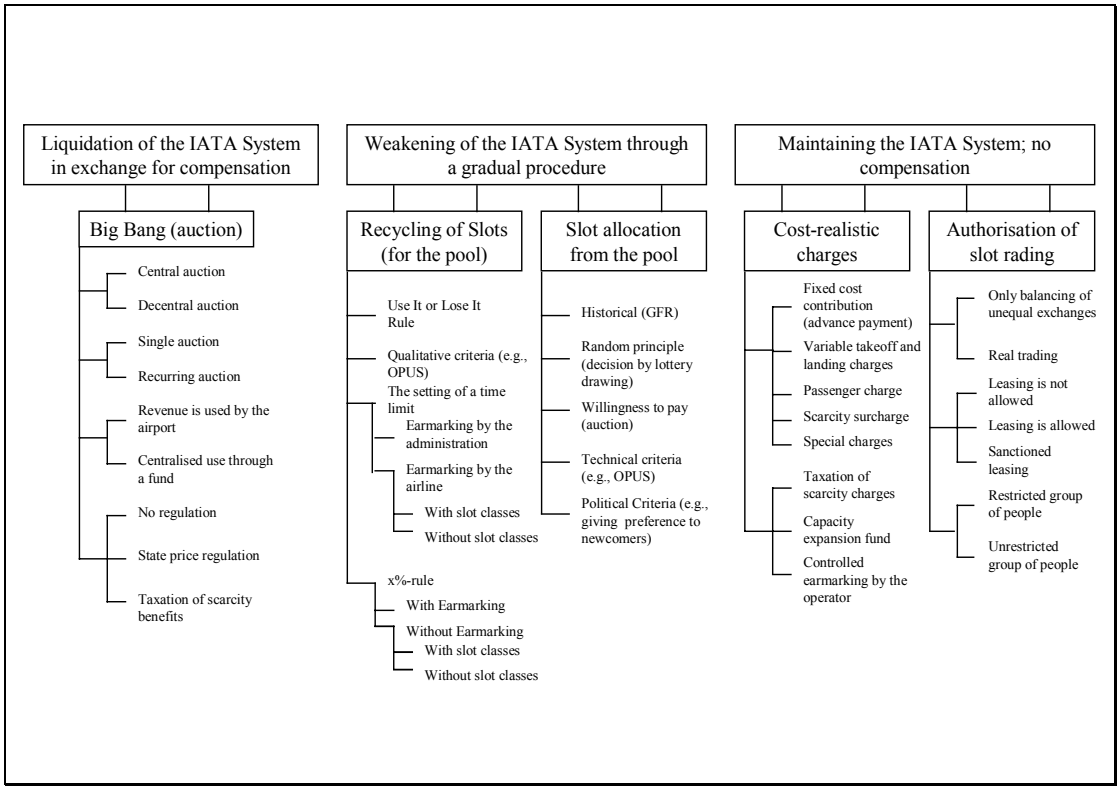
The decisive problem that can give rise to incomplete slot trading is the uncertainty of the airline that is giving up its slot about the future use of the slot. It will have to adjust the respective sales proceeds with an uncertainty component (*discount*) in such a way that the sale will often become unattractive.[45] Alternatively, it could try to hedge against undesired further uses of the sold slot by, for example, contractually binding the buyer to maintain the original connection (or one of similar value) for a minimum of at least three flight plan periods; otherwise, it would have to return the slots.

On balance, it can be emphasised that one should not have excessive expectations concerning the introduction of slot trading with respect to the scarcity of slots. Although slot trading raises the opportunity costs for the use of grandfather rights for the airlines that hold slots, the discounting effect prevents slots from being sold automatically to the airline that could obtain better value from its use. The current grandfather rights would, consequently, not be eliminated. One should not expect too much from pure slot trading if it is not combined with other

[45] This discontinuation effect has also contributed to the fact that the high expectations of the introduction of slot trading were not fulfiled in the US.

measures that create flexibility, e.g., the x% rule. A concluding and summary overview of feasible slot allocation instruments is given in Figure 3.

Figure 3 Overview of Slot Allocation Instruments



Practical Example 7: Slot Trading in the US

After various experiments in the area of slot allocation, the US introduced free slot trading at four co-ordinated airports in 1986.[46] The results showed that the concentration of airlines at the airports continually increased and that leasing developed into the dominant transaction form. In specific cases, financial services (banks and insurance companies) were owners of slots.[47] From today's point of view, this development is not surprising:

The concentration went hand in hand with a correction of the market that inevitably had to set in in the wake of the liberalisation of the air traffic market in the US after 1978 (and which can, under different framework conditions, presently be observed in Europe as well).

The US aviation industry is insofar not comparable to the European system in that, by recognising the large airlines as virtual owners of airports, it gives them considerable possibilities to discriminate against unwanted competitors.

If the leasing of slots is permitted without time limitations, as it is in the US, then it proves to be the superior and more low-risk transaction form from the point of view of the slot owner. It also allows financial transactions in which banks are included in such a way as to allow the sale of slots by airline companies to banks for liquidity reasons which they then lease back from them (*sale and lease back*). A corresponding EU regulation should definitely set a time limit on leasing or sanction leasing in connection with a specific *Use It or Lose It Rule*.

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[46] Parallel to the introduction of slot trading, the slot stock of the airlines was, for the first time, recognised as a grandfather right. Previously there was merely an allocation of r*eal time slots* in the US based on the *first come first served principle*. The management of slots according to the present system (allocation on the basis of the grandfather principle) will be revoked again at the *high density airports* Chicago O´Hare by July 2002, as well as at LaGuardia and J.F.Kennedy (January 2007).

[47] See in detail STARKIE (1992).

D. ASSESSMENT OF SUITABLE INSTRUMENT COMBINATIONS

A total of four variants can be separated out of the examined feasible instrument alternatives that are apparently suitable for achieving better slot allocation in Germany and in the European Union. These are:

a) The **Big Bang**, i.e., the auctioning of all existing slots by a central auctioneer. The airlines can bid for single slots, as well as for any slot and network combinations. The auction is organised in several stages, i.e., the auctioneer asks the airlines to hand in modified bids on the basis of the bids that have been received until clearance of the market is achieved.[48] A *fine tuning* of the auction result is achieved via slot trading ex post—slot trading therefore ensures that a constant adaptation of slot distribution to new conditions, new companies entering the market, changes in demand, etc. takes place. The revenue (of only this first auction) is used in part for the compensation of the grandfather right owners. The remainder can, for example, be deposited in a special fund. All those who want to contribute to the elimination of capacity bottlenecks can apply for money from the fund. At the same time, a government price regulator ensures (as it should already do today) that the airports in the EU do not integrate any hidden second scarcity components into their fees. The auction should, at first, only occur once and further allocations can be left to trading. After eight to ten flight plan periods, an evaluation will take place as to whether the criterion of competitive efficiency has been met. If this is not the case, the Big Bang would need to be repeated after ten to twelve flight plan periods.

b1) The recycling of slots through the **x% rule with earmarking**, for which x should be between 10 and 20. With earmarking, slots are assigned a period of validity that is, in principle, a standard time limitation. From this it follows that the airlines, depending on x, need to return five to ten percent of their slots at every airport they fly to or from into that airport's specific pool every flight plan period. An earmarking of the slot stock ensures that after ten or twenty flight plan periods all slots have been returned at least once. The slots that have fallen back into the pool, insofar as they are even scarce, are auctioned off at a centralised auction. A compensation of grandfather right holders with the auction revenue is not necessary due to the long-term adaptation period; for this reason the entire revenue is available for capacity expansion. The respective regulatory agency prevents the airports from collecting double scarcity proceeds through airport charges. Trading is allowed. It is real trading with no restrictions, i.e., the airlines can trade slots freely with each other, and not for the financial equalisation of unequally weighted slot trading actions. Leasing must be registered. All leased slots are assigned an expiry date that is a maximum of half as long as the calculated expiry date of the x% rule.

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[48] A second price auction (Vickrey Auction) is, in this case, not possible, because the slot combinations that are bid upon will as a rule be different; see VICKREY (1961).

b2) The **x% rule with slot classification** does without the earmarking of slots. This enables the airlines to have more freedom with the time and location-specific selection of the slots that they return to the pool, they can also put slots that they have just purchased into the pool, and they can decide freely which airports' slots they return. However, the slots are divided into classes according to their value, so that the x% rule does not refer to the whole stock of an airline's slots but to the classes. Within the classes, it is permitted to return only the relatively undesirable slots to the airport-specific pool.

c) **Congestion pricing**: Airports are granted the right to set scarcity-oriented, peak load prices. All airports are subject to price regulation. They have to indicate separately the different elements of which their fees are comprised. At congested airports the revenue from the scarcity-oriented price component, capacity fees say, is transferred to identified reserve funds that must be used within a time period that needs to be set for capacity expansion.[49] If this does not happen, then they must be reimbursed or paid to the state. Congested airports can be granted the possibility of subsidising the passenger fees with the revenue from the capacity fees on a pro rata basis in order to create incentives for the use of large aircraft. This subsidy should, however, not exceed certain amounts, for example, five to ten percent of the additional revenue resulting from scarcities, so that funds are not permanently withdrawn from capacity expansion. Slots are allocated now, as before, according to the IATA rules. However, all airlines have to pay a fixed reservation fee at the beginning of the flight plan period according to the number of slots they own to cover the infrastructure fixed costs. This reservation fee is due independent of use and is not reimbursed if a slot is not used or is not fully used. Part of the reservation fees could be reimbursed if a slot is returned in time, i.e. if it can be then meaningfully allocated elsewhere. Accompanying trading can be allowed.

The summary (see Table 3) shows that this charging instrument is superior to the alternatives in respect to efficiency and secondary criteria.

In respect to the criterion *allocative efficiency*, the Big Bang and the system of congestion pricing are relatively uncompromising and therefore slightly superior to the more incrementally designed x% rule, which features a longer adaptation time frame.

The criterion of *competitive efficiency* is also best fulfilled by the Big Bang, because at the time of the auction all competitors are given the same bidding chances. This positive assessment must be somewhat weaker for the other alternatives that formally retain the IATA system of grandfather rights or that only weaken them gradually. Nevertheless, congestion pricing, as well as the x% rule with earmarking, lead to the desired competitive political goals after some time. With the x% rule with slot classes, the owners of grandfather rights have more discretionary scope. This decreases the market entry chances of newcomers who, above all, receive

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[49] See GROSSEKETTLER (1995), p. 499 ff., as well as BOSS et al. (1996), p. 179.

the remaining unattractive slots; however, it also increases the acceptance of this solution on the part of the established airlines.

Table 3 Assesment of the Four Instrument Scenarios

	Allocative efficiency	Com-petetive efficiency	Infrastruc-tural effi-ciency	Imple-mentation	Transaction costs	Political acceptance	Fiducial protection
α) Big Bang	++	++	0/+	0	0/–	– –	+
β_1) x% rule with earmarking	+	+	+	+	0/–	0/+	+
β_2) x% rule with slot classes	+	0/-	+	+	0/–	+	+
γ) congestion pricing	++	+	++	++	0	0/+	+

Legend: ++ = criterion is very positively met; + = positive;
0/+ = neutral with a positive tendency; 0 = neutral
0/- = neutral with a negative tendency; - = negative
-- = very negative

The *infrastructural efficiency* is highest if congestion prices are charged and used directly for airport-specific expansion measures. With the x% rule, and in the case of a central auction, there would be the added disadvantage that the entire revenue from the auction of slots would land in a central fund, which creates higher implementation and transaction costs in the distribution of funds. In the case of the simultaneous, decentralised auction the auction procedure is more complex and presumably also more prolonged. If the revenue from the first auction would also need to be used to compensate the owners of the grandfather rights to satisfy the criterion of fiducial protection (the funds are thereby withdrawn from the expansion of capacity) then the Big Bang is least suitable in relationship to the infrastructural efficiency.

The *implementation* of the Big Bang requires, as has already been mentioned, considerable preparatory time and organisation, which reduces the efficiency of the instrument. The introduction of the x% rule can, however, build on the EU Regulation 95/93, which among other things already comprises the instrument of the slot pool. Implementation costs arise with the x% rule through the establishment of rules for the distribution of the auction revenue and through the implementation of these rules; with the introduction of congestion prices, on the other hand, mechanisms for controlling the use of scarcity proceeds at overloaded airports are required.

Ultimately the same arguments are also valid for the *transaction costs* in the running operations of the slot allocation system. However, a transfer of scarcity proceeds in accordance with fixed rules into controlled reserve funds creates less problems for operators in the long term than the management of a central capacity expansion fund.

The *political acceptance* of the Big Bang is very low due to the large implementation difficulties. However, the x% rule with slot classes is superior to the x% rule with earmarking because the airlines that hold grandfather rights retain discretionary scope concerning those slots they do and do not return. The introduction of congestion pricing should require some political persuasion, but in light of the ongoing and promising political debate about fair and efficient prices for the use of infrastructure we believe that this hurdle can be overcome.

It is not surprising that the criterion of *fiducial protection* is fulfilled by all suggested alternatives, as we have treated it as a necessary condition in any case. The implementation and political acceptance acquire the importance of an essential condition, so that the Big Bang can be eliminated from any further consideration. Whether one prefers the x% rule with slot classes to the earmarking is ultimately determined by whether one gives more weight to the competitive efficiency or to the political effectiveness. The decision between the x% rule with earmarking and congestion pricing is also by no means trivial: due to the higher infrastructural efficiency of congestion pricing, the authors however, have come to the conclusion that the potential reservations concerning the political acceptance of the higher fees resulting from congestion pricing can be overcome and are, therefore, secondary.

Measured according to the criteria of efficiency and implementability, the introduction of congestion pricing seems to be most suitable to improve the allocation of slots. The transportation policy efforts should, therefore and above all be directed towards the optimisation of the charges instrument.

E. A PRACTICABLE PROPOSAL

With the introduction of a system of congestion pricing, the authors have developed a proposal that, with a corresponding political will, can be implemented within five years. The authors are, however, aware of the fact that legal and political obstacles can stand in the way of a quick and faithful implementation of their model. It is foreseeable that the decisive obstacle hindering implementation is the fact *that an acceptance of opportunity costs as a part of airport charges might not be legally and politically possible*.[50] For the instrument of scarcity pricing, this means that an approach to the economic ideal model is possible though incomplete due to its failure to accept economic opportunity costs and cannot by itself lead to the complete balance of slot supply and demand. For this reason, the authors recommend a combined model that is based upon discussions with the EU Commission but that goes beyond the measures discussed. It consists of the following elements:

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[50] The background of this restriction is the principle of being based on costs (EU), as well as the cost covering precept or the ban on exceeding costs which are established in German fee law (for detailed information, see footnote 28).

- Introduction of a scarcity / capacity surcharge on overloaded airports on the condition that the airport operator has to prove that he re-invests additional fee revenues in the expansion of airport capacity. If he can not prove this within a specified period of time, e.g. in five years, he has to either refund the charged scarcity proceeds or transfer them to government.

- The charging of a stand-by takeoff and landing fee component to cover fixed costs which is paid by the airlines in advance (reservation fee). The remaining variable parts of takeoff and landing fees will be charged according to use.

- Setting a validity period for slots of about five to eight years via earmarking (which can be done by airlines themselves) within certain slot classes to be created for all airports flown to within the Community. After a transitional period, slots are returned to the pool and are put up for auction from it.

- Introduction of slot trading in the short term according to the revised EU Regulation 95/93. Thereby it is thought of a limited slot trading which regulates the forms of leasing and subjects them, for example, to a time limit (by a modified *Use It or Lose It Rule*).

Figure 4 Types of Slot Utilisation

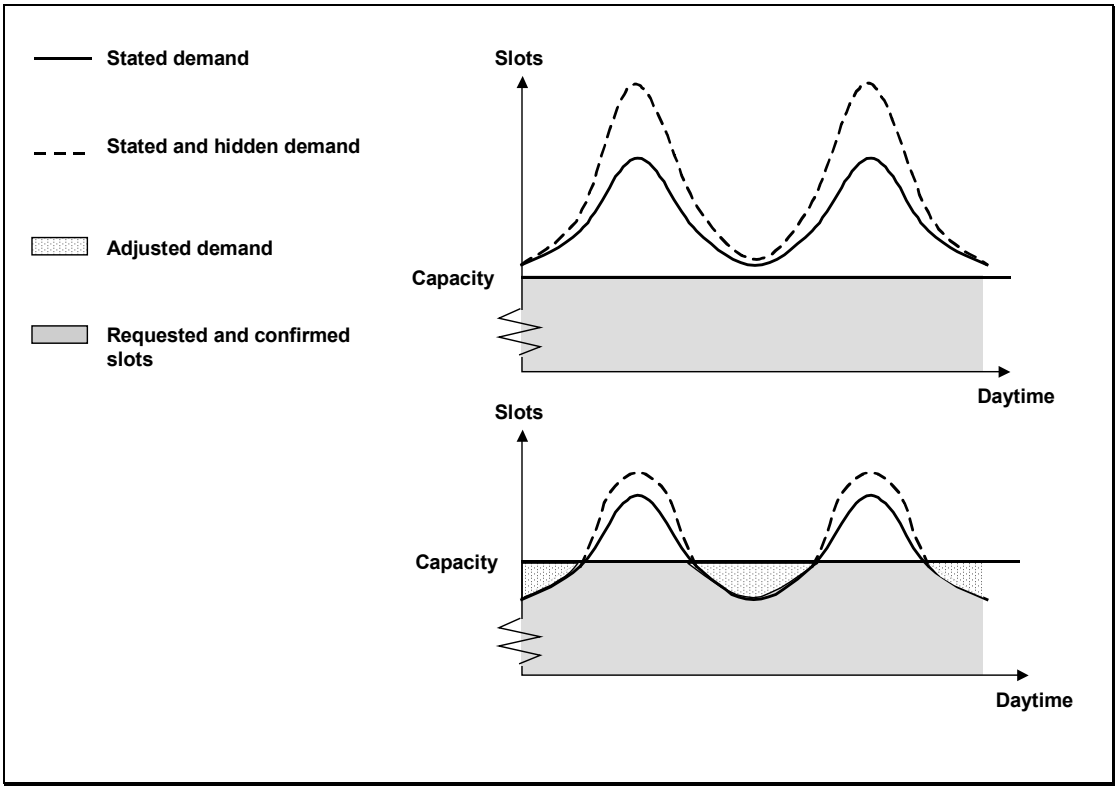

Figure 4 shows different types of airport overloads. As regards type 2 (below) it is possible with the help of so-called *peak load charges* and a subsidy to users in off peak periods to attract demand into the valleys (light grey). With regard to completely overloaded airports as type 1 (above), this opportunity does not exist.

I. Introduction of Capacity Surcharges

Airports shall be enabled to adjust their fees more closely to the scarcity situation. Nevertheless, the European Commission would have the following provisons:

- The adjustments shall not serve to provide airports with additional revenues (Art. 5 of the proposal for a guideline of the Council for airport charges 97/0127 SYN). The extra revenues from congestion pricing shall, in accordance with the Commission's ideas, either be used to subsidise the demand in off peak periods (in Figure 4 this is possible only on airports of the second type (see illustrations above) which in the course of a day are not completely overloaded) or to expand the capacity.

- The fees must be cost-based (Art. 4 of the guideline draft). It is possible to take into consideration environmental requirements (Art. 5). According to the understanding of the Commission, the financing of future expansion investments are to be regarded as a cost component when the planning has reached a certain degree of realisation.

In principle, it is currently possible, and also in the case of an adoption of the guideline draft, to include considerable cost components in the calculation and a more scarcity-oriented structuring of airport charges, such as:

- *Peak load charges* to entice demand into off peak periods,

- Infrastructure expansion,

- Compensation for the benefit of local residents or for the relocation of whole districts (as is planned and/or discussed presently, for example, in connection with the new Berlin-Brandenburg International Airport) for nuisance effects caused by the airport,

- Measures for the protection against harmful effects on the environment through air pollution, noise, vibrations, and similar factors, landscape conservation measures, active and passive noise protection (barriers, heavier glazing, etc.),

- Financial compensation for remaining disturbances,

- Substitution investments for compensatory social amenities in the concerned communities (recreational and fitness facilities, rest zones, health care, etc.),

- Costs for the preliminary planning (mediation procedure, etc.),

- Research, development, and application of technological innovations to increase slot utilisation,

- Investigations, tests, and application of organisational innovations for capacity increases,

- Subsidies for alternative feeder traffic, e.g. by train,
- Improvement of intermodal links to nearby airports,

An approval of capacity surcharges at airports by the relevant approval authorities at state level is possible in accordance with German law if these are presented appropriately and their implementation can be credibly established.[51] If in spite of this, a situation results in which plans can not be realised, capacity surcharges charged in connection therewith are to be refunded or released to government. In principle, users (i.e. passengers) who have prepaid the unused capacity surcharges should be recipients of the refund. But because a direct refund to passengers would very likely be inordinately expensive, the refund would have to be made to airlines. This would, nevertheless, produce *windfall profits* , which even though moderated in a competitive environment would not necessarily benefit end users. That is why economic theory recommends lowering the fixed price components in favour of market-oriented, variable price components.

The refund and the underlying capacity surcharges will principally effect takeoff and landing fees. The problem of refunding passenger payments would not occur under this solution. A proper and transparent documentation of charging with the help of modern computer-aided accounting systems should ensure that this is accomplished without excessive administrative loss. An alternative solution would be the transfer of the non-invested additional revenues from the scarce slot situation to government.[52] In accordance with the principle of fiscal equivalence, the proceeds should, nevertheless, be used for the development of the aviation system. This alternative solution would have the advantage that the behaviour direction of capacity and reservation fees would not be impaired by the expectation of a refund.

To make the appropriate use (or non-use) of the capacity surcharges transparent an accounting system fitting this purpose will have to be created, including a special purpose account.[53] In addition, it would have to be clarified whether and to what extent possible refunds have to bear interest because it has to be taken into account that the reserves are at the airport's disposal in the meantime. Furthermore, it is of importance that both, the inflow of funds and potential investment decisions regarding funds take place continously and that procedures and

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[51] The charging of such costs is also recognized in international law, compare WITTEN (1995), P. 188.

[52] In literature, proposals regarding a special tax can be found on this subject. A model for this is offered by the British *Windfall Tax* which was levied by the Labour Government in 1997, distributed to the two following years, by the privatised former state-owned enterprises and amounted to 4.8 thousand millions GBP in total. BAA airports contributed 102 GBP to this. Compare HM TREASURY (1997). One cannot resist comparisons with the auctioning of UMTS-licenses, but at second glance they, nevertheless, are not valid: With UMTS, frequencies are natural scarce non-increasable goods. The criterium of investive efficiency can therefore not be applied here in contrast to principally increasable goods.

[53] The transparent financial reporting is by no means a matter of course at the airports within the Community. According to expert information that is the reason why the EU Guideline Draft on airport payments which includes the cost transparency principle is vehemently refused by some member-states.

protocols for distribution of due refunds have to be defined. In addition to the approval authority and the airport, users and local residents should be involved in this policy formation. To this end, a special committee governed by a constitution would need to be created. The constitution of such a committee will surely still raise many questions in practice; but for the composition of such a committee it is essential to set only minimum standards – exactly how the committee would be involved in investment decisions should be heavily influenced by the airport manager who, having the appropriate knowledge and ability, should be permitted to defend his market position and maintain competitive advantages over his competitors.

In spite of legal margins of discretion, in the present system there are few incentives for airports to actually assert the mentioned costs.[54] Since airports first have to present fee increases and new fee structures to the User Committee and defend them there and can only then present a draft which in practice is then in most cases already watered-down to the approval authority, the principle of consensus prevails in practice. Supposedly, this does not hurt anybody as long as airports are public property and the costs of inefficient practices are not sanctioned by the capital markets. But if airports are under pressure with regard to their efficiency they also have an incentive to assert their total costs and this also against the resistance in the User Committee and the State Ministries of Transport. While this is not a new concept in a general legal sense, it is practically unknown in Germany.

With a new regulation there would be little incentive to airports to calculate capacity surcharges that are so excessive that the refund becomes the rule because it would otherwise invalidate, over time, the balance of supply and demand through congestion pricing.[55] If airports calculate the surcharges too cautiously excess demand would remain. This problem disappears if the capacity fees, which are not refunded to airlines, are paid out to the government.

If airports compete with each other, narrow limits exist with regard to their charging practices. If such an airport would increase fees so much that its customers switch to a nearby airport or to other modes of transport this would deprive the planned investments of their financial basis. As a rational actor the airport will know how to avoid this. An exact anticipation of customer behaviour is, nevertheless, possible only if the provider knows the cross price elasticity of his actual and potential customers. In other words, if he knows how many customers would come to him from the competing airport if he reduces his price by one per cent. In practice, the cross price elasticity of demand is difficult to determine, but with the help of modern market research, approximate values can be obtained.

In the literature, it is sometimes cited as a disadvantage of the solution based on a redesign of charges that it initiates an unforeseeable *Trial and Error-Process* in pricing determination.[56]

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[54] Compare also FICHERT (2000), P. 241.

[55] Airlines would anticipate the refund effect and declare more willingness to pay for takeoff and landing fees.

[56] Compare WOLF (1991), P. 194.

This view neglects that market research instruments currently exist with which the behaviour of customers can be approximately anticipated. A typical example for this is the *Conjoint Analysis* with the help of which customers are asked implicitly which combination of certain service and fee structure characteristics they finally prefer (see the design of PAGLIARI 1996, P. 55 ff.). The *Conjoint-Measurement* was also applied at the introduction of the *Bahncard*[57] which establishes a two-part level tariff for train customers.[58] The analyses can also be extended to include dynamic aspects with the help of modern simulation methods.[59] The fixing of scarcity-oriented airport charges will always be subject to a *Trial and Error Process*, but this process is not blind and in numerous sectors of the economy it is common practice.

Nonetheless, there are several reasons for the conjecture that capacity charges would be lower than charges resulting from an auction process in practice:

- Capacity fees can only be fixed in a longer term iterative process in which the airport, as a rule, will not risk exceeding the market-clearing price because otherwise the threat would exist that enquiring parties would continue to drift away. That is why the airport will always tend to calculate cautiously.

- In the given administrative practice, the principle of cost-based pricing will have the effect that presently only accounting costs, and not economic costs (opportunity costs), are accepted as part of the capacity fees.

- Airports will calculate cautiously and not let the refund of undisbursed capacity fees to the airlines or the government become the rule because in so doing, they would put at risk the credibility of future expansion measures and the fee increases necessitated by them.

- In the airport business in particular, it is noteworthy that fees are published two months prior to their taking effect and that they have to be valid for one whole year even though they could differ depending on the flight schedule period (summer-winter). Prior to their publication, fees have to be calculated and discussed with the airlines in a consultation process. This necessitates a lead time of about 18 months and has the effect that scarcity fees can only be calculated carefully.

Medium-Term Perspective: In the proposed solution, capacity fees according to accounting practices reflect the anticipated costs for the removal of scarcity regarding the slot situation at airports (compare footnotes 28, 51, and 52). Nevertheless, the introduction of scarcity-oriented airport charges would take on a further-reaching perspective if economic opportunity costs are included in the calculation of shortage surcharges (incurred by forcing out airlines willing to pay

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[57] A card enabling the purchase of rail tickets at a significant discount.

[58] In addition, VAVRA/GREEN/KRIEGER (1999) have applied the instrument of the Conjoint-Analysis for assessing the effects of a new road toll.

[59] Compare BÜSCHKEN (1997).

more than would be accepted as costs). In the long run, only the inclusion of opportunity costs would lead to the balance of supply and demand and improve operational-allocative and investive efficiency. That is why in the medium term opportunity costs should also be allowed as costs in the sense of the EU draft of directives on airport charges.

II. Imposing a Reservation Fee

Art. 6 of the draft EU directive on airport charges prescribes that all fees should subject to the transparency principle. In particular, this includes the clearly laid out and itemised statement of services rendered by the airport in return for the airport fee and the applied method of calculation. With the Europe-wide introduction of the transparency principle, the opportunity would be provided to divide airport charges into fixed, variable, and scarcity-relevant components everywhere and to impose them accordingly. One could even go as far as to allow environmental and scarcity surcharges on the fees only on those airports which comply with the transparency requirement.

Imposing a reservation fee which covers the fixed costs and which would have to be paid by the airlines for each reported slot independent of whether they use the slot or— in the *no show-case*— do not use it, is not prohibited by the draft of directives, especially since it is also in conformity with the principle of being cost-based because fixed costs are incurred independent of whether a slot is used or not. Also, nothing in the German legal system opposes the imposition of such a fixed, use-independent fee component.

In principle, the governing ICAO-Guideline 9082/5 stipulates that airlines and other users of airports have to pay fees only for the services of which they actually make use.[60] Nevertheless, no serious objection against a reservation fee results from this because the reservation is already a special utilisation action as such: with a reservation, a user makes clear that he intends to make use of a service. If the use is not realised he does not pay variable utilisation fees, but also does not get his reservation fee refunded.

The economic advantage of such a fixed fee consists in incentivising airlines to avoid *no shows* by either making use of the slot, returning it to the pool or selling it by way of slot trading.

Against a reservation fee one could argue that it would have to be borne by the airlines in case that they can not use, through no fault of theirs, a real time-slot, e.g. because of unforeseeable circumstances (delays, military crises etc.) as well. Here one has to differentiate as follows:

- If the non-use of the slot is caused by circumstances which were already foreseeable when fixing the reservation (e.g. public holidays), a reservation should not be made in the first place.

- If a third party is responsible for delays (e.g. other airports, air-traffic control), airlines will have to put in claims for damages to that third party, not as is the case today, to the airport which reserves the capacity in good faith.

- If the *no show* is to be attributed to non-foreseeable force majeure, the airlines should be able to effectively insure themselves against the losses. This is also customary in other industry sectors.

III. Time Limitation of Slots

In the medium term, a time limitation of slot rights should be determined with the help of the x%-rule. This ensures that in spite of the imperfections of setting scarcity prices for airport charges, change will occur in the slot market such that it will become open for newcomers. To which extent this opening will be realised, finally also depends on criteria in accordance with which slots released from the pool will be allocated. The present system provides for 50% of the slots in the airport-specific pool to be reserved for newcomers. Future regulations should provide for the auctioning of slots from the pool.

On the primary market, the x%-rule should provide for standardised duration terms for slots. Nevertheless, different validity terms could result on the secondary market (compare section E part 4).

Considerations to limit the duration of slots are, at least in principle, in agreement with comparable considerations within the European Commission. In addition, these are covered by the project of the EU-Commission to clearly determine in the revised version of the 95/93 regulation on the allocation of slots, that they are not the property of airlines. The x%-rule provides for the practical structuring of slot duration, in accordance with which the airlines have to return a certain percentage of their total stock each flight plan period to the pool, and this differentiated in accordance with slot value criteria. The airlines are to decide which slots they, within the slot classes, return first. If x is, for example, fixed at 12.5, the airlines have to return the last slots from their old stock in the 8th flight plan period.

Efficiency increases in the allocation of slots from the airport-specific pool can be mobilised if the allocation is organised analogously to the market with a procedure which is similar to an auction. The yield from these auctions should remain within the aviation industry in accordance with the principle of fiscal equivalence in the air traffic system, i.e.:

- be available to the relevant airports for capacity increases,

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[60] Compare ICAO (1997), sub-paragraph 14 ii).

- be committed to the charge of the government with the purpose of conducting the expansion of the aviation industry (in accordance with the *principle of fiscal equivalence*),

- be refunded in an incentive-neutral manner to airlines.

With an increasing introduction of scarcity-relevant fees at airports and through a limitation of the duration of slot rights, slots in the pool will have a tendency to have increasingly less value.[61] Even though there will always be one airline which values the slot more than another airline, this would be determined by an auction.

In principle, the auction can be conducted decentrally by airports themselves if auction dates are combined and if it is ensured with the help of modern information technology that a bidder can also bid for slot packages which apply to all airports within the community. A stock exchange could be charged with the technical linkage of all auctions. The professional supervision, but not the conduct of the auction, should be with the slot co-ordinator. After having verified the professional suitability of bidders, he could offer these admission to the auction. Analogously to the IATA slot conference it would improve effectiveness to conduct auctions in several stages or rounds. This would enable the airlines to bid in a more targeted manner for supplementary slots in the context of an existing network, and possibly, also return slots for which there is no longer use.

Independent of the specific admission, it should be considered at the regulatory level which persons may at all be bidders in an auction (compare the statements in the following paragraph on this subject).

Ultimately, the auctioning of slots from the pool would eventually become obsolete if it were politically possible to accept opportunity costs as admissible basis for calculating airport charges. Even if this is not possible in the longer term due to legal and political obstacles, the auctions would permanently retain their justification (as well as the x%-rule).

IV. Introduction of Slot Trading Elements

Currently, the European Commission recognises the possibility that the exchange of slots of unequal value between airlines often requires financial compensation for the differences in value. But considerations for the introduction of a slot trading are still in their infancy. Apparently, the trend is such that the airline willing to sell discloses its sales request to a public body which then arranges the sale. Naturally, this has only very little to do with true slot trading. Nevertheless, all approaches to slot trading are to be appreciated in comparison with the present relatively rigid situation, because they provide airlines with more flexibility. Slot trading thus makes the *fine tuning* of slot allocation possible, nevertheless, the expectations regarding slot

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[61] This effect also reduces the sales value of slots in the case of trading, compare the following paragraph.

trading should not be too high. That is why slot trading is applicable only as an accompanying instrument, but not as the only one.

Slot trading as *fine tuning* establishes no proprietary right of the airlines such as a grandfather right, but recognises their legitimate interest in the fungibility of slots: If short or medium term changes in demand occur or if an airline wants to change its strategic orientation it should also be able, in the short term, to adapt its slot portfolio accordingly.

If the possibilities of slot trading are to be extended, slot leasing should be limited. Principally, airline leasing provides for short-term planning flexibility. It must, nevertheless, be ensured that the relevant slot is actually used. An acceptable method to ensure that slot leasing is consistent with market rules would be a modified *Use it or Lose It Rule* which prescribes that slot rights holders use at least 60% of the slots in five years themselves. The possibility of leasing them out would thus be restricted to four flight schedule periods in five years, for example.

Moreover, with the increasing introduction of scarcity-relevant airport charges and a validity limitation as a consequence of the x%-rule it is important to take into account that slots decrease in value considerably. Should it even result in the complete introduction of scarcity-relevant fees, the slot value should theoretically tend towards zero. Nevertheless, as a result of valuation differences of airlines, there will, as a rule, be one customer who rates the value of a slot positively (and because of this the possibility of slot trading as *fine tuning*).

If, on the contrary, slots have a positive value at certain airports, this reflects the fact that the fees there do (can) not yet completely include scarcity costs. Since the x%-rule with earmarking is simultaneously in force this positive residual value must, nevertheless, be completely written off over x periods.

With a precise slot limitation as regards time, futures and options enable airlines to acquire slots also for shorter time periods. With this they can by-pass the risk of a utilisation obligation extending over several years. This should be of particular importance to newcomer airlines since it would enable them to make investments in slots with a shorter durations than normal. Additionally, futures and options enable airlines to take out some kind of residual value insurance.[62]

A decisive factor is that the introduction of options and futures allows individual airlines to gain certainty for their planning beyond the maximal residual term of their most important slots by acquiring a right to the respective slot of the following period (and possibly exceeding it) for the time after the slot return is due. It would be expedient to also admit airports to the trading of slot futures; with this they could finance in advance future capacity increases already in the

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[62] For a detailed presentation of futures trading compare PERRIDON/STEINER (1999), P. 300 ff.

present. Overall, slot trading provides more intra-temporal and inter-temporal flexibility to participating stakeholders and thereby an improvement of overall economic allocation.

An institution which performs tasks similar to that of a stock exchange supervision could be appointed for the supervision of proper slot trading. A principle decision has to be made on the issue which groups of actors will be admitted to slot trading:

- The airlines would be admitted to slot trading in any case, but it should be left to their discretion whether they buy or sell slots bilaterally or make use of slot auctions which are conducted at regular intervals; in other words, airlines should not only be able to participate as purchasers in auctions of slots from pools but also as sellers.

- The admission of airports as purchasers of slots would enable them to appear vis-à-vis airlines not only as brokers of takeoff or landing points, but also as brokers of routes. For the time being, this would stimulate competition among airports. Fears, that individual airports could purchase slots of their competitors and set them aside to be left unused is unfounded because of the high costs of unused slots and the use it or lose it rule. The competent supervising authority should, nevertheless, make sure that slot purchases by airports are not used to obstruct the activities of competitors.

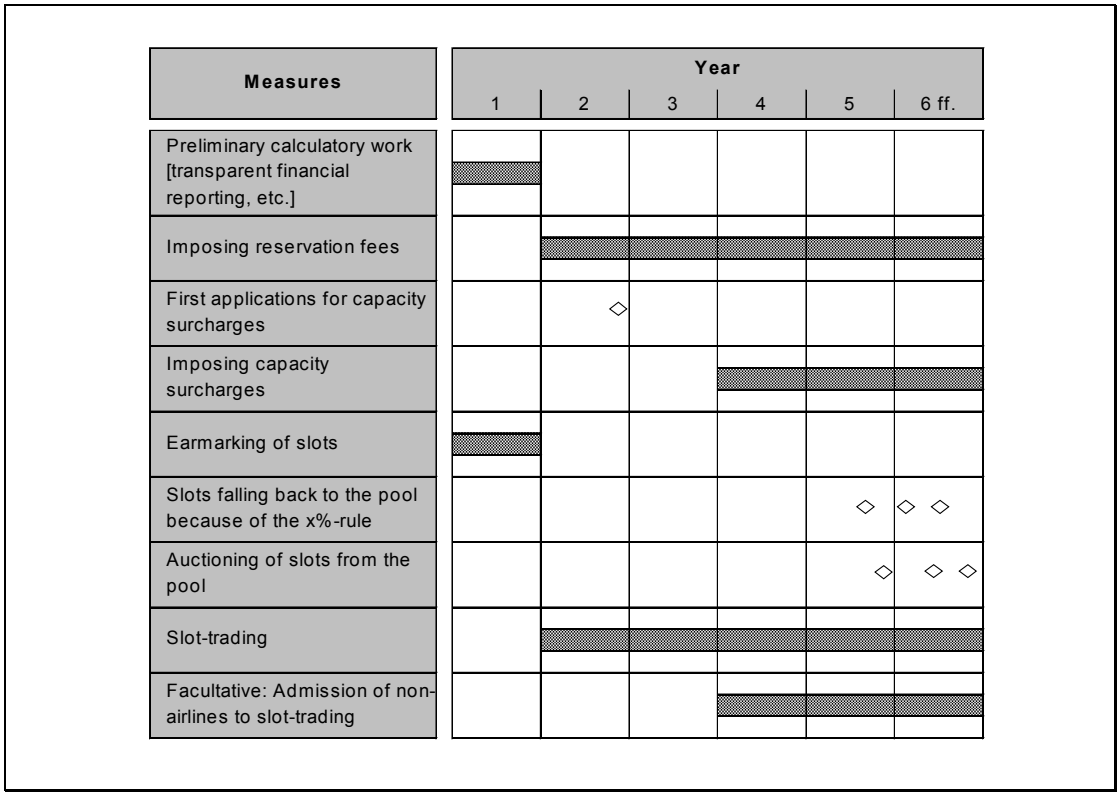
- The admission of banks and other financial intermediaries to slot trading is expedient if an effective secondary market (including regulated leasing, options/futures) would be created. This would also be helpful in lowering the market entry barriers for smaller airlines since they would then be able to sell slots to banks and lease them back (*sale and lease back*).

- Specialised third parties who could then appear as slot-brokers of routes or network branches could be admitted to slot acquisition. This could promote a completely new market with dynamic growth perspectives.

V. Implementation Schedule

The political implementation of the proposed measures can be realised within a time period of five years. A possible time schedule for this is shown in the following table.

Table 4 Time Schedule



F. APPENDIX: GLOSSARY

ATM	Air Traffic Management (Air Traffic Management and Air Traffic Control /ATC/)
CAA	Civil Aviation Authority (Great Britain)
Earmarking	Provision in connection with the x%-rule according to which every airline has to return x% of its slot stock to the pool. Earmarking is the act of setting a validity period for existing slots. (After expiry of the validity period the slots would be free from any grandfather right ties and enter the free slot pool).
Airport Capacity Parameters (‘Koordinationseckwert’)	In Germany, for example, the capacity of an airport is defined within parameters stipulating the number of allowable flight operations per hour, day, flight schedule period or some combination of all of these.
Fiducial Protection	Where a person has enjoyed established ownership rights over property that he will lose, the person will be entitled to protection of his legitimate interests. Fudicial protection is intended to mitigate the damage potential to the former enjoyer of established ownership rights. Protection can come in the form of changes to be made in a gradual way, or the payment of compensation.
First Come First Served Principle	Allocation principle of real time slots: whoever comes first gets the slot.
Fiscal Equivalence	The principle requires that a product or service should be financed by its users.
Flight Schedule Period	There are two Flight Schedule Periods per year. The usually busier and longer summer Flight Schedule Period occurs approximately between 1 April and 31 October inclusive, while the winter Flight Schedule Period is from 1 November to 31 March. Slot requests by airlines for a particular period are typically made at the beginning of the period preceeding it.
Grandfather Right	Right to dispose of a slot of the coming flight schedule period, if it has already been used by the respective airline in the current period.
IATA	IATA (International Air Transport Association) was set up in 1945 as an independent interest group of airlines. Its primary goal is the promotion of world-wide air traffic business.
ICAO	International Civil Aviation Organisation.

No Shows	Slots, which were allocated to an airline according to plan but not completely used.
Peak Load Charges	Peak load charges are surcharges imposed to attract demand during peak hours to *off peak* hours.
Pool	In accordance with the EU-Regulation 95/93, all slots which become available by expansion measures or the application of the Use It or Lose It Rule revert to the slot pool. Half of the slots in it are reserved for newcomers.
Real Time Slot	In contrast to planned slots which are allocated prior to the commencement of a Flight schedule period, real time slots are allocated by the tower directly before takeoff or landing.
Slot classes	In connection with the x%-rule, the creation of slot classes is a complement to the earmarking system. Should incumbent airlines themselves earmark the slots in their possession, they would earmark the most desirable slots with the longest validity. The creation of slot classes is an attempt to limit the earmarking discretion of the incumbent airlines. Classes to be created could be e.g.: • slots at fully co-ordinated airports at peak-times; • slots at fully co-ordinated airports at off-peak-times; • slots at co-ordinated airports at peak times, and • all other slots.
Slot Co-ordinator	As a rule, the Slot Co-ordinator is in charge of the allocation of slots at the national level. In Germany, he exercises a sovereign function and applies the IATA allocation criteria.
Slot Request	Demand for planned slots which is applied for by the airlines to the slot co-ordinator.
Use It or Lose It Rule	The rule prescribes a slot utilisation quotient. In the EU this percentage is 80%. If an airline fails to reach this percentage, it loses the Grandfather Right and the Slot reverts to the pool.
WTO	World Trade Organisation—successor institution of *GATT* (General Agreement on Tariffs and Trade) with headquarters in Geneva.
x%-Rule	By the x% rule, the airlines are required to return x% of their slot stock in each flying schedule period to the pool. x is a political requirement. The rule intends to induce the withdrawal of grandfather rights step by step observing the principle of fiducial protection.

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