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ITEM 4

CONFERENCE ON THE ECONOMICS OF AIRPORTS AND AIR NAVIGATION SERVICES

(Montreal, 19 - 28 June 2000)

Agenda Item 4: Determinants of the economic regulation of airports and air navigation services

CAPACITY MANAGEMENT AND SLOT ALLOCATION

(Presented by the Secretariat)

1. Introduction

1.1 In adopting the Agenda for this Conference, the Council indicated that particular attention would be given to capacity constraints and the issue of slot allocation.

1.2 Capacity constraints at airports and in airspace are becoming an increasing challenge to the continued growth of air transport. In some regions the limited availability and/or utilization of infrastructure has already led to serious problems, notably in the form of flight delays, with spillover effects worldwide. Current ICAO forecasts are for an increase in the global demand for air transport at an average annual growth rate of 4.5 per cent for the period 1997-2020, with aircraft movements growing at an average annual growth of 3.5 per cent (see ANSConf-WP/13 for more details). This means that airports and air traffic management systems will be expected to accommodate almost a 2.7 fold increase in passenger traffic (somewhat more for freight traffic) and a doubling of aircraft movements by the year 2020. These forecasts are predicated on the assumption that sufficient system infrastructure and capacity will be available to handle the demand.

2. Increasing availability of capacity

2.1 Evidently the primary objective of the civil aviation community should be to increase the availability of capacity rather than to have to ration demand (this should also be a primary objective beyond the aviation sector given the substantial contribution of civil aviation to the economy at large, both directly and indirectly).

2.2 Potential exists both through improved utilization and through increased capacity. As regards utilization, examples of potential improvements are through better coordinated air traffic flow management and airport scheduling, technology such as the communications, navigation and surveillance (CNS)/air traffic management (ATM) systems, reduced aircraft separation, improved runway usage, airside and groundside facilitation at airports, etc.

2.3 That there is some potential for increasing capacity *per se* is evidenced from replies to the pre-conference questionnaire (circulated under State letter SR 167/1 of 6 August 1999). Of the 85 responding States, 42 indicated that they have measures in effect and 23 *additional* States that they have measures planned for increasing airport capacity through runway/taxiway and/or terminal expansions (covering 117 international airports for which measures are in effect and 139 for which measures are planned). As regards airspace, 37 States indicated that they have measures in effect and 13 *additional* States have measures planned for increasing capacity (for example, through additional facilities or staff) at the approach and aerodrome control level, while 33 States have measures in effect and 12 *additional* States have measures planned at the en route level.

2.4 At the same time, that the potential for increasing capacity is limited is also evident from the replies to the questionnaire. As regards airports, of the 65 States with measures in effect or planned for increasing capacity: 20 also indicated that they had measures in effect or planned to assign certain traffic (on the basis, for example, of aircraft size or origin/destination) from an airport to another one; 34 States also indicated that slot allocation was in effect or planned; 18 States that peak charges were in effect or planned; and 18 States that high minimum charges were in effect or planned. Similarly, of the 50 States with measures to increase capacity for approach and aerodrome control: 28 States were also involved in slot allocation; 11 States with peak charges; and 5 States with high minimum charges. Finally, of the 45 States with measures to increase capacity at the en route level: 18 States were also involved with slot allocation; and 5 States with various charging mechanisms.

2.5 In practice, despite the very considerable efforts being made to overcome infrastructure constraints, and even assuming funding requirements[*] can be met, there are physical and increasing environmental limitations on the supply of infrastructure which not only lead to potential for local monopoly but also place limitations on the supply of operations. In this context, the present paper focuses on the economic instruments of slot allocation and charging mechanisms.

3. Economic instruments

3.1 In the questionnaire responses, 65 States indicated that they were experiencing lack of capacity at one or more of their international airports, with slot allocation measures in effect at 67 airports and planned for 20 airports (see Table 1, data on planned measures from here on in this paper reflect total figures supplied rather than additional, ie some of the 20 latter airports may be included also in the former 67, with new or modified slot allocation measures planned). About half these airports are in Europe, but slot allocation measures are also in effect at 15 airports in the Caribbean/Central/South America, 11 airports in Asia/Pacific and 11 airports in Africa (see regional breakdown in Appendix A, Exhibit 1). Peak charges are reported in effect at 28 airports and planned at 30, again predominantly in Europe but with Caribbean/Central/South America once more being significant. High minimum charges are reported in effect at 19 airports (15 in Europe), but planned for 25 (9 in Caribbean/Central/South America and 9 in Africa). Other economic measures indicated include slot violation penalties (Greece) and noise charges (specified by Germany and Romania, but known to be applied more widely, although not necessarily for capacity management).

[*]Funding issues are specifically addressed under Agenda item 3, see also ANSConf-WPs/8 and 15.

TABLE 1

AIRPORT CAPACITY MANAGEMENT IN 65 STATES

Measures		Increased Capacity	Reassign Traffic	Slot Allocation	Peak Charges	High Minimum Charges	Other
In effect	No. of States	42	10	28	8	11	3
	No. of Airports	117	20	67	28	19	9
Planned	No. of States	52	12	12	13	9	5
	No. of Airports	139	31	20	30	25	5

3.2 Turning to management of approach and aerodrome control capacity (Table 2 and Appendix A, Exhibit 2), of the 55 States indicating lack of capacity, 21 have slot allocation in effect and 11 planned, with Asia/Pacific here being the most significant region, ahead of Europe, Middle East and Africa. Peak charges are reported in only 3 States, but planned in 12, with Asia/Pacific predominating, with high minimum charges in effect in 3 States and planned in 2. Other measures indicated are essentially technical rather than economic, such as automated information processing, air traffic services (ATS) sequencing, ground relay programme, etc.

TABLE 2

APPROACH AND AERODROME CONTROL CAPACITY MANAGEMENT IN 55 STATES

Measures		Increased Capacity	Slot Allocation	Peak Charges	High Minimum Charges	Other
In effect	**No. of States**	**37**	**21**	**3**	**3**	**4**
Planned		**27**	**11**	**12**	**2**	**3**

3.3 As regards management of en route capacity (Table 3 and Appendix A, Exhibit 3), of the 51 States indicating lack of capacity, at the national level 12 States have slot allocation in effect with 9 planning slot allocation measures. Asia/Pacific and Europe again head the list on a regional basis. Only 2 States presently have charging mechanisms in effect for management of en route capacity and 3 States have plans for them. As regards other measures at the national level, these are again essentially technical, including minimum departure intervals, RVSM[1], automated information processing, change in ATS structure and sequencing, CFMU[2], etc. As far as international measures are concerned States in Europe mentioned ATFM[3] through the CFMU, implementation of BRNAV[4] routings, and RVSM; other States mentioned international cooperation (Swaziland and South Africa), RNAV[5] and RVSM (Jordan), restructured route network and RVSM (Vietnam) and flight information region (FIR) flow control measures (China).

[1]RVSM: Reduced vertical separation minimum

[2]CFMU: Centralized flow management unit

[3]ATFM: Air traffic flow management

[4]BRNAV: Basic area navigation

[5]RNAV: Area navigation

TABLE 3

NATIONAL EN ROUTE CAPACITY MANAGEMENT MEASURES IN 51 STATES

Measures		Increased Capacity	Slot Allocation	Charging Mechanisms	Other
In effect	No. of States	33	12	2	5
Planned		28	9	3	4

3.4 One conclusion that can be drawn from the above survey is that congestion is now a worldwide problem. While Europe predominates in terms of numbers of airports affected, the lack of capacity has "knock on" effects worldwide, and as far as airways are concerned there are clearly capacity problems in all regions, even if not yet widespread within each region.

3.5 Given the limited potential for improving utilization and increasing capacity and the continuing traffic growth in all regions, economic instruments for capacity management are inevitably going to be of increasing significance, with implications in the international arena.

3.6 Peak pricing has proved to be of limited effectiveness for capacity management, partly because of schedule constraints and the fact that airport and en route charges make a relatively small contribution to airline operating costs (3.9 per cent and 2.6 per cent respectively in 1998) and hence are relatively price inelastic. Peak pricing can, if not carefully designed, also raise issues of cost relationship and equity (see ANSConf-WP/14 on Application of advanced economic principles in setting airport and air navigation service charges). High minimum charges have, however, proven effective moving general aviation traffic from congested major airports principally serving commercial traffic, to secondary airports primarily catering to general aviation.

3.7 As regards slot allocation, the Secretariat has recently carried out a *Study on the Allocation of Flight Departure and Arrival Slots at International Airports*. This study was reviewed by the Air Transport Committee in March 2000 and, following a number of revisions to reflect comments of Committee Members, now appears as Appendix B to this paper. The study concentrates on: the regulatory implications of the current situation and trends for airports where the demand for airlines to use the airport exceeds its capacity (on a continuous basis or during peak periods); the regulatory framework involved; and the means by which States, airports and airlines have sought to alleviate or minimize this situation. The study also assesses current and potential mechanisms for dealing with a chronic shortage of airport capacity and suggests possible improvements (see paragraphs 5.10 through 5.18). The study is expected to be published as an ICAO circular later this year, taking into account any comments and related guidance that may be developed by the present Conference

3.8 While the study addresses the linkage between airspace congestion and airport congestion, it does not address the potential issue of slot allocation for air traffic management *per se*, focusing on airport capacity management (encompassing approach and aerodrome control, runway and terminal capacity). A factor of increasing concern, notably in Europe, is that air traffic capacity management is generally handled by a completely different mechanism to airport capacity management, with different planning and implementation time frames.

4. Action by the Conference

4.1 The Conference is invited to note this paper and:

a) review the attached *Study on the Allocation of Flight Departure and Arrival Slots at International Airports* at Appendix B and consider the need for regulatory improvements as suggested in paragraphs 5.10 through 5.18, particularly as regards the independence of slot coordinators; and

b) consider whether there is a need for any other ICAO guidance regarding capacity management at airports or for airspace.

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APPENDIX A

Exhibit 1 - **AIRPORT CAPACITY MANAGEMENT MEASURES**
Number of Airports by Region

	Increased Capacity	Reassign Traffic	Slot Allocation	Peak Charges	High Minimum Charges	Other
Asia/Pacific (13 States)						
In effect	**13**	**1**	**11**	**1**	**2**	**0**
Planned	**14**	**2**	**5**	**2**	**2**	**2**
Middle East (6 States)						
In effect	**4**	**0**	**0**	**0**	**1**	**0**
Planned	**5**	**2**	**1**	**0**	**1**	**0**
Africa (15 States)						
In effect	**23**	**8**	**11**	**1**	**1**	**1**
Planned	**41**	**7**	**2**	**10**	**9**	**1**
Europe (23 States)						
In effect	**52**	**1**	**29**	**16**	**15**	**8**
Planned	**63**	**8**	**12**	**1**	**4**	**2**
In effect		**4**	**1**		**0**	**0**
	4	**2**		**1**	**0**	
Caribbean/Central/South America (6 States)						
fect	**1**	**6**	**15**		**0**	**0**
	12	**10**		**6**	**9**	
Total* (65 States)						
fect	**1**	**20**	**67**		**19**	**9**
	139	**31**		**30**	**25**	**5**

*

Asia/Pacific Australia, Bangladesh, Brunei Darussalam, Indonesia, Japan, Maldives, New Zealand, Singapore, Sri Lanka, ajikistan, Thailand, Uzbekistan and V

Middle East

Africa Botswana, Burkina Faso, Egypt, Eritrea, Gambia, Ghana, Kenya, Mauritius, Namibia, Sao T and Principe, South Africa, unisia, United Republic of T

Eur : ,
Netherlands, Poland, Republic of Moldova, Romania, Russian Federation, Slovakia, urkey
United Kingdom;

: Canada and United States;

: Barbados, Brazil, Costa Rica, Jamaica, Mexico and St. V

Exhibit 2 **- APPROACH AND AERODROME CONTROL CAPACITY MANAGEMENT**
Number of States by Region

	Increased Capacity	Slot Allocation	Peak Charges	High Minimum Charges	Other
Asia/Pacific (11 States)					
In effect	**8**	**7**	**3**	**0**	**1**
Planned	**6**	**2**	**5**	**0**	**1**
Middle East (8 States)					
In effect	**4**	**3**	**0**	**1**	**0**
Planned	**1**	**4**	**2**	**0**	**0**
Africa (13 States)					
In effect	**10**	**3**	**0**	**0**	**0**
Planned	**9**	**3**	**3**	**2**	**1**
Europe (17 States)					
In effect	**10**	**5**	**0**	**2**	**2**
Planned	**9**	**1**	**1**	**0**	**1**
North America (2 States)					
In effect	**2**	**1**	**0**	**0**	**1**
Planned	**1**	**0**	**0**	**0**	**0**
Caribbean/Central/South America (4 States)					
In effect	**3**	**2**	**0**	**0**	**0**
Planned	**1**	**1**	**1**	**0**	**0**
Total* (55 States)					
In effect	**37**	**21**	**3**	**3**	**4**
Planned	**27**	**11**	**12**	**2**	**3**

* Based on information received from the following States:

Asia/Pacific: Australia, China (Hong Kong SAR), Maldives, New Zealand, Singapore, Sri Lanka, Tajikistan, Thailand, Turkmenistan, Uzbekistan and Viet Nam;

Middle East: Bahrain, Iran (Islamic Republic of), Jordan, Kuwait, Lebanon, Oman, Qatar and Saudi Arabia;

Africa: Botswana, Burkina Faso, Egypt, Eritrea, Gambia, Kenya, Mauritania, Namibia, South Africa, Swaziland, Tunisia, Uganda and Zimbabwe;

Europe: Belgium, Czech Republic, Finland, France, Georgia, Germany, Greece, Iceland, Ireland, Netherlands, Poland, Portugal, Republic of Moldova, Russian Federation, Sweden, Switzerland and the former Yugoslav Republic of Macedonia

North America: Canada and United States;

Caribbean/Central and South America: Bolivia, Brazil, Costa Rica and Mexico.

Exhibit 3 - **NATIONAL EN ROUTE CAPACITY MANAGEMENT**
Number of States by Region

	Increased Capacity	**Slot Allocation**	**Charging Mechanisms**	**Other**
Asia/Pacific (10 States)				
In effect	**8**	**4**	**1**	**1**
Planned	**5**	**3**	**0**	**1**
Middle East (7 States)				
In effect	**5**	**1**	**1**	**0**
Planned	**2**	**2**	**1**	**0**
Africa (11 States)				
In effect	**6**	**1**	**0**	**1**
Planned	**9**	**3**	**1**	**0**
Europe (18 States)				
In effect	**10**	**4**	**0**	**3**
Planned	**10**	**1**	**1**	**3**
North America (2 States)				
In effect	**2**	**1**	**0**	**0**
Planned	**1**	**0**	**0**	**0**
Caribbean/Central/South America (3 States)				
In effect	**2**	**1**	**0**	**0**
Planned	**1**	**0**	**0**	**0**
Total* (51 States)				
In effect	**33**	**12**	**2**	**5**
Planned	**28**	**9**	**3**	**4**

* Based on information received from the following States:

Asia/Pacific: Australia, China (Hong Kong S.A.R), New Zealand, Singapore, Sri Lanka, Tajikistan, Thailand, Turkmenistan, Uzbekistan and Viet Nam;

Middle East: Bahrain, Iran (Islamic Republic of), Jordan, Kuwait, Lebanon, Oman and Saudi Arabia;

Africa: Botswana, Egypt, Eritrea, Kenya, Mauritania, Namibia, South Africa, Swaziland, Tunisia, Uganda and Zimbabwe;

Europe: Bulgaria, Czech Republic, Finland, France, Georgia, Germany, Greece, Iceland, Ireland, Netherlands, Poland, Portugal, Republic of Moldova, Russian Federation, Slovakia, Sweden, Switzerland and the former Yugoslav Republic of Macedonia

North America: Canada and United States;

Caribbean/Central and South America: Bolivia, Brazil and Mexico

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APPENDIX B

STUDY ON THE ALLOCATION OF FLIGHT DEPARTURE AND ARRIVAL SLOTS AT INTERNATIONAL AIRPORTS

FOREWORD

Introduction

During the past ten years, the increase in commercial air services has continued to outstrip the available capacity at more and more airports. Although many of these airports are located in Europe, there are growing numbers in other regions as well. Moreover, because of the interconnected aspect of air transport, capacity constraints at some airports impact on other airports within the international air transport system. Environmental, economic, political and physical constraints on increasing airport capacity have, in some instances, exacerbated this problem.

Governments, airlines and airports have each developed measures designed to overcome or ameliorate situations of insufficient airport capacity. However, governments are increasingly likely to face additional situations where the demand by airlines to initiate or increase commercial operations cannot be met because of a lack of airport capacity.

In the light of this, the ICAO Council included in the *Programme Budget of the Organization for 1999-2000-2001*, a study on the regulatory implications of slot allocation at airports, for submission by the Secretariat in the fourth quarter of 1999. This study accordingly concentrates on the regulatory implications of the current situation and trends for airports where the demand by airlines to use the airport exceeds its capacity (on a continuous basis or during peak periods); the regulatory framework involved; and the means by which States, airports and airlines have sought to alleviate or minimize this situation. The study also assesses current and potential mechanisms for dealing with a chronic shortage of airport capacity and suggests possible improvements of and alternatives to the existing systems. While the study addresses the linkage between airspace congestion and airport congestion, it does not address the potential issue of slot allocation for air traffic management *per se*, focusing on airport capacity management (encompassing approach and aerodrome control, runway and terminal capacity).

Sources

The Bibliography, which appears at the end of this study, has been extensively referenced. The study was prepared in the Air Transport Bureau of ICAO, with information and assistance provided by the Air Navigation and Legal Bureaux, Airports Council International (ACI) and the International Air Transport Association (IATA). A draft was reviewed by the ICAO Air Transport Committee in March 2000 and the present text includes a number of revisions to reflect comments of Committee Members.

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EXECUTIVE SUMMARY

1. Although the situation of individual airports with capacity constraints varies widely, with the steady increase in air traffic it is clear that more and more States will be confronted with difficult slot allocation decisions. These decisions will be particularly difficult in the international arena because, as a market access issue, this involves which airlines will operate to/from a capacity-constrained airport and which will not, often when airlines from both groups have the underlying traffic rights and authorization to operate international air services to/from the city in which the airport concerned is located.

2. Increasing airport capacity through new or enlarged airports, runways and terminals is clearly the best solution for a capacity-constrained airport. However, it is equally clear that this solution is not feasible at a number of airports with environmental, physical and other constraints which prevent their replacement or expansion. For these cases, States must find some means to deal effectively and fairly with situations where the demand to operate commercial air services exceeds the capacity of the airport.

3. Measures to manage a lack of airport capacity can ameliorate the situation in the short term and help to avoid bilateral disputes related to the allocation of airport slots for international services. Improvements in air traffic control and groundside facilitation as well as to existing mechanisms for slot allocation can increase the use of existing capacity and thereby provide some relief for a shortage of airport capacity.

4. Some issues related to capacity-constrained airports will involve broader regulatory policy questions, such as enhancing competition, avoiding excessive concentration and abuses of dominant positions, as well as the compatibility of broad market access with capacity-constrained airports. Although the broad grant of traffic rights bilaterally and regionally with multiple airline designation creates additional potential demand for airport slots, it also provides some relief in the flexibility to use alternate airports and cities which can accommodate new and increased air services.

5. A number of States will nevertheless have the task, in the long term as well as the short term, of balancing conflicting objectives in terms of which international air services will be able to use their capacity-constrained airports. In fashioning responses to this problem, States will have to take into account the legal framework provided by the Chicago Convention, air services agreements, regional and national slot allocation rules and existing voluntary mechanisms for managing insufficient airport capacity. However, the response will have to fit the situation of the individual airport(s) concerned and will therefore vary, depending on the nature of the constraint and the means taken to overcome it.

CHAPTER 1

TERMINOLOGY

1.1 For the purposes of this study the following terms and definitions have the meaning indicated.

Airport capacity – the amount of passengers and cargo which an airport can accommodate in a given period of time; it is a combination of *runway capacity* and *terminal capacity.*

Airport slot – a designated day and time (usually within a 15- or 30-minute period) for an aircraft to arrive at or depart from an airport.

Air Traffic Control (ATC) slot – the take-off or landing time of an aircraft which is assigned by the relevant ATC authority to make optimum use of available capacity at points en route or at the destination airport by sequencing the air traffic to regulate its flow efficiently.

Capacity-constrained airport – an airport at which the demand for airport slots for commercial operations exceeds the available supply

Curfew – a period of time during which no commercial flights are allowed to use an airport, for example, between midnight to 0600 hours local time, almost always to reduce the adverse effects of aircraft noise on nearby communities.

Historical slot – in IATA Schedule Coordination Procedures, a slot which has been operated by an airline in the previous similar season (e.g. summer to summer).

IATA Schedule Coordination Conference – a voluntary assembly of both IATA and non-IATA airlines for the sole purpose of providing a forum for reaching consensus on the schedule adjustments necessary to conform to airport capacity limitations.

Noise limitation – a restriction on the use of an airport by certain aircraft which do not meet an aircraft noise criterion, e.g. exceeding the noise levels in Volume I, Chapter 3 to Annex 16 of the *Convention on International Civil Aviation* (the Chicago Convention).

Runway capacity – the number of aircraft movements which aeronautical authorities determine can safely be operated, usually stated as the total number of landings and take-offs per hour.

Slot retention requirement – a specific level of use required during a certain period of time to retain an assigned airport slot, usually stated as a percentage, e.g. 80 per cent of the maximum possible operations; sometimes referred to as a “use or lose” rule.

Terminal capacity – the number of passengers and tonnes of cargo per hour which can be processed in a terminal building (sometimes referred to as *passenger* or *cargo throughput)*.

Window – a period of time during which a non-stop flight between two airports can operate when one or both of the airports concerned is not open 24 hours a day.

CHAPTER 2

CURRENT SITUATION AND TRENDS

The concept of airport capacity

2.1 Airport capacity is a combination of runway and terminal capacity. The runway capacity is determined by the aeronautical authorities, usually in terms of the number of movements (landings or take-offs which can safely be performed per hour), taking into account such factors as the physical characteristics of the runway and the surrounding area, altitude, the types of aircraft involved (larger aircraft may mandate greater separation) and air traffic control (approach and aerodrome control) capabilities.

2.2 Terminal capacity is the amount of passengers and cargo which the airport can accommodate in a given period of time, sometimes referred to as passenger or cargo throughput. The type of passenger or passenger mix can influence the rate of passenger throughput. International passengers who have to clear customs and immigration require more time and space than domestic passengers who are not subject to these procedures. Domestic and international cargo presents a similar situation. Thus, in general, terminals with a high percentage of domestic passengers and cargo will have a greater passenger and cargo capacity than those with a substantial percentage of international passengers who must comply with customs and immigration procedures. However, where a substantial part of international passenger and cargo traffic does not need to clear immigration/customs, the capacity will be closer to a predominantly domestic traffic mix, although additional facilities such as transit areas for passengers and controlled access areas for cargo will often be required.

2.3 Aircraft size can also affect terminal capacity. For example, a seven gate terminal may readily accommodate a mix of small and large jet aircraft. However, if there are seven wide-bodied aircraft at these gates at the same time, there could be an unacceptable level of passenger congestion in the terminal and gate areas, overloading of baggage processing facilities and possible delays to flights. Theoretically, the terminal's gate capacity is seven aircraft; from a practical standpoint, the usable capacity needs to take into account aircraft size and expected load factors.

2.4 Matching runway and terminal capacity to the demand for use of the airport requires careful planning analysis and cooperation between aeronautical authorities, airports and airlines. It is important that this coordination and cooperation involve all entities concerned, for example aeronautical authorities and airlines from countries outside regions with capacity-constrained airports to ensure, for example, that measures to ameliorate a lack of capacity at those airports do not have unintended effects in airports outside of the region.

2.5 Traffic patterns, based on the underlying demand for air services and air carrier practices, can also influence the use of available capacity. Certain days and certain hours of the day when passengers prefer to fly, or when efficient scheduling through several airports on a flight itinerary dictates, can result in peak periods in which airport capacity will be fully utilized. There are, of course, seasonal peaks as well, for example, those associated with tourist traffic during the summer. The airline scheduling practice of hub-and-spoke operations in which banks or waves of flights arrive at an airport from many origins and depart shortly thereafter to many destinations, although minimizing the time passengers spend changing planes, creates a

series of peak periods throughout the day. When these banks of flights increase and spread so as to be continuous, the capacity of the airport is fully utilized.

2.6 Airport capacity can also be adversely affected by external factors, such as environmental restrictions and air traffic control capabilities.

2.7 Efforts to minimize the effect of aircraft noise on surrounding areas by curfews, or night limitations on the type of aircraft which can use the facility, can reduce airport capacity not only at the airport with the curfew but at other airports as well. For example, a prohibition on take-offs and landings at an airport between 2400 and 0600 hours creates a comparable period of unusable capacity at other airports insofar as services to or from the airport with the curfew is concerned. This band of "dead time" for services between an airport with a curfew and others which do not have this limitation varies with the number of time zones crossed and flight time. Where both airports have curfews and are distant from each other, the available time for a flight to operate between them is further narrowed. In industry terms, this is referred to as a "window" – a period of time in which flights between airports with curfews must operate in order to comply with the curfew(s) concerned.

2.8 Airport capacity can obviously be directly affected by the capabilities of the air traffic control systems, both at the airport itself (approach and aerodrome control) as well as for en-route navigation to and from it. Relatively low movement rates at an airport with available runway and terminal capacity can indicate a lack of capacity in the relevant air traffic control systems involved.

2.9 Finally, there can be political impediments to increasing airport capacity by constructing new or enlarging existing airports. These may be rooted in the status of private property in the legal system, or more broadly may reflect views adverse to air transport *per se*, based on a belief that this economic activity is neither necessary nor desirable.

2.10 Given the many variable factors which impact on it, airport capacity tends to be unique to a specific facility. An airport with many aircraft movements may have no formal capacity allocation mechanism; another with much fewer aircraft movements may require one. Regulatory mechanisms to deal with a lack of airport capacity for commercial air services need to take these variations into account. What works in one instance may well be counter-productive in another.

The concept of an airport slot

2.11 All formal mechanisms for dealing with a lack of airport capacity are based on the concept of an airport slot which is the time that an aircraft is expected to arrive or depart from a capacity-constrained airport. For commercial operations which use airport gates this time is calculated when the aircraft arrives at or leaves the gate. To take into account variations in flight times, unavoidable delays, etc. airport slots may actually be allotted in terms of a time period, such as 16:45 to 17:00. Airline schedules, of course are stated in more precise terms and, for example five flight arrivals in that time period could each appear in the respective airlines' schedules at a specific time, for example 16:45, 16:48, 16:52, 16:53 and 16:58. However, different airlines may schedule their flight departures at the same time (for commercial or operational reasons), for example on the hour, which at busy airports can exacerbate peaking and often result in aircraft having to wait in line for a take-off clearance.

2.12 An airport slot should not be confused with an air traffic control (ATC) slot , the take-off or landing time of an aircraft which is assigned by the relevant ATC authority to make optimum use of available

capacity at points en route or at the destination airport by sequencing the air traffic to regulate its flow efficiently. Thus, as noted in the preceding paragraph commercial operations may not land or take off in the same order as reflected in their respective schedules, but at times which would enable air traffic control to regulate efficiently the flow of aircraft into or out of the airport and the en-route system. This may involve, for example, interspersing commercial flights with general aviation flights and varying the order of take-off or landing to take account of greater separation requirements for larger aircraft, late arriving aircraft, etc. With the assignment of an airport slot, airlines can build their schedules, taking into account time to taxi to and from gates and customary en route time, on the assumption that an ATC slot will be made available as close as possible to the time necessary for the flight to operate on schedule. This underlies the importance of close coordination between the coordinator assigning the airport slots and the air traffic control authorities responsible for flowing aircraft into take-off, landing and the en route system.

2.13 An airport slot is an essential element in order to mount commercial services at an airport which has a slot allocation regime, but it is also part of a multi-faceted package of services and facilities provided by different entities, such as gates, air traffic control, ground handling, passenger and cargo processing – all of which require close coordination and cooperation between and among national authorities, airports and airlines.

2.14 In a few slot allocation regimes, procedures have been different depending on the type of entity using them. Thus, there can be commuter slots, air carrier slots, new entrant (to a city-pair market) slots, and slots for general aviation, military, domestic or international flights.

2.15 There has been a continuing debate as to the "ownership" of airport slots primarily in terms of claims by airlines which have historically used them for long periods of time. However, some formal regulatory regimes either explicitly or implicitly exclude this concept, for example, stating that airlines do not acquire property rights to the slots assigned to them and that the slots must be returned to the aeronautical authority under certain circumstances. The implicit approach ties the continued use of the slot to its use at a specified level (e.g. 80 per cent) and allows the exchange of slots on a one-for-one basis. (In one instance in the United Kingdom, a court ruled in March 1999 that financial considerations in connection with an exchange of slots under the European Union (EU) common slot rules did not invalidate the exchange. However, the court did not rule on whether the exchange as such involved real property.)

2.16 Nevertheless, the obvious value in terms of market access of slots at airports with severe constraints on capacity has led to the treatment of these slots as a *de facto* financial asset of the airlines holding them. Thus, the purchase by one airline of another will take into account an estimated value of the airport slots involved. However, regulatory authorities have retained the right to approve or disapprove the transfer of airport slots in this manner, primarily through the approval/disapproval of the purchase or merger involved. The only formal pricing of airport slots has occurred in the United States where the purchase, sale and lease of certain domestic slots at the four airports currently subject to the Federal Aviation Administration's High Density Rule[1] has been permitted since 1986. This has led some airlines serving these airports which purchase such slots to reflect their value as assets in their financial accounts.

Capacity-constrained airports

[1] Chicago O'Hare, New York-JFK, New York-La Guardia and Washington Reagan.

2.17 Where the demand by air carriers for slots at a particular airport exceeds the available supply, the airport can be considered as capacity constrained. However, as noted above, this situation may occur only at certain periods of the day or on certain days of the week, or in certain seasons (such as summer), or in the most severe cases, during all hours the airport is open. Thus, the severity of a capacity constraint can vary widely among airports calling for different measures to deal with different situations. These variations in the extent of the constraint on the supply of airport slots also preclude a precise quantitative definition of a capacity-constrained or congested airport, for example, in terms of aircraft movements or passenger or cargo throughput per hour, as well as making simplistic comparisons among airports on such a basis.

2.18 One means of assessing the current situation and some significant trends in capacity-constrained airports is to examine developments at airports included in IATA's Schedule Coordination Conferences.

2.19 Schedule Coordination Conferences, in which any airline (IATA or non-IATA) may participate, are held twice each year about four months before the start of the summer and winter (northern hemisphere) scheduling seasons to be discussed. Airport capacity limitations applicable for the season under discussion are declared before the Conferences by the appropriate authorities in consultation with airlines. A Coordinator, often a national airline, is appointed by the authorities for each constrained airport – presently around 200 worldwide. About three weeks before each Conference, airlines provide Coordinators with schedule clearance requests for the arrival and departure times required at the airports concerned. The Coordinator collates this information and identifies periods in which slot requests exceed declared airport capacities. Airlines with requests which are regarded as having lower priority are offered the nearest alternative timings available at the commencement of each Conference, and demand is thus reduced to meet capacity. Under historical precedence, a slot request is accepted as receiving priority if the airline operated 80 per cent of the flights scheduled during the same period in the previous year.

2.20 During the Conference, in which over 260 airlines currently participate, schedules are adjusted mainly through bilateral discussions between airlines and Coordinators regarding alternatives offered, or between airlines to exchange slots offered or accepted. A schedule change at one airport of course affects one or more other airports. Because all Coordinators attend the Conference, it represents a viable forum in which all such repercussive changes can be quickly and efficiently processed. The entire process is based on consensus.

2.21 To reflect different degrees of capacity constraints, the Conference and the related IATA Schedule Coordinating Procedures have two different levels for resolving scheduling difficulties at an airport. Airports which are designated as *schedules facilitated* are those where demand is approaching capacity and where voluntary cooperation in adjusting schedules can be used to resolve, for example, an emerging shortage of slots at certain periods during the day. Airports which are designated as *fully coordinated* are those where demand exceeds capacity, it is impossible to resolve the problem through voluntary cooperation, there are no possibilities of resolving the problem in the short term (e.g. through opening a new runway or terminal), and formal procedures are used to coordinate schedules. Where there are seasonal capacity constraints, both these designations can be used with airports being fully coordinated in the summer and with schedules facilitated in the winter.

2.22 The extent on a global basis of the problem of capacity-constrained airports can be roughly estimated by seeing how many airports which are fully coordinated under the IATA system are included in the most active airports in the world on the basis of annual movements (total take-offs and landings). Of the top twenty-five such airports in 1998, only four were fully coordinated under the IATA system. However, twenty-two of these airports are located in the United States, which, with a large domestic market and

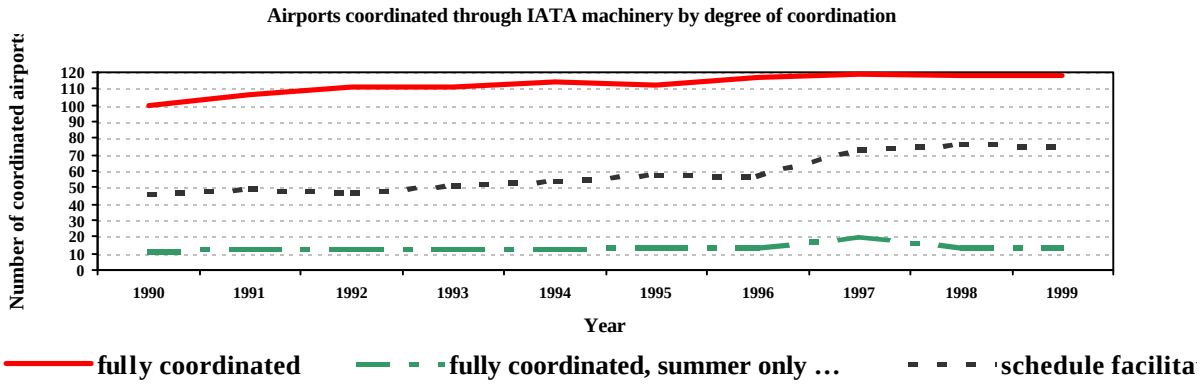
extensive use of the hub-and-spoke system, could be expected to produce a large number of movements per airport. However, when the measure is the total number of passengers, thirteen of the top twenty-five airports were fully coordinated in the IATA system in 1998. Moreover, ranking the top twenty-five airports in terms of international passengers in 1998 shows twenty-two were fully coordinated under the IATA system. Finally, the twenty-one airports involved in the top twenty-five city-pairs based on international scheduled traffic in 1997 were all included in the IATA coordination system. Thus, the problem of capacity- constrained airports appears to have a greater impact on international than on domestic passenger traffic, which tends to be concentrated in airports that are not capacity constrained.

2.23 A more precise estimate of the extent of the problem of capacity-constrained airports can be made by analyzing changes in the number of airports which are coordinated in the IATA system. For this assessment it is assumed that, in general, airports using the schedule facilitation approach are less constrained than those which are fully coordinated with airports which are only fully coordinated in the summer falling between these two levels.

2.24 As indicated in **Table 1** below, the number of airports coordinated under the IATA system grew at varying rates from 1990 to 1999, depending on the procedure involved. The growth over this period for fully coordinated airports was approximately 18 per cent; for those fully coordinated only in the summer, there was a slight increase; while, for airports using the schedule facilitation approach, there was a high growth of about 63 per cent. The figures in Table 1 may overstate the extent of capacity constraints in terms of fully coordinated airports because a number of airports in this category have low annual totals of aircraft movements. For example, there are twenty fully coordinated airports with an average of twenty-four movements a day or less, or the equivalent of about two landings or takeoffs per hour in a 12-hour period of operation. One possible explanation is that some small tourism and island airports may have limited terminal capacity which cannot accommodate more than a few large aircraft, but runway capacity would be available for additional commercial services. A year-round peaking problem may also be a determining factor. However, in some instances IATA has noted a tendency to designate airports as fully coordinated. A thorough capacity analysis would indicate that a lesser level of coordination could probably resolve a particular capacity problem, for example, as fully coordinated in the summer season and schedule facilitated in the winter. Designating an airport as fully coordinated brings into play formal assignment of slots (as well as the 80 per cent retention requirement). Airlines which are anxious to confirm an airport slot for future use could be expected to press for a fully coordinated status. Also, some authorities might regard a fully coordinated airports as a sign of a modern air transport system; others might view this as a means of exercising greater control over the use of the airport by non-national air carriers.

Table 1

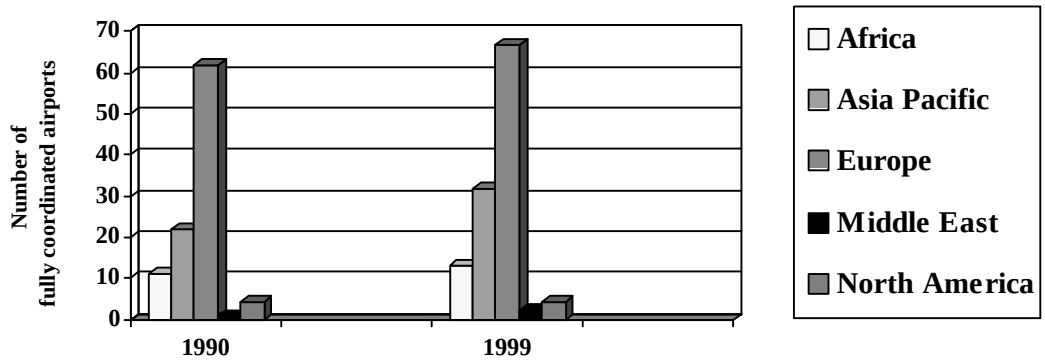
Airports coordinated through Schedule Coordination Procedures by degree of coordination



2.25 The geographic distribution of fully coordinated airports over the past ten years is shown in **Table 2** below. These airports tend to be concentrated in Europe. One major factor contributed to this is the impetus given by the introduction of the 1993 EU common rules on slot allocation (see Chapter 3), which led to many additional airports being designated as such by national administrations, hence also in the IATA system. There have also been increases in fully coordinated airports in other regions, particularly in the Asia/Pacific in the second half of the period, reflecting strong traffic growth in that area. The absence of airports in South America and the Caribbean in either the list of fully coordinated airports or the list of those using the schedule facilitation approach is probably due to a combination of factors, including the use of national slot allocation procedures, timely expansion of airport capacity, an historical preference for predetermination of capacity authorized and a large proportion of international origin and destination traffic. (Only two airports in this region are included among the top 100 airports in the world in terms of aircraft movements and there are none in the top twenty-five airports ranked by total or by international traffic.)

Table 2

Airports coordinated through Schedule Coordinating Procedures by region



2.26 The changing classification of airports between the IATA levels of coordination should give an indication of improvements in airport capacity or the lack thereof, or increases or decreases in traffic, depending on which direction the change takes. For example, in the absence of any change in capacity and with steadily increasing traffic, one would expect a change from schedule facilitated to fully coordinated status. Improvements in capacity or declines in traffic would see a progression in the opposite direction. With respect to changes to fully coordinated airports between 1990 and 1999, twenty-four airports were added and six were dropped for a net gain of eighteen. In addition, during that period, there were five airports that were fully coordinated for short periods. Eight airports out of the increase of eighteen fully coordinated airports in the period 1990 to 1999 came from the schedule facilitated level; four airports in this period moved from fully coordinated to schedule facilitated. Airports usually drop from fully coordinated status because of major increases in capacity from new or expanded airports, runways, or terminals. Conversely, a strong, unanticipated surge in traffic can quickly exhaust available airport capacity and suddenly push an airport into a fully coordinated status.

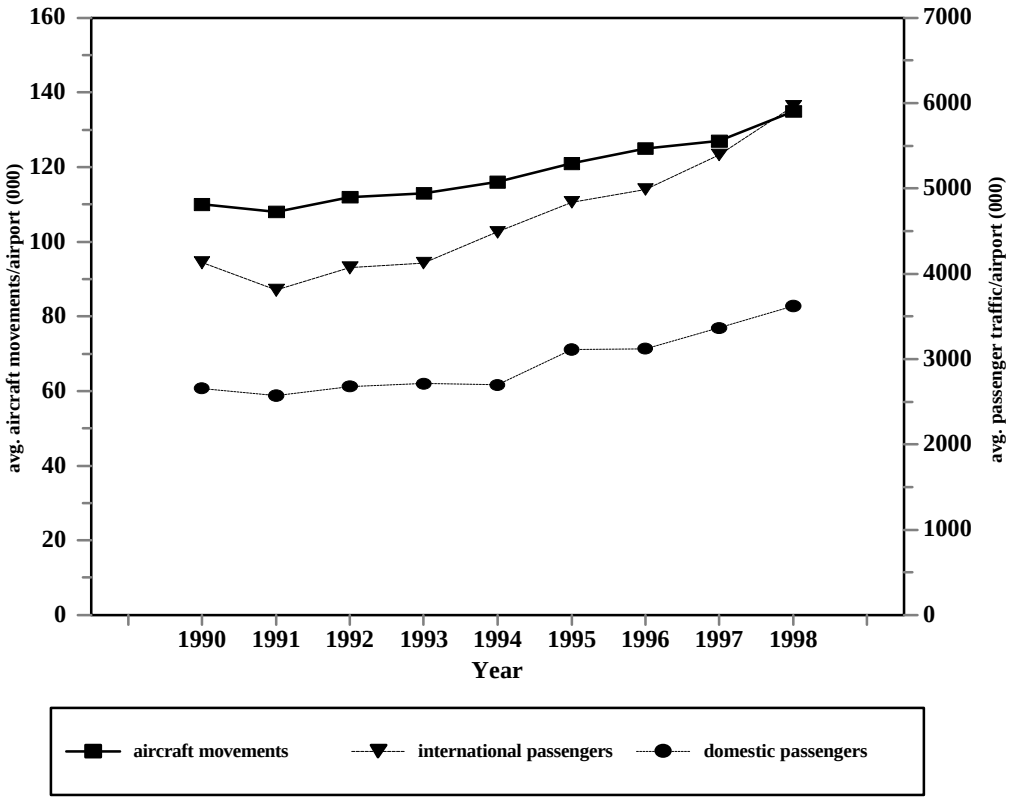
2.27 Two more significant trends are: (1) a strong tendency of fully coordinated airports to retain that status; and (2) the sharp increase in schedule facilitated airports in 1997 (see Table 1). On the first point, ninety-seven of the airports which were fully coordinated in 1990 were fully coordinated in 1999, evidence of a persistent lack of capacity. A similar situation prevailed with airports fully coordinated only in the summer season; twelve of fourteen airports in this category were so classified for the entire ten-year period. This indicates a fairly stable seasonal market with a corresponding lack of capacity for part of the year. On the second point, there is clearly less stability in the category of airports using schedule facilitation, with thirty-three airports in this category in 1999 which were not classified as such in 1990 and thirty-eight airports in that category at the beginning of the period which were also in the same category at the end. Here, there were greater percentage increases in each of the other regions than the percentage increase for Europe, an indication that capacity constraints are emerging on a wider scale.

2.28 However, airports can be fully coordinated because of year-round traffic peaking at certain times of the day. In such cases, there is some additional capacity in terms of unused slots, although this may be at odd times of the day. Another means of assessing the global trends in capacity constraints using fully coordinated airports is to look at the increase in average annual movements and passenger traffic at those airports. **Table 3** below presents this information for the period 1990 to 1998, with aircraft movements on

the left-hand scale and domestic and international passenger traffic on the right-hand scale. In each case, the average for the number of airports fully coordinated during that year has been used.

Table 3

Traffic at fully coordinated airports



2.29 Taking into account that the number of fully coordinated airports changes from year to year as airports are added and others are dropped from this category, the modest but steady increase in average movements per airport indicates that, in general, fully coordinated airports are using more runway capacity, and some may face constraints for this component of airport capacity. The average traffic figures do not track the high usage of certain airports for non-commercial (e.g. general aviation, military) purposes or an expansion of commercial services using smaller aircraft. In terms of composition of traffic, there was a slight shift from domestic to international traffic earlier in the period, with an increase in this divergence later in the period. This tends to indicate that, in general, international traffic is gaining a greater share at many slot-controlled airports at the expense of domestic traffic.

External constraints on increasing airport capacity

2.30 External constraints on increasing airport capacity by constructing new or expanding existing airports tend to fall into two broad general areas: environmental considerations and physical limitations.

2.31 In the environmental area, curfews and noise abatement procedures designed to minimize the adverse effect of aircraft noise on communities adjacent to or in the approach path of an airport are used at about 35 per cent of the fully coordinated airports in the IATA system. These measures can vary from an overall annual limitation on aircraft movements to curfews (periods of time, for example 2400 to 0600 hours local time) in which no aircraft can be scheduled to land or take off, to limitations based on the noise characteristics of the aircraft involved. Although it is clear that such measures reduce the capacity of the airport, their quantitative impact is difficult to measure because they tend to be tailored to specific airports or conditions. For example, simple curfews are in effect for thirteen of the fully coordinated airports and three others are not operational during comparable periods at night. Another thirteen airports have curfews of varying periods depending on the noise characteristics of the aircraft concerned with, for example, quieter aircraft being permitted to operate later and begin operations earlier than noisier aircraft. Five have curfews or noise abatement procedures applicable to specific runways and four have requirements that aircraft noise not exceed a specified level.

2.32 The introduction of quieter aircraft is an important factor in providing capacity relief for environmentally constrained airports to help cope with the steady increase in traffic and demand for air services. Over time, however, the number of aircraft movements is likely to increase, notwithstanding the use of larger aircraft. It should be borne in mind that many of these environmental measures are the result of delicate compromises between local populations and the airport and are unlikely to be readily changed.

2.33 There are two aspects to physical limitations on increasing airport capacity. The first is the altitude or surrounding terrain (e.g. mountains) which cannot be changed. The second is the airport location in relation to population or economic activity. Where the airport is located in a densely populated area, the cost of acquiring the land to lengthen a runway or to handle larger aircraft, or to add a new runway, or to expand terminal capacity, may well be prohibitively expensive, even if environmental concerns could be met. If the country itself suffers from a shortage of land, alternative sites for new airports may also be difficult to realize.

2.34 Airports in either of these categories and particularly those in both are most in need of some mechanism for slot allocation.

CHAPTER 3

REGULATORY FRAMEWORK

3.1 The regulatory framework within which slot allocation mechanisms are employed at international airports has three levels: (1) a basic global one based on Article 15 of the *Convention on International Civil Aviation* (Chicago, 1944) supplemented by bilateral and regional air services agreements and arrangements on traffic rights for international commercial air services; (2) a specific regional regulation on slot allocation for countries of the European Union; and (3) national slot allocation rules.

Global

3.2 International access to airports is governed by Article 15 of the *Convention on International Civil Aviation*, the first sentence of which states,

> "Every airport in a contracting State which is open to public use by it national aircraft shall likewise, subject to the provisions of Article 68, be open under uniform conditions to the aircraft of all other contracting States." (Article 68 allows States to designate the routes and airports which a scheduled international air service can use, subject to the provisions of the Convention, including the foregoing one on uniform conditions of access.).

3.3 This provision establishes a national treatment standard for the use of all ICAO Member States' airports for international flights. Thus, where a State has opened a public airport for international air services by its national aircraft, that airport must be open under uniform conditions for the aircraft of all other ICAO Member States to operate the same type of air services. The actual operation of international air services by a national carrier is not required, only authorization to operate.

3.4 Article 15, however, does not itself accord a right to operate international scheduled or non-scheduled air services. Article 6 of the Convention states that "no scheduled international air service may be operated over or into the territory of a contracting State, except with the special permission or other authorization of that State, and in accordance with the terms of such permission or authorization." Although Article 5 allows aircraft engaged in non-scheduled commercial flights to overfly or make non-traffic stops in the territory of a Member State without the necessity of obtaining prior permission, it does require authorization for such commercial flights from any State in which passengers and/or cargo are loaded or unloaded.

3.5 The authorization required for international scheduled air services in Article 6 is customarily accorded on the basis of traffic rights exchanged bilaterally or regionally, which either name a specific city at which such rights may be exercised or make a broader, non-specific grant in terms of any city in a State's territory. Although some bilateral and regional agreements include provisions for non-scheduled flights, the general practice has been for the States concerned to approve such flights on a national basis. Regardless of the underlying source of the authorization to operate international commercial air services, once granted, national treatment and the uniform condition criteria of Article 15 apply.

3.6 A combination of this clear standard of treatment and the practice of having common traffic points for national and foreign airlines may explain why bilateral agreements, except in rare instances, do not deal with slot allocation or access to specific airports. However, air service negotiators have to be mindful of the difficulties of obtaining access to capacity-constrained airports, and take into account that the rights they are seeking for their airlines at those airports may not be able to be exercised for some time.

3.7 The uniform treatment criterion is important not only for access to airports, but also with respect to conditions on their use, particularly for environmental purposes. Thus curfews, or aircraft noise criteria, as well as any exceptions thereto, must be applied uniformly to both national and non-national aircraft engaged in similar international services. Inter-governmental disputes involving airport access under the uniform treatment rule have been rare; it has been more common for airport access disputes to focus on specific cases where airlines which have the underlying route rights to serve a city have not been able to secure access or increase service to that city's airport because of a lack of available slots. In such cases, States have usually relied on the bilateral provision which requires that designated air carriers have a fair and equal opportunity to operate or compete with respect to the services covered by the agreement.

3.8 The national treatment criterion carries over to the area of charges for the use of airports for international flights. The second paragraph of Article 15 states that,

> "Any charges that may be imposed or permitted to be imposed by a contracting State for the use of such airports and air navigation facilities by the aircraft of any other contracting State shall not be higher,
>
> (a) as to aircraft not engaged in scheduled international air services, than those that would be paid by its national aircraft of the same class engaged in similar operations, and
>
> (b) as to aircraft engaged in scheduled international air services, than those that would be paid by its national aircraft engaged in similar international services."

3.9 This requirement has led to airport user charges for national and foreign aircraft being the same for the two types of international services (scheduled and non-scheduled), resulting in non-discriminatory treatment in this area within those categories.

Regional

3.10 Regionally, slot allocation at airports in the European Union (EU) which have been designated as coordinated by the country concerned are governed by Council Regulation No. 95/93 of 18 January 1993 on common rules for the allocation of slots at Community airports. In 1999, sixty-three airports were fully coordinated under European slot rules and eleven were coordinated.

3.11 The common rules and the IATA scheduling system share several features. These include: the use of an airport coordinator, allowing air carriers to freely exchange slots, and a requirement to use a slot at a level of 80 per cent to retain it in a succeeding season. Levels of coordination in the two systems are comparable, "coordinated" in the EU common rules equating to "schedule facilitated" in the IATA system with "fully coordinated" having the same meaning in both systems. Both regimes also have a preference for new entrants (defined as air carriers with less than four slots at a airport on the day on which they are requesting slots) of up to 50 per cent of new or unused slots.

3.12 A key difference between the two systems is that the IATA system is voluntary while the EU common rules are mandatory at airports which EU Member States have designated as coordinated. This designation requires that principles of transparency, neutrality and non-discrimination be met. In addition, a Member State must ensure that airport coordinators carry out their duties in an independent manner. Under certain conditions a Member State may reserve slots for domestic scheduled services on regional routes and on routes where public service requirements have been imposed under Community legislation, and the common rules may be suspended in whole or in part with respect to third countries which do not accord Community air carriers comparable or national treatment or which grant more favourable treatment to other third country airlines.

National

3.13 One of the oldest national regulations on slot allocation is the high density airport rule of the United States Federal Aviation Administration which was introduced in 1968 to meet a temporary air traffic control problem.

3.14 In 1999, the high density rule applied to two international airports, Chicago O'Hare and New York-JFK (both of which are also fully coordinated under the IATA scheduling system), and two airports designated as domestic (New York-La Guardia and Washington Reagan, although both offer services to Canadian points). The rule has evolved and changed over the years, but it retains some features which it shares with the IATA and the European systems, such as air carriers being able to continue to use seasonal slots which have been used in a previous similar season for international services, allowing air carriers to exchange slots on a one-for-one basis, and a preference for new entrants. However, unlike the IATA and the EU systems, slot allocation at high density airports in the U.S. is directly operated by the aeronautical authorities.

3.15 The high density rule is considerably more complex than either the IATA or the EU systems, largely because it creates separate limits for different categories of users within an overall hourly or half hour limit on takeoffs or landings (described as Instrument Flight Rule - IFR - operations per hour) and because it permits the purchase, sale or lease of slots for certain domestic air services. The simplest of the prescribed limits is at Newark airport where the IFR operations per hour cannot exceed forty for air carriers, ten for commuters and ten for other; however, slot reservations or assignments are not currently required at this airport. The hourly limits at New York-JFK airport vary during the period 1500 to 1900 hours from sixty-three to eighty for air carriers, from ten to fifteen for commuters and from none to two for other. At Chicago O'Hare airport, there are limitations for both half-hours and hours from 0645 until 2115 hours, with the number and type of operations (air carrier, commuter and other) varying to take into account peak periods of traffic throughout the day.

3.16 The introduction in 1986 of selling, purchasing, and leases of airport slots for domestic services at the United States airports subject to the high density rule required separate procedures for allocating slots for international services and for domestic services classified as essential air services, which cannot be bought, sold or leased. In effect, there are separate pools of slots for international, essential air services and domestic air services with the pool for domestic air services sub-divided by air carrier, commuter, and other. If no slot is available for an international service by a foreign airline during the period requested, a slot may be withdrawn from domestic service to satisfy the request at New York-JFK airport, but not at Chicago O'Hare, where the Secretary of Transportation has statutory authority to grant an exemption to the slot allocation rule to enable United States and foreign air carriers to provide foreign transportation using Stage 3 aircraft (equivalent to ICAO Annex 16, Volume I, Chapter 3), if he finds such action to be in the

public interest. In addition, the high density rule contains a reciprocity provision similar to that of the EU, permitting its suspension for an air carrier or commuter operator of a country that provides slots to United States air carriers and commuter operators on a more restrictive basis than the United States rule.

3.17 In 1995, the United States Department of Transportation conducted a comprehensive and detailed study of the high density rule, looking specifically at the expected results, based on the situation in 1993, of four alternatives: (1) eliminating the high density rule; (2) phasing it out over 5 years; (3) keeping the rule but adding some slots; and (4) lifting the rule during certain periods when airport operations are not congested. In March 2000, legislation was in hand which would phase out the high density rule with exemptions being used during the transition period.

CHAPTER 4

MEASURES TO DEAL WITH SCARCITY

4.1 States, airports and airlines have sought to deal with insufficient airport capacity through measures that focus on either increasing capacity or managing the lack thereof. In economic terms, this focus could be termed a supply side or a demand side approach. Some States where airport capacity constraints have been particularly severe have used one or more measures from both the supply and demand side approaches.

Supply side approaches

4.2 Among the supply side actions which can overcome or reduce a shortage of airport slots are: (1) building new or expanding existing airports; (2) improving air traffic control capabilities with new technology and procedures; and (3) increased efforts and resources in passenger and cargo facilitation.

4.3 With regard to (1), among the airports which were fully coordinated under the IATA system at some point during the period 1990 through 1999, there were six new airports, eighteen new terminals and six new runways. In 1999, there were three new airports, twelve terminals and two runways under construction for airports in this group. Although this expanded capacity permitted some of the airports which had been fully coordinated to require that status no longer, for other airports, particularly those where capacity was added during the early part of this period, growth in traffic appears to have absorbed a large part of the capacity increase. Increases in airport capacity occurred, of course, at airports which were not fully coordinated under the IATA system and these could have a indirect beneficial effect in some instances by relieving traffic pressure on coordinated airports.

4.4 In contrast to increasing the physical capacity, measures (2) and (3) above focus on more efficient use of existing capacity. Improving air traffic control for both en-route and approach/aerodrome control phases which increases the number of movements that can safely be accommodated on a runway obviously increases the number of airport slots available. Thus, governments and airlines alike are making strenuous efforts to improve air traffic control services, notably in the United States and in Europe (where regional organizations are also involved), on the basis that this represents the best short-term means in the face of physical limitations, environmental concerns and other difficulties in expanding airport infrastructure, to increase utilization of existing runways. Of particular note is the endorsement by the transport ministers meeting of the European Civil Aviation Conference (ECAC) in January 2000, which formally launched a “gate-to-gate” air traffic management strategy. Similarly, for passengers and cargo, the use of facilitation measures such as machine readable passports, visa waiver programs, pre-inspection, and electronic cargo clearance increases the number of passengers and cargo which can use existing facilities. Although improvements in capacity use can be demonstrated at individual airports in both these cases, it is difficult to measure on a global basis the amount of an increase in aircraft movements as well as in passenger and cargo throughput that is attributable to better air traffic control and facilitation measures. Because those fully coordinated airports with peaking problems at which increases in aircraft movements, passenger and cargo handled may reflect, in part, increased airport use during non-peak periods.

4.5 In this regard, ACI and IATA have jointly developed guidelines (Guidelines for Airport Capacity/Demand Management, Third Edition, 1996) to assist airport operators and airlines in dealing with

the peaking problem, and in maximizing the utilization of their facilities and other resources (for example, through use of common criteria to improve analysis of supply/demand forecast and capacity constraints; timely consultation and coordination among all concerned parties to identify cause of problems and optimum solutions; and encouragement of use of IATA schedule coordination machinery).

Demand side approaches

4.6 The most widely used mechanism for managing scarcity of capacity at airports on a global basis is the IATA Schedule Coordination Conferences and Procedures, which currently include some 200 airports in schedule coordination efforts. Although the IATA system cannot physically increase airport capacity, it can increase airport use by providing a convenient and transparent mechanism for the over 260 participating airlines to adjust their schedules on a worldwide basis by applying for or trading slots at the fully coordinated airports concerned, working with all the airport Coordinators and airlines involved in a single place - one of IATA's biannual scheduling conferences. The IATA process also helps in squeezing out additional slots through assigning schedule procedures advisors to all coordinated airports and joint missions by its scheduling and operation experts to carry out capacity analyses at airports wishing to become coordinated airports. In this regard, the ICAO Worldwide Air Transport Conference in 1994 concluded that "on slot allocation, no worldwide regulatory arrangement was practicable because of the many varied conditions that existed in and between airports; the continued use of the IATA scheduling committees for slot allocation continued to prove a viable way to deal with the problem of slot allocation for congested airports".

4.7 Faced with a scarcity of slots for international air services at their airports States have used the following regulatory policies and practices aimed at the demand side of the problem.

(a) **Set annual limits on the number of aircraft movements or passengers**. Some growth in capacity can occur with a limit on movements by a shift to larger aircraft; an annual passenger limit, on the other hand, tends to result in changes to points served (increased traffic on one city-pair must be balanced by a decrease on another, city-pairs with new services and those with discontinued ones would have to "balance out" in terms of passenger traffic).

(b) **Only negotiate new or expanded traffic rights when these can be accommodated at the airport(s)** concerned. For consistency, policies with respect to increasing the capacity of existing services need to be examined as well. States which follow a policy of predetermination of capacity can take into account constraints on airport capacity.

(c) **Negotiate access to slots bilaterally in advance** of the date on which new capacity in the form of a new airport or airport expansion is completed. Although this may help to defuse bilateral disputes over airport access, it can only be used when new facilities are being constructed.

(d) **Apply a policy of reciprocity** which links the allocation of airport slots to national air carriers at foreign airports to the allocation of slots at national airports to foreign air carriers from the State in which the foreign airport is located. This is only likely to be effective where a foreign air carrier from

a State in which national carriers are having difficulty securing slots seeks to increase capacity at a national airport.

(e) **Develop and encourage the use of alternate airports.** For cities with more than one airport this can involve a formal traffic distribution policy in which certain types of commercial services (e.g. non-scheduled, domestic, or non-stop flights within a specified radius) operate from one of the airports serving a city. However, care must be taken in requiring airlines to change operations from one airport to another serving the same city so as not to place them at a disadvantage vis-a-vis competing airlines (a factor which is particularly important for major gateway airports and airports which have a high proportion of connecting traffic). Another approach is to improve access and facilities of lesser used airports to increase their attractiveness for commercial services.

(f) **Recognize the linkage between noise rules and demand.** Although aimed at minimizing the effect of aircraft noise on communities surrounding the airport, noise rules can also have an effect on the demand side. For example, rules requiring that aircraft meet ICAO Annex 16, Volume I, Chapter 3 or individually set noise standards to use an airport during certain periods, or the use of "noise budgets" which seek to spread landings and take-offs by noisier aircraft during the day, can result in a reduction in demand or a system of traffic distribution based on noise criteria rather than airline, passenger or shipper preference.

(g) **Employ peak period pricing** in landing charges to help spread the demand for slots to periods when the airport's capacity is not fully utilized. Thirty-eight of the 118 fully coordinated airports in the IATA scheduling system levy such charges. (In addition to being a capacity management tool, peak period pricing also recovers the cost of providing additional facilities needed, such as gates or parking areas, needed because of the increased use of the airport during peak traffic periods.) Spreading demand by inducing airlines to shift flights to less congested periods to avoid a peak period charge has proved to be of limited effectiveness because of the small impact on the overall operating costs of airlines (landing and associated airport charges overall currently represent about 4 per cent of worldwide airline operating expenses) and because of the impracticality of operating many of the flights concerned at other times. It has had some impact in the short term, at least until traffic peaks become continuous throughout the airport's operating hours. It is less effective in instances where a substantial number of flights in the peak period are also in a "window" that precludes their moving to another time outside of the peak period. In some instances airlines may prefer to remain in the peak period because of the attractiveness of their schedule to passengers, simply passing on the cost of the peak period charge in the form of higher fares. Ultimately, it will be passengers and shippers who will determine whether they are prepared to accept a higher price for travel at a peak period, and hence who will shape the balance of supply side criteria.

4.8 As indicated, all these demand side approaches have drawbacks. They also have to be considered against the broader policy aspects of the Article 15 of the Chicago Convention, international air services agreements (obligations and commitments regarding market access) and competition (notably as regards access for new entrants). In this regard, in response to a recommendation of the Worldwide Air Transport Conference in 1994, the ICAO Secretariat developed some purely indicative, preferential measures for developing countries for consideration and use by States (now published as Appendix 3 of Doc 9587, *Policy and Guidance Material on the Economic Regulation of International Air Transport*, Second Edition, 1999), which include the following proposed measures on slot allocation, with associated commentary:

> "Potential preferential measures
>
> At airports where demand for slots exceeds supply, preference could be accorded to air carriers from developing countries in two ways with respect to the use of airport slots:
>
> 1) to give priority to their requests when new slots are made available by increases in airport capacity or when slots are made available as a result of a "use-or-lose rule;
>
> 2) where a "use-or-lose" rule applies, to apply a less rigorous "use-or-lose" criterion for slots presently held by air carriers of developing countries.
>
> Comments
>
> The existing IATA scheduling committees for slot allocation continue to provide a viable way to deal with slot allocation problems at congested airports. However, since most carriers of developing countries have a smaller fleet and usually operate less frequency than their counterparts from the developed States, certain preference accorded to them would help alleviate potential difficulties in scheduling their operations, thus assist the participation objective.
>
> The European Union has introduced regulation in respect of slot allocation, under which, *inter alia*, a certain percentage of the newly available slots must be allocated to new entrant carriers. In a similar situation, the request of a developing country carrier, particularly for slots required for starting a new service, could be given similar treatment as that accorded to new entrant carriers in the group."

CHAPTER 5

ASSESSMENTS OF EXISTING MEASURES, PROPOSED IMPROVEMENTS AND ALTERNATIVES

Assessments of existing measures

5.1 In assessing the existing measures for dealing with a lack of airport capacity, there are those which have resolved this problem and those which have served to ameliorate it. The first group of measures involve physically increasing capacity; the second involves making more efficient use of existing capacity.

5.2 Clearly, increasing airport capacity through new or expanded airports, runways and terminals has the greatest impact on resolving a scarcity of slots. However, these types of improvements usually take years to put in place and, in some cases, the additional capacity is quickly used up by traffic growth. Moreover, it is also equally clear that for some airports environmental and physical constraints make a substantial expansion of the existing facilities impractical or prohibitively expensive. Nevertheless, even at these airports incremental capacity increases are possible.

5.3 Improvements in facilitation and air traffic control services can be employed to use the existing airport infrastructure more efficiently. These can provide important incremental increases in the number of aircraft, passengers and cargo which can use a capacity-constrained airport, and these merit continuous evaluation by airlines, airport and customs/immigration authorities. Improvements in air traffic control involving coordination with many States can take time and patience, but will ultimately provide benefits in terms of increased use of both en route and airport capacity.

5.4 IATA schedule coordination clearly helps the over 260 airlines which participate to adjust their schedules within the existing airport capacity. However, when slots needed for new or expanded services are at heavily congested airports where new capacity rarely becomes available, it can take years to achieve the combination needed, particularly for an additional long-haul service where the choice of slots are limited to a “window.” The system is transparent in terms of which airlines have slots and what exchanges have occurred, but it remains a voluntary system which is heavily reliant on its success on the impartiality of airport Coordinators and airlines being willing to exchange slots. New entrants are critical of the historical rule which allows an airline to retain the use of a slot it has operated during a previous season which they allege prevents them from mounting competitive services. However, this situation also reflects steady underlying traffic growth at airports where no new capacity is being added and therefore the preference for new entrants of 50 per cent of the new and returned slots does not come into play. A related problem is that of “overbooking” where some of the slots requested and allocated at Conferences are eventually not utilized and other airlines wanting the slots may not be able to use them at short notice; efforts are being made to overcome this by monitoring plans with actuals, establishing overbooking profiles and encouraging prompt release of slots no longer required.

5.5 Although the actions by States to cope with this problem from the demand side described in the previous chapter have ameliorated the situation at specific airports and have thus avoided some bilateral disputes in the short term, they do not represent a long-term solution.

5.6 The European Union’s common slot rules appear to have struck a reasonable balance between the different types of commercial air services using European airports. The use of experienced, independent

slot coordinators at airports also appears to have improved the transparency and functioning of the slot allocation process. One anomaly is that eleven airports in seven EU States have not been designated by the respective State as coordinated and are therefore not subject to the common slot rules, although all these airports are coordinated within the IATA system. Designation by the States concerned would result in a more uniform treatment for EU airports.

5.7 The U.S. high density airport rule, although applicable to only three international airports, generally treats international services differently, for example, not applying the buying, selling and leasing provisions to slots used for international services[2]. The allocation of slots for international services for foreign air carriers are linked to obligations in U.S. bilateral agreements and reciprocal treatment and those for U.S. air carriers are based on fairness and competitive considerations. However, the rule was never extended to other airports and, over the years, the system became increasingly complex and difficult to administer, particularly when exemptions from the rule were allowed for particular types of services. Among the factors leading to the proposal to phase out the high density rule is the anticipated increase in airport capacity envisioned from a modernized air traffic control system as well as the availability of alternative airports, a perception that the rule had contributed to unfair competitive situations as well as a loss of air services to smaller communities, and the incongruity of government implementation of detailed provisions on market access where the basic policy relies on the provision of air services being determined by consumer demand.

5.8 As noted in Chapter 3, all of the current mechanisms for slot allocation have provisions for a preference for new entrants as a means of maintaining and stimulating competition. The effectiveness of the new entrant rule is difficult to assess both because new and returned slots have not been plentiful and because other factors have played a role in the success and failure of new air carriers and new services by established ones. The U.S. DOT's assessment of the high density rule revealed that, despite efforts to provide mechanisms for new entry into airports subject to the high density rule, as of January 1990, of the 145 slots made available to new entrants and limited incumbents, only fifteen were still in the possession of the original holders. Consequently, attention in the U.S. has shifted to a more comprehensive examination of aspects of airport operations, such as access to gates and ground-handling arrangements, which affect the competitiveness of air services.

5.9 Internationally, the question of slots held by airlines in alliances has become an issue in the assessment of potential anti-competitive effects of such alliances, with differing proposals for giving up slots or subsequently providing them on demand to new entrants. Although there is currently a lack of consensus on this issue, this particular aspect of slot allocation tends to be treated as a competition issue, rather than one simply of slot allocation.

Improvements to the existing system

5.10 Given the situation and trends in the functioning of the current systems which base allocation of slots primarily on historical use with a use or lose rule, there are three possibilities for improvements that bear closer investigation and analysis. The first is a general one, applicable to coordinated airports. The other two are mutually exclusive alternatives, to be chosen on the basis of certain characteristics of an individual airport's traffic and would be employed as an additional option to existing airport slot allocation systems.

5.11 The general suggestion is that **independent coordinators** be appointed at each coordinated airport. In the IATA scheduling system, twenty-seven national airlines serve as coordinator for one or more

[2] One exception is the slots accorded to Canadian air carriers in the U.S./Canada bilateral air services agreement.

airports in their respective countries. This can place these airlines, or their employees, in an untenable position when called upon to decide, for example, whether a flight by the national airline has met the use or lose rule in order to retain a slot in a subsequent season. It is important that a coordinator not only be independent but also be thoroughly experienced in airline operations to ensure that schedule adjustments can actually work in practice. The requirement for an independent coordinator already exists in the EU common slot rules, and largely in response to this there are thirteen independent coordinators in the IATA scheduling system. In addition there are five governmental entities which act as airport coordinators.

5.12 One option for use with the current system at fully coordinated airports would be to accord a **preference to international flights based on stage length of the flight.** This would enable long-haul, non-stop international flights (particularly cross-continental flights), which usually have less flexibility than short-haul flights, to obtain the slots they need in a "window." Assigning slots for long-haul international flights first could result in domestic flights having to move to other slots. This could pose a problem for those international flights codesharing or interlining with domestic flights unless the process resulted in long-haul international flights occupying slots in the middle of a "window" and international connecting flights fitting on either side. Based on the traffic composition at fully coordinated airports in the IATA system in 1998, about 26 per cent had predominantly domestic traffic and for a further 20 per cent the traffic was roughly evenly divided between international and domestic. Although it had earlier considered that access to slots was important to ensure competition on European long-haul routes, the UK CAA subsequently concluded, on the basis of further analysis, that the position was less critical for long-haul routes and therefore requests for slots for such services should not be given special new entrant status.

5.13 Another option would be to accord a **preference at fully coordinated airports based on flight stage length alone.** This criterion should also be attractive to large traffic-generating countries with a significant amount of long-haul domestic flights, which would not be able to adjust as readily as short-haul flights. This option may also have an environmental benefit for the airports using it through promoting the switching of short-haul traffic from air to surface transport. A potential problem here, not present in the case of a preference for international flights, is that some short-haul international flights could be affected, involving a foreign country and bilateral obligations.

5.14 There will, of course, be airports where either of the foregoing alternatives would not be found helpful in accommodating more flights. As alternatives, while they would provide more flexibility, they would also be exceptions to IATA's general criteria, and would introduce more complexity to the system. After the initial use of either of the alternatives the current procedures of historical slots, use or lose, one for one slot exchanges would continue to be used. In terms of the EU common rules, this would be similar to the exception for community service routes. Nevertheless, the choice of whether to use either of these alternatives or continue with the existing criteria should depend on what best suits the needs of individual airports. Analyzing in detail how each of these alternatives would function at specific airports using current and proposed operations before actually putting either into effect would serve as a practical test of these concepts.

5.15 In addition to the above, and in light of the close link between airport and en-route capacity management, the following proposed improvements to the air traffic control component of the system could also help achieve an improved use of airport and en-route capacity.

5.16 Future IATA schedule coordination conferences should include the ATC components in the schedule evaluation. Current schedules at busy airports may have up to 20 aircraft scheduled to depart at exactly the same time. This is happening at many airports and could be called a "scheduled delay". In addition, many long distance flights, for example North Atlantic flights, are scheduled to cross at the same time, altitude and track. The penalties involved are scheduled penalties. The proposed schedules should be

simulated and potential bottlenecks on the ground and in the air should be identified. Minor alterations to the schedule at this time should mitigate the risks of congestion and penalties.

5.17 Future air traffic management systems should be based on collaborative decision making and include all users and air navigation service providers. Input to the system could be made by authorized users and service providers, and the distribution of information should be enhanced to include users and providers. This would ensure that all were aware of the current situation. Communications technology has advanced such that the distribution and input by all is now economically viable. This would result in active participation and cooperation to improve flight planning estimates, consideration of additional participants in the planning process and redistribution of decision making responsibility.

5.18 Regional air traffic flow management units should be established to provide a centralized flight plan processing and information distribution centre. All users should be required to file a flight plan at least two hours prior to departure. This flight plan would be converted into a four dimensional profile and introduced into demand and capacity calculations. If the demand on any component, including gates and terminal capacity, exceeds the capacity and the capacity cannot be increased, the user could be advised and an alternate solution proposed by the air traffic flow management unit or another appropriate authority. The user could then select the solution that best met its priority in that particular situation. Since the ATC environment is extremely dynamic, the demand and capacity ratio will also be dynamic. All participants would be able to monitor the evolving situation and base their decisions on this information. This process should maximize use of existing resources and identify the requirement to increase the capacity at defined air navigation services components to meet the demand.

Proposed alternatives

5.19 One frequently proposed alternative to the existing systems for slot allocation has been to permit airlines to purchase, sell and lease airport slots. By attributing a market value to slots, airlines would not hoard them but would have an incentive to use them efficiently to recover their cost. Auctioning of slots would need to be on a transparent and non-discriminatory basis. Concerns about potential anti-competitive results (e.g. undue concentration, abuse of a dominant position, etc.) could be addressed by competition law. Reliance on a market mechanism would enable airlines which are willing and able to mount new air services to obtain the slots they need without waiting a long time for them to become available. Airlines could therefore respond quickly to changes in demand for air services, exiting those markets which have become unprofitable and entering more profitable ones. Voluntary buying, selling and leasing of slots between airlines would result in the cost being viewed as a business expense, rather than a charge for using airport facilities.

5.20 The reliance on a pricing mechanism to allocate airport slots as a scarce resource has some support in economic organizations such as the Organization for Economic Cooperation and Development (OECD), and a number of fairly detailed proposals have been put forward. At least one European State believes that if congestion is not to be a barrier to effective competition on many of Europe's main air routes, then secondary trading in slots needs to be legitimised to supplement the current system of slot swaps; that trading would have to be transparent and safeguards against abuse might need to be incorporated. The idea of a secondary market in airport slots has been suggested in the European Commission, but objections have been raised on competition grounds that it would enhance the dominant position of larger airlines which would be in a position to buy up the available slots and exclude potential competitors. The United States experience with buying, selling and leasing slots could be helpful, although it was limited to certain domestic slots at four U.S. airports. For example, although in 1986 there was an initial surge in slot sales, purchases and leases, two years later the number of slot exchanges dropped to one-sixth the total in a market characterized by an

overabundance of buyers and a lack of sellers. There has been, however, a steady increase in the number of slots leased by operators from less than 1 per cent in 1986 to 4.6 per cent in 1993.

5.21 There are some aspects of a general buy/sell proposal for airport slots which require further study and analysis. First, on the legal side, a strict reading of the requirement of Article 15 of the Chicago Convention that charges for the use of an airport be no higher for foreign aircraft than national aircraft, would imply a single price for a slot (that of the national carrier) which would be difficult to square with an auction of slots by governmental or airport authorities based on the highest bid that resulted in different charges for national and foreign aircraft using the airport (unlike the situation with a peak period charge, in which the same charge is levied on all aircraft arriving or departing during the peak period, regardless of nationality). As noted earlier, there are non-economic constraints, principally environmental, on increasing airport capacity. If price increases for using the airport do not call forth increased supply in the form of new infrastructure (which should be the result in a market-priced system) in an increasingly competitive commercial air transport system, these additional costs would be recovered from consumers in the form of higher fares and rates. Finally, there needs to be a clear criteria for the application of competition law, for example, to an auction of slots or to their sale, purchase and lease among airlines to avoid anti-competitive results.

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